МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ЗАПОРІЗЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ

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ПРОФЕСІЙНО-ОРІЄНТОВАНИЙ ПРАКТИКУМ ІНОЗЕМНОЮ МОВОЮ

Навчально-методичний посібник для здобувачів ступеня вищої освіти магістра

спеціальності «Галузеве машинобудування»

освітньо-професійної програми «Металургійне обладнання»

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Навчально-методичний посібник призначений для здобувачів ступеня вищої освіти магістра спеціальності «Галузеве машинобудування» освітньо-професійної програми «Металургійне обладнання» для використання під час аудиторних занять.

Основною метою видання є формування англомовної професійно-комунікативної компетенції. До змісту включено теми, спрямовані на формування комунікативної компетенції в читанні та говорінні, розвиток умінь писемного мовлення, збагачення термінологічного словникового запасу.

У посібнику подано в систематизованому вигляді програмний матеріал дисципліни «Професійно-орієнтований практикум іноземною мовою». У виданні представлено теоретичний та практичний матеріал з 15 тем, об’єднаних у 4 розділи: Fundamentals of professional communication, Academic communication, Material Processing Equipment, Steelmaking Equipment. Структура розділів уніфікована і включає теоретичний матеріал, автентичні тексти професійно-навчальної спрямованості, комплекс мовних і мовленнєвих вправ та завдання, що сприятимуть розширенню активного тематичного словника й формуванню комунікативних умінь писемного та усного мовлення.

Видання спрямоване на формування у майбутніх машинобудівельників практичних навичок володіння англійською мовою в обсязі, необхідному для роботи з науковою літературою за фахом; навичок усного спілкування в професійній сфері в контексті окресленої тематики.

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ЗМІСТ

ВСТУП **4**

CHAPTER 1 FUNDAMENTALS OF PROFESSIONAL COMMUNICATION **6**

UNIT 1 CAREER **6**

UNIT 2 SOFT SKILLS **16**

UNIT 3 MY SPECIALTY **22**

UNIT 4 MACHINE DESIGN ENGINEERING **30**

CHAPTER 2 ACADEMIC COMMUNICATION **35**

UNIT 5 WRITING PAPERS, ABSTRACTS, SUMMARIES **35**

UNIT 6 WRITING PRESENTATIONS **43**

UNIT 7 WRITING QUALIFICATION PAPER SUMMARY **49**

CHAPTER 3 MATERIAL PROCESSING EQUIPMENT **52**

UNIT 8 MACHINE PARTS AND FASTENINGS **52**

UNIT 9 MATERIAL PROCESSING EQUIPMENT **60**

UNIT 10 FORGING MACHINES **67**

UNIT 11 ROLLING MILLS **79**

CHAPTER 4 STEELMAKING EQUIPMENT **89**

UNIT 12 CONTINUOUS CASTING MACHINE **89**

UNIT 13 ELECTRIC ARC FURNACES **97**

UNIT 14 OPEN HEARTH FURNACES **104**

UNIT 15 CONVERTER **112**

FINAL TEST **120**

APPENDICES **123**

GLOSSARY OF TERMS IN MACHINE BUILDING **123**

COMMON PHRASES USED IN ACADEMIC TEXTS **126**

ВИКОРИСТАНА ЛІТЕРАТУРА **132**

РЕКОМЕНДОВАНА ЛІТЕРАТУРА **133**

ВСТУП

Відповідно до робочої програми дисципліни «Професійно-орієнтований практикум іноземною мовою » є обов'язковою дисципліною у навчальному плані підготовки здобувачів ступеня вищої освіти магістра спеціальності «Галузеве машинобудування» освітньо-професійної програми «Металургійне обладнання» для студентів першого року навчання. Основним *завданням* курсу є формування навичок ефективної комунікації англійською мовою в академічному, науковому, професійному середовищі.

У результаті вивчення навчальної дисципліни студент повинен набути таких результатів навчання (знання, уміння тощо) та компетентностей: *загальні компетентності* (Здатність вчитися і оволодівати сучасними знаннями, здатність до пошуку, оброблення та аналізу інформації з різних джерел); *програмні результати навчання* (аналізувати інженерні об'єкти, процеси та методи, відшуковувати потрібну наукову і технічну інформацію в доступних джерелах, зокрема, іноземною мовою, аналізувати і оцінювати її, системно аналізувати інженерні об'єкти, процеси і методи в металургійній та суміжних галузях виробництва).

Для досягнення компетентностей студент повинен **знати:**

- базову фахову термінологію іноземною мовою;
- основні фахові міжнародні видання та науково-метричні бази даних із галузі машинобудування;
- можливості використання їх інформативного потенціалу для проведення досліджень;
- правила складання наукових статей, анотацій, доповідей іноземною мовою;
- правила складання CV іноземною мовою;

уміти:

- володіти й вільно оперувати фаховою англомовною термінологією;
- користуватися сучасними міжнародними академічними виданнями т а спеціалізованими науково-метричними базами даних із галузі машинобудування;
- користуватися сучасними спеціалізованими словниками з різних галузей науки і техніки;
- володіти електронними засобами перекладу як у режимі on-line, так і спеціалізованими програмними продуктами (Lingvo тощо);
- складати анотації та резюме статей іноземною мовою;
- писати наукові статті іноземною мовою;
- складати особисте резюме та CV;
- складати анотації до кваліфікаційних робіт та наукових статей іноземною мовою;
- розробляти презентації до доповідей і виступити на науковій конференції;
- здійснювати інноваційну діяльність в машинобудуванні;

- розуміти професійні і етичні стандарти діяльності, застосовувати їх під час діяльності у сфері машинобудування.

У виданні представлено теоретичний та практичний матеріал з 15 уроків, об'єднаних у 4 розділи: Fundamentals of professional communication, Academic communication, Material Processing Equipment, Steelmaking Equipment. Тексти висвітлюють загальні та сучасні питання машинобудівельної галузі. Структура кожного уроку уніфікована і включає:

- теоретичний матеріал (що висвітлює проблеми науково-технічного перекладу, бізнес комунікації, складання технічної документації, граматичних труднощів технічних текстів, написання наукових статей, анотацій, створення презентацій. Після кожного теоретичного блоку студентам пропонуються питання для самоперевірки у тестовому форматі;
- практичний матеріал, мета якого полягає в опрацюванні теоретичних знань. Практичні завдання спрямовані на активізацію певного лексичного, граматичного матеріалу та розвиток іншомовної професійної компетентності у говорінні та письмі.

Поєднання теоретичного та практичного матеріалу уможливлює працювати як індивідуально, так і самостійно.

Використання технології скаффолдингу (методики підтримуючої дії) сприяє ефективному вивченню англійської мови студентами немовних спеціальностей. Посібник надає вичерпні пояснення та ілюстративні приклади для кращого розуміння матеріалу та виконання завдань. Крім того, він містить чіткі алгоритми для послідовного виконання завдань, допомагаючи студентам систематизувати свої знання та навички.

Також, студентам запропоновано приклад підсумкового тесту з дисципліни, який є зразком залікового тесту на платформі Moodle. Тест акумулює знання і навички з вивченої дисципліни.

В якості додатка до видання включено англо-український словник термінів з машинобудування, необхідних для розуміння текстів видання. Окрім того, додаток містить список наукових кліше для написання анотацій до фахових статей та власне статей. Викладення матеріалу ґрунтується на принципах методики CLIL.

CHAPTER 1. FUNDAMENTALS OF PROFESSIONAL COMMUNICATION
UNIT 1. CAREER



THEORETICAL PART. FUNDAMENTALS OF TECHNICAL TRANSLATION

Read and check your understanding.

A technical translation is a type of translation that involves the translation of technical content from one language to another. Technical content includes documents, manuals, instructions, patents, software, and other technical materials that require specialized knowledge in the subject matter.

Accuracy is crucial in technical translations, as even a small error can have serious consequences in technical fields such as engineering, medicine, and law.

While quality and accuracy are always a priority in any translation project, they take on an even greater role when it comes to technical translations. This is because small inaccuracies can have serious consequences: fines, lawsuits, public embarrassment, or even patent rejection—with the subsequent inability of the company to continue operating in that market.

In other words, with technical translation, compliance and corporate responsibility are tightly linked to the quality of the technical translations that the company produces. Every specialty in technical translation has its own prerequisites and specialized terminology and requires a highly qualified, experienced team of linguists who are familiar with the field.

In the case of intellectual property rights (IPR)—which includes patents, copyrights, trademarks, trade secrets, licensing, and unfair competition—for example, translators need to master a very specific and highly regulated language. They also require interdisciplinary knowledge since they have to be familiar with aspects of technology, business, economy, and law.

Technical translation involves translating technical documents, such as user manuals, technical reports, and instruction manuals. These documents often contain highly technical and specialized terminology that requires an in-depth understanding of the subject matter. As such, technical translators are often highly skilled and specialized professionals with expertise in a particular field.

The use of technical translation in technical education has numerous benefits. It helps students access information previously unavailable to them due to language barriers. This, in turn, increases the quality and relevance of the education they receive, making them better prepared for the global workforce.

Requirements for technical translation:

Accuracy: Technical translation requires precision and accuracy to ensure the translated document conveys the same meaning as the source text. Technical translations must be reliable and trustworthy, as any translation error could lead to misunderstandings, errors, or accidents.

Quality: Technical translation requires specialized knowledge, vocabulary, and experience. A professional technical translator is trained to understand the nuances of technical language and can provide accurate and high-quality translations.

Speed: Technical translation projects are time-sensitive and require a quick turnaround. A professional translator with technical expertise can work efficiently to deliver translations promptly.
Compliance: Technical translation projects require compliance with industry standards, regulations, and legal requirements. A professional translator with technical expertise can ensure compliance with all relevant standards and regulations.

ChatGPT for technical translation.

ChatGPT is a general-purpose online language model that is not only designed for machine translation. Although the developers of ChatGPT claim that this technology can be particularly useful in industries where accuracy and precision are critical elements, there is still doubt about its efficacy. Industries that are highly regulated, such as the medicine and law industry uses complex terminology and content. They must also adhere to strict formatting guidelines. As the guidelines can vary globally, it can cause changes in the entire layout of the content. As a result, the content often needs extensive adaptation to suit foreign audiences and markets.

This is the reason why translations of highly regulated industries are challenging to get right. ChatGPT may be a powerful AI tool but it does not have the capacity and knowledge to make all the required adaptations. Additionally, the stakes for these highly regulated industries are high, as any mistake can possibly have legal and financial repercussions. Perhaps this is why it is suitable to trust professional translators for these industries instead of relying on the ChatGPT tool.

ChatGPT is an online tool that has wide uses in terms of delivering accurate and efficient results. While it can have huge benefits for certain industries such as technology, its efficacy may be questionable for the translation industry. Although speedy translations are easier to obtain with the help of ChatGPT, these translations may lack context. Nevertheless, with the combination of both human translation and ChatGPT, it can be ensured that the translations are accurate and professional.

Machine building terminology.

Machine building terminology has some peculiarities that are specific to the field. Here are some examples:
Standardization: Many terms in machine building come from standardized systems and conventions, such as metric or imperial measurements, industry-specific standards like ISO (International Organization for Standardization), and engineering norms like ASME (American Society of Mechanical Engineers).
Jargon and Acronyms: Like any specialized field, machine building has its own jargon and acronyms that may not be immediately familiar to outsiders. Terms like CNC (Computer Numerical Control), CAD (Computer-Aided Design), and CAM (Computer-Aided Manufacturing) are commonly used in the industry.
Modularity: Machine building often involves the assembly of modular components into larger systems. Consequently, there are many terms related to modular design, such as interfaces, mounting points, and compatibility standards.

Safety Terminology: Safety is paramount in machine building, so there are numerous terms related to safety features, regulations, and protocols. This includes terms for safety mechanisms like emergency stops, interlocks, and guarding systems.
Materials and Processes: Machine building encompasses a wide range of materials and manufacturing processes, leading to a diverse vocabulary related to materials (e.g., steel, aluminum, polymers) and processes (e.g., milling, turning, welding, casting).

Structural features of Machine Building terms

As noted by Karaban V.I. [5, p. 243], to accurately translate a term, it's important to understand its word formation and morphological structure, which categorizes terms into:

a) simple: *gear, bolt*. The main feature of simple one-word terms is their compactness, as they consist of only one component.

b) derivative: suffixal *milling, welding*; prefixal *overheating*; suffixal-prefixal *inflammation, microcontroller*.

c) compound, or term phrases: *safe distance, production risk, fuel rods*.

Compounds may consist of: N+N *conductor's valve*, Adj.+N *vertical component*, Participle I+ N *rectifying tube*, Participle II +N *fixed-in stabilizer*.

SELF-ASSESSMENT

1) What is technical translation?
   a) Translating technical documents from one language to another
   b) Translating literary works from one language to another
   c) Translating legal documents from one language to another
2) What are some of the challenges of technical translation?
   a) Understanding technical terms and concepts in the source language
   b) Finding the equivalent technical terms in the target language
   c) Maintaining consistency of terminology throughout the translation
3) What is localization in technical translation?
   a) Adapting a product or service to a specific locale or target market
   b) Translating technical documents for a specific industry
   c) Providing on-site interpretation services for technical conferences
4) Which of the following industries require technical translation?
   a) Medical and pharmaceutical
   b) Information technology
   c) Legal and financial
5) Which of the following translation tools can be used for technical translation?
   a) Translation memory software
   b) Machine translation software
   c) Terminology management tools
6) What is a technical glossary?
   a) A list of technical terms and their definitions

b) A glossary of common phrases in a language
c) A list of idioms and colloquial expressions in a language

7) What is a style guide in technical translation?
a) A set of rules for writing and formatting technical documents
b) A guide to translation quality assurance and best practices
c) A guide to using specific translation tools and software

8) What is the role of a technical translator?
a) Translating technical documents accurately and effectively
b) Understanding technical terms and concepts in the source language
c) Maintaining consistency of terminology throughout the translation

9) Which of the following factors can affect the quality of a technical translation?
a) The qualifications and experience of the translator
b) The use of appropriate translation tools and software
c) The amount of time and resources allocated for the translation project

10) What is back translation in technical translation?
a) Translating a document from the target language back to the source language
b) Translating a document multiple times using different translators
c) Checking the accuracy and consistency of a translation by having it translated back to the source language.

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:

employee/employer
a full-time/part-time job
job interview
to apply for a job
vacancy

to fire somebody, to sack somebody
to give somebody notice
unemployment
flexible timetable
salary
to work in shifts
to work overtime

II. Reading Text

Strategies to Build a Successful Career

Having a successful career will offer you a lot of benefits and real profitable opportunities. As we live in a world governed by social status and money, working your way up to the top will definitely improve your quality of life. There are many possible reasons for which an individual would desire success.

1. Identify Your Goals

You need to identify what are your biggest rational wishes. Then, start going deeper and make an in-depth introspection in which you should think about the connection between your inner desires and your rational goals.

They have to match. Otherwise, you will not be truly fulfilled with your professional life. Identifying your goals takes some time and effort, but it is a truly important process in any successful person's journey.

2. Build a Professional Resume

By taking care of this aspect, you are making sure that you'll never be caught off guard. Opportunities are everywhere, and you should always be ready with a quality resume. I believe that letting professionals deal with your resume is a productive choice.

3. Become Aware of Your Strengths

Awareness is an essential key to personal improvement. By being aware of your inner thoughts, your strengths, your desires, and your disadvantages, you can adapt your life to whatever conditions you' re being put through. You'll also get many benefits as you can leverage your knowledge and wisdom for the best purposes.

No matter your strengths and disadvantages, you should choose a career path that advantages your traits and qualities.

4. Assume Full Responsibility for Your Life

One difference between mediocre and successful professionals: responsibility. Even though you know the concept, you may not apply it every day. Whenever something bad happens, you need to assume it.

Start assuming responsibility for all of your actions and never blame anyone for your mistakes. That's the worst thing someone can do. Do not take things personally, and be calm.

5. Always Raise Your Standards

Here's another critical factor that differentiates the successful from the non-successful. Your standards influence the way you think, believe, and behave. If your standards are high, you'll never be satisfied with less than you can accomplish. People with high standards are most of the time more successful than the average.

Every two or three months take a moment to reflect upon your standards and values. Try to improve them bit by bit up until you realize that you've become the best version of yourself.

6. Brand Yourself

Branding is very important nowadays. Big companies are spending hundreds of millions in order to establish themselves as the "big dogs" in the marketplace. It is an old business strategy used by almost every professional company. Your branding is your image in the marketplace.

Professional employees should brand their names and services and constantly improve it. You can do that by starting a blog, creating a professional social media profile, or simply by providing awesome services.

7. Network -- A LOT

Networking is all about opportunities and connections. When you meet new people, you basically get a chance to use their skills to your advantage. Of course,

you must also give back something: your services, your knowledge, your money. Successful people always network and create those life-lasting profitable relationships.

Start by creating social media profiles on LinkedIn, Twitter, and Facebook. These three specific networks are the best choices when it comes to this type of activity.

✍ After-reading tasks

1. Insert the appropriate word or word combination from Vocabulary:

There are as many kinds of careers as there are people. They vary greatly in the type of work involved and in the ways they (1) _____ a person's life.

The kind of career you have can (2) _____ your life in many ways. For example, it can (3) _____ where you live and the friends you make. It can reflect how much education you have and can determine the (4) _____ of money you earn. Your career can also affect the way you feel about yourself and the way other people act toward you. By making wise decisions (5) _____ your career, you can help yourself build the life you want.

To make wise career decisions and plans, you need as much information as possible. The more you know about yourself and career (6) _____, the better able you will be to choose a (7) _____ career.

Learning about oneself. People differ in what they want from a career. Many people desire a high income. Some hope for fame. Others want (8) _____. Still others want to serve people and make the world a better place.

Before you begin to (9) _____ career fields, you should determine (a) your values; (b) your interests; and (c) your aptitudes (abilities). Most people are happiest in jobs that (10) _____ their values, interests, and aptitudes.

Each person has many values, which vary in strength. For example, money is the strongest value for some people — that is, wealth is more important to them than anything else. As a result, they (11) _____ their thoughts, behaviour, and emotions on the goal of earning a high income. Other values include devotion to religion, taking risks, spending time with family, and helping others. People should understand their values prior to making a career decision. You can develop an understanding of your values by asking yourself what is most important to you and by examining your beliefs. For example, is it important to you to work as a member of a team? Or would you rather be in charge or work alone? If working alone or being in charge is important to you, independence is probably one of your (12) _____ values.

	A	B	C	D
1	move	influence	persuade	guide
2	move	interest	disturb	affect

3	control	choose	determine	discover
4	amount	mass	volume	supply
5	in relevant to	concerning	respect	in a case
6	hours	moments	occasions	opportunities
7	satisfying	delightful	comfortable	suitable
8	accident	experience	adventure	incident
9	research	examine	inspect	explore
10	fit	agree	change	belong
11	move	meet	focus	follow
12	best	primary	elementary	primitive

2. Answer the questions:

1) Do you agree with all strategies for building a successful career?
2) What categories of people are a part-time job suitable for?
3) Is the unemployment level high in Ukraine?
4) What steps should you take to apply for a job?
5) Why is it difficult/easy to run a firm?
6) What are the most important criteria for a successful job?

3. Quiz:

1. Abilities relating to dealing with persons on the job
   a) Interpersonal
   b) Teamwork skills
   c) Networking
   d) Punctuality
2. A meeting between an employer and a job applicant
   a) board meeting
   b) interview
   c) on the job training
   d) negotiation
3. A person working for someone else
   a) employer

b) employee
c) co-worker
d) trainee

4. A form in which you supply information about yourself that will help an employer make a hiring decision
   a) References
   b) Summary
   c) CV
5. Someone who hires another person
   a) Employee
   b) Employer
   c) HR
   d) Job personnel
6. Making use of all your personal connections to achieve your career goals
   a) Teamwork
   b) Collaboration
   c) Negotiation
   d) Promotion
7. People who know an applicant well and can provide information about that person professionally
   a) Parents
   b) References
   c) Acquaintances
   d) Colleagues
8. Someone who applies for a job
   a) Candidate
   b) Applicant
   c) Employee
   d) Job seeker
9. Being able to easily accept new challenges
   a) Flexible
   b) Integrity
   c) Creativity
   d) Aptitude
10. An arrangement in which someone learns an art, trade, or job under another
   a) Courses
   b) apprenticeship
   c) training
   d) negotiation

4. Discussing the topic "Job satisfaction"

Work in pairs or groups. Arrange "job satisfaction features" in the order of importance. Make use of the relevant features and appropriate expressions for discussion:

Being able to learn new things
Earning plenty of money
Being part of a team
Meeting people through work
Having pleasant colleagues
Being praised by my superiors or bosses
A pleasant working environment
Using a foreign language
Financial independence
Good chances of promotion
Professional growth
Being a boss/exercising power
Status of my organization

The most important thing for me is…
The second important thing for me is….
I don't consider this aspect of my future job very important because…..
I'm afraid you are mistaken/wrong when you say that….
I think your opinion is absolute nonsense because….
It matters very little for me….
It matters very little in my job….
…. is less significant than….
…. is more significant/ more important than….
I don't attach too much importance to…

6. Write your own CV based on the sample

STEVEN TERRY

Sales Staff



CONTACTS

Male

May 19, 1992

986-2323-3434

Steven@3223.com

Http://steven-info.me

London, England

OBJECTIVE

Take advantages of sales skills & experience and understanding of market to become a professional Sales Staff and bring a lot value to Customers. From that, I will contribute to development of TOPCV Company.

SKILLS

Language: English, Japanese, Chinese

Computer: Word, Excel, Powerpoint

INTERESTS

I like soccer, music..

EDUCATION

Oct 2010 - May 2014

TOPCV University, Major: Corporate Administration

GPA: 3.6/4

Oct 2010 - May 2014

TOPCV University, Major: Corporate Administration

GPA: 3.6/4

WORK EXPERIENCE

June 2014 - Present

TOPCV JSC, Sales Staff

- Write and upload product advertising post via Facebook, Forum...
- Introduce, consult products and answer customers' queries via phone and email.

Nov 2013 - Jun 2014

TOPCV Shop, Part-time Sales Staff

- Sell goods for Foreigners and Vietnamese at the Shop
- Advertise products on media publications such as: banner, posters,leaflets...
- Make reports of sales every day.

ACTIVITIES

Jan 2014 - Feb 2014

TOPCV - EDUCATION TALK 2014, Member of US Ambassador

- Organize monthly events, network with US alumni
- Share how to hunt scholarships and US student's life experiences to all students who have received offers from US universities

HONORS & AWARDS

2013-2014: TOPCV Scholarship in 2nd semester 2012-2013 and 1st semester 2013-2014

REFERENCES

Mr: Jack Harison - Director of TOPCV JSC

Phone: 986-2323-3434

Unit 2. SOFT SKILLS



THEORETICAL PART
TRANSLATION PECULIARITIES OF MACHINE BUILDING TERMS

Read and check your understanding.

The same word in the source language can have different translations in English, for example, *граничнодопустиме значення шкідливого чинника* can be translated as *threshold value of harmful factor* or *permissible concentration*; *виробниче приміщення* can be translated as *industrial facilities*, while *виробниче середовище* can be translated as *work environment*. Such synonymy in English translation is mainly represented by doublets - semantically identical units.

Many Ukrainian terms formed by stem compounding in English translation are two-component terms: *вогнестійкість* is translated as *fire resistance*, *вогнезахист* as *fire protection*, *теплопровідність* as *thermal conductivity*, and т*еплообмінники* as *heat exchangers*. However, *турбокомпресор* in English translation has an equivalent stem compounding – *Turbocharge*r.

It should be noted that there are syntactic features of term translation. Government is a syntactic relationship between words in which the dependent word has the case required by the main word. The peculiarity of government in English terms is that it is non-prepositional. As a rule, prepositions are used in Ukrainian. For example, *шкода від пожежі* can be translated as *fire harm*, and *вимоги до систем вентиляції* as *ventilation system requirements*.

Transliteration: *конвертер – converter, кюмпель – kumpel; робот – robot; фільтр – filter; радіус – radius; плазма – plasma;*

Transformations. Transformations are used when the terms in the source text have a different structural-functional order in the target text. Among lexical, grammatical, and stylistic translation transformations in translating terms related to machine building engineering, grammatical transformations predominate:

substitution of singular with plural: *техніка безпеки – safety measures; виробничий травматизм – industrial injuries*;

change of a part of speech: *холодільний цикл - Refrigeration cycle, державний стандарт – the state standard*;

change in word order: *equipment vendor – постачальник обладнання; energy consumption – споживання енергії;*

addition: *energy audit scope – характер та обсяг робіт з енергетичного аудиту; energy audit reporting – представлення звіту за результатами енергоаудиту; maintenance work – роботи з технічного обслуговування;*

It should be noted that as a result of addition, Ukrainian terms usually become multi-component terms in English.

omission: *арматурний прокат в мотках – rebar in coils; шпиндель із підключенням через привідний ремінь – belt drive spindle; верстат розточувальний для чистової обробки – fine boring machine*.

Calque. This is a technique where the component parts of a word are translated by the corresponding elements in the target language. Calque can only be applied when the translation equivalent does not violate the norms of usage and word combination in the Ukrainian language. Calque is not always a simple mechanical operation aimed at transferring the source form into thetarget form. For example: *профілюванняі валків – profiling of rolls; гнучка автоматизація – flexible automation; допуск форми – form tolerance*.

Grammar transformations in translation of Machine Building terms

1) changing the Genitive case into the Nominative case:
- *регулювання валків – roll adjustment;*
- *регулятор тиску – pressure governor;*

2) the alteration of one word in Ukrainian by means of a phrase in the English translation:
- *чавун – cast iron*;

3) changing singular form into plural:
- *сира руда – crudes;*
- *холоднокатаний прокат – cold rolled products;*

4) omitting the preposition from the translation:
- *здатність до згинання – Bendability;*
- *допуск на корозію – Corrosion allowance.*

SELF-ASSESSMENT

1. What transformation is used in translation *Laval nozzle – насадка Лаваля*?
   a) Change of a part of speech
   b) change in word order
   c) substitution of singular with plural
2. What transformation is used in translation *load breaking isolator – вимикач навантаження?*
   a) Omission
   b) Addition
   c) Calque
3. What transformation is used in translation *measuring relay – вимірювальне електричне реле?*
   a) Omission
   b) Calque
   c) Addition
4. What transformation is used in translation *standby mode – режим очікування*?
   a) change in word order
   b) substitution of singular with plural
   c) Calque
5. What transformation is used in translation *enthalpy – ентальпія*?
   a) Transcription
   b) Calque

c) substitution

PRACTICAL PART

I. Preparation

Before reading study the following vocabulary:

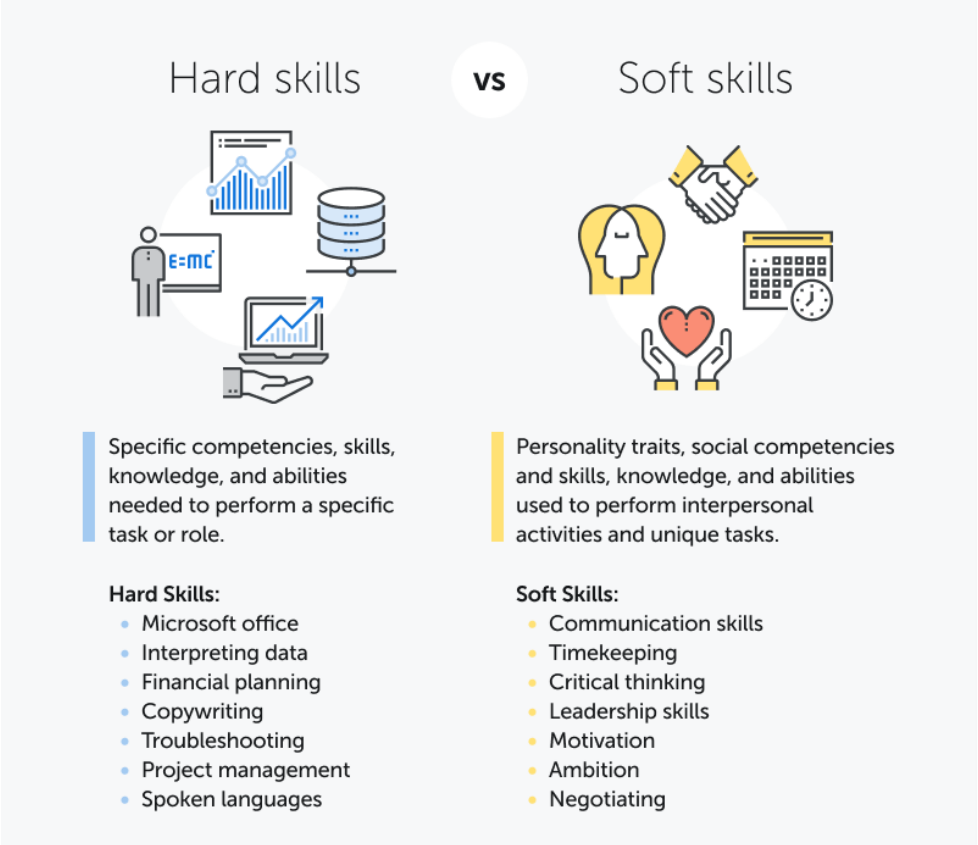
to perform
to define
abilities
negotiating
troubleshooting
measurable
specific tasks
requirements
accurate
to highlight
to elaborate

II. Reading Text

Hard skills vs. Soft skills

When you are looking for new recruits or promoting from within there will be a set of skills your roles require. Some skills people will have as part of their nature, while others need to be taught.

The hard skills can be defined as part of the role specification. And soft skills are defined as the person specification.



What are Hard Skills?

Hard skills are specific competencies, skills, knowledge, and abilities needed to perform a specific task or role. They can be learned through education and professional development. Usually, they are technical (but not always) and easily measurable.

Hard skills can be demonstrated through educational certificates or practical demonstrations.

For example, software development requires knowledge of some programming language and can be used for a variety of tasks, but the main goal is to write a computer program. The proficiency level can be easily measured.

Another example, design (of course it can be different - interior design, web design, etc.) but in general it is a specific skill set needed to perform exact tasks.

Microsoft suite knowledge, another example of hard skills, you can learn how to use Microsoft Word and Excel, and most often it will be needed for specific tasks.

So, each role will have different skill set requirements but they will be needed to perform a specific task.

Soft skills are personality traits, social competencies and skills, knowledge, and abilities used to perform interpersonal activities and unique tasks. Sometimes they are also called *human* skills.

Usually, they are more closely linked to people's personality traits they are born with and social skills. But they also can be trained and developed through practice and professional development.

Unfortunately, it is not that easy to gauge if someone has the right soft skills as there is less information to draw upon. This is especially true when hiring new employees as their soft skills will need to be assessed by getting to know them.

There are specific techniques and tests that can be used to measure soft skills, but note the results will be quite vague and not accurate. Only real-life situations will display how good people are in this area.

Certain soft skills you would ideally like all of your employees to have are punctuality and collaboration. Other skills might only be necessary for specific roles like leadership, communication, strategic thinking, and problem-solving.

Soft skills don't come with certification but they are easily identified while working with someone. People with leadership skills will naturally take ownership and step up to lead. Those who are excellent timekeepers will always be on time or be forthcoming about potential lateness.

How to highlight your skills throughout the interview process

Once you make it to the interview phase, you will have an opportunity to display your soft skills and elaborate more on your hard skills. You may be asked to display your hard skills with a test or portfolio.

You can highlight key soft skills by:

Showing up on time or early to the interview (punctuality or dependability)

Maintaining eye contact (active listening)

Speaking clearly when prompted (effective communication)

Answering questions about your resume and experience honestly (integrity)

Asking follow-up questions (active listening)

You can highlight your hard skills by:

Elaborating on your experience and training
Providing a portfolio (digital or physical)
Effectively answering technical questions related to the work
Asking follow-up questions related to the work
Effectively working through skills tests (if required at the interview)

(From: https://www.valamis.com/hub/hard-skills-vs-soft-skills)

✍ After-text exercises

1.Tick the sentences true/false:

1) Hard skills may be easy to observe, quantify, and measure.
2) Hard skills are not generally listed in the job postings or job descriptions.
3) Hard skills are often learned in schools, Universities, and from books.
4) Soft skills are the Non-Technical Skills necessary for success in the workplace.
5) Soft skills are not typically associated with the behaviors and personality traits of an individual.

2. Insert the appropriate word or word combination from Vocabulary:

1) Hard skills are technical (but not always) and easily ….
2) We need someone who is practiced at … business deals.
3) He's very good at … because he knows these computers as well as anybody.
4) The report … the need for improved safety.
5) He refused … on why he had resigned.
6) The figures they have used are just not …
7) We usually ask interviewees … a few simple tasks on the computer just to test their aptitude.
8) One of the …of the job is fluency in two or more languages.

3. Answer the questions:

1) What soft skills do you have?
2) What soft skills would you like to have?
3) Is it possible for a person to have all of them?
4) What soft skills should an engineer have?
5) What steps should be taken to develop soft skills?
6) What is troubleshooting
7) Evaluate your hard skills.

4. **Speak about the differences between hard and soft skills.**

5. **Find simple, derivative, complex terms in the text. Translate it into Ukrainian. What translation techniques did you apply?**

In the field of machine building, precision is paramount. Engineers utilize advanced CAD software to design intricate components with tolerances as tight as 0.001 inches. CNC machines, equipped with cutting-edge tooling, execute these designs with unparalleled accuracy. Modular systems, comprised of standardized components, facilitate rapid assembly and reconfiguration of production lines. Automated conveyors transport raw materials to machining centers, where robotic arms manipulate workpieces with dexterity. Quality control inspectors monitor the process, ensuring compliance with stringent industry standards. Predictive maintenance algorithms analyze machine performance data to anticipate component failures before they occur. Industrial robots, equipped with vision systems and force sensors, collaborate with human operators in a seamless workflow. Additive manufacturing technologies, such as 3D printing, enable the rapid prototyping of complex parts. Digital twins provide real-time insights into machine performance, allowing for optimization of production processes. Augmented reality systems overlay digital instructions onto physical machinery, guiding technicians through maintenance procedures. Industry 4.0 initiatives aim to integrate IoT devices and cyber-physical systems to create smart factories of the future."

UNIT 3. MY SPECIALTY



THEORETICAL PART

TRANSLATION OF MULTICOMPONENT TERMS

Read and check your understanding.

Multicomponent terms have great importance in any scientific or technical texts because they have a clear scientific definition, possess stability and semantic integrity of the concept being represented. Multicomponent terms include multi-word expressions with three or more components. For example, "*магнетичний динамічний генератор"* (magnetic dynamic generator) can be translated as "*magnetic hydrodynamic (MHD) generator*" and "*правила пожежної небезпеки*" can be translated as "*fire safety rules*."

The emergence of a significant number of multi-component terms in machine building terminology in is associated with the fact that this field has very close ties to a range of scientific and technical disciplines (physics, mechanics, electrical engineering, energy, mathematics, etc.). However, multi-component term-phrases can eliminate ambiguity in terminology.

Multicomponent terms in English consist of a base component (BC), one or several left modifiers (LM), and one or several prepositional modifiers (PM) that specify and modify the meaning of a term. English multicomponent terms with typical left deployment have dependent components that are located to left of the base component, while for Ukrainian multicomponent terms, the opposite is true with typical right deployment. This fact should be taken into account when translating multicomponent terms.

In general, the structural scheme of a terminological group in the target language (TL) can be presented in the following form:

LMn←LM2←LM1←**BC**

For example, a multi-component term "*акт про нещасний випадок на виробництві*" (literally "act about an accident at the production") is translated as "*occupational accident-related act*". The main component in the source language, "акт" (act), becomes the last component in the translated term, then the sequence of translated components is unfolded from left to right. Another example: *коефіцієнт використання стану – mill utilization factor*.

Here are some examples of English-Ukrainian term translations from the right to the left: *"energy transmission channel" - "канал передачі енергії", "combustion chamber pressure" – "тиск в камері згорання", product data management (PDM) – керування даними про вироби.*

It's worth noting that multi-component terms can also be translated through transformations (omission or addition). For instance, "voltage sensitive light emitting diode" became "світлодіод, чуттєвий до напруги" in Ukrainian, reducing from a five-component term to a three-component one. Conversely, "coordinate positioning control" became "числове програмне керування позиційне" in Ukrainian, expanding from a three-component term to a four-component one by addition. Another example of addition is "key for hexagon socket screws" translated

as "ключ для гвинтів з шестигранним отвором в головці" in Ukrainian, and "distance from spindle end to table" translated as "відстань від торця шпинделя до поверхні стола" in Ukrainian.

Thus, translating a multi-component term consisting of four, five, or more components means:

- establishing inter-component connections in the terminological phrase;
- identifying the main component – the headword of the term-phrase and translating it;
- translating all isolated basic terms within the multi-component term that are semantically related to the main component, based on context and taking into account the specific terminology of the corresponding science;
- performing the actual translation of the multi-component term (usually translating from right to left, starting with the main component, and coordinating the previously translated basic units with each other);
- verifying the accuracy of the translation using dictionaries, reference literature, or internet search engines to ensure that such a term actually exists in the professional construction environment.

To sum it up, the main way of creating multi-component terms is syntactic, i.e. non-prepositional. For English multi-component terms with typical left deployment, dependent components are located to the left of the main component, while for Ukrainian multi-component terms, on the contrary, right deployment is typical.

SELF-ASSESSMENT

1. What is a multicomponent term?
   a) A term that consists of multiple words
   b) A term that consists of multiple components that have specific meanings and are used in specific contexts
   c) A term that has multiple translations in different languages
2. What is the main method of creating multicomponent terms?
   a) Semantic derivation
   b) Syntactic derivation
   c) Borrowing from other languages
3. What is the typical word order for English multicomponent terms?
   a) Left-to-right
   b) Right-to-left
   c) It depends on the type of term
4. What is the main component of a multicomponent term?
   a) The first component
   b) The middle component
   c) The head component that gives the term its meaning
5. What is the process of translating a multicomponent term?
   a) Breaking it down into its individual components and translating each one separately
   b) Translating the term as a whole, without considering its components

c) Identifying the core component and translating it, while also considering the meanings of the other components in the specific context

6. What is the importance of considering the word order in multicomponent terms during translation?

a) It is not important and can be ignored

b) It is important for maintaining the correct syntax and grammar in the target language

c) It is important for determining the correct meanings of the individual components in the source language?

7. What are some strategies for verifying the accuracy of a translated multicomponent term?

a) Consulting dictionaries and reference materials

b) Checking the translation with a native speaker of the target language

c) Searching for the term in online databases and specialized resources

8. What is the most common direction for translating multicomponent terms?

a) Left-to-right

b) Right-to-left

c) It depends on the type of term and the language pair involved

9. What is the difference between a multicomponent term and a compound word?

a) There is no difference, they are synonyms

b) A multicomponent term is a technical or specialized term, while a compound word is a more general term

c) A compound word is a type of multicomponent term that is commonly used in everyday language

10. What is the purpose of using multicomponent terms in technical or specialized fields?

a) To create confusion and obscure meaning

b) To simplify communication and provide a precise, unambiguous vocabulary

c) To make communication more colorful and interesting

PRACTICAL PART

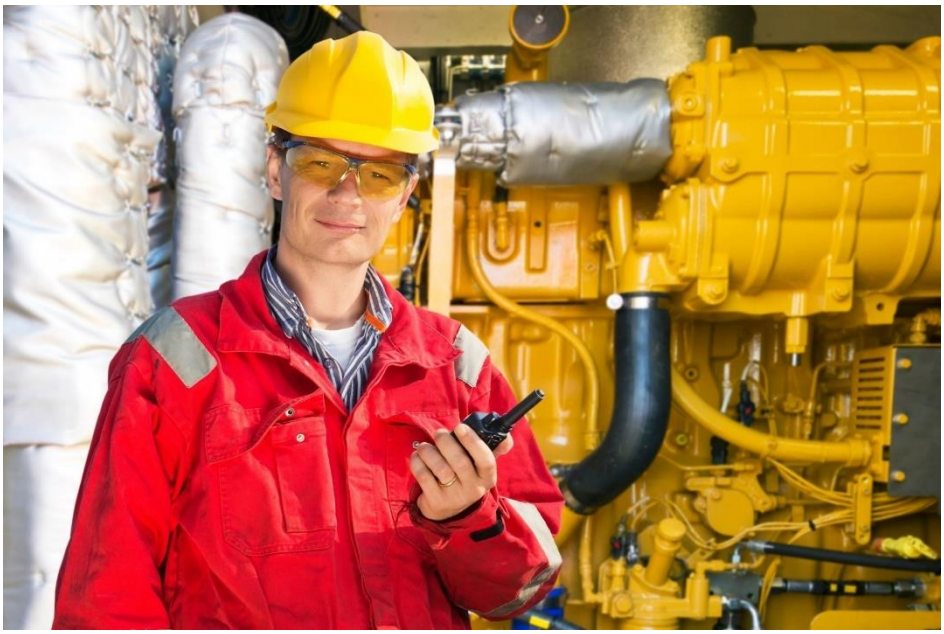
I.Preparation

Before reading study the following vocabulary:

Welding equipment
Sustainable mining practices
Mining pits
Design drawings
Field research
Alloys
Personal protective equipment
Conflict resolution
Quality assurance

II.Reading Text

Metallurgical Engineers: Career, Skills, Degree and Salary



Metallurgical engineering is the study and practice of transforming metals into useful everyday products. Metallurgical engineers can work in a variety of fields, from medical technology to automotive design and development. This field of engineering facilitates the creation of computer chips, aerospace components. The specific responsibilities of a metallurgical engineer can depend on their employer and their position. These are some duties a metallurgical engineer may manage:

Study different metals

One of a metallurgical engineer's primary responsibilities is to study various metals. They test metals and expose them to a variety of conditions to better understand the metal's characteristics.

A metallurgical engineer may also identify methods to extract and isolate metals for testing. The engineer can perform tests in the laboratory, or in the field. Field testing may require the engineer to withstand natural conditions like extreme heat and wind.

Use machines and welding equipment

A metallurgical engineer operates various machines and welding equipment. Some machines they use include electron microscopes, spectrographs and X-ray devices. This equipment helps them determine metals' properties and perform thorough research and development.

They also use advanced welding equipment to merge metals and create new alloys. Metallurgical engineers receive thorough training to ensure they use all machinery safely. They also wear the proper personal protective equipment at all times to preserve their safety.

Create drawings and maps

Depending on the engineer's specific role, creating maps and drawings can be a part of their duties. They may map out mining operations and determine where to find

specific metal deposits. The engineer may also use design drawings to illustrate new product ideas or testing methods.

Produce various types of reports

Part of the metallurgical engineer's role is documenting processes and results to communicate information and keep an accurate store of metal data. For example, they may create data analysis reports and regular interval reports to record new opportunities they discover through field research.

They also record accurate measurements of any tests they perform, like a metal's boiling point, thickness or pore size. Engineers record their observations while repeating tests to ensure accuracy.

Assist miners with mining projects

When necessary, a metallurgical engineer can assist miners with mining projects. They may help miners load and haul various metals and develop mining pits. A metallurgical engineer can also help mines run more sustainably so that these operations can minimize land disturbances and decrease waste production.

How to get a job as a metallurgical engineer

These are some steps you can follow to pursue a career as a metallurgical engineer:

1. Graduate from high school

Four-year programs for metallurgical engineering almost always require that you have a high school diploma or equivalent to apply. If you're still in high school and you want to pursue a career in metallurgical engineering, consider taking more classes focusing on physics, geology and calculus. If you didn't complete a traditional four-year high school program, you can obtain your GED.

2. Earn a bachelor's degree in metallurgical engineering

Once you have a high school education, you can apply to a university that awards four-year bachelor's degrees. Very few schools specifically offer metallurgical engineering programs, but it's helpful to apply for one of these to earn your bachelor's degree. If your desired school doesn't have a metallurgical engineering program, you may earn your bachelor's degree in geological engineering, chemical engineering or a related field.

3. Consider earning a master's degree

A master's degree isn't necessary to pursue a career in metallurgical engineering, but it can offer more opportunities. A postgraduate degree may qualify you for higher-paying positions that come with more responsibilities. For example, a metallurgical engineering manager may find work developing projects, training new employees, researching new products and performing quality assurance tests.

If you choose to pursue a postgraduate degree, prepare to take traditional courses, perform fieldwork and write a thesis. A master's degree may not be required for many positions. Engineers may want to obtain a master's to increase their salary or become more competitive in the job market.

5. Apply for metallurgical engineering positions

Once you earn an education and gain valuable experience, you can begin applying for full-time positions. Create a resume and cover letter that highlight your skills and qualifications. These are some skills you can include on a metallurgical engineer resume:

Heat treatment
Conflict resolution
Data gathering and analysis
Problem-solving
Metal manufacturing
Aluminum or titanium
Quality assurance
Leadership
Failure analysis
ASTM and ASME standards
Process improvement

(from: https://www.indeed.com/career-advice/finding-a-job/metallurgical-engineers)

✍ After-text exercises

1. Insert the appropriate word or word combination from the text:

1. Metallurgical engineers _____ various metals to better understand their characteristics.
2. They operate _____ and welding equipment to determine metals' properties.
3. Metallurgical engineers may also create _____ and drawings to illustrate new product ideas.
4. Part of their role involves documenting processes and results through _____.
5. Metallurgical engineers may assist miners with _____ projects to optimize operations.

2. Match the words with their definitions:

Electron Microscopes	a. Devices used to measure the intensity of light at different wavelengths in a spectrum.
Welding Equipment	b. Mixtures composed of two or more metallic elements or metallic and non-metallic elements.
Design Drawings	c. The study and practice of transforming metals into useful everyday products.
Data Analysis	d. The process of inspecting, cleaning, transforming, and modeling data to discover useful information.
Sustainable Mining Practices	e. Activities involved in extracting valuable minerals or other geological materials from the earth.
X-ray Devices	f. Machines that use electron beams to produce high-resolution images of microscopic structures.
Personal Protective Equipment	g. Measures implemented to minimize environmental impact and ensure responsible resource extraction.
Mining Pits	h. Protective gear worn to minimize exposure to workplace hazards and ensure worker safety.

3. Answer the questions:

1. What are the primary responsibilities of a machinery engineer within the field of mechanical engineering?
2. Can you describe the typical educational background and qualifications required to become a machinery engineer?
3. What are some key skills and competencies that are essential for success in the role of a machinery engineer?
4. How does a machinery engineer contribute to the design and development of industrial machinery and equipment?
5. What are some of the current trends and advancements in machinery engineering, and how do they impact the role of machinery engineers in the industry?
6. Is that profession essential in Ukraine? Why?
7. Why did you decide to become an engineer?

4. Write down multicomponent terms from Glossary (Appendix A) and the Text and complete the table:

multicomponent terms translated from the right to the left	multicomponent terms translated from the left to the right
1.	
2.	
3.	

5. Speak upon the topic "My Specialty" according to the template:

- Introduction (introduce your profession, explain why you chose it);
- Skills and Knowledge (describe the specific skills and knowledge required for your specialty);
- Work environment (explain the typical work environment, discuss any challenges or rewards associated with working in your fields);
- Career Paths (outline the various career paths, discuss any trends in the industry that may impact career prospects);
- Conclusion (summarize your thoughts on your specialty and its importance).

UNIT 4. MACHINE DESIGN ENGINEERING



THEORETICAL PART

STRUCTURAL PECULIARITIES OF MACHINE BUILDING TERMS

Read and check your understanding.

In machine building terminology, you'll often find a variety of structural peculiarities in terms based on their complexity and composition. Let's break down some examples:

Simple Terms: These are basic terms that consist of a single word representing a concept or component in machine building. Examples include "gear," "motor," "shaft," or "valve." Simple terms are straightforward and often serve as building blocks for more complex terminology.

Compound Terms: Compound terms are formed by combining two or more simple terms to create a new concept or describe a specific component or process. These terms typically follow a pattern of noun-noun or adjective-noun combinations. For instance, "gearbox," "hydraulic pump," "rotary encoder," or "control panel" are compound terms commonly used in machine building. They provide more precise descriptions by combining multiple elements into one term.

Complex Terms: Complex terms involve additional elements such as prefixes, suffixes, or modifiers to further specify or modify the meaning of the base term. These elements can indicate characteristics such as size, function, material, or operation. For example, "multi-axis CNC machine" includes the prefix "multi-" to indicate multiple axes, while "high-pressure hydraulic system" uses the modifier "high-pressure" to specify the system's pressure level.

Derivative Terms: Derivative terms are formed by modifying an existing term to create a new word with a related meaning. This modification can involve adding a prefix or suffix, altering the spelling, or combining elements from different languages. In machine building, derivative terms often arise from technological advancements, industry jargon, or specialized applications. Examples include "miniaturization," "roboticize," "lubrication," or "automated." The typical structure models for machine building terms are:

- Noun+Noun

Heat exchanger,
Power distribution,
Force sensor,
Voltage regulator,

- Participle I + Noun:

Pumping station,
Welding robot,
Cutting tool,
Mixing tank,

- Adj. + Noun + Noun:

linear displacement sensor,
high precision lathe,

- Noun+Noun+Noun:

gang type lathe,
bevel gear cutter,

- Participle II +Noun+Noun:

integrated machine system,
finished goods warehouse.

When translating from one language to another, understanding the structural model of terms in the source language helps translators accurately convey the intended meaning in the target language. Understanding the structural model of terms facilitates the identification of equivalent expressions or constructions in the target language that best capture the original meaning.

SELF-ASSESSMENT

1. Which of the following terms represents a simple term?
a) Variable-speed drive motor
b) Gear
c) Precision machining
d) Multi-axis CNC machine
2. Identify the multicomponent terms term:
a) Hydraulic pressure sensor
b) Automated assembly line
c) Control panel
d) Heavy-duty conveyor
3. Identify the complex term below:
a) Heavy-duty conveyor
b) Precision machining
c) Variable-speed drive motor
d) Power distribution
4. What type of term is "lubrication"?
a) Simple
b) Compound
c) Complex
d) Derivative
5. Determine the derivative term in the list below:
a) Roboticize
b) Gearbox
c) Conveyor belt
d) Hydraulic cylinder

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:

Components
CAD/CAM
Requirements
Displacement
Torque
Fluid
Gears
Shafts
Couplings
Planar
Revolve

III.Reading a text.

What Is Machine Design Engineering?

Machine Design Engineering (also known as Machine Design, Mechanical Engineering Industry) is an engineering discipline that covers the application of principles of physics for manufacturing or otherwise creating objects, mechanisms, machines, and tools. It is the branch of engineering that combines mathematics, materials science, and engineering for the design, analysis, manufacturing or operation of machines and tools.

This discipline focuses on the combination of different machine elements such as mechanical components (such as gears, bearings etc.), electrical components (such as wires), hydraulic components (such as pipes) to accomplish a given task. Machine Design Engineering is a vast field that includes many sub-disciplines such as manufacturing engineering, CNC programming, CAD/CAM, CMM etc.

Machine designing involves a high degree of mathematics and physics to produce desired precision and aesthetics in the machine or tool that is being designed. The built by the engineer should be fully functional and must satisfy the requirements of the end-user. The machine design engineer should be able to judge what degree of accuracy is expected from a particular machine or tool and then produce a design that will result in the desired level of performance.

What Are Machine Elements?

Machine elements are the discrete building blocks that are used to construct a machine. These components are either solid or fluid in nature and have distinct properties of flow, heat transfer etc.

The most basic machine element is the solid member, which has no capability of traveling through itself at any time. Solid members can be classified further into linear members and non-linear members. Linear members are subject to displacement under load, whereas non-linear members come into play only when they are subjected to an applied force or torque.

The fluid elements include the following: control piping, air ducts, hydraulic cylinders & hoses, gas storage cylinders, and pressure vessels, etc.

There are many more machine elements that are used in the construction of machines, these include gears, shafts, spindles, couplings, clutches and brakes, bearings, etc.

What Is A Mechanism?

A mechanism is a collection of machine elements that work together to perform a task. It is a combination of solid and fluid elements that allows a machine to do more than what its individual elements can accomplish. For example, a car is a mechanism that uses a motor to drive the wheels and gears that transfer the power from the engine to the drive axles. The different types of mechanisms are:

1. Planar Mechanisms – it involves only planar motion of links around a single axis.
2. Spherical Mechanism – it is the one in which links revolve around a point, called as the center of rotation.
3. Cylindrical Mechanism – it involves rotational motion around a non-perpendicular line that passes through the center of rotation.

What are the Types of Machines?

There are three types of machines:

1. Mechanical Devices – these are simple devices that use energy to perform a task.
2. Machines – these are complex devices that use energy to perform a task and have the ability to transmit power from one part of the machine to another.
3. Systems – this is a combination of two or more machines that perform a task.

What are Different Types of Machine Design?

The process of designing is integral to machine design engineering. The initial step in designing is to create a sketch of the machine or assembly that one hopes to design. This enables the designer in understanding the need and concept of what it takes to solve a particular problem with a machine. Designing begins with a clear definition of problems, development of ideas and concepts for solving these problems. Then it is followed by the development of a design and its analysis with the help of engineering science and mathematics. Most machine design engineers use computer-aided design (CAD) tools for their work.

(FROM: HTTPS://WWW.NEVATIO.COM/RESOURCES/MACHINE-DESIGN-ENGINEERING)

SELF-ASSESSMENT

1. What is Machine Design Engineering primarily concerned with?
a) Application of principles of biology
b) Application of principles of chemistry
c) Application of principles of physics
d) Application of principles of mathematics
2. Which of the following is NOT mentioned as a sub-discipline of Machine Design Engineering?
a) Manufacturing engineering
b) CNC programming
c) Aerospace engineering
d) CAD/CAM

3. What are machine elements?
a) The energy source of a machine
b) The discrete building blocks used to construct a machine
c) The mathematical formulas used in machine design
d) The aesthetic features of a machine
4. What distinguishes linear members from non-linear members among machine elements?
a) Linear members are made of metal, while non-linear members are made of plastic.
b) Linear members are subject to displacement under load, while non-linear members are not.
c) Linear members are used in planar mechanisms, while non-linear members are used in cylindrical mechanisms.
d) Linear members are only used in mechanical devices, while non-linear members are used in machines and systems.
5. What is a mechanism?
a) A collection of machine elements that work together to perform a task
b) The energy required to operate a machine
c) The mathematical representation of a machine's operation
d) The study of motion within a machine
6. Which type of mechanism involves links revolve around a point called the center of rotation?
a) Planar Mechanism
b) Spherical Mechanism
c) Cylindrical Mechanism
d) Rotary Mechanism
7. What are the three types of machines mentioned in the text?
a) Mechanical Devices, Systems, Tools
b) Machines, Systems, Mechanisms
c) Mechanical Devices, Machines, Systems
d) Tools, Mechanisms, Systems
8. What is the initial step in the process of designing according to the text?
a) Creating a sketch of the machine or assembly
b) Developing ideas and concepts
c) Defining problems
d) Analyzing the design with engineering science and mathematics
9. Which tool is commonly used by machine design engineers for their work?
a) Hand tools
b) Power tools
c) Computer-aided design (CAD) tools
d) Measuring tools
10. What does CAD stand for?
a) Computer-Aided Design
b) Creative and Design
c) Computer Analysis Design

d) Calculated Automated Design

✍ After-text exercises

1. **Answer the questions**:
2. What is the primary objective of Machine Design Engineering?
3. What are some sub-disciplines mentioned within Machine Design Engineering?
4. What are machine elements, as described in the text?
5. How are linear members distinguished from non-linear members among machine elements?
6. What is CAD commonly used for in Machine Design Engineering?

2.True/false:

1. Machine elements are the mathematical formulas used in machine design.
2. Linear members among machine elements are subject to displacement under load.
3. A mechanism is a combination of machine elements that work together to perform a task.
4. Planar Mechanism involves rotational motion around a non-perpendicular line that passes through the center of rotation.
5. Systems are a combination of two or more machines that perform a task.

3. Complete the table: write down the terms from Glossary according to their morphological structure:

Simple	Derivatives	Complex	Compond

4. **Speaking.** Discuss the role, importance, and challenges of Machine Design Engineering in modern industry according to the plan:

The definition and scope of Machine Design Engineering.
The application of principles of physics, mathematics, and materials science in machine design.
The role of CAD/CAM and other technologies in machine design.
The significance of precision and aesthetics in machine design.
The challenges faced by machine design engineers in today's industry.



CHAPTER 2. ACADEMIC COMMUNICATION
UNIT 5. WRITING PAPERS, ABSTRACTS, SUMMARIES, ANNOTATIONS, CONFERENCE PROCEEDINGS

THEORETICAL PART

Read and check your understanding.

Academic papers, abstracts, annotations, etc. belong to formal style.

Formal style includes:

- impersonal not colloquial or chatty language
- only facts
- not irrelevant details
- use of reporting verbs and passive voice
- no use of short forms

The structure of an **academic paper** can vary depending on the specific discipline, journal or publication guidelines, and the nature of the research. However, a typical structure may include the following sections:

Title page: Includes the title of the paper, the authors' names and affiliations, and the date of publication.

Abstract: Provides a brief summary of the research, including the research question, methods, results, and conclusions.

Introduction: Introduces the topic and research question, provides background information and context, and outlines the purpose and objectives of the study.

Literature Review: Reviews the relevant literature related to the research question, and synthesizes the previous research to establish a theoretical framework or research gap that the current study addresses.

Methods: Describes the research design, participants or subjects, data collection procedures, and analysis methods.

Results: Presents the findings of the study, usually with the aid of tables, graphs, and figures.

Discussion: Interpretation of the results, analysis of the data, and comparison to previous research.

Conclusion: Summarizes the main findings of the study, identifies the implications and contributions of the research, and suggests avenues for future research.

References: Lists all the sources cited in the paper according to the required citation style.

Appendices (optional): Includes additional material that supports the study, such as questionnaires, transcripts, or additional figures and tables.

You can find common phrases used in academic papers in Appendix B.

Annotation is a shorten version of the paper written for people who may never read the full version. There are 2 types: descriptive and informative. *Descriptive annotation*: present tense. Generalized vocabulary and phrases.

Informative annotation: past tense. Precise specific language including numbers.

Annotation structure:

1. Introduction (explanation)\explanation of the title.
2. Discussing the characteristic features of the problem (the aim of the research).
3. Methods and materials describing method equipment and conditions of the experiments.
4. Results (main findings).
5. Pros and cons (recommendations).
6. Conclusion.

Clinches for annotation writing

The object (purpose) of this paper is to present (to discuss, to describe, to show,

to develop) …

The paper (article) discusses some problems relating to (deals with some aspects

of, considers the problem of, presents the basic theory of, and provides information

on) …

The objective of this article is …

The work is divided into … major parts.

The first part deals with …

Then follows a discussion on …

Then the author goes on to the problem of …

The next part presents (describes, discusses) …

After discussing the author turns to …

The final part states …

The conclusion is that the problem is …

According to the author …

The author concludes that …

In summing up the author …

Evaluating the situation the conclusion can be drawn that …

In my opinion (to my mind, I think) …

The paper is interesting (not interesting), of importance, valuable (invaluable), upto-

date (out-of-date), useful (useless) …

It gives (doesn't give) me more technical terms …

It enlarges (doesn't enlarge) the scope in the sphere of …

An abstract is a 150- to 250-word paragraph that provides readers with a quick overview of your essay or report and its organization. It should express your thesis (or central idea) and your key points; it should also suggest any implications or applications of the research you discuss in the paper

Typically, an abstract for paper or presentation is one or two paragraphs long (120 – 500 words). Abstracts usually spend

- 25% of their space on the purpose and importance of the research (Introduction)
- 25% of their space on what you did (Methods)
- 35% of their space on what you found (Results)
- 15% of their space on the implications of the research

Sample of an abstract:

Purpose	This paper analyzes how novices and experts can safely adapt and transfer their skills to new technology in the medical domain.
Methods	To answer this question, we compared the performance of 12 novices (medical students) with the performance of 12 laparoscopic surgeons (using a 2D view) and 4 robotic surgeons, using a new robotic system that allows 2D and 3D view.
Results	Our results showed a trivial effect of expertise (surgeons generally performed better than novices). Results also revealed that experts have adaptive transfer capacities and are able to transfer their skills independently of the human-machine system. However, the expert's performance may be disturbed by changes in their usual environment.
Implications	From a safety perspective, this study emphasizes the need to take into account the impact of these environmental changes along with the expert's adaptive capacities.

A summary is the information from a text or an article. The summary contains an essential information of the literary sources. Writing summary one must understand the main ideas of any reading paper. The information of the original literary sources should be compressed. Summary is written for people who have already read the whole thing.

Steps for writing a summary.

1. Identify the main idea.
2. Decide what you are going to leave out. Include the most essential details.
3. At the beginning include some sentences stating the subject matter of the summary, where the original text came from, and the original author's name.
4. State the author's opinion and not your own.
5. Make sure your verb tenses are appropriate.
6. Make the summary short, not more than 1/3 of the original text.

Guidelines for writing a summary.

1. Read the whole original text quickly to gain an impression of the content and its

relevance to your work.

2. Highlight the main points in every paragraph as you read.

3. Make notes of your own on these points.

4. Put away the original and rewrite your notes in your own words in complete sentences.

5. Begin your summary with the statement of the main idea at the start.

6. Using your notes write out supporting points in well-connected sentences.

7. Reread your work to check that you have concluded all the information than you need.

Pattern for writing a summary.

Definition

The main idea is…..(to+V); according to the writer, a_____is.

Description

According to the writer, a___has (characteristics).

Classification

(Two) types of_____were discussed in the lecture.

Chronology

The writer explained the sequence of events for_____.

Comparison

The writer compared_____with_____.

Contrast

The writer contrasted_____with_____.

Cause and effect

The writer explains why_____.

Problem and Solution

The writer presents several solutions for the problem of._____.

Abstract	**Summary**	**Annotation**
Is a shortened version of the paper written for people who never read the full version.	Restates the main findings and conclusions of a paper and is written for people who have already read the whole thing.	What is it about; goals.

Conference Proceedings

Conference proceedings are the publications of papers presented at a conference. A conference may require that papers missing the publication deadline for the proceedings cannot be presented at the conference. Proceedings usually contain four kinds of information:

• purpose or rationale of study (why they did it)
• methodology (how they did it)
• results (what they found)
• conclusion (what it means) It is not easy to include all the information in just a few words.

Start by writing a summary that includes whatever you think is important, and then gradually prune it down to size by removing unnecessary words, while retaining the necessary concepts. Some rules:

- Scientific writing must be accurate. Although writing instructors may tell you not to use the same word twice in a sentence, it is okay for scientific writing.
- Make sure you say what you mean.
- Be careful with commonly confused words.

For example: *Temperature has an effect on the reaction. ≠ Temperature affects the reaction.*

I used solutions in various concentrations. ≠ I used solutions in varying concentrations.

Less food (can't count numbers of food), but: Fewer animals (can count animals) A large amount of food (can't count them), but: A large number of animals.

The erythrocytes, which are in the blood, contain hemoglobin. ≠ The erythrocytes that are in the blood contain hemoglobin. (Wrong. This sentence implies that there are erythrocytes elsewhere that don't contain hemoglobin.)

- Write in a formal style, but at a level appropriate for your audience.
- Use verbs instead of abstract nouns (Instead of: take into consideration – Write: consider)
- Use strong verbs instead of 'to be' (Instead of: The enzyme was found to be the active agent in catalyzing... – Write: The enzyme catalyzed...)
- Use short words and short sentences. A sentence made of more than 40 words should probably be rewritten as two sentences.
- Check your grammar, spelling and punctuation. Use a spellchecker, but be aware that they do not catch all mistakes. Don't use commas.

SELF-ASSESSMENT

1. What is the typical order of sections in an academic paper?
   a) Introduction, methods, results, discussion, conclusion, references
   b) Introduction, literature review, methods, results, discussion, conclusion, references
   c) Introduction, background, methods, results, discussion, conclusion, references
2. What is the purpose of the introduction section in an academic paper?
   a) To provide a summary of the methods used in the study
   b) To discuss the significance of the research
   c) To present the results of the study

3. What is the literature review section of an academic paper?
   a) A summary of the data collected during the study
   b) A discussion of the methods used in the study
   c) A review of the relevant research and theories related to the study
4. What is the purpose of the results section in an academic paper?
   a) To discuss the implications of the research
   b) To present the data collected during the study
   c) To provide a summary of the research question and methods used
5. What is the conclusion section of an academic paper?
   a) A summary of the study's results and their implications
   b) A discussion of potential future research
   c) An explanation of the methods used in the study

PRACTICAL PART

1. Answer the questions:

1. What do you mean the word “annotation”?
2. What does the concise annotation?
3. What types of annotation do you know?
4. What stages of annotation do you know?
5. What is the recommended volume of annotation?

2. Read the text, entitle and write the annotation.

The internal combustion engine (ICE) is an engine in which the combustion of a fuel occurs with an oxidizer (usually air) in a combustion chamber. In an internal combustion engine the expansion of the high temperature and pressure gases, that are produced by the combustion, directly apply force to a movable component of the engine, such as the pistons or turbine blades and by moving it over a distance, generate useful mechanical energy. The term *internal combustion engine* usually refers to an engine in which combustion is intermittent, such as the more familiar four-stroke and two-stroke piston engines, along with variants, such as the Wankel rotary engine. A second class of internal combustion engines use continuous combustion: gas turbines, jet engines and most rocket engines, each of which are internal combustion engines on the same principle as previously described. A large number of different designs for ICEs have been developed and built, with a variety of different strengths and weaknesses. While there have been and still are many stationary applications, the real strength of internal combustion engines is in mobile applications and they completely dominate as a power supply for cars, aircraft, and boats, from the smallest to the biggest.

3. As you know any scientific article consists of a certain structure and starts

with an abstract. Look through the abstracts and try to identify their composition and purpose.

Abstract example (1)

Numerical simulation was performed of the motion of a viscous incompressible no isothermal fluid (heat carrier) in an open rectangular cavity under conditions of forced convection and conjugate heat exchange. The effect of the jet dynamic parameter (Reynolds number) and fluid flow conditions on the character of motion and heat exchange of viscous incompressible no isothermal fluids in rectangular cavities is studied. A hydrodynamic pattern of viscous flow in an open cavity under forced convection conditions (in the conjugate and no conjugate formulations of the problem) is obtained. The effect of parameters of the model on the character of motion is studied. Temperature profiles for the solid and fluid phases are obtained. The effect of parameters of the model on the character of temperature distribution in both phases is studied.

Simulation, viscous, conjugate heat exchange, rectangular cavity, temperature distribution

Abstract example (2)

The scientific text is about superconductivity. The performance of wires made from yttrium, barium, copper and oxygen is getting tantalizing close to what is needed to compete with conventional conductors. A new generation of wires has been produced by the scientists of the USA (CA). This product is available on the market and the operational principle is higher than the former. The production arises on a lot of discourses in the scientific world. The performance of the wires of new generation is competitive with conventional conductors.

Superconductivity, wires, produce, scientist, conductors

4. Read the abstract of the article "Optimizing Efficiency and Sustainability in the Machine Building Industry": what are the peculiarities of a scientific style?

Abstract

The machine building industry faces increasing pressure to enhance efficiency and sustainability amidst evolving technological and environmental challenges. This paper presents a comprehensive study aimed at optimizing these crucial aspects through advanced material selection and process optimization techniques. Leveraging a combination of computational simulations and experimental validations, we analyze the performance of various materials, considering factors such as mechanical properties, durability, and eco-friendliness. Furthermore, we propose novel process optimization strategies to minimize energy consumption and waste generation during manufacturing processes. Our findings demonstrate significant improvements in both efficiency and sustainability metrics, offering actionable insights for practitioners in the machine building industry to achieve higher productivity and reduced environmental impact. This research contributes to the ongoing discourse on advancing industrial practices towards a more sustainable future.

5. Find any Ukrainian article in your field and write an abstract in English based on the given sample (also see Appendix)

1. The article (paper, book, etc.) deals with…	1. Ця стаття (робота, книга тощо) стосується…
2. As the title implies the article describes…	2. Згідно з назвою, у статті розглядається…
3. It is specially noted…	3. Особливо варто відмітити…
4. Basic information on … is presented.	4. Надається основна інформація про …
5. The text gives a valuable information on…	5. Текст надає цінну інформацію щодо …
6. The paper consists of …parts (chapters). The paper contains the following parts: ……	6. Робота складається з … частин (розділів). Робота складається з наступних частин:…
7. The article is of great help to …	7. Ця стаття стане у нагоді…
8. The article is of interest to…	8. Ця стаття становить інтерес для…
9. It (the article) gives a detailed analysis of …, contains the data on…	9. Стаття дає детальний аналіз…, містить дані про…
10. Special attention is given (paid) to…	10. Особлива увага приділяється…
11. It should be stressed (emphasized) that…	11. Варто зазначити (підкреслити), що …
12. The method proposed …	12. Запропонований метод...



UNIT 6. WRITING PRESENTATIONS
THEORETICAL PART

Read and check your understanding.

Here are some tips on how to make a proper presentation:

Know your audience: Before creating your presentation, you should consider who your audience is, what their interests are, and what they hope to learn from your presentation. This will help you tailor your presentation to meet their needs.

Set clear goals: Determine what you want to achieve with your presentation and set clear goals. This will help you focus your presentation and ensure that your message is clear and concise.

Use a clear structure: Organize your presentation into a clear structure, using headings and subheadings to group related information together. This will help your audience follow your message and understand the key points.

Use visuals: Use visuals such as images, charts, and graphs to help illustrate your points and make your presentation more engaging. Ensure that your visuals are high-quality and relevant to your message.

Practice your delivery: Practice delivering your presentation multiple times to become familiar with the content and build your confidence. Time yourself to make sure you stay within the allotted time frame.

Engage your audience: Engage your audience with interactive elements such as questions, polls, or group discussions. This will help keep their attention and make your presentation more memorable.

Collect feedback: After your presentation, collect feedback from your audience to improve your future presentations. Consider what worked well and what could be improved upon for next time.

Useful phrases for presentations:

Introduction

- Good morning/afternoon everyone and welcome to my presentation. First of all, let me thank you all for coming here today.
- Let me start by saying a few words about my own background.
- As you can see on the screen, our topic today is.....
- My talk is particularly relevant to those of you who....
- This talk is designed to act as a **springboard** for discussion.
- This morning/ afternoon I'm going to take a look at the recent developments in...

Presentation structure

- In my presentation I'll focus on three major issues.
- This presentation is structured as follows....
- The subject can be looked at under the following headings.....

- We can break this area down into the following fields....

Timing

- It will take about X minutes to cover these issues.

Handouts

- Does everybody have a **handout** / copy of my report?
- I'll be handing out copies of the slides at the end of my talk.
- I can email the PowerPoint presentation to anyone who would like it.
- Don't worry about taking notes, I've put all the relevant statistics on a **handout** for you

Questions

- If you have any questions, I am happy to answer them
- If you don't mind, I'd like to leave questions until the end of my talk /there will be time for a **Q&A** session at the end...

Sequencing phrases

- My first point concerns...
- First of all, I'd like to give you an overview of....
- Next, I'll focus on.....and then we'll consider....
- Then I'll go on to highlight what I see as the main points of....
- Finally, I'd like to address the problem of.....
- Finally, I'd like to raise briefly the issue of....

Highlighting information

- I'd like to put the situation into some kind of perspective
- I'd like to discuss in more depth the implications of....
- I'd like to make more detailed recommendations regarding....
- I'd like you to think about the significance of this figure here
- Whichever way you look at it, the underlying trend is clear

Conclusion

- I'd just like to finish with the words of a famous scientist/ politician/ author.....
- Now let's go out and create opportunities for...!

SELF-ASSESSMENT

1) What is the purpose of a presentation?
   a) To inform or persuade an audience

b) To entertain an audience
c) To sell a product or service

2) What are the key elements of a successful presentation?
a) Clear and concise message, engaging visuals, and effective delivery
b) Complex and technical information, large amounts of text, and monotone delivery c) Humorous anecdotes, flashy animations, and excessive use of jargon

3) What is the recommended amount of text on a slide?
a) 5-7 words
b) 10-12 words
c) As many words as necessary to convey the message

4) What is the rule of thirds in slide design?
a) Dividing the slide into three equal parts horizontally and vertically
b) Placing important elements on or near the intersecting points of imaginary lines dividing the slide into thirds
c) Using three different font styles or sizes on each slide

5) What is the recommended font size for text on slides?
a) 12-14 points
b) 16-18 points
c) 20-22 points

6) What is the recommended length of a presentation?
a) 30-45 minutes
b) 60-90 minutes
c) As long as necessary to convey the message

7) What are some common presentation delivery techniques?
a) Using a conversational tone, maintaining eye contact with the audience, and using gestures to emphasize key points
b) Speaking in a monotone voice, reading directly from the slides, and avoiding eye contact with the audience
c) Speaking loudly and quickly, using slang or profanity to engage the audience, and pacing back and forth across the stage

8) What is the purpose of rehearsing a presentation?
a) To ensure a smooth and confident delivery
b) To memorize the entire presentation word-for-word
c) To save time and avoid making changes to the presentation

9) What is the recommended format for presenting numerical data?
a) Using graphs or charts to visualize the data
b) Presenting the data in a table format
c) Describing the data in detail using text

10) What is the recommended way to end a presentation?
a) Summarizing the main points and leaving the audience with a memorable message
b) Abruptly ending the presentation without a conclusion
c) Repeating the introduction and thanking the audience for their time

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:
Extensive
Segmentation
Nonferrous
Smelting
Resonate
Implications
Transparency
Systematize
Sustainable
Indispensable

II. Reading Text

Metallurgical Equipment Market trends

What is Metallurgical Equipment?

Metallurgical Equipment plays a crucial role in the extraction, processing, and refinement of metals, making it indispensable for numerous industries. As a Consultant or Industry expert, it is imperative to stay informed about the growth dynamics and trends of this market. Extensive market research indicates a consistent rise in the demand for metallurgical equipment due to a surge in industrialization, urbanization, and infrastructure development across the globe. The market is expected to experience steady growth in the coming years, driven by advancements in technology, increasing efforts towards resource optimization, and the exploration of alternative raw materials. This growth trajectory presents promising opportunities for businesses operating in the metallurgical equipment sector as they navigate the evolving demands and challenges of the industry.

Study of Market Segmentation (2023–2030)

The metallurgical equipment market consists of various types of equipment used in the ironmaking, steelmaking, and metal rolling processes. Ironmaking equipment includes blast furnaces, direct reduction furnaces, and sinter plants. Steelmaking equipment comprises electric arc furnaces, oxygen converters, and ladle furnaces. Metal rolling machines are used in the shaping and rolling of metal products.

In terms of application, the metallurgical equipment market finds significant use in the steel industry and nonferrous metals sector. The steel industry relies on metallurgical equipment for the production of various steel products, including construction materials, automotive parts, and machinery components. The nonferrous metals market, encompassing metals like aluminum, copper, and nickel,

also employs metallurgical equipment for smelting, refining, and processing purposes. This equipment plays a crucial role in enhancing the productivity, efficiency, and quality of the steel and nonferrous metal production processes.

Automated processes and digitalization

Digitalization is yet another significant aspect of modern metallurgy. It is aimed at full automation of the enterprises, with the employment of robots in dangerous working areas resulting in increased workers' safety. Equipment monitoring systems and effective tools will increase the transparency of processes contributing to the optimization of all the working procedures.

Digitalization will also make it easier to check surfaces and working parts in real-time to determine the quality of the completed product and to systematize faults.

Digitalization has both tremendous business and human impacts. It is necessary to acquire new skills and competencies. People will have to adapt to a new style of working, which will include learning, self-improvement strategies, sharing a transparent work culture, and making decisions based on numerous data. As we can see, innovations are much more than just brilliant ideas. A well-thought-out strategy and far-reaching planning, taking into account possible difficulties, are also required. Thus, the strategy of the metallurgy industry will continue to develop in the following directions:

- meeting future demands on new products encouraging product innovation, for new social and economic problems solutions;
- constant improvement of materials' characteristics and performance;
- optimization of exploration, manufacturing, processing, and recycling;
- empowering modern technologies and infrastructure.

In the nearest future, advances in material science and metallurgy will give possibilities to improve traditional metallurgy, taking into account its key issues in the economics, energy, environment, and social aspects, using improved current and completely new processes. These developments will have a huge influence on the global economy as well as society's social image.

(FROM: https://medium.com/@jeffrystehr/metallurgical-equipment-market-trends-and-market-analysis-forecasted-for-period-2023-2030-d9ed08767874)

✍ After-text exercises

1. Answer the questions:

1) How do current market trends in the metallurgical equipment industry reflect broader global shifts in industrialization, urbanization, and infrastructure development?

2) What are the key benefits and challenges associated with the digitalization of metallurgical processes, particularly in terms of automation, equipment monitoring, and skill development?

3) In what ways can businesses in the metallurgical equipment sector leverage advancements in material science and process optimization to drive innovation and meet future demands for new products?

4) What strategic considerations should companies operating in the metallurgical equipment market take into account when planning for future growth and competitiveness, given the evolving landscape of technology, market trends, and societal needs?

2. **Creating presentations**. Identify the key components of the presentation, such as the introduction, market segmentation analysis, impact of digitalization, future directions, and conclusion. Create 10-12 presentation slides with detailed content for each section, incorporating text, images, and data visualizations as needed.

UNIT 7. WRITING QUALIFICATION PAPER SUMMARY

THEORETICAL PART

 ***Read and check your understanding.***

Qualification Paper is an independent study of a specific scientific or artistic issue or an artistic accomplishment illustrating the student's general knowledge and skills related to a particular field of study, the level and profile of education, and the ability to carry out an independent analysis and formulate conclusions.

The Qualification Paper should demonstrate the following from the student concerning the field of study:

• Awareness and understanding of important current work in the field; • Ability to plan a research activity;

• Knowledge and motivation to carry out the planned research activity;

• Ability to analyze the results of the research;

• Ability to draw reasonable conclusions from the research;

• Ability to complete a written description of the work in the form of a well-written, properly organized thesis;

• Ability to complete a thesis with potential for presentation at and/or participation in professional meetings and/or publication in scholarly journals.

Qualification Paper should have the following structure:

– title page;

– summary;

– contents;

– introduction;

– list of abbreviations and symbols (if necessary);

– chapters of the main body (not less than two);

– conclusions;

– bibliographic reference list;

– appendices (if necessary)

The summary is a key part of your thesis and part of what is evaluated by your thesis committee. Make sure to reserve sufficient time at the very end to write a very good summary. The summary should be about one page long and include your research question, describe the data you used, briefly describe the methodology applied and (very important) also summarize the results you found. Summary elements:

Purpose: should start by describing the main purpose or aim of the research.

Methods: as a second point, the methodology carried out should be explained.

Results: a concise summary of the results should be included.

Conclusion: a short outline of the general outcome of the research should be given.

Keywords: specific words and phrases related to the topics discussed in the research should be added. These words are usually around five, but the number can vary depending on the journal's guidelines.

PRACTICAL PART

1. Read a summary and answer the questions:

Title: "Optimizing Efficiency in Machine Building: A Comprehensive Analysis"

This thesis delves into the intricacies of machine building with a focus on optimizing efficiency in manufacturing processes. Through a rigorous examination of industry practices, the research identifies key challenges and opportunities for improvement. Utilizing a combination of theoretical frameworks and empirical analysis, the study investigates the impact of various factors on productivity, quality, and cost-effectiveness. Results reveal insights into the effectiveness of different strategies and technologies, shedding light on best practices for enhancing overall efficiency in machine building operations. By addressing these findings, industry stakeholders can make informed decisions to streamline processes, reduce waste, and maximize output. The conclusion highlights the importance of continuous improvement and adaptation to meet evolving demands in the competitive landscape of machine building.

1. Does the summary clearly outline the main purpose or aim of the research in the machine building industry?
2. Does the summary provide concise results or conclusions of the research?
3. Are there specific keywords related to machine building topics included in the summary?
4. Is there an appropriate balance between description and analysis in the summary?
5. Does the summary adhere to the necessary elements of a thesis summary, such as purpose, methods, results, and conclusion?

2. Read a summary and answer the same questions:

Title: "Enhancing Sustainability in Machine Building: Innovations and Challenges"

Purpose: The primary objective of this research is to explore strategies for enhancing sustainability within the machine building industry. This includes investigating innovative technologies, processes, and practices aimed at reducing environmental impact, optimizing resource utilization, and promoting social responsibility.

Methods: The research methodology involves a comprehensive review of literature, case studies, and industry reports related to sustainable practices in machine building. Additionally, empirical analysis and case studies are conducted to examine the effectiveness of various sustainability initiatives implemented by machine building companies.

Results: The findings of this research highlight the importance of adopting sustainable practices in machine building, including the use of renewable materials, energy-efficient manufacturing processes, and waste reduction strategies. Furthermore, the study identifies key challenges and barriers to achieving sustainability goals in the industry.

Conclusion: In conclusion, this research underscores the critical role of sustainability in the machine building sector and provides insights into effective strategies for promoting environmental stewardship and social responsibility. By embracing sustainable practices, machine building companies can enhance their competitiveness, mitigate risks, and contribute to a more sustainable future.

Keywords: Sustainability, machine building, environmental impact, resource utilization, social responsibility, renewable materials, energy efficiency, waste reduction, sustainable practices.

3. Make a glossary of terms related to your research topic.

Term	Description	Ukrainian equivalent

4. Speaking.

Conduct a comprehensive review of academic papers relevant to your research topic in machine building. The purpose of this assignment is to deepen your understanding of existing literature, identify key trends, gaps, and controversies in the field, and synthesize findings to inform your own research project.

Review and Analyze Papers: Read and critically evaluate the selected papers, focusing on their relevance, quality, and contribution to the field. Pay attention to key concepts, methodologies, findings, and conclusions presented in each paper. Highlight important insights, strengths, and limitations of the research.

5. Write a summary to your qualification paper (purpose, methods, results, conclusion, keywords).

CHAPTER 3. MATERIAL PROCESSING EQUIPMENT

UNIT 8. MACHINE PARTS AND FASTENINGS

THEORETICAL PART
EDITING OF MACHINE TRANSLATION



Read and check your understanding.

When a computer rather than a human performs an initial translation, editing and proofreading are crucial for revising and improving the text. Machine translation engines like Google and Bing are much better than they used to be, but they still produce inaccurate or confusing phrases, so an expert (who is often a translator trained in editing techniques) needs to edit the text to remove errors and correct word choice. This specific type of translation editing and proofreading is called machine translation post-editing, and it focuses on errors unique to machine-generated results.

Proofreaders work with almost-finalized drafts and cover the following topics:
major grammar mistakes
spelling and punctuation
word choice inconsistencies
typos and cut-and-paste errors
formatting problems

Handy tips:

1) Get rid of words that do not contribute to the meaning of a sentence, or words that over-complicate the structure.

   Good example: He works on marketing projects.

   Bad example: He is the man who works on marketing projects.

2) Keep your sentences short, with a simple grammatical structure. Where possible, break long sentences into two shorter ones
3) Avoid ambiguity, use the active voice

The active voice is a style of writing that cuts out vagueness and ambiguity. Again, if a human is unsure on the exact meaning of a phrase, then a machine translation engine is going to struggle, especially if your sentence has a double meaning.

Good example: I will always remember my first time using a machine translation engine.

Bad example: My first time using a machine translation engine will always be remembered.

4) Use the definite article, even when you don't want to

Try to specify nouns using "the", as a machine translation engine can struggle to distinguish between verbs and nouns. A lot of short nouns can also be verbs, for example 'skip', 'bank', 'lodge' – these can cause further confusion if used without a definite article. Instructions and user manuals often omit the definite article.

Good example: Build the engine. Train the engine. Use the engine.

Bad example: Build engine. Train engine. Use engine.

5) Avoid idioms/clichés/slang/colloquialisms/abbreviations

A machine translation engine may not convey the correct meaning of colloquial or idiomatic phrases and the meaning may not make sense to international users.

Good example: She didn't come into the office as she was not feeling well.

Bad example: She didn't come into the office as she was under the weather.

5) Avoid the preposition – of more than three times within a sentence. Instead, -of phrases convert into multicomponent terms.

SELF-ASSESSMENT

1. Which of the following is NOT a common error in machine translation?
   a) Missing words
   b) Incorrect verb tense
   c) Inconsistent terminology
   d) Perfect grammar and syntax
2. True or False: Machine translation is always 100% accurate.
   a) True
   b) False
3. Which of the following is a good strategy for proofreading machine translation?
   a) Reading the translation out loud
   b) Comparing the translation to the original text
   c) Using a spell-checker
   d) All of the above
4. Which of the following is NOT a benefit of machine translation?
   a) Speed
   b) Cost-effectiveness
   c) Accuracy
   d) Personalization
5. True or False: Machine translation is a replacement for human translators.
   a) True
   b) False

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:

Fastenings
Bearings
Rivets
Screws
Expenditures
Lubrication
Rolling mills
To grind
Welding

To assemble

II.Reading Text

Bearings

Machine parts refer to the individual components or elements that collectively make up a machine. These parts can vary widely depending on the type and function of the machine, ranging from simple components like bolts and gears to complex assemblies such as engines and turbines. Machine parts are designed to perform specific functions within a machine, such as transmitting power, controlling motion, or supporting loads. They are typically manufactured to precise specifications using materials suitable for the intended application, ensuring durability, reliability, and performance. Examples of machine parts include bearings, shafts, pistons, valves, gears, cams, and housings, among many others. Each part plays a crucial role in the overall operation and functionality of the machine, contributing to its efficiency, accuracy, and safety.

Bearings are "parts that assist objects' rotation". They support the shaft that rotates inside the machinery. Machines that use bearings include automobiles, airplanes, electric generators and so on. They are even used in household appliances that we all use every day, such as refrigerators, vacuum cleaners and air-conditioners.

Bearings support the rotating shafts of the wheels, gears, turbines, rotors, etc. in those machines, allowing them to rotate more smoothly. In this way, all sorts of machines require a great many shafts for rotation, which means bearings are almost always used, to the point where they have become known as "the bread and butter of the machine industry". At first glance, bearings may seem like simple mechanical parts, but we could not survive without bearings.

They fulfill the following two major functions:

Function 1: Reduce friction and make rotation more smooth. Friction is bound to occur between the rotating shaft and the part that supports the rotation. Bearings are used between these two components. The bearings serve to reduce friction and allow for smoother rotation. This cuts down on the amount of energy consumption. This is the single most important function of bearings.

Function 2: Protect the part that supports the rotation, and maintain the correct position for the rotating shaft.

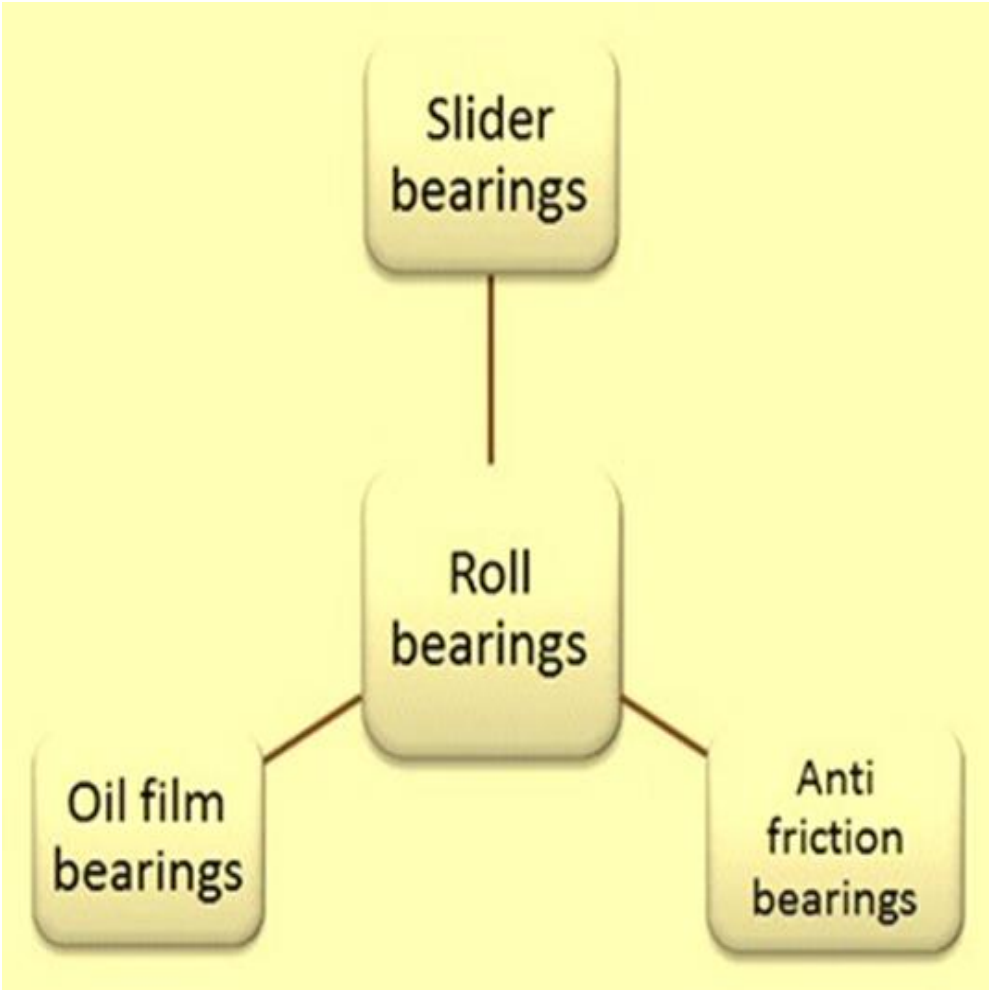
A large amount of force is needed between the rotating shaft and the part that supports the rotation. Bearings perform the function of preventing damage from being done by this force to the part that supports the rotation, and also of maintaining the correct position of the rotating shaft. This function of bearings is what allows us to use our machines over and over again for an extended period of time.

Roll neck bearings need proper lubrication for the enhancement of the overall efficiency. Proper lubrication of the bearings not only increases the bearing life but also reduces frictional and energy losses.

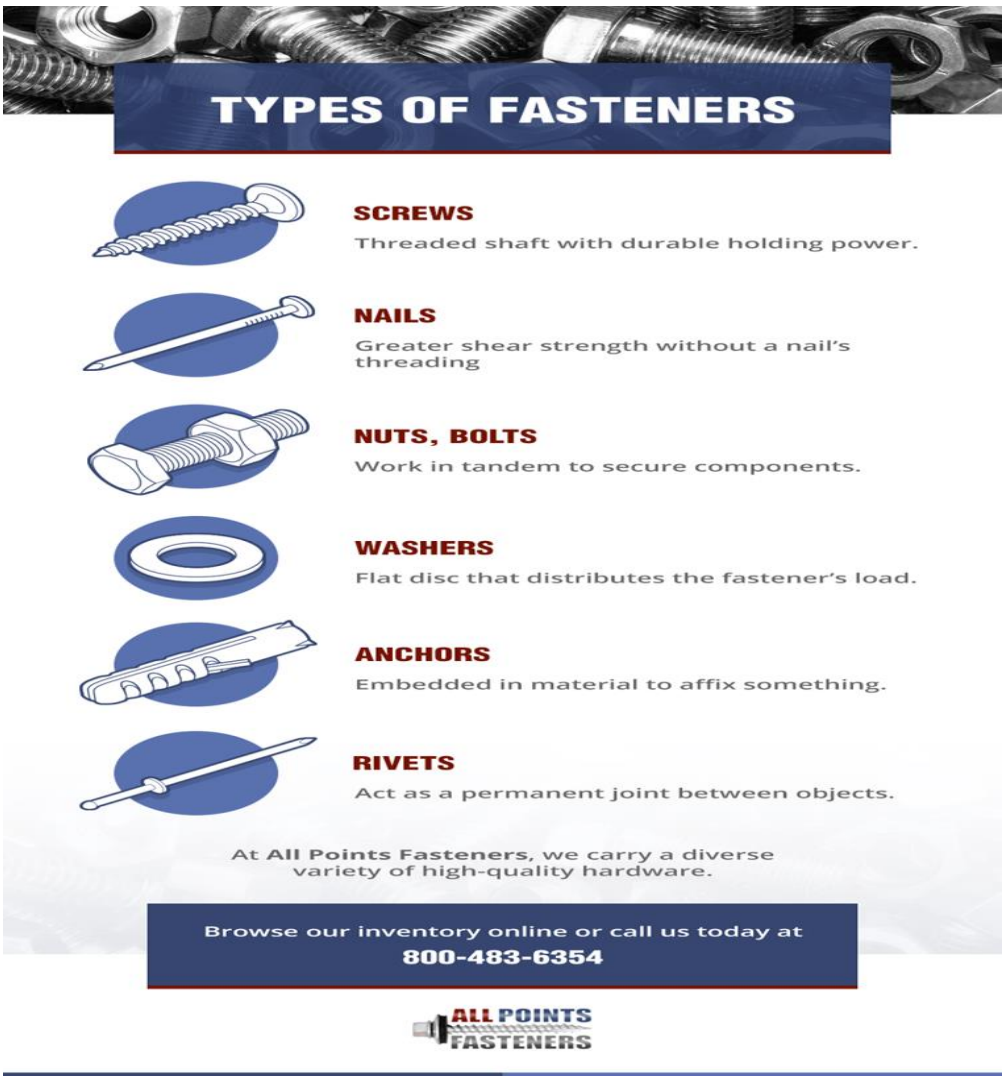
Different types of bearings for rolls are used in different types of rolling mills for the meeting of the specific requirements of the mills. Some types of bearings need substantial capital investment but low recurring expenditures while other types of

bearings need low capital investments and substantial recurring expenditures. There are the three basic types of bearings which are used in different rolling mills. These are slider bearings, anti frictional bearings, and oil film bearings or hydrodynamic bearings.

Types of roll bearings



Machine parts fastenings. Some form of fastening, such as welding, riverting, direct threaded joints, bolting, or keying, must be used in assembling the individual members to form a complete machine or structure.



from: https://allpointsfasteners.com/blog/types-of-fasteners.html)

✍ **After-text exercises**

1. **Do a comprehension quiz:**

1. What is the main function of bearings in machines?
a) Transmit power
b) Control motion
c) Support loads
d) Reduce friction and make rotation smoother
2. Which of the following is NOT an example of a machine part?
a) Gears
b) Bearings
c) Housings
d) Refrigerators
3. What is the purpose of bearings in machines like automobiles and airplanes?
a) To transmit electricity
b) To support rotating shafts
c) To generate heat
d) To provide illumination

4. What are the two major functions of bearings as described in the passage?

a) Providing illumination and generating heat

b) Transmitting power and controlling motion

c) Reducing friction and supporting loads

d) Reducing energy consumption and increasing friction

5. Which type of bearing is designed to take extreme abuse from the environment in which they operate?

a) Slider bearings

b) Anti-frictional bearings

c) Oil film bearings

d) Roll neck bearings

6. What is one way to enhance the overall efficiency of roll neck bearings?

a) Increase frictional losses

b) Reduce lubrication

c) Proper lubrication

d) Increase energy losses

7. What are the three basic types of bearings used in different rolling mills?

a) Slider bearings, anti-frictional bearings, and oil film bearings

b) Gears, pistons, and valves

c) Bolts, nuts, and rivets

d) Housings, cams, and shafts

8. Which function of bearings allows us to use machines over an extended period of time?

a) Transmitting power

b) Reducing friction

c) Supporting loads

d) Maintaining correct position for rotating shafts

9. What happens to operating bearings and other components over time in rolling mills?

a) They improve

b) They remain unchanged

c) They can be detrimental

d) They become obsolete

10. Which type of bearing requires low capital investments and substantial recurring expenditures?

a) Slider bearings

b) Anti-frictional bearings

c) Oil film bearings

d) Roll neck bearings

2.Answer the questions:

1. How do bearings contribute to the overall efficiency and performance of machines in various industries?
2. Can you explain the difference between slider bearings, anti-frictional bearings, and oil film bearings, and their respective applications in rolling mills?

3. What are some common challenges faced in maintaining and lubricating roll neck bearings, and how can these challenges be addressed?
4. How do machine part fastenings, such as bolts and rivets, play a role in ensuring the structural integrity and stability of machines?
5. In what ways do machine parts like gears and pistons contribute to controlling motion and transmitting power within mechanical systems?

3. True/false:

1. Bearings are primarily used to generate heat in machines.
2. Anti-frictional bearings are designed to withstand extreme abuse from their operating environment.
3. Proper lubrication of roll neck bearings can increase frictional losses.
4. Oil film bearings require substantial capital investments but have low recurring expenditures. (False)
5. Machine part fastenings, such as bolts and rivets, are not essential for ensuring the stability of machines.

4. Match the terms with their definitions:

Term	**Definition**
Fasteners	Components designed to prevent the unintended loosening or movement of fasteners.
Sleeve bearings	Bearings designed to withstand heavy axial and radial loads, commonly used in automotive applications.
Locking devices	Bearings with a cylindrical shape, often used in low-speed and high-load applications.
Tapered roller bearings	Bearings utilizing a film of lubricating oil to reduce friction and support rotating shafts.
Hydrodynamic bearings	Mechanical devices used to join or secure components within a machine or structure.

5. Analyze the Google translation of Master's thesis titles and edit them

Title	Google Translate	Proofreading
Обгрунтування раціональних параметрів розподільника шихти конусного завантажувального пристрою доменної печі	Justification of the rational parameters of the charge distributor of the conical loading device of the blast furnace	

Підвищення ефективності конвеєра стрічкової машини розливки чавуну	Increasing the efficiency of the conveyor of the cast iron casting machine	
Обгрунтування геометричних параметрів безконусного завантажувального пристрою доменної печі	Justification of the geometric parameters of the coneless loading device of the blast furnace	
Дослідження роботи та удосконалення конструкції натискного механізму стана гарячої прокатки	Study of the operation and improvement of the design of the pressure mechanism of the hot rolling mill	
Дослідження режимів роботи та обґрунтування раціональної конструкції механізмів барабанного змішувача шихти	Study of operating modes and substantiation of the rational design of the mechanisms of the drum mixer of the charge Study of operating modes and rational design substantiation for the drum mixer mechanisms in the charge.	

6. **Role play.** Complete the dialogue:

Technician: Good morning! I've been tasked with maintaining our metallurgy equipment.

Metallurgist: Of course. What specific machine parts are you interested in?

Technician: I'm particularly interested in the components used in our furnace system. Can you provide some insights?

Metallurgist: Absolutely. Let's start with the refractory lining in the furnace.

Technician: Ah, yes. I've noticed some wear and tear on the refractory lining.

Metallurgist: How often should it be replaced?

Technician: It depends on factors like….. Generally, it's recommended to …..

What about the heating elements in the furnace?

Metallurgist: Check them for signs of wear or damage.

Technician: …… ….

Metallurgist: Bearings are another critical component, especially in equipment with ….. . Proper …. and …… can prevent breakdowns and extend their lifespan.

Technician: I'll ensure we prioritize bearing maintenance moving forward.

7. **Make a presentation on machine fastenings (description, functions, application).**

UNIT 9. MATERIAL PROCESSING EQUIPMENT



THERETICAL PART
GRAMMAR PECULIARITIES OF TECHNICAL TEXTS

Read and check your understanding.

Technical texts have their own set of grammar peculiarities that distinguish them from other types of texts. Some of these peculiarities include:

Passive voice: Technical texts tend to use the passive voice more often than other types of texts. This is because technical writing is often focused on processes and procedures rather than on people or actions. E.g. "The experiment was conducted under controlled conditions to ensure accuracy."

Gerund. The gerund is a verb form that functions as a noun and is created by adding "ing" to the base form of the verb. In technical texts, gerunds are commonly used to describe ongoing actions, processes, or activities. E.g. "The software automates the process of converting raw data into visualizations." Gerunds can also be used to describe actions that are happening simultaneously. For example, "The machine is constantly monitoring the temperature and adjusting accordingly" uses "monitoring" as a gerund to describe an action that is happening simultaneously with the action of adjusting the temperature.

Additionally, gerunds can be used to create lists of actions or to group similar actions together. For example, "The design process includes researching customer needs, creating prototypes, and testing functionality" uses gerunds to group together the various actions involved in the design process.

Present tense: Technical texts often use the present tense to describe processes and procedures that are ongoing or repeated.

Specialized vocabulary: Technical texts rely heavily on specialized vocabulary, which may include technical terms, acronyms, and jargon. These terms may not be familiar to the general reader, but are necessary for communicating technical information effectively.

Sentence structure: Technical texts tend to use longer and more complex sentences than other types of texts. This is because technical writing often requires precise and detailed explanations of complex concepts.

Abbreviations: Technical texts often use abbreviations to save space and simplify language. However, it's important to define abbreviations when they are first introduced to ensure that readers understand their meaning. *CTS - coolant through spindle, HRSG - Heat Recovery Steam Generator, LHV - Lower Heating Value, NGCC - Natural Gas Combined Cycle, O&M - Operations and Maintenance, PC - Pulverized Coal, SCR - Selective Catalytic Reduction, ST - Steam Turbine, CAM - computer-aided manufacturing, VOC - Volatile Organic Compounds, ATC - automated tool changer*

Numerical information: Technical texts often contain numerical information, which must be presented clearly and accurately. This may include measurements, statistics, and other quantitative data. Here are some common numerical terms and measurements used in heat power terminology: *BTU - British Thermal Unit - A*

measure of heat energy equivalent to the amount of energy needed to raise the temperature of one pound of water by one degree Fahrenheit; MW - Megawatt - A unit of power equal to one million watts; GJ - Gigajoule - A unit of energy equivalent to one billion joules; kg/s - Kilograms per second - A unit of mass flow rate, commonly used to express the flow rate of fluids or gases, % - Percent - A unit of proportion, equal to one part in 100; Efficiency - A measure of how much of the input energy is converted into useful output energy, expressed as a percentage; Heat rate - The amount of heat energy required to generate one unit of electricity, typically measured in BTUs per kilowatt-hour (BTU/kWh), Pressure - The force exerted per unit area, commonly measured in pounds per square inch (psi) or kilopascals (kPa); Temperature - The degree of hotness or coldness of a substance, commonly measured in degrees Celsius (°C) or Fahrenheit (°F), Flow rate - The amount of fluid or gas that passes through a given area in a given amount of time, commonly measured in cubic meters per second (m^3/s) or cubic feet per minute (CFM).

Standardized formats: Technical texts may follow standardized formats, such as the format for a scientific research paper or the format for an engineering report. These formats help to organize information and make it easier to understand.

SELF-ASSESSMENT

1) Which sentence is correctly written in passive voice?
   a) The company designs new products every year.
   b) New products are designed by the company every year.
2) Which sentence is correct?
   a) You can improve performance by updating the codebase
   b) You can improve performance to update the codebase
3) What statement is correct?
   a) Use slash notation in technical texts to express combined units. For example, "m/s" for meters per second
   b) Don’t use slash notation in technical texts to express combined units. For example, "m/s" for meters per second
4) What sentence is correct:
   a) A process can be improved by changing a technology.
   b) One can improve a process to change a technology.
5) Technical texts tend to use shorter sentences.
   a) true
   b) false

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:

Homogeneity
Gyrating
Pneumatic Conveying

Compressive Strength
Hazardous Tasks
Eccentrically
Versatility
Size reduction
Homogeneous Catalysis
Scalability
Particle size

II. Reading a text

Material processing equipment

Material processing equipment is used to transform raw materials into usable forms and components for construction projects. This equipment is used in various industries to process, transform, or modify raw materials or substances into finished products or components. It is designed to perform specific tasks and processes related to material processing.

Uses of material processing equipment

Material processing equipment is used for a variety of reasons across different industries. Here are some key purposes of using material processing equipment:

1. Size Reduction: Material processing equipment is often used to reduce the size of raw materials or bulk solids. By breaking down large materials into smaller particles, it becomes easier to handle, transport, and store them.

2. Particle Size Control: In many applications, achieving a specific particle size distribution is essential. Material processing equipment allows for precise control over particle size, ensuring that the final product meets the desired specifications.

3. Mixing and Blending: Material processing equipment enables thorough mixing and blending of different components or materials. This is critical in industries where uniformity, homogeneity, or the creation of new materials is necessary.

4. Separation and Sorting: Material processing equipment is employed to separate different components or fractions based on their physical or chemical properties. This enables the extraction of valuable materials, removal of impurities, or segregation of different particle sizes.

5. Forming and Shaping: Some material processing equipment is used to shape and form materials into specific geometries or structures.

Different types of material processing equipment:

Feeders. Feeders are material processing equipment used to control and regulate the flow of bulk solids, granules, or powders from a storage unit or hopper to downstream processing equipment.

Crushers. Crushers are a type of material processing equipment used in various industries to reduce the size of large rocks, ores, and other raw materials into smaller, more manageable pieces. They are commonly used in mining, quarrying, recycling, construction, and demolition applications. Crushers utilize mechanical force to break

down the material by applying pressure or impact. Here are some common types of crushers used for material processing:

Jaw Crushers: Jaw crushers are primary crushers designed to handle large, hard, and abrasive materials. They consist of a fixed jaw and a movable jaw that forms a V-shaped chamber. The material is fed into the chamber and crushed between the jaws as they close together.

Impact Crushers: Impact crushers involve the use of impact rather than pressure to crush materials. They are used to crush softer, less abrasive materials such as limestone, gypsum, and recycled concrete. Impact crushers can be horizontal shaft impactors (HSI) or vertical shaft impactors (VSI). HSI crushers use a horizontal impact force to break the material, while VSI crushers utilize the material's velocity to impact and break it against a rotating surface.

Cone Crushers: Cone crushers are used for secondary and tertiary crushing applications. They are capable of producing finely crushed materials and are commonly used in the mining and aggregate industries. Cone crushers operate by squeezing the material between an eccentrically rotating cone and a stationary mantle. The crushed material falls through the bottom opening.

Gyratory Crushers: Gyratory crushers are similar to cone crushers but have a different crushing chamber design. They consist of a conical head gyrating inside a larger bowl-shaped concave. Gyratory crushers are primarily used in mining and large-scale quarrying operations for high-capacity crushing.

Roll Crushers: Roll crushers are composed of two rotating cylindrical rolls that crush the material between them. They are used for primary and secondary crushing of materials with compressive strength less than 200 MPa. Roll crushers are commonly used in the mining industry and in smaller-scale aggregate production.



✍ **After-reading exercises**

1. Do a comprehension quiz:

1.What is the primary purpose of using material processing equipment in various industries?

a) Entertainment

b) Size reduction

c) Decoration

d) Transportation

2. In material processing, why is achieving a specific particle size distribution important?

a) It looks aesthetically pleasing

b) It ensures safety

c) It meets desired specifications

d) It reduces equipment costs

3. What is a key function of material processing equipment related to mixing and blending?

a) Increasing material size

b) Reducing material weight

c) Ensuring uniformity and homogeneity

d) Enhancing material hardness

4. What does material processing equipment enable in terms of separation and sorting?

a) Combining different materials

b) Ignoring impurities

c) Separating components based on properties

d) Reducing particle size

5. Which function does some material processing equipment perform in terms of shaping and forming materials?

a) Enlarging

b) Disintegration

c) Shaping into specific geometries

d) Softening

6. What is a significant advantage of material processing equipment in terms of safety?

a) It increases risk

b) It automates hazardous tasks

c) It reduces consistency

d) It doesn't have safety features

7. How does material processing equipment contribute to consistency and quality control?

a) By introducing errors

b) By reducing standardization

c) By enabling consistent and standardized processing

d) By increasing defects
8. What is a characteristic that makes material processing equipment versatile?
a) Limited adaptability
b) Handling only one type of material
c) Adaptability to various applications and material properties
d) Slow processing speed
9. How can material processing equipment be designed to accommodate growing production needs?
a) By reducing capacity
b) By limiting scalability
c) By incorporating safety features
d) By designing for scalability
10. What is a common type of material processing equipment used in mining, quarrying, recycling, construction, and demolition applications?
a) Computers
b) Crushers
c) Feeders
d) Robots

2. Answer the questions:

1. What is the primary purpose of using material processing equipment in various industries, and how does it contribute to the overall efficiency of production processes?
2. Explain the significance of achieving a specific particle size distribution in material processing. Provide examples of industries where precise control over particle size is crucial.
3. In the context of material processing equipment, discuss the role of mixing and blending. Why is it essential in industries where uniformity and homogeneity are critical?
4. Describe the process of separation and sorting in material processing. How does this function contribute to the extraction of valuable materials and the removal of impurities?
5. Highlight the advantages of incorporating automation and integration in material processing equipment. How does this contribute to improved safety, efficiency, and quality control in industrial settings?

3. True/false:

1. Gravimetric feeders measure the weight of material being fed and adjust the feed rate accordingly.
2. Belt feeders use vibrations to convey material along a tray or trough.
3. Micromechanics is the study of mechanical behavior at the macroscale in material processing.
4. Automation and integration in material processing equipment can enhance overall process efficiency but do not contribute to safety.

5. Roll crushers are commonly used in the mining industry and are suitable for primary and secondary crushing of materials.

4. Find examples of Passive and Gerund in a text.

5. Fill in the blanks with verbs in Passive:

1. Thorough mixing and blending of different materials ….. by material processing equipment, ensuring uniformity and homogeneity in the final product (to facilitate).
2. Last week separation and sorting tasks …… by material processing equipment, enabling the extraction of valuable components and the removal of impurities (to perform).
3. The flow of bulk solids, granules, or powders from storage units … and regulated by feeders 2 days ago (to control).
4. The size reduction of large rocks, ores, and raw materials into smaller, manageable pieces … by crushers (to achieve).

6. Fill in the blanks with verbs in Gerund:

1. ….. precise particle size control is accomplished by material processing equipment (to achieve).
2. Thoroughly mixing and blending of various materials is essential for … uniformity in the final product (to ensure).
3. Efficiently … and …. different components is facilitated by material processing equipment's capabilities (to separate, to sort).
4. …. and …… the flow of bulk solids, granules, or powders is done by feeders without … the production process (to control, to regulate, to disrupt).
5. The process of … and …. materials involves precise manipulation by material processing equipment to achieve desired geometries 9to form, to shape).

7. **Speaking.** Watch a video https://www.youtube.com/watch?v=nlnNpwCjAVM and speak about possible failures in feeders and solutions.

8. **Role play.** You are representing a machinery company that specializes in crushers. Your goal is to sell a high-quality crusher system to a potential buyer from a mining company. The buyer is seeking efficient material processing equipment for a new mining project. Highlight the technical specifications and advantages of your crusher system. Make up a dialogue between a seller and a buyer.

UNIT 10. FORGING MACHINES

THEORETICAL PART

MAKING CONTRACTS



Read and check your understanding.

A contract is a binding and enforceable legal agreement between two or more parties. Important features of every contract include:

Basic information: Legal names and/or business names of the involved parties, their addresses, and a description of the property or service being exchanged for money or other consideration.

Agreement: This is a statement of the terms of the contract, such as the rights and responsibilities of all involved parties. If the contract records a loan, this section might cover the payment terms.

Specific considerations: This is a more detailed description of the property and/or terms, like the condition of the item, what the parties will and will not be responsible for, and what, if any, warranty or guarantees exist.

Dates: Every agreement notes the date of sale, dates for any warranties in effect, and due dates for payment installments, if any.

Null and void: This section explains how the contract can be nullified if there is a breach of contract.

Writing a contract requires careful consideration of legal language and specific requirements. Here are some general steps to follow when writing a contract:

Identify the parties involved: Begin by identifying the parties involved in the contract, including their full legal names and addresses. This will ensure that the contract is binding and enforceable.

Define the terms and conditions: Clearly define the terms and conditions of the agreement. This includes the scope of work or services to be provided, payment terms, deadlines, and any other relevant details. Be sure to use clear and concise language.

Include legal language: Contracts typically include legal language, such as indemnification clauses, limitations of liability, and dispute resolution provisions. Consult with a lawyer to ensure that these clauses are appropriate and enforceable.

Include signatures and dates: Once the contract is complete, have all parties sign and date it. This ensures that everyone has agreed to the terms and conditions.

Keep a copy for your records: Be sure to keep a copy of the contract for your records. This can be important if any disputes arise in the future.

It's important to note that contract writing can be complex and vary based on the specific industry and legal requirements. It's recommended to consult with a lawyer or legal professional when drafting contracts to ensure that they are legally binding and enforceable.

Sample contract

Brighton, England **April 10, 2009**	**Брайтон, Англія** **10 квітня, 2009 р.**
Continental Equipment Plc, Brighton, England, hereinafter referred to as "the Seller", on the one part, and TST Systems Ltd., Kyiv, Ukraine, , hereinafter referred to as "the Buyer", on the other part, have concluded the present Contract as follows:	Компанія Continental Equipment Plc, Брайтон, Англія, яка надалі іменується „Продавець", з однієї сторони, і компанія ТСТ Системз Лтд.Ю Київ, Україна, яка надалі іменується „Покупець", з іншої сторони, уклали цей контракт про наступне:
I. *Subject of the Contract* 1.1. The Seller has sold and the Buyer has bought the machinery, equipment, materials, and services ("Equipment") as listed in Appendix 1 being an integral part of this Contract.	I. *Предмет Контракту* 1.1. Продавець продав, а Покупець купив машини, облад-нання, матеріали і послуги ("Обладнання"), перераховані у Додатку 1, який є невід'ємною частиною цього Контракту.
2. Prices and Total Value of the Contract 2.1. The Total Contract Value is as follows: Equipment and engineering FOB U.K. port + documentation £ ____ Supervision, start-up and training £ ____ Spare and wear parts £ ____ Freight £ ____ Total price CIF Odessa £ ____ Discount £ ____ Total Contract Value £ ____	2. *Ціни і загальна сума Контракту* 2.1. Загальна сума Контракту складає: Обладнання і техніка на умовах FOB (порт Великобританії) +документація £ ____ Супровід, запуск і підготовка персонал £ ____ Запасні і зношувані деталі £ ____ Фрахт судна £ ____ Загальна сума на умовах CIF Одеса £ ____ Знижка £ ____ Загальна сума Контракту £ ____
2.2. The prices are understood to be CIF Odessa including cost of packing, marking, loading on board a ship, stowing and fastening the equipment in the hold, and the cost of the materials used for this purpose.	2.2. Ціни розраховуються на умовах CIF Одеса, включаючи вартість упаковки, маркування, завантаження на борт судна, розміщення і кріплення в трюмі, а також вартість матеріалів, які використовуються для цієї мети.
2.3. The prices are firm for the duration of the Contract and shall not be subject to any revision except on account of any mutually agreed changes or modifications to equipment specification and/or quantities listed in Appendix 1 to this Contract.	2.3. Ціни залишаються незмінними протягом всього строку дії Контракту і можуть бути переглянуті лише у випадку взаємно погоджених змін у специфікації обладнання або його модифікації, а також змін кількості його складових частин, вказаних у Додатку 1 до цього Контракту.
3. Time of Delivery 3.1. The Equipment specified in Appendix 1 of the present Contract is to be delivered within two (2) months from the date of opening the Letter of Credit specified in Clause 4.1 of this Contract.	*3. Срок поставки* 3.1. Обладнання, перераховане у Додатку 1 до даного Контракту, повинно бути поставлене протягом двох (2) місяців з моменту відкриття акредитиву, вказаного у п.4.1 даного Контракту.
3.2. The delivery date is understood to be the date of the clean Bill of Lading issued in the name of the	3.2. Датою поставки Обладнання вважається дата видачі чистого коносамента із вказівкою імені Покупця

Buyer, destination Odessa, Ukraine.

4. Terms of Payment

4.3. Within thirty (30) days from the date of signing this Contract, the Buyer is to open in favour of the Seller an irrevocable confirmed Letter of Credit with CityBank, London, for hundred per cent (100%) of the total contract value. The Letter of Credit is to be valid for three (3) months.

4.2. Payment from this Letter of Credit at the rate of hundred per cent (100%) of the total contract value is to be effected in GB pounds against the following shipping documents:

4.2.1. Original Bill of Lading issued in the name of the Buyer, destination Odessa, Ukraine.

4.2.2. Shipping Specification.
4.2.3. Certificate of Quality.
4.2.4. Certificate of Origin.
4.2.5. Packing List.
4.2.6. Insurance Policy.

5. Technical Documentation

5.1. Within five (5) days from the delivery date the Seller shall send two (2) sets of the technical documents as listed in Appendix 2 to the address of the Buyer.

5.2. All instructions on the drawings are to be in English, with all the instructions contained in Items 1,2,3, and 4 of Appendix 2 translated into Ukrainian.

6. Guarantee of the Quality of the Equipment.

6.1. The guarantee period is twelve (12) months from the date of the start-up of the Equipment, that is reflected in an appropriate Act signed by the representatives of the Parties to the present Contract, but not more than eighteen (18) months from the date of delivery of the Equipment.

6.2. If the Equipment proves to he defective or faulty during the guarantee period, the Seller has at its expense at the choice of both Parties either to remedy the defects or to replace the faulty equipment with new equipment of good quality which is to be delivered without delay to the port of delivery.

7. Packing

7.1. The Equipment is to be shipped in export sea packing suitable for the type of equipment delivered. Packing should also be suitable for transshipment in transit and reasonable long storage of the Equipment.

7.2. Each container is not to exceed the following dimensions: length - 2,500 mm, width = 2,500 mm, height = 2,500 mm.

7.3. The Seller is responsible to the Buyer for any damage to the Equipment resulting from inadequate packing of the equipment.

8. Marking

8 1. Ail the containers are to be marked on three (3) sides. Each container should bear the following markings made in indelible paint (in Ukrainian and

і кінцевого порту призначення - Одеса, Україна.

4. Умови оплати

4.1. Протягом тридцяти (30) днів з моменту підписаній цього Контракту Покупець повинен відкрити у CityBank (Лондон) на ім'я Продавця безвідкличний підтверджений акредитив на сто відсотків (100%) від загальної суми Контракту. Акредитив дійсний протягом трьох (3) місяців.

4.2. Платіж за цим акредитивом у розмірі ста відсотків (100%) від загальної суми Кон-тракту здійснюється в анг-лійських фунтах проти пред' явлення наступних відвантажу-вальних документів:

4.2.1. Оригіналу коносамент та, виписаного на ім'я Покупця, із вказівкою кінцевого порту призначення Одеса (Україна).
4.2.2. Відвантажувальної специфікації.
4.2.3. Сертифікату якості.
4.2.4. Сертифікату походження товару.
4.2.5. Пакувального списку.
4.2.6. Страхового поліса.

5. Технічна документація

5.1. Протягом п'яти (5) днів з моменту поставки Продавець повинен надіслати на адресу Покупця два (2) комплекти технічних документів, перерахованих у Додатку 2.

5.2. Усі пояснення на кресленях повинні бути зроблені англійською мовою. Повинні бути також надані переклади українською мовою усіх пояснень на кресленнях, що входять у п.п.1, 2, 3 і 4 Додатку 2.

6 Гарантія якості Обладнання

6 1. Гарантійний строк складає дванадцять (12) місяців з моменту запуску Обладнання, що фіксується у відповідному Акті, підписаному уповноваженими представниками сторін, які укладають цей Контраст, але не більше вісімнадцяті (18) місяців з дати поставки Обладнання.

6.2. Якщо Обладнання вийде з ладу протягом гарантійного строку, Продавець повинен за власний рахунок і за вибором обоє сторін або усунути наявні дефекти, або замінити облад-нанія, яке вийшло з ладу, новим обладнанням відповідної якості, яке повинно бути без затримки доставлене У порт прзначення.

7. Пакування

7.1. Обладнання має бути поставлене у морській експортній упаковці, призначеній для транспортування обладнаній даного типу. Упаковка повинна також бути придат-ною для транзитних переве-зень і для зберігання Облад-нанія протягом розумного стрску.

7.2. Кожний контейнер за розмірами не повинен перевищувати наступні габарити: довжина — 2 500 мм, ширина -2 500 мм, висота — 2 500 мм.

7.3. Продавець несе відпові дальність перед Покупцем за будь-які пошкодження Об ладнання, що сталися через йо го неправильне пакування.

8. Маркування

8.1. Всі контейнери мар-куються з трьох (3) сторін. На кожному контейнері повинні бути нанесені незмивною фарбою наступні написи (ук раїнською і

English):

Contract No.
Seller: Continental Equipment Plc (Address)
Buyer: TST Systems Ltd. (Address)
Railway Station of Destination: Kyiv
Container No.:
*Gross weight:*____kg
*Net weight:*____kg
Case dimensions in cm (length x width x height)

8.2. If a case requires special handling it should bear additional marks: "Fragile", "Top" or "This side up", etc.

9. Shipping Instructions and Notifications

9.1. Within twenty-four (24) hours after shipment, the Seller is to inform the Buyer by fax regarding the date of shipment, the Bill of Lading number, number of containers, their weight, the vessel name.

10. Insurance

10.1. The Seller is to take care of and cover expenses for insurance of the Equipment under the Contract from the moment of its dispatch up to the moment of its arrival at the port of Odessa.

11. Sanctions

11.1. In the event of delay in delivery of the Equipment the Seller is to pay the Buyer a penalty at the rate of 1.0% of the total contract value for every week of delay. However, the total amount of penalty for delay in delivery is not to exceed 10% of the total contract value.

11.2. While calculating penalty for delay, the amount of days comprising over half of a calendar week is considered to be a full week.

12. Force Majeure

12.1. The Parties are released from their responsibility for partial or complete non-execution of their liabilities under the Contract should this non-execution be caused by the force majeure circumstances including, but not limited to: fire, flood, earthquake, and if these circumstances have had a direct damaging effect on the execution of the present Contract.

12.2. The Party which is unable to fulfil its obligations under this Contract is to inform the other Party within ten (10) days from the beginning of force majeure circumstances.

13. Arbitration

13.1. The Seller and the Buyer will take all possible measures to settle amicably any disputes or differences which may arise out of the present Contract or in connection with it.

13.2. If the Parties do not come to an agreement, all the disputes and differences are to be submitted for Arbitration in Stockholm, Sweden, in accordance

англійською мовами):

Контракт №
Продавець: Continental Equipment Plc (Адреса)
Покупець: TST Systems Ltd. (Адреса)
З/д станція призначення: Київ
Контейнер № :
*Вага брутто:*____кг
Вага нетто: ____кг
Розміри контейнера у см (довжина х ширина х висота)

8.2. Якщо контейнер потребує спеціального поводження, то на ньому повинно бути нанесене додаткове маркування: "Крихкий", "Вверх", або "Тут верх" тощо.

9. Інструкції і повідомлення про відвантаження

9.1. Протягом двадцяти чотирьох (24) годин після відвантаження обладнання Продавець повинен повідомити Покупця факсом про дату відвантаження, номер коносаменту, кількість контейнерів, їх вагу, назву судна.

10. Страхування

10.1 Продавець здійснює страхування Обладнання, що поставляється у відповідності до цього Контракту, і покриває усі пов'язані з цим витрати з моменту відвантаження Обладнання і до моменту прибуття його у порт Одеси.

11. Санкції

11.1 У випадку затримки поставки Обладнання Продавець повинен виплатити Покупцеві пеню у розмірі 1% від загальної суми Контракту за кожний тиждень затримки поставки. При цьому, загальна сума пені за затримку поставки Обладнання не повинна перевищувати 10% від загальної суми Контракту.

11.2. Під час розрахунку пені за затримку поставки Облад-нання кількість днів, що перевищує половину календарного тижня, вважається повним тижнем затримки.

12. Форс-мажор

12.1. Сторони звільняються від відповідальності за повне або часткове невиконання своїх обов'язків за цим Кон-тарктом, якщо таке невиконання було викликано форсмажорними обставинами, які включають, але не обмежу- ються такими, причинами, ЯК| пожежа, повінь, землетрус, її якщо дані обставини малий безпосередній вплив на можливість виконання цих зо-бов'язань.

12.2. Сторона, яка не може виконати своїх зобов'язань за даним Контрактом, повинна протягом десяти (10) днів після початку дії форс-мажорних обставин повідомити іншу сторо-ну про їх наявність.

13. Арбітраж

13.1. Покупець і Продавець вживають усі можливі заходи для врегулювання спорів розбіжностей, які можуть виникнути під час виконання цього Контракту або у зв'язку з його виконанням.

13.2. Якщо сторони не мо-жуть дійти згоди, усі спори і розбіжності передаються на розгляд до арбітражного

with the rules and regulations of the Chamber of Commerce in Stockholm and applying the substantive laws of Sweden.	суду у Стокгольмі (Швеція) згідно з правилами і положеннями Торгової Палати Стокгольму і із застосуванням відповідних законів Швеції.
14. Other Terms 14.1. The Seller upon written consent of the Buyer shall be permitted to substitute equipment of comparable quality and conforming to the technical requirements for any item of equipment that may not be available for one reason or another. 14.2. Any changes, amendments or supplements to the terms and conditions of this Contract shall be valid only if set forth in a written document duly signed by authorized representatives of both Parties to the present Contract. 14.3. After the Contract has been signed all the preliminary agreements, discussions and correspondence between the Parties concerning this Contract are to be considered null and void if conflicting with this Contract. 14.4. The Contract becomes effective and comes into full force from the date of signing.	*14. Інші умови* 14.1. За наявності письмової згоди Покупця Продавець може здійснити заміну тих чи інших частин Обладнання, яких з тієї чи іншої причини нема в наявності, на інше обладнання порівняної якості, яке задовольняє технічним вимогам. 14.2. Будь-які зміни, поправки і доповнення до умов цього Контракту вважаються дійсними тільки у тому випадку, якщо вони зроблені письмово і належним чином підписані уповноваженими представниками сторін. 14.3. Після підписання Контракту всі попередні угоди, домовленості та листування між сторонами, які уклали цей Контракт, стають недійсними, якщо вони суперечать положенням цього Контракту. 14.4. Контракт набуває чинності і вступає в силу з датийого підписання.
15. Legal Addresses of the Parties SELLER (ПРОДАВЕЦЬ): Continental Equipment Plc 9 North Road Brighton BN1 5JF England for and on behalf of the Seller (від імені та за дорученням Продавця) Alfred Rogers Chairman (Президент)	*15. Юридична адреса сторін* ПОКУПЕЦЬ (BUYER): TST Systems Ltd. P.O.Box 171 Kyiv 253100 Ukraine від імені та за дорученням Покупця (for and on behalf of the Buyer) Віктор Клименко Коммерційний директор (Commercial Director)

SELF-ASSESSMENT

1) What is the purpose of including legal language in a contract?
   a) To make the contract longer and more formal
   b) To make the contract legally binding and enforceable
   c) To make the contract more difficult to understand
2) When writing a contract, what should be included in the terms and conditions section?
   a) The names of the parties involved
   b) Payment terms
   c) The scope of work or services to be provided d) All of the above
3) Why is it important to use clear and concise language in a contract?
   a) To make the contract more formal
   b) To make the contract easier to read and understand
   c) To make the contract more legally binding
4) What is the purpose of having all parties sign and date a contract?
   a) To make the contract legally binding and enforceable
   b) To make the contract more formal
   c) To make the contract longer
5) When drafting a contract, what should you do if you are unsure about the legal language or requirements?

a) Include the legal language you think is appropriate
b) Consult with a lawyer or legal professional
c) Ignore the legal requirements and write the contract as you see fit

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:

Roll Forging
Roll Bearings
Frame
Drive System
PLC (Programmable Logic Controllers)
HMI (Human-Machine Interface)
Feeding Mechanism
Bearings
Alignment
Disassembly

II.Reading Text

Roll forging machines

An automatic roll forging machine is a type of forging equipment that utilizes rolls to shape and deform metal workpieces. This machine is designed to automate the process of roll forging, a technique where continuous and controlled pressure is applied to a workpiece between two rotating rolls to achieve the desired shape and dimensions. Automatic roll forging machines are commonly used in the production of a variety of metal components, offering efficiency, precision, and automation in the forging process. The specific features and capabilities of these machines can vary based on their design and intended application.

Here's a general description of the structure and functions of an automatic roll forging machine:

Structure:

Rolls: The machine typically consists of two or more rolls that rotate in opposite directions. These rolls come into contact with the workpiece, applying compressive forces to shape it.

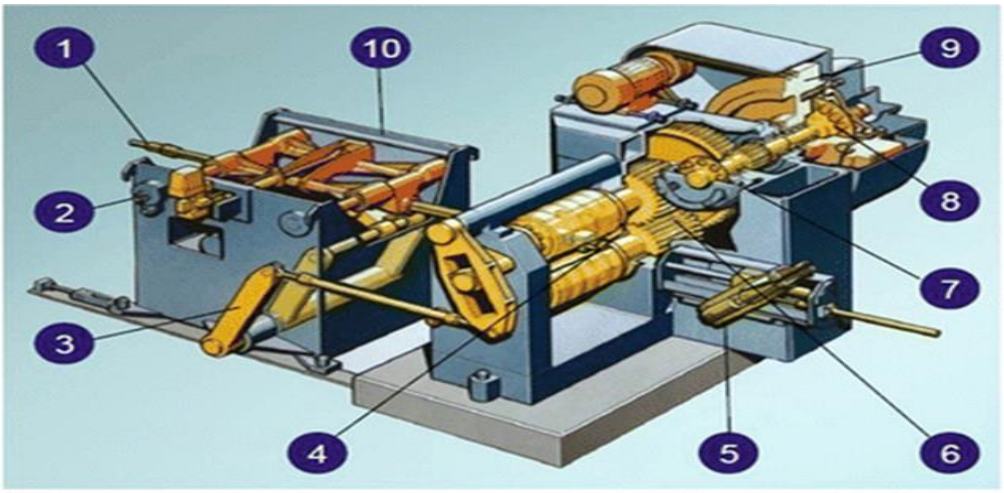
Roll Bearings: Heavy-duty bearings support the rolls, ensuring smooth rotation and minimizing friction during the forging process.

Frame: The rolls and associated components are mounted on a sturdy frame, providing structural support and stability to the machine.

Drive System: An electric motor or hydraulic system drives the rolls, providing the necessary power to rotate them and exert pressure on the workpiece.

Control System: Modern automatic roll forging machines are equipped with sophisticated control systems. These systems may include PLCs (Programmable Logic Controllers) and HMI (Human-Machine Interface) panels for easy operation and monitoring.

Feeding Mechanism: A mechanism is included for feeding the workpiece into the rolling area. This could be a conveyor system or other feeding devices depending on the specific design of the machine.
Cooling System: Due to the heat generated during the forging process, a cooling system may be integrated to maintain optimal operating temperatures.
Repairing. Repairing automatic roll forging machines requires a good understanding of their components, mechanisms, and the specific issues they may be facing. It's important to note that repairs should be performed by qualified technicians with experience in the maintenance and repair of forging equipment. Here are general steps that might be involved in repairing automatic roll forging machines:
Identify the Problem: Conduct a thorough inspection to identify the specific issues affecting the machine. This may include issues with the rolls, bearings, drive system, control system, or other components.
Safety Precautions: Before starting any repairs, ensure that the machine is safely shut down and disconnected from power sources. Follow appropriate lockout/tagout procedures to prevent accidents.
Disassembly: Depending on the identified issue, disassemble the relevant parts of the machine to access the components that require repair. This may involve removing covers, guards, or access panels.
Inspect and Assess: Inspect the components for damage, wear, or misalignment. Assess the condition of the rolls, bearings, gears, and other critical parts.
Replace Worn or Damaged Parts: Replace any worn, damaged, or malfunctioning parts with new ones. This may involve obtaining replacement parts from the manufacturer or a reliable supplier.
Align and Calibrate: Ensure proper alignment of components, especially in the case of rolls. Misalignment can lead to uneven forging and affect the quality of the end product. Calibrate the machine according to the manufacturer's specifications.
Lubrication: Proper lubrication is crucial for the smooth operation of the machine. Lubricate moving parts, such as bearings and gears, according to the manufacturer's recommendations.
Electrical and Control System Checks: If the machine has an electrical or control system issue, inspect wiring, sensors, and other electrical components. Use diagnostic tools to identify and address control system problems.
Testing: After repairs are complete, conduct a series of tests to ensure that the machine operates smoothly and meets the required performance standards. Test for proper pressure application, roll rotation, and overall functionality.



1. Length compensation cylinder
2. Servo-controlled electric transverse feed
3. Crank-rocker drive mechanism
4. Eccentric mounting of the lower roll for adjusting the distance between rolls
5. Feeder device to position the workpiece between the grippers of the manipulator
6. Roll drive with automatic backlash compensation
7. Water-cooled brake and asbestos-free brake pads
8. Clutch with asbestos-free pads
9. Flywheel with large energy reserve
10. Automatic rocker arm

Parameters of forge roll machine

Item		Unit	ZGD370	ZGD460	ZGD560	ZGD680	ZGD1000	ZGD1250
Outer diameter of rolling die		mm	370	460	560	680	1000	1250
Width in commission for rolling		mm	500	570	700	850	1200	1400
Max. length of work-piece		mm	570	710	870	1050	1920	2500
Adjustment of center distance		mm	15	17	20	20	25	20
Rotating speed of roller		rpm	62	56	52	40/25	15/30	8
Max blank dimension	Square	mm	50	65	90	110	140	180
	Round	mm	φ55	φ75	φ100	φ125	φ160	φ200
Longitudinal stroke of transfer arm		mm	490	630	758	ndependent manipulator 800	ndependent manipulator 7000	ndependent manipulator 7000
Lateral stroke of transfer arm		mm	436	505	550	750	920	1420
Vertical and horizontal adjustability		mm	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable
Adjustment of longitudinal position		mm	200	200	400	Unadjustable	Unadjustable	Unadjustable
Single lateral stroke		mm	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable
Max. load capacity		kg	12	12	30	50	150	250
Main motor power		kw	18.5	22	55	132	250	355
Total weight		Ton	10	12.5	22	60	70	120

✍ **After-text exercises**

1.Do a comprehension quiz:

1. What is roll forging?

A. A metalworking technique using rotary drills.

B. A forging process involving continuous pressure and shaping with rotating rolls.

C. A welding method for roll-shaped components.

2. Which component supports the rolls and minimizes friction during the forging process?

A. Drive System

B. Frame

C. Roll Bearings

3. What is the purpose of the cooling system in an automatic roll forging machine?

A. To generate heat during forging.

B. To maintain optimal operating temperatures.

C. To lubricate the machine parts.

4. What does PLC stand for in the context of automatic roll forging machines?

A. Power Load Control

B. Programmable Logic Controllers

C. Precision Lubrication Control

5. What precaution should be taken before starting any repairs on the machine?

A. Increase the machine's speed.

B. Disconnect it from power sources and follow lockout/tagout procedures.

C. Conduct repairs while the machine is running.

6. What is a critical step in repairing misalignment issues in an automatic roll forging machine?

A. Lubrication

B. Calibration

C. Inspection

7. Which term refers to the mechanism for feeding the workpiece into the rolling area?

A. Drive System

B. Conveyor System

C. Control System

8. What should be done during the testing phase after repairs are complete?

A. Lubricate the machine.

B. Conduct a series of tests to ensure smooth operation.

C. Disassemble the machine.

9. Which term describes the technique where two rotating rolls apply continuous pressure to shape a workpiece?

A. Welding

B. Roll Forging

C. Hydraulic System

10. What component of an automatic roll forging machine requires proper alignment to prevent uneven forging?

A. Frame

B. Roll Bearings

C. Rolls

2. Answer the questions:

1) What is the primary technique used in roll forging machines to shape metal workpieces?
2) Which components in a roll forging machine are responsible for applying compressive forces to deform the workpiece?
3) Why is proper lubrication crucial in the operation of roll forging machines?
4) What is the function of the feeding mechanism in a roll forging machine?
5) In the context of automatic roll forging machines, what role do Programmable Logic Controllers (PLCs) play in the overall operation?

3. True/false:

1) A cooling system is integrated into forging machines to generate additional heat during the forging process.
2) Alignment in forging machines refers to the process of taking the machine apart for routine inspection.
3) The drive system in an automatic roll forging machine can be powered by either an electric motor or a hydraulic system.
4) HMI (Human-Machine Interface) panels are used for calibration purposes in forging machines.
5) Disassembly is a step in the forging machine repair process that involves adjusting components to meet specific standards.
6) Calibration is the process of ensuring proper positioning and coordination of components in a forging machine.

4. Fill in the blanks with the correct terms from the text:

1) Before conducting any maintenance, it's crucial to follow the ……procedure to ensure safety.
2) Regular … … is essential to prevent equipment failure and ensure reliability.
3) During the …. process, the technician identified worn bearings that needed replacement.
4) The Control System of the machine includes …. and …. panels for efficient control.
5) …. is necessary to reduce friction between moving parts and extend the machine's lifespan.

5. Match the words with their definitions:

Term	Definition
1. Roll Forging	A. System integrated to maintain optimal operating temperatures during the forging process.
2. Roll Bearings	B. Electric motor or hydraulic system powering the rolls and providing pressure for forging.
3. PLC (Programmable Logic Controllers)	C. Mechanism responsible for moving the workpiece into the rolling area of the forging machine.
4. Feeding Mechanism	D. Heavy-duty components supporting rolls, ensuring smooth rotation and minimizing friction.
5. Cooling System	E. Process of taking the machine apart to access components for inspection or repair.
6. Alignment	F. A metalworking technique where continuous pressure is applied to a workpiece between rotating rolls.
7. Drive System	G. Adjusting components to meet the manufacturer's specifications for proper operation.
8. HMI (Human-Machine Interface)	H. Interface panels allowing easy operation and monitoring of the automatic roll forging machine.
9. Disassembly	I. Ensuring proper positioning and coordination of components, especially the rolls.
10. Calibration	J. Electronic controllers providing automation and control of various machine functions.

6. **Role play.** The Buyer initiates the conversation with the Seller, expressing interest in purchasing a forging machine. The Seller provides information about the available forging machines, highlighting key features, and addresses the specific needs of the manufacturing company. The Buyer raises questions about pricing, warranty, delivery timelines, and any potential customization options. Make up a dialogue.

7. **Writing**. Fill in the gaps in the outline draft contract choosing from the words given below:

terms, arbitration matter, charges, pay penalty, delivery, contract, parties

DRAFT CONTRACT

Between Valeo Ltd., here in after referred to as "the Seller" and Mercury, here in after referred to as "the Buyer". The Seller undertakes to supply the Buyer with 12 000 pumps to 765 and to pay all and insurance.

The terms of … (1) and immediate payment of charges by confirmed and irrevocable ___... (2) are to be standard. A _... (3) clause will be included in the contract. It will be against the Buyer for … (4) payment.

In the event of non-payment, the Seller shall be entitled to … (5) for the goods. In case of a dispute between the… (6) to the contract the…(7) will be taken to independent…(8). All the … (9) of the contract must be complied with by both parties.

8.Role play. The dialogue illustrates a professional and transparent exchange between a Service Provider and a Client as they navigate the process of contract termination.

SP: I'm reaching out today because I wanted to discuss the service contract we have in place for the maintenance of [*describe the machinery or equipment*].

C: Of course, is there something wrong?

SP: Unfortunately, yes. After careful consideration and review of our current workload and resources, we've decided to terminate the contract.

C: Oh, I see. Can you tell me more about the reasons for the termination?

SP: Certainly. Due to [explain reasons for termination, such as changes in service offerings, resource constraints, or other unforeseen circumstances], we believe it's in the best interest of both parties to end our agreement.

C: I understand. That's disappointing news, but I appreciate your honesty. What are the next steps?

SP: We'll need to review the termination clauses outlined in the contract and ensure that all necessary procedures are followed. We'll also discuss [*enumerate the problems*].

C: Understood. Thank you for informing me about this. I appreciate your transparency.

SP: Please let me know if you have any questions or need further clarification on anything.

UNIT 11. ROLLING MILLS

THEORETICAL PART



Read and check your understanding.

CONFERENCE VOCABULARY

Conferences play a crucial role in facilitating knowledge exchange, collaboration, and innovation across various disciplines and industries. Whether academic, professional, or trade-focused, conferences offer valuable opportunities for learning, networking, and professional development, contributing to individual growth and collective advancement within the global community.

Benefits of Conferences:

Knowledge Exchange: Conferences provide opportunities to learn about the latest research, trends, and best practices within a particular field.

Networking: Attendees can connect with peers, experts, and potential collaborators, expanding their professional network and fostering partnerships.

Professional Development: Conferences offer workshops, seminars, and skill-building sessions to enhance participants' knowledge and expertise.

Visibility and Recognition: Presenting research or speaking at conferences can increase visibility and recognition within one's field of expertise.

Inspiration and Motivation: Engaging with like-minded individuals, hearing success stories, and learning about groundbreaking innovations can inspire and motivate attendees in their respective endeavors.

Conference Vocabulary:

Early Bird Registration: A discounted registration fee offered to attendees who register for the conference before a specified early bird deadline.

Late Registration: Registration for the conference after the early bird deadline, often subject to higher fees.

Registration Fee: The cost associated with attending the conference, covering access to sessions, materials, meals, and other conference amenities.

Student Rate: A reduced registration fee offered to students attending the conference, typically requiring proof of current enrollment.

Presenter: An individual who delivers a presentation, speech, or paper at the conference, sharing research findings, insights, or expertise on a specific topic.

Proceedings: A compilation of papers, abstracts, or presentations delivered at the conference, often published in print or digital format for distribution to attendees.

Poster Presentation: An alternative to oral presentations, where presenters display research findings or project summaries on posters for viewing and discussion by conference attendees.

Session Chair: An individual responsible for moderating a session, introducing speakers, managing time, and facilitating audience participation.

Conference App: A mobile application designed to provide attendees with access to conference schedules, session details, networking opportunities, and interactive features.

Awards Ceremony: A formal event held during the conference to recognize outstanding contributions, achievements, or research excellence in specific areas related to the conference theme.

Vendor Booth: A designated space within the exhibition hall where vendors, sponsors, or exhibitors showcase products, services, or solutions relevant to conference attendees.

Ballot: A voting form or paper used to cast votes or make selections, typically used in elections, awards, or decision-making processes during the conference.

Agenda: A detailed schedule or outline of sessions, presentations, activities, and events planned for the conference, including timings, topics, speakers, and locations.

Keynote Speaker: A distinguished speaker who delivers a keynote address at the opening or closing of a conference, setting the tone and providing insights on the main theme.

Panel Discussion: A session where a group of experts or panelists discuss a specific topic, often moderated by a facilitator.

Workshop: An interactive session where attendees engage in hands-on activities, discussions, or exercises to learn practical skills or explore specific topics in depth.

Breakout Session: Concurrent sessions held simultaneously during the conference, offering attendees the opportunity to choose from a variety of topics based on their interests.

Networking Event: A designated time or session for attendees to connect with each other, share ideas, and build professional relationships.

Delegate: An individual attending the conference, often representing an organization or institution.

Plenary Session: A session attended by all conference participants, typically featuring keynote speakers, presentations, or discussions on overarching themes or topics.

Abstract: A concise summary of a presentation, paper, or research topic submitted for consideration to be included in the conference program.

Facilitator: A person responsible for guiding discussions, managing sessions, and ensuring smooth communication and interaction among participants.

Feedback Form: A questionnaire or survey provided to attendees to gather feedback and evaluations on the conference content, organization, and overall experience.

Live Polling: An interactive tool used during sessions to engage attendees by allowing them to respond to polls or surveys in real-time using mobile devices or audience response systems.

Closing Remarks: Concluding statements delivered by conference organizers or hosts, summarizing key takeaways, expressing gratitude to participants, and providing information on future events or initiatives.

Here are some phrases commonly used in conferences:

Opening Remarks:

"I'm delighted to see such a diverse and engaged audience here today."
"Thank you all for joining us. Let's get started with our first session."

Introduction of Speakers:

"Our first speaker is [Name], who will be sharing insights on [Topic]."
"Next, we have [Name], an expert in [Field], who will be discussing..."
"Please join me in welcoming [Name] to the stage."

Transitioning Between Sessions:

"Now that we've heard from [Speaker Name], let's move on to our next topic."
"Before we proceed, does anyone have any questions for our current speaker?"
"Our next session will focus on [Topic], led by [Speaker Name]."

Encouraging Audience Participation:

"We value your input and encourage you to share your thoughts and questions."
"Don't hesitate to raise your hand if you have any comments or insights to contribute."
"Let's make this session interactive. I invite you all to join the discussion."

Moderating Discussions:

"Thank you for those insightful questions. Let's address them one by one."
"I'd like to hear from some of our quieter attendees. What are your thoughts on this topic?"
"Let's keep the conversation focused and respectful as we explore different perspectives."

Closing Remarks:

"As we wrap up [Conference Name], I want to express my gratitude to our speakers, sponsors, and attendees."
"I hope you found today's discussions valuable and inspiring. Safe travels, and see you next time."
"Thank you all for your participation. Let's continue the conversation online and stay connected.

SELF-ASSESSMENT

1. What is the primary purpose of an academic conference?
a) Networking with industry professionals
b) Showcasing innovative products
c) Sharing research findings and scholarly work
d) Organizing entertainment events
2. What type of session at a conference involves a group of experts discussing diverse perspectives on a specific topic?
a) Keynote speech

b) Workshop
c) Panel discussion
d) Poster presentation
3. Which of the following is a common feature of trade shows or expos within a conference?
a) Hands-on activities
b) Research presentations
c) Showcasing products and innovations
d) Interactive debates
4. What is the purpose of a networking event at a conference?
a) Showcasing keynote speakers
b) Demonstrating new technologies
c) Connecting attendees and building professional relationships
d) Presenting awards and recognitions
5. What are some benefits of attending conferences?
a) Decreased visibility and recognition
b) Limited opportunities for networking
c) Enhanced learning and professional development
d) Decreased motivation and inspiration

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:

Quenching
Adjustments
Crushing
helix angles
ingots
coiled strips
cold rolling
hot rolling
I-beams
Indispensable
To withstand

II.Reading a text

Rolling mills

Rolling mills are industrial machines or facilities used for shaping and reducing the thickness of metal sheets or ingots through a series of rolling processes. These mills play a crucial role in the manufacturing and processing of metal products across various industries. The primary function of rolling mills is to deform and reshape metal materials into desired shapes and thicknesses. Rolling mills consist

of two or more cylindrical rolls that rotate in opposite directions. The rolls exert pressure on the metal, causing it to deform and reduce in thickness.

Types of Rolling Mills:

Flat Rolling Mills: Used for rolling sheets, plates, and strips.

Shape Rolling Mills: Employed for producing various shapes like I-beams, channels, and angles.

Universal Rolling Mills: Capable of both flat and shape rolling.

Stand Configuration: Rolling mills are organized into stands, each containing a set of rolls.

Stands can be arranged in tandem for a continuous rolling process.

Hot Rolling vs. Cold Rolling:

Hot Rolling: Metal is processed at elevated temperatures, making it easier to deform and reducing the risk of cracking. Cold Rolling: Metal is rolled at room temperature or slightly below, producing a smoother surface finish and tighter tolerances.

Processes:

Blooming: Reducing the cross-sectional area of an ingot to a bloom.

Slabbing: Reducing the thickness of a slab.

Plate Mills: Rolling plates to achieve desired thickness.

Hot Strip Mills: Producing hot-rolled coils from slabs.

Reversing Mills: Some rolling mills are designed as reversing mills, allowing the material to pass back and forth through the rolls.

Automation and Control: Modern rolling mills often incorporate advanced automation and control systems to optimize the rolling process. These systems monitor parameters like temperature, thickness, and tension, making adjustments for quality and efficiency.

Applications: Rolling mills are used in various industries, including steel manufacturing, aluminum processing, automotive, aerospace, construction, and more. They produce a wide range of products such as sheets, plates, bars, rails, structural shapes, and coiled strips.

Maintenance Measures for Rolling Mill in Daily Steel Rolling Process

Currently, most rolling mills are not designed for high rolling speeds. The reason is that when the linear speed is at a moderate level, the rolling mill operates more steadily with lighter wear, albeit at a lower production capacity. Extensive research has shown that appropriately increasing the rolling speed of the rolling mill is an effective method to improve rolling efficiency. The rolling mill is an indispensable steel rolling equipment in steel mills, and methods and effects to increase the rolling mill line speed have been practiced in some domestic steel mills.

In the daily maintenance of the rolling mill, special attention should be given to observing the rolling rolls and gear parts. If there are any issues with either the rolls or gears, it directly affects the normal operation of the rolling mill. Let's take a look at some related issues with rolling rolls and gears: the rolling mill displays tooth damage due to inaccurate gear parameter measurement. When modifying and measuring gears, inaccurate helix angles and modules result in significant

differences in gear tooth profiles compared to the old ones. The meshing coincidence of the rolling mill is small, causing large impact and high stress at a certain point of the gear, making the gear prone to fracture. A useful solution is to adjust the parameters of each gear inside the gearbox to ensure accurate and error-free gear parameters for precise processing.

Immature heat treatment processes, the lack of quenching and strengthening on the tooth root of the new gear, results in low bending strength of the rolling mill. The quenching and strengthening layer on the tooth surface is too shallow and cannot withstand the impact load for an extended period, causing premature crushing and deformation. Once there is poor accuracy in the tooth profile, increased clearances introduce additional loads. A useful approach is to establish a reasonable heat treatment process, determine the bending resistance of the tooth root based on the structure, and strengthen it through quenching. To ensure that the rolling mill gear can withstand the contact load for an extended period and prevent premature crushing and deformation due to the introduction of additional loads, it is necessary to redesign a reasonable thickness for the quenching and strengthening layer on the tooth surface.



✍ After-text exercises

1. Do a comprehension quiz:

1. What is the primary objective of routine maintenance in a rolling mill?
A) Increase production speed
B) Extend the lifespan and reduce costs
C) Enhance rolling product quality
D) Introduce new features
2. Why are most rolling mills not designed for high rolling speeds?
A) Higher speeds cause excessive wear
B) Lower speeds improve efficiency
C) Safety concerns at higher speeds
D) Limited power supply

3. In rolling mill maintenance, what should special attention be given to regarding rolls and gears?

A) Lubrication systems

B) Electrical components

C) Observing their condition

D) Temperature control

4. What is the consequence of inaccurate gear parameter measurement in rolling mills?

A) Increased efficiency

B) Tooth damage

C) Improved safety

D) Reduced wear

5. How is the practical effect of increasing rolling mill speed described in the text?

A) Decreased productivity

B) Unchanged wear on rolls and guides

C) Increased productivity by 10-20%

D) Reduced wear on rolls and guides

2. **Answer the questions**:

1) What is the primary purpose of routine maintenance in a rolling mill, according to the text?
2) Why are most rolling mills not designed for high rolling speeds?
3) What aspect of rolling mill maintenance requires special attention, as mentioned in the text?
4) What is the consequence of inaccurate gear parameter measurement in rolling mills?
5) How is the practical effect of increasing rolling mill speed described in the text?

3. **True/false**:

1) Determine whether the following statements are true or false based on the information in the text.
2) Increasing the rolling mill speed has no impact on productivity.
3) Quenching and strengthening are essential for preventing premature crushing of the rolling mill gear.
4) Belt drive is a common method used in rolling mills to change the transmission ratio.
5) Roll adjustments are not affected by wear on the rolls in the rolling mill.

4. **Fill in the blanks with the correct terms from the text**:

1) In the daily maintenance of the rolling mill, special attention should be given to observing the rolling rolls and _____.
2) The _____ and strengthening layer on the tooth surface is too shallow.
3) A method to increase rolling mill speed is to increase the number of teeth on the gear to change the _____.
4) After increasing the rolling mill speed, the wear of rolls and _____ increases.

5. **Match the words with their definitions**:

Terms	Definitions
1. Rolling Mill	E. The ability of a material to resist deformation under stress.
2. Linear Speed	H. The circle that passes through the center of a gear with evenly spaced teeth.
3. Helix Angles	J. The measure of how efficiently a system or process produces output.
4. Quenching	B. The speed of movement in a straight line, especially the periphery of a rotating body.
5. Bending Strength	A. The rotating part of a machine that presses, shapes, or reduces metal into thin sheets or forms.
6. Lubricating Grease	F. A substance used to reduce friction between moving parts in machinery.
7. Transmission Ratio	G. The ratio of the number of teeth on one gear to the number of teeth on another.
8. Pitch Circle	D. The rapid cooling of hot metal to obtain certain material properties.
9. Belt Drive	I. A system of gears and belts that transmits motion from one shaft to another.
10. Productivity	C. The angles formed by helix lines on the surface of a cylinder.

6. **Speaking.** *Prepare a brief presentation or discussion on the general information about rolling mills* (a brief overview of what rolling mills are and their significance in metalworking and steel production; the various types of rolling mills, such as hot rolling mills and cold rolling mills; Components and Functions; Rolling Process; Common Challenges and Solutions; Importance in Industry).

7. **Role play.** *A steelmaker and a machinery engineer are discussing current failures in rolling mills and solutions. Make up a dialogue between a steelmaker and a machinery engineer based on the information in the table:*

Types of rolling mills failures and their solutions

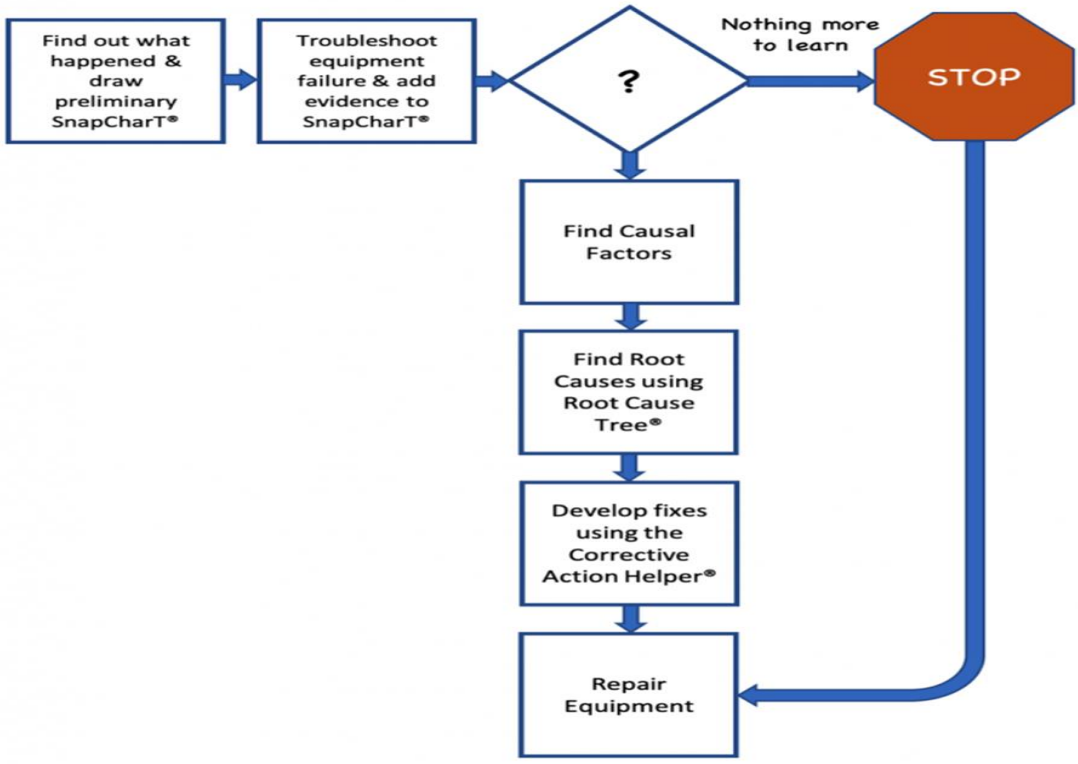
Types of Defects	Symptoms	Causes	Prevention or Solution
Roll Surface Wear	Gradual reduction in roll diameter, uneven strip surfaces.	Continuous friction between rolls and metal strip.	Regular inspection, proper lubrication, selecting rolls with suitable coatings.
Chatter Marks	Regular surface defects resembling waves.	Mechanical vibrations during the rolling process.	Balancing rolls, optimizing mill parameters, maintaining proper alignment.
Rolling Mill Misalignment	Non-uniform products, increased wear on rolls.	Incorrect roll alignment, worn-out bearings.	Regular alignment checks, timely bearing replacements, proper setup.
Strip Edge Cracking	Cracks along the edges of the rolled strip.	Excessive roll pressure, misalignment, uneven strip thickness.	Controlling rolling parameters, ensuring proper alignment, monitoring thickness.
Rolling Mill Overheating	Increased temperatures in the rolling mill.	Friction, inadequate cooling, improper lubrication.	Efficient cooling systems, proper lubrication, regular maintenance.
Roll Deflection	Non-uniform thickness in the rolled product.	Insufficient roll stiffness, excessive roll load.	Designing rolls with appropriate stiffness, optimizing rolling parameters.
Gearbox Failures	Irregularities in rolling speed, abnormal noises.	Gear misalignment, worn-out gears, inadequate lubrication.	Regular gearbox inspections, proper lubrication, timely component replacement.

Torsional Vibrations	Oscillations in the rolling mill system.	Inadequate damping, improper mill setup.	Enhancing damping, optimizing mill setup, using vibration control systems.
Electrical Failures	Power supply disruptions, erratic control.	Electrical component malfunctions, wiring issues.	Regular electrical system inspections, timely replacements, proper grounding.
Material Defects	Inclusions or defects in the rolled product.	Material impurities, worn-out rolls.	Quality control measures, regular roll inspections, selecting high-quality materials.

CHAPTER 4. STEELMAKING EQUIPMENT
UNIT 12. CONTINUOUS CASTING MACHINE

THEORETICAL PART
WRITING MACHINE FAILURE REPORT

The Process of Equipment Failure Analysis/Root Cause Failure Analysis
There are six basic steps to the process of equipment failure analysis/root cause failure analysis. They are:
Step 1: What Happened
Step 2: Troubleshooting
Step 3: Causal Factors
Step 4: Root Causes
Step 5: Corrective Actions
Step 6: Repairs and Improvement



Equifactor® Steps for Troubleshooting and Analyzing an Equipment Failure

Machine Failure Report
Step 1: What Happened On [date], at approximately [time], our [machine/equipment] experienced a failure during [operation/task]. The failure resulted in [specific issue or symptom], leading to a disruption in production/service.
Step 2: Troubleshooting Upon discovery of the failure, our maintenance team conducted troubleshooting activities to identify the source of the problem. This involved a thorough examination of the machine's components, including [list of components/systems checked].

Step 3: Causal Factors After thorough troubleshooting, several causal factors contributing to the failure were identified:
Component Wear: Examination revealed signs of wear and tear on [specific component], indicating prolonged usage without adequate maintenance.
Lubrication Failure: Analysis showed insufficient lubrication on [relevant parts], resulting in increased friction and heat generation.
Electrical Issues: Further investigation revealed irregularities in the electrical wiring, potentially leading to voltage fluctuations and component malfunction.
Environmental Factors: Environmental conditions, such as temperature and humidity levels, may have contributed to accelerated degradation of certain components.
Step 4: Root Causes Based on the identified causal factors, the following root causes were determined:
Lack of Maintenance: Inadequate maintenance practices, including irregular lubrication and inspection schedules, contributed to premature component wear.
Poor Lubrication Management: Failure to monitor and maintain proper lubrication levels led to increased friction and component failure.
Electrical System Deficiencies: Defects in the electrical wiring and insufficient grounding measures resulted in electrical issues and potential damage to sensitive components.
Environmental Neglect: Failure to address environmental conditions within the operational environment exacerbated wear and corrosion of machine parts.
Step 5: Corrective Actions To address the identified root causes and prevent future failures, the following corrective actions will be implemented:
Enhanced Maintenance Procedures: Implement a more rigorous maintenance schedule, including regular lubrication, inspection, and replacement of worn components.
Improved Lubrication Practices: Implement automated lubrication systems and conduct training for personnel on proper lubrication techniques and monitoring.
Electrical System Upgrades: Upgrade electrical wiring and grounding systems to ensure stability and prevent voltage fluctuations.
Environmental Controls: Implement environmental monitoring and control measures to regulate temperature, humidity, and other factors affecting machine performance.
Step 6: Repairs and Improvement Following the corrective actions, repairs and improvements will be made to the machine to restore functionality and enhance performance. This may include:
Replacement of worn or damaged components.
Calibration and alignment of machine parts.
Installation of upgraded or more durable components.

SELF-ASSESSMENT

1. What factor was NOT identified as a causal factor contributing to the machine failure?
a) Component Wear
b) Software Malfunction
c) Lubrication Failure
d) Electrical Issues
2. What is one root cause determined from the machine failure?
a) Inadequate maintenance practices
b) Excessive environmental monitoring
c) Proper lubrication management
d) Electrical system upgrades
3. What corrective action will be taken to address poor lubrication management?
a) Implementing a more rigorous maintenance schedule
b) Upgrading electrical wiring
c) Installing environmental monitoring systems
d) Implementing automated lubrication systems
4. Which of the following is NOT listed as a potential root cause of the machine failure?
a) Lack of Maintenance
b) Poor Lubrication Management
c) Inadequate Troubleshooting
d) Environmental Neglect
5. What is the purpose of making repairs and improvements in the machine failure report?
a) To identify causal factors
b) To implement corrective actions
c) To conduct troubleshooting
d) To restore functionality and enhance performance

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:
Slabs
Blooms
Billets
Furnace
Mold
Tundish
Casting
Extrusion
Nozzle
Oscillation

II.Reading Text

Continuous casting machine

A Continuous Casting Machine (CCM) is a crucial component in the steelmaking process that transforms molten steel into semi-finished products such as slabs, blooms, or billets in a continuous and efficient manner. The continuous casting machine is made of molten steel carrier (ladle, rotary table),tundish, crystallizer, secondary cooling device, Vibration device, straightening roll and bending roll, and cutting machine, dummy bar etc.This process is commonly used in both Basic Oxygen Furnace (BOF) and Electric Arc Furnace (EAF) steelmaking routes. Here's an overview of the Continuous Casting Machine, including its parameters and functions. Continuous Casting Machines (CCM) and their types:

Vertical Continuous Casting Machine (VCCM):

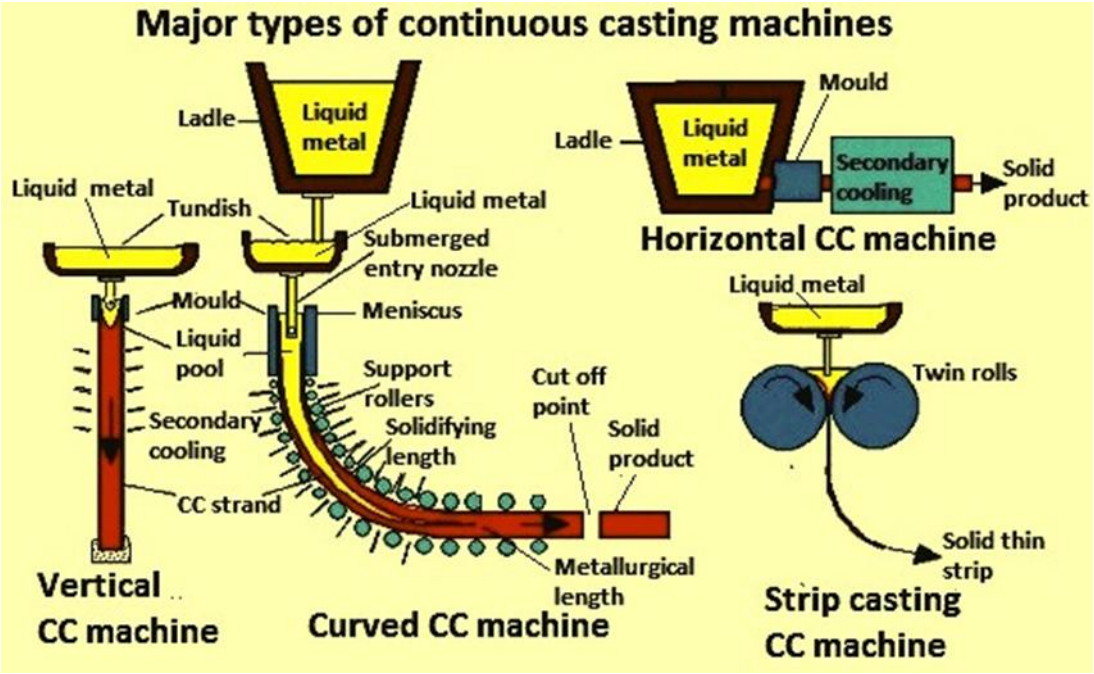
In a VCCM, molten metal is poured into a vertical mold, and the solidified strand is continuously pulled upwards. This type is commonly used for casting long and slender shapes such as bars and tubes.

Horizontal Continuous Casting Machine (HCCM):

HCCMs are used for casting wide and flat shapes such as slabs and strip. Molten metal is poured into a horizontal mold, and the solidified strand is continuously pulled horizontally.

Curved-Mold Continuous Casting Machine (CMCCM):

CMCCMs use a curved mold that can be either vertical or horizontal. This type is suitable for casting shapes with varying cross-sections, providing flexibility in producing different profiles.



Parameters:

Casting Speed: The rate at which the molten steel is cast into the molds. It is a critical parameter influencing the productivity and quality of the continuous casting process.

Cooling Rate: The speed at which the semi-finished steel product solidifies. Controlled cooling is essential to achieve the desired metallurgical properties.

Mold Oscillation: The movement of the mold during the casting process. Oscillation helps in achieving uniform solidification and minimizing surface defects.

Mold Level: Maintaining a consistent level of molten steel in the mold is crucial for achieving uniform casting and preventing disruptions in the process.

Tundish Temperature: The temperature of the steel in the tundish (a vessel that holds the molten steel before it enters the mold). Proper tundish temperature is essential for controlling the casting temperature.

Casting Powder Application: The type and amount of casting powder applied to the surface of the steel to prevent surface defects and improve the quality of the cast product.

Here are some common issues that may occur in casting machines:

Cracks in the Mold: Over time, molds can develop cracks due to thermal cycling, wear, or manufacturing defects, leading to casting defects.

Blockage in the Mold: Accumulation of impurities or solidified steel in the mold can obstruct the continuous casting process.

Rolls and Bearings Failure: Excessive wear or inadequate lubrication can lead to failure in rolls and bearings, impacting the movement of the cast strand.

Breakage of Straightening Rolls: If the straightening rolls are subject to excessive stress, they can break, affecting the quality of the cast product.

Failure of Cooling Water Supply: Inadequate cooling can result from issues with the water supply system, leading to overheating and defects in the cast product.

Clogged Water Passages: Accumulation of debris or scale in water passages can reduce the efficiency of the cooling system.

Sensor Failures: Malfunctioning sensors, such as those measuring temperature or mold level, can lead to inaccurate process control and defects.

Faulty Control Systems: Problems in the automation and control systems can result in erratic operation and casting issues.

Tundish Clogging: The tundish, which holds molten steel before entering the mold, can become clogged, affecting the casting process.

Tundish Temperature Control Issues: Inconsistent temperature control in the tundish can impact the casting temperature and product quality.

Inadequate Lubrication: Insufficient or uneven lubrication of the mold and strand can lead to increased friction, affecting the surface finish of the cast product.

Electrical Power Interruptions: Power outages or voltage fluctuations can disrupt the casting process and potentially damage equipment.

Crystallizer Malfunctions: Issues with the crystallizer, such as uneven cooling, can result in inconsistent solidification and defects in the cast product.

Irregular Casting Speed: Problems in the casting speed control system can lead to variations in product dimensions and quality.

✍ **After-text exercises**

1. Do a comprehension quiz:

1. What is the primary function of a Continuous Casting Machine (CCM)?

A) Cooling the molten steel

B) Pouring molten metal into molds

C) Heating steel billets

D) Rolling semi-finished products

2. Which type of Continuous Casting Machine is suitable for casting wide and flat shapes like slabs and strips?

A) Vertical Continuous Casting Machine (VCCM)

B) Horizontal Continuous Casting Machine (HCCM)

C) Curved-Mold Continuous Casting Machine (CMCCM)

D) Rotary Continuous Casting Machine (RCCM)

3. What is the purpose of mold oscillation in the continuous casting process?

A) Enhancing steel composition

B) Preventing surface defects and improving quality

C) Controlling tundish temperature

D) Adjusting the running speed

4. Which parameter is crucial for achieving uniform solidification and preventing disruptions in the casting process?

A) Casting Speed

B) Cooling Rate

C) Mold Oscillation

D) Tundish Temperature

5. What does the secondary cooling device in a Continuous Casting Machine ensure?

A) Centered nozzle and uniform water distribution

B) Mold lubrication and reduced friction

C) Quick and convenient mold change

D) Adjustment of the running speed

2. Answer the questions:

1) What are the advantages of using a Continuous Casting Machine (CCM) in the steelmaking process?
2) Which type of Continuous Casting Machine is suitable for casting shapes with varying cross-sections, providing flexibility in producing different profiles?
3) What role does the unique balance spring play in the Continuous Casting Machine (CCM)?
4) Why is maintaining a consistent level of molten steel in the mold crucial in the continuous casting process?
5) What is the function of the mold and strand lubrication systems in the Continuous Casting Machine (CCM)?

3.Insert the appropriate word or word combination from the text:

1) The _____ is a crucial component in the steelmaking process that transforms molten steel into semi-finished products.
2) In a Vertical Continuous Casting Machine (VCCM), molten metal is poured into a _____ mold, and the solidified strand is continuously pulled upwards.
3) _____are used for casting wide and flat shapes such as slabs and strip in the continuous casting process.
4) The continuous casting machine is made up of molten steel carrier, tundish, crystallizer, secondary cooling device, _____, and cutting machine.
5) The running speed of the continuous casting machine is _____, allowing for flexibility in the production process.

4.Match the words with their definitions:

Terms	Definitions
1. Crystallizer	a. The vessel that holds the molten steel before it enters the mold.
2. Tundish	b. A device used to control the cooling rate and achieve uniform solidification.
3. Mold Oscillation	c. The movement of the mold during the casting process.
4.Secondary Cooling Device	d. A semi-finished steel product resulting from the continuous casting process.
5. Billet	e. The part of the continuous casting machine responsible for solidifying the molten steel.

5. Role –play:

The casting machine has suddenly stopped during a production run. the Production Operator is reporting the issue to the Maintenance Technician. Complete the dialogue:

MT: Hello, this is [*Your Name*], the Maintenance Technician. I heard there's an issue with the casting machine. Can you tell me what happened?

PO: Yes, the casting machine just stopped suddenly, and I'm not sure what's wrong.

MT: Alright, let's start by describing what you observed.

PO: Well, there was ……

Diagnosing the Issue:

MT: Thanks for sharing that. The noise might give us a clue. Did you notice any specific part of the machine where the sound was coming from?

PO: Yes, it seemed to be coming from the area around the mold. I also saw some sparks just before it stopped.

Safety and Preliminary Checks:

MT: Sparks and an unusual noise near the mold, got it. Safety first – have you shut down the power to the machine?

PO: Yes, I turned off the power immediately after it stopped.

MT: Good. Safety is crucial. Let's make a quick visual inspection. Can you see any obvious damage or loose parts around the mold area?

PO: I'll take a look... Yes, there's a visible crack on the side of the mold, and there are metal fragments around it.

Proposing Solutions:

MT: Thanks for checking. A cracked mold could be the source of the issue. We might need to replace it. I'll need to order a new mold, but in the meantime, we can secure the area to prevent any further damage.

PO: Okay, sounds like a plan. How long do you think it'll take to get the new mold?

MT: I'll check availability and expedite the order. In the meantime, let's secure the area, document the damage, and schedule a full inspection once the new mold arrives.

6. Writing. Write a CCM fault report on the sample.

Fault Report Table

Fault No.: xx Day xx Month xx Year No. xx

Company Information		Engineer	
Fault occurrence time		Fault repair time	
Who found the fault		How to contact you (Tel or E-mail)	
Fault report submit time		Fault Number	
Fault Symptom			
Solution Progress and Result			
Fault Cause			
Fault Handling Sign : XXX			
Known Issus			
System State after the Fault Repaired			



UINIT 13. ELECTRIC ARC FURNACES
THEORETICAL PART
WRITING A TECHNICAL REPORT

Read and check your understanding.

A technical report is described as a written scientific document that conveys information about technical research in an objective and fact-based manner. This technical report consists of the three key features of a research i.e process, progress, and results associated with it. Technical reports are used by industries to convey pertinent information to upper management. This information is then used to make crucial decisions that would impact the company in the future.

To make a report about technical solutions, you should follow these general steps:

Define the problem: Start by defining the problem or challenge that you are trying to solve. Explain why this problem is important and what impact it has on the organization.

Describe the technical solution: Explain the technical solution in detail, including the components, design, and functionality. Use diagrams or images to illustrate your point.

Discuss the benefits: Describe the benefits of the technical solution, including how it addresses the problem and what impact it will have on the organization. Use concrete examples to demonstrate these benefits.

Discuss potential risks: Highlight any potential risks associated with the technical solution, including any challenges that may arise during implementation or operation.

Provide a cost-benefit analysis: Outline the costs associated with implementing the technical solution and provide a cost-benefit analysis that demonstrates the value of the solution.

Conclude with a recommendation: Conclude the report with a clear recommendation for how the organization should proceed. Summarize the benefits and risks of the technical solution and provide a clear justification for your recommendation.

Include references and appendices: Provide references to any sources you have used in your report and include any additional information in appendices, such as technical specifications or cost estimates.

Reports are formal documents, but that doesn't mean you have to use overly complex words or grammar. Use simple words that you'd use in everyday conversation to get your meaning across, e.g. 'send' rather than 'dispatch' and 'finish' rather than 'draw to a conclusion'. If you choose more complex language, readers could be unnecessarily distracted by it. Writing in an impersonal style can also make sentences difficult to read, e.g. 'It was immediately apparent to the writers...' If your company or university policy permits, use the more straightforward active voice: 'I recommend' or 'We recommend'.

SELF-ASSESSMENT

1. What is a technical report?
   a) A document that describes the process and results of technical research or experimentation.
   b) A document that outlines the financial and marketing strategies of a company.
   c) A document that summarizes the opinions of industry experts on a specific topic.
2. What are the key components of a technical report?
   a) Abstract, introduction, methodology, results, discussion, and conclusion.
   b) Executive summary, company history, financial statements, and recommendations.
   c) Title page, table of contents, and appendix.
3. What is the purpose of the introduction in a technical report?
   a) To provide background information on the problem being addressed.
   b) To summarize the results of the study.
   c) To present the recommendations and conclusions.
4. How should technical terms be presented in a technical report?
   a) In their original language.
   b) In a simplified form to make them more accessible to non-experts.
   c) With definitions or explanations to help readers understand their meaning.
5. What is the purpose of the conclusion in a technical report?
   a) To provide recommendations based on the results of the study.
   b) To restate the research question.
   c) To introduce new ideas or topics for future research.

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:

refractory
hydraulically
taphole
magnesite
electrodes
nipples
mast
vault
overvoltage
Insulation
flashovers

II.Reading Text

Electric arc furnace

The electric-arc furnace (EAF) is a squat, cylindrical vessel made of heavy steel plates. It has a dish-shaped refractory hearth and three vertical electrodes that reach down through a dome-shaped, removable roof (see figure). The shell diameter of a 10-, 100-, and 300-ton EAF is approximately 2.5, 6, and 9 metres. The shell sits on a hydraulically operated rocker that tilts the furnace forward for tapping and backward for slag removal. The bottom—i.e., the hearth—is lined with tar-bonded magnesite bricks and has on one side a slightly inclined taphole and a spout or, as shown in the figure, an oval hearth and a vertical taphole. With this latter arrangement, a furnace needs be tilted only 10° for tapping, producing a tight and short tap stream that decreases heat loss and reoxidation of the liquid steel. Before charging, the vertical taphole is closed from the outside by a movable bottom plate and is filled with refractory sand.

Most furnace walls are made of replaceable, water-cooled panels; these are covered inside by sprayed-on refractories and slag for protection and to keep heat loss down. The roof is also made of water-cooled panels and has three circular openings, equally spaced, for insertion of the cylindrical electrodes. Another large roof opening, the so-called fourth hole, is used for off-gas removal. Additional openings in the furnace wall, with water-cooled doors, are used for lance injection, sampling, testing, inspection, and repair. The roof and electrodes can be lifted and moved away for charging scrap and for hearth maintenance.

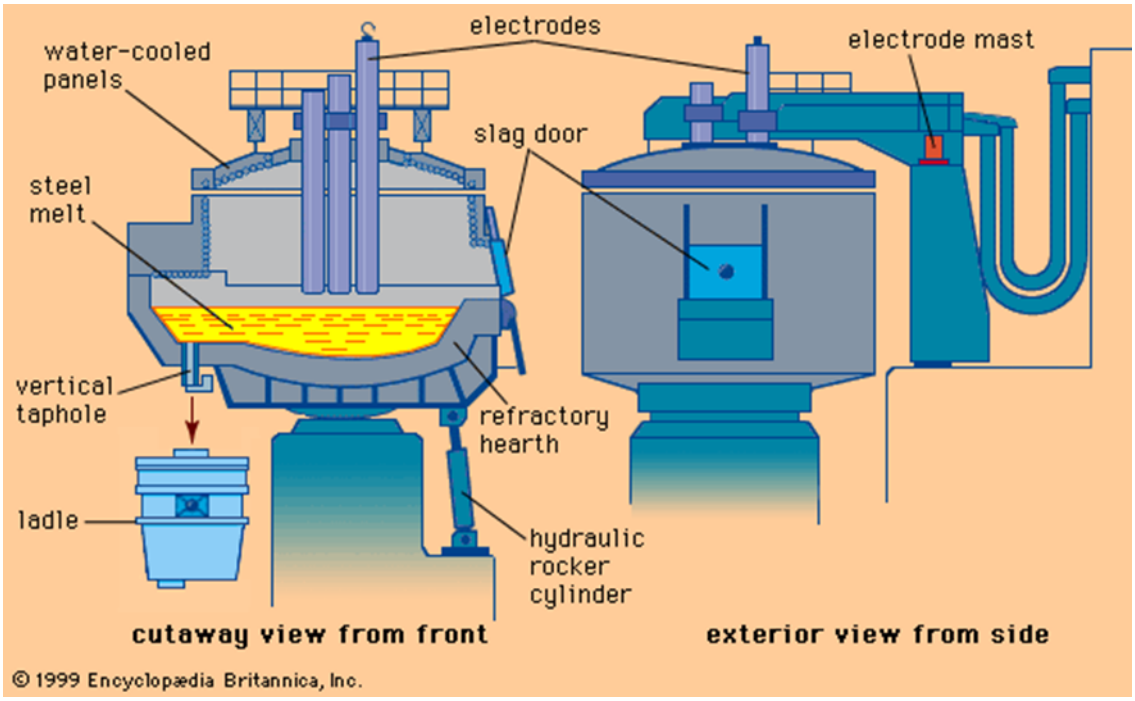
The graphite electrodes, produced to high standards by a specialized industry, are actually strings of individual electrodes bolted end to end by short graphite nipples. This is done because shorter electrodes are easier to manufacture, transport, and handle. Electrode diameters depend on furnace size; a 100-ton EAF typically uses 600-millimetre electrodes. Three electrode strings are each clamped to arms that extend over the furnace roof and that are bolted to a vertically movable mast located beside the furnace. The mast controls the distance between each electrode tip and the scrap or melt, thereby regulating the arc length and current flow. Power-supply equipment—normally a step-down transformer, vacuum circuit breakers, a tap changer for electrode voltage control, and a furnace transformer—is installed in a concrete vault a short distance from the furnace. Heavy water-cooled cables and the power-carrying arms connect the furnace transformer with the electrodes.

Possible EAF transformer failures. The arc furnace must have a supplying transformer which is custom designed to meet erratic loads for what will effectively be the equivalent of many short circuits.

The solutions to preventing some arc furnace transformer failures will be found by considering what is happening to cause failure. It must be accepted that the loading of the furrnace and the initial melt will set up abnormal conditions such as overvoltage, overcurrents and harmonic distortion and these should be provided for in the general design. However, there is no escaping the fact that the result will still be mechanical pounding, high but fluctuating currents and voltage distortions. The basics requirements then are to guard against this by ensuring that currents are kept within design limits and to minimum proportions by ensuring good contact surfaces

and tight connections. If possible, monitor the heat generated by the. high current bars with thermal imaging systems or heat sensitive devices now available. Include, or check, the relaying system which protects against extreme overcurrents and make sure such protection is adequate to give notice of early problems. Internal inspection of the transformer should be carried out at least once a year by independent experts in conjunction with the manufacturer.

The severe conditions experienced by furnace transformers can lead to oil contamination much quicker than conventional units. Even evidence of severe gassing will be found. Therefore, regular and more frequent oil analysis checks are recommended - at least quarterly. In addition to measuring the degree of polymerization of the paper insulation, this measures the chemical by products of the insulating paper degradation.



(from:https://brosz.net/site/brosz_group_of_companies/assets/pdf/electrical_digest_11_-_arc_furnace_transformer_failure.pdf)

✍ After-text exercises

1. Do a comprehension quiz:

1. What is the shape of the electric-arc furnace (EAF)?
a) Rectangular
b) Cylindrical
c) Square
d) Triangular
2. How many vertical electrodes does the electric-arc furnace typically have?
a) One
b) Two

c) Three
d) Four
3. What material lines the bottom of the EAF hearth?
a) Concrete
b) Tar-bonded magnesite bricks
c) Steel plates
d) Aluminum foil
4. What is the purpose of the inclined taphole in the furnace?
a) Slag removal
b) Off-gas removal
c) Charging scrap
d) Tapping
5. How are most furnace walls protected from heat loss?
a) With water-cooled panels
b) With concrete
c) With plastic sheets
d) With fiberglass insulation
6. What are the graphite electrodes typically bolted end to end with?
a) Steel nipples
b) Aluminum rods
c) Copper wires
d) Graphite nipples
7. How are the distance between electrode tips and the scrap or melt regulated?
a) By adjusting the mast located beside the furnace
b) By adjusting the size of the electrodes
c) Automatically
d) By manually lifting the roof
8. Where is the power-supply equipment typically installed?
a) Inside the furnace
b) On the furnace roof
c) In a concrete vault
d) On the electrodes
9. What is recommended to monitor the health of the arc furnace transformer?
a) Regular oil analysis checks
b) Visual inspection once every five years
c) No monitoring is necessary
d) Annual inspection by the manufacturer
10. What is suggested to prevent flashovers and insulator breakdowns in arc furnace transformers?
a) Locating the transformer in a clean, pressurized vault
b) Increasing the voltage
c) Decreasing the oil analysis frequency
d) Installing additional electrodes for protection

2. Answer the questions:

1. What is the material composition of the hearth in the electric-arc furnace (EAF)?
2. How is the furnace tilted for tapping and slag removal?
3. What is the primary purpose of the circular openings in the roof of the EAF?
4. How are the graphite electrodes connected in the electric-arc furnace (EAF)?
5. What is recommended for monitoring the health of the arc furnace transformer?

3. True/false:

1. The electric-arc furnace (EAF) typically has a dish-shaped refractory hearth.
2. The shell diameter of a 100-ton EAF is approximately 6 meters.
3. Most furnace walls are made of non-replaceable, water-cooled panels.
4. The distance between each electrode tip and the scrap or melt is regulated by adjusting the mast located beside the furnace.
5. Furnace transformers for EAFs are typically located inside the furnace itself.

4. Match the words with their definitions:

Electric Arc Furnace Parts	Descriptions
Graphite electrodes	Circular openings in the roof
Refractory hearth	Power-supply equipment
Hydraulically operated rocker	Material lining the bottom of the hearth
Oval hearth and vertical taphole	Water-cooled panels
Lance injection	Movable bottom plate

5. Complete the table summarizing the information from the paper and the video
(https://marinerspointpro.com/electric-arc-furnace/
https://www.youtube.com/watch?v=o9QrqAYAFwE)

Parts of EAF	Their application
Shell	It provides structural support and helps contain the heat and materials inside the furnace.

6. Role play. Watch a video about advantages and disadvantages of EAFs https://www.youtube.com/watch?v=o9QrqAYAFwE. Make up a dialogue between a director advocating for EAF and a stakeholder who opposes it.

7.Writing. Complete the technical report on EAF:

Introduction: This technical report provides an overview of the electric arc furnace, including its components, operation, and maintenance requirements.
Components of the Electric Arc Furnace: The EAF consists of several key components:
…….
…….
Operation of the Electric Arc Furnace: The EAF operates by ……. The process involves:
…….
……..
Maintenance tasks include:
……..
……..

UNIT 14. OPEN HEARTH FURNACES



THEORETICAL PART
WRITING TECHNICAL CHARACTERISTICS

Read and check your understanding.

Writing technical characteristics of a device is an important aspect of technical documentation. Here are some steps to follow when writing technical characteristics: Identify the key components of the device: Before writing the technical characteristics, it is important to identify the key components of the device. This will help you to organize your information and ensure that you include all relevant details.

Determine the relevant technical parameters: The technical characteristics of a device typically include details about its physical dimensions, weight, power consumption, operating temperature range, and other technical parameters that are relevant to its performance.

Use clear and concise language: When writing technical characteristics, it is important to use clear and concise language. Avoid using jargon or technical terms that may not be familiar to your audience.

Use tables and diagrams: Tables and diagrams can be helpful for presenting technical information in a clear and organized way. Use them to summarize technical data and highlight key features of the device.

Include information about safety and regulatory compliance: If the device is subject to safety or regulatory requirements, be sure to include information about compliance with relevant standards or regulations.

Review and revise: Once you have written the technical characteristics, review and revise them to ensure that they are accurate, complete, and easy to understand.
Overall, the key to writing effective technical characteristics is to present technical information in a clear, concise, and organized way, while ensuring that all relevant details are included.

Technical characteristics of steelmaking equipment may include:

Capacity: The maximum amount of steel that the equipment can produce within a specified time frame, often measured in tons per hour or per batch.

Power Requirements: The electrical power or energy consumption needed to operate the equipment efficiently, typically measured in kilowatts (kW) or megawatts (MW).

Melting Method: The process used to melt raw materials and scrap steel, such as electric arc furnace (EAF), basic oxygen furnace (BOF), or induction furnace.

Heating Source: The energy source used for heating, such as electricity, natural gas, or coal, which can impact the efficiency and environmental footprint of the equipment.

Melting Capacity: The rate at which the equipment can melt raw materials and scrap steel into liquid form, often expressed in tons per hour or per heat.

Refining Capability: The ability of the equipment to refine molten steel to achieve the desired chemical composition and remove impurities, such as oxygen, sulfur, and phosphorus.
Temperature Control: The precision and accuracy of temperature control systems to maintain the molten steel at the desired temperature throughout the steel-making process.
Cooling System: The system used to cool and solidify the molten steel into solid steel products, including water-cooled panels, spray cooling, or air cooling methods.
Automation Level: The degree of automation and control systems integrated into the equipment, such as PLCs (Programmable Logic Controllers), SCADA (Supervisory Control and Data Acquisition) systems, and robotic automation, to optimize efficiency and productivity.
Environmental Compliance: The equipment's adherence to environmental regulations and emission standards, including measures to minimize air and water pollution, energy consumption, and waste generation.
Maintenance Requirements: The frequency and types of maintenance tasks required to keep the equipment operational and ensure its longevity, including routine inspections, repairs, and component replacements.
Safety Features: The built-in safety mechanisms and protocols designed to protect operators and prevent accidents, such as emergency shut-off systems, safety interlocks, and protective barriers.

SELF-ASSESSMENT

1. What are technical characteristics of a device?
   A. A list of technical terms related to the device
   B. A detailed description of the device’s features and specifications
   C. A brief overview of the device’s appearance
2. What should be included in the technical characteristics of a device?
   A. Brand name and price
   B. Colors and sizes available
   C. Technical specifications such as size, weight, power consumption, etc.
3. Why is it important to include technical characteristics in a device’s documentation?
   A. To make the document look more professional
   B. To provide customers with detailed information about the device
   C. To confuse customers with technical jargon
4. How should technical characteristics be presented in the documentation?
   A. In paragraph form
   B. In bullet points or tables for easier reading and understanding C. In a narrative style with lots of technical jargon
5. What is the purpose of including technical drawings or diagrams in the documentation?
   A. To show off the designer’s artistic skills

B. To help customers understand the device's technical features and how it works
C. To fill up empty space in the document

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:

Regenerators
Checker bricks
Combustion air
Fuel gas
Off-gases
End-wall
Heat-recovery boiler
Injection burners
Spalling
Insulation
Structural integrity
Malfunctions

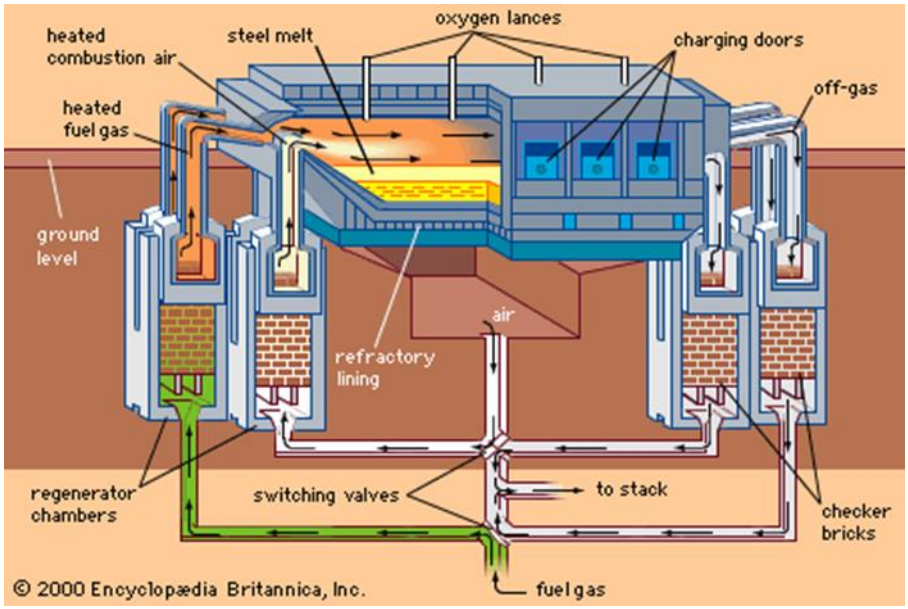
II.Reading Text

The Open-hearth furnace

The open-hearth furnace (OHF) uses the heat of combustion of gaseous or liquid fuels to convert a charge of scrap and liquid blast-furnace iron to liquid steel. The high flame temperature required for melting is obtained by preheating the combustion air and, sometimes, the fuel gas. Preheating is done in large, stovelike regenerators or checker chambers, located beneath the furnace (see figure). These contain checker bricks stacked in such a way that they absorb heat from furnace off-gases as they are directed through the chamber. After one chamber has been heated for about 20 minutes, a sliding valve is activated, directing the off-gases to the other chamber and simultaneously bringing air into the heated chamber. This combustion air, after picking up the heat from the checker brick, then enters the furnace through an end-wall above the checker chamber and burns the fuel, which also enters the furnace at the same wall. The combustion flames heat the charge, and the off-gases, after moving across the hearth to the other end wall, are directed downward to heat the other chamber. This cycle, with entry ports becoming exit ports, is reversed every 15 to 20 minutes. After heating the regenerator, the off-gases flow through a heat-recovery boiler and a gas-cleaning system before they are discharged into the atmosphere through a stack.

The OHF itself consists of a shallow, rectangular hearth that holds the charge, liquid steel, and slag (see figure). Depending on the furnace size, the long front wall on the charging side usually has three to seven rectangular openings fitted with water-cooled doors. These are used for charging scrap and iron, adding flux and

alloying agents, running off slag, conducting tests, and repairing the hearth refractory. On the opposite side of the furnace, at the back wall, is the taphole and a spout for tapping into one or two ladles. The two end walls are used as inlets or outlets for gas and air, and they also hold the injection burners for heavy oil, tar, or natural gas, when used.



Possible failures in open hearth furnaces can include:

1. Refractory lining deterioration: Over time, the refractory lining of the furnace can degrade due to high temperatures and chemical reactions, leading to reduced insulation and heat retention.
2. Brick spalling: The bricks used in the hearth and walls of the furnace can experience spalling or cracking, compromising the structural integrity of the furnace and potentially causing leaks.
3. Burner malfunction: Issues with the burners used to heat the furnace can result in uneven heating or failure to reach desired temperatures, impacting the efficiency of the heating process.
4. Slag buildup: Accumulation of slag, a byproduct of the steelmaking process, can interfere with heat transfer and furnace operation, leading to reduced productivity and increased maintenance requirements.
5. Gas leaks: Leaks in the gas supply lines or combustion chambers can pose safety hazards and impact furnace performance, potentially leading to explosions or fires.
6. Mechanical failures: Components such as valves, pumps, and controls can experience wear and tear over time, leading to malfunctions or breakdowns that require repair or replacement.
7. Electrical failures: Electrical components such as motors, transformers, and heating elements can fail due to overload, short circuits, or other electrical faults, disrupting furnace operation and requiring troubleshooting and repairs.

(from: https://www.britannica.com/technology/steel/Open-hearth-steelmaking)

✍ After-text exercises

1. Do a comprehension quiz

1. What is the main source of heat used in the open-hearth furnace (OHF)?
a) Electrical energy
b) Heat generated from coal combustion
c) Heat generated from gaseous or liquid fuels combustion
d) Solar energy
2. How is the high flame temperature required for melting obtained in the OHF?
a) By preheating the combustion air and fuel gas
b) By using water-cooled doors
c) By injecting oxygen lances
d) By stacking checker bricks in the furnace
3. What is the purpose of the regenerators or checker chambers located beneath the furnace?
a) To absorb heat from furnace off-gases
b) To release heat into the atmosphere
c) To cool down the furnace
d) To store liquid steel
4. How often is the cycle of reversing entry and exit ports in the regenerators typically done?
a) Every 5 minutes
b) Every 10 minutes
c) Every 15 to 20 minutes
d) Every hour
5. What is the function of the arched roof in the OHF?
a) To hold the liquid steel and slag
b) To release heat into the atmosphere
c) To absorb heat from furnace off-gases
d) To contain the flames and reflect the heat onto the melt
6. What material is the roof of the OHF typically made of?
a) Concrete
b) Steel
c) Chrome-magnesite refractory bricks
d) Glass
7. What are retractable oxygen lances used for in the OHF?
a) To increase the flame temperature and melting rate
b) To cool down the furnace
c) To absorb heat from furnace off-gases
d) To release heat into the atmosphere
8. What are the rectangular openings with water-cooled doors on the front wall of the OHF used for?
a) Charging scrap and iron
b) Running off slag
c) Conducting tests

d) All of the above
9. Where is the taphole and spout located in the OHF?
a) On the front wall
b) On the arched roof
c) On the back wall
d) On the side walls
10. What is the purpose of the injection burners in the OHF?
a) To inject oxygen into the furnace
b) To add flux and alloying agents
c) To heat the regenerators
d) To burn heavy oil, tar, or natural gas

2. Answer the questions:

1. Can you describe the construction and purpose of the regenerators or checker chambers in the open-hearth furnace (OHF), and how they contribute to heat management and furnace efficiency?
2. What are some common types of failures observed in the refractory lining of the OHF, and what maintenance strategies can be employed to address these issues and prolong the lifespan of the furnace?
3. How do water-cooled doors on the front wall of the OHF contribute to furnace operation and maintenance, and what specific tasks are typically performed through these openings?
4. Could you discuss the importance of regular inspection and maintenance of the arched roof in the OHF, particularly in relation to its material composition and its role in containing flames and reflecting heat onto the melt?
5. In what ways do retractable oxygen lances impact furnace operation and maintenance in the OHF, and how are they utilized to optimize flame temperature and melting rate while minimizing maintenance requirements?

3. True/false:

1. The open-hearth furnace (OHF) utilizes the heat of combustion of gaseous or liquid fuels to convert a charge of scrap and liquid blast-furnace iron to liquid steel.
2. The regenerators or checker chambers located beneath the furnace are used to release heat into the atmosphere.
3. The cycle of reversing entry and exit ports in the regenerators is typically done every 5 minutes.
4. The arched roof of the OHF is made of low-grade concrete to withstand intense thermal exposure.
5. Retractable oxygen lances are used in the OHF to decrease the flame temperature and melting rate.

4. Match the words with their definitions:

Open-Hearth Furnace Component	Description
Regenerators or checker chambers	Contains the flames and reflects the heat onto the melt, typically made of high-grade chrome-magnesite refractory bricks.
Arched roof	Used for tapping into ladles.
Retractable oxygen lances	Located on the front wall of the furnace, these are rectangular openings fitted with doors that are used for various furnace operations.
Water-cooled doors	Used to preheat combustion air and fuel gas, contributing to achieving the required flame temperature for melting.
Taphole and spout	Used to increase the flame temperature and melting rate.

5. Speaking. Based on the information in the table, identify the top three maintenance priorities for ensuring the smooth operation of the OHF.

Failures in Open-Hearth Furnace	Solutions
Refractory lining damage (e.g., cracks, spalling)	1. Conduct regular inspections to identify damage early. 2. Repair damaged areas promptly using appropriate refractory materials and techniques. 3. Implement preventive maintenance measures, such as proper cooling and heating cycles, to minimize thermal stress on refractory linings.
Combustion system malfunctions (e.g., burner issues)	1. Monitor combustion system performance regularly to detect malfunctions. 2. Conduct routine maintenance on burners, including cleaning and calibration. 3. Train furnace operators on proper combustion system operation and troubleshooting techniques.
Slag buildup and blockages	1. Implement slag management practices, such as regular removal and disposal of slag. 2. Optimize furnace tapping procedures to minimize slag buildup. 3. Use slag detection sensors or probes to monitor slag levels and take corrective actions as needed.
Heat exchanger failures	1. Inspect heat exchangers regularly for signs of corrosion, erosion, or leaks.

	2. Clean heat exchanger surfaces to remove deposits and improve heat transfer efficiency. 3. Replace worn-out or damaged heat exchanger components with new ones.
Electrical system faults (e.g., transformer failures)	1. Conduct preventive maintenance on electrical components, including inspections, testing, and cleaning. 2. Monitor electrical system performance and address any abnormalities promptly. 3. Have backup transformers and spare parts on hand to minimize downtime in case of failures.

6. **Writing.** Write technical characteristics for OHF: heat source, combustion system, heat recovery, checkers chambers, regeneration cycle, charging and tapping, burners, failures and maintenance.

UNIT 15. CONVERTER



THEORETICAL PART
WRITING A MAINTAINANCE REPORT

Read and check your understanding.

It is a document that records all the activities that were carried out in a maintenance operation. It includes information such as what was done; when it was done; who did it, and how long it took. This report is then used to improve maintenance operations or as a reference for future maintenance activities.

Writing a maintenance report involves documenting the maintenance activities that have been performed on equipment, facilities, or a property. The report should be clear, concise, and include all relevant information. Here are the steps to follow when writing a maintenance report:

Identify the maintenance activity: Start by identifying the type of maintenance activity that was performed. This could include routine maintenance, repairs, or upgrades.

Describe the maintenance activity: Provide a detailed description of the maintenance activity that was performed. This should include information such as the date and time the activity was performed, the equipment or facilities involved, and any materials or supplies used. The description should briefly summarize what was done during the maintenance task. However, it should also be detailed at the same time. Elaborate enough so that someone reading the maintenance report will understand what was done, but don't include so much information that it becomes overwhelming.

Note any issues or problems: If any issues or problems were discovered during the maintenance activity, be sure to note them in the report. This could include anything from worn out parts to safety hazards.

Provide recommendations: Based on the maintenance activity and any issues that were discovered, provide recommendations for any additional maintenance or repairs that may be needed in the future.

Include photos or videos: If possible, include photos or videos of the maintenance activity and any issues that were discovered. This can help to provide a clear visual representation of the work that was performed.

Provide supporting documentation: If available, include supporting documentation such as work orders, inspection reports, and maintenance logs.

KPIs, or Key Performance Indicators, are specific metrics used to measure the success or progress of an organization, team, or individual in achieving their goals or objectives. KPIs are typically used in business, but can be applied in other contexts as well.

KPIs are chosen based on the specific goals and objectives of the organization or team, and should be relevant, measurable, and trackable over time. KPIs are important because they provide a clear and objective way to measure progress and

success, and help organizations and teams make informed decisions about where to focus their efforts and resources. By regularly monitoring and analyzing KPIs, organizations can identify areas for improvement, make strategic adjustments, and ultimately achieve their goals more effectively.

The most common KPIs and metrics for maintenance, including:

- Planned maintenance percentage (PPC)
- Overall equipment effectiveness (OEE)
- Mean time to repair (MTTR)
- Mean time between failure (MTBF)
- Preventive maintenance compliance (PMC)

SELF-ASSESSMENT

1. What is the first step in writing a maintenance report?
   a) Provide a detailed description of the maintenance activity.
   b) Identify the maintenance activity.
   c) Note any issues or problems.
2. What should be included in the description of the maintenance activity?
   a) The date and time the activity was performed.
   b) The equipment or facilities involved.
   c) Any materials or supplies used.
   d) All of the above.
3. Why is it important to note any issues or problems discovered during the maintenance activity?
   a) To show that the maintenance was completed properly.
   b) To provide recommendations for future maintenance or repairs.
   c) To highlight safety hazards or other concerns.
4. What should be included in the recommendations section of the maintenance report?
   a) Any additional maintenance or repairs that may be needed in the future.
   b) Any upgrades or improvements that could be made.
   c) Both a and b.
5. Why might it be helpful to include photos or videos in the maintenance report?
   a) To provide a clear visual representation of the work that was performed.
   b) To show that the maintenance was completed properly.
   c) To highlight safety hazards or other concerns.

PRACTICAL PART

I.Preparation

Before reading study the following vocabulary:

Ferroalloys
Tuyeres
Refractory-lined
Trunnion
Thermal shock

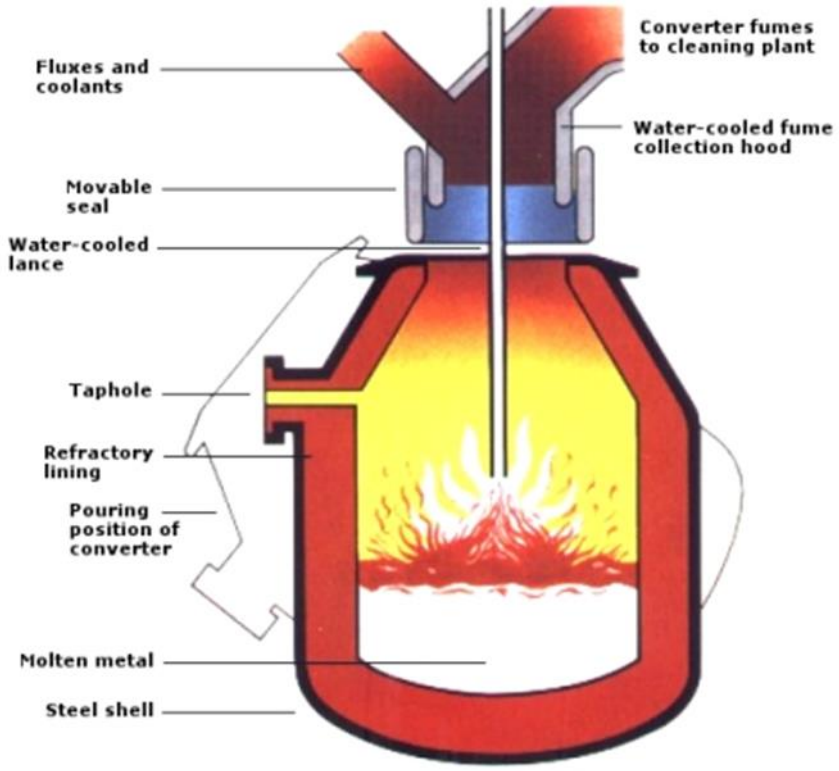
Hot patching
Dust collection
Emission control
Predictive maintenance
Operational best practices
Chromium yield
Argon-oxygen

II.Reading Text

Converter

In the production of stainless steel and other high-alloy grades that contain highly oxidizable elements such as chromium, lowering the levels of carbon by regular oxygen injection has the undesirable consequence of oxidizing the alloying elements as well. Converter steelmaking uses molten iron, scrap steel, and ferroalloys as the main raw materials, adding a small amount of quicklime, blowing in air or oxygen to oxidize impurities such as silicon, manganese, phosphorus, sulfur, and carbon, and release a large amount of heat (including 1%(w) of silicon can increase the temperature of pig iron by 200℃), which can make the furnace reach a high enough temperature (without external energy), relying on the physical heat of the molten iron itself and the chemical reaction between the components of the molten iron Generate heat to complete the steelmaking process in the converter.

The AOD process is carried out in a refractory-lined converter similar to the BOF but with two to six argon-oxygen tuyeres installed in the lower side wall. The tuyeres consist of two concentric steel tubes, with the inert gas flowing in the outer annulus and oxygen in the inner tube. The converter has tilting and emission-control equipment similar to that of the BOF; the lining is also basic, but it lasts only 50 to 100 heats because of the long refining time and the high temperature of more than 1,700° C (3,100° F) that is necessary for improving the chromium yield. Most shops have three converter shells and one trunnion ring at a blowing station, rotating them between operation, relining, and preheating.



Some common services for converters include:

1. Refractory Maintenance: Regular inspection and repair of refractory linings to prevent wear, erosion, and thermal shock damage caused by the high temperatures and chemical reactions within the converter.
2. Lance Maintenance: Inspection and cleaning of oxygen lance equipment to ensure proper functioning and efficient oxygen injection into the molten metal.
3. Slag Management: Handling and disposal of slag generated during the steelmaking process, including removal from the converter and proper disposal or recycling.
4. Lining Repair and Replacement: Repairing or replacing damaged refractory linings, including hot patching, gunning, or complete relining as needed to maintain structural integrity and prevent heat loss.
5. Converter Shell Inspection: Regular inspection of the converter shell for signs of wear, corrosion, or structural damage, with repairs or reinforcements implemented as necessary.
6. Temperature and Gas Monitoring: Monitoring and control of converter operating parameters, including temperature, gas flow rates, and pressure, to optimize steelmaking efficiency and quality.
7. Dust and Emissions Control: Implementation of measures to control dust emissions and air pollution associated with converter operations, such as dust collection systems and emission control technologies.
8. Safety Inspections and Training: Conducting regular safety inspections of converter equipment and providing training to operators on safe handling procedures, emergency protocols, and use of personal protective equipment (PPE).

9. Predictive Maintenance: Utilizing predictive maintenance techniques, such as vibration analysis, thermography, and oil analysis, to anticipate and prevent equipment failures before they occur.
10. Process Optimization: Continuous improvement initiatives aimed at optimizing converter operations, increasing productivity, reducing energy consumption, and improving product quality through technological advancements and operational best practices.

✍ After-text exercises

1. Do a comprehension quiz:

1. What are the main raw materials used in converter steelmaking?
a) Iron ore and limestone
b) Molten iron, scrap steel, and ferroalloys
c) Aluminum and copper
d) Nickel and titanium
2. What is the purpose of adding quicklime and blowing in air or oxygen during converter steelmaking?
a) To lower the temperature of the furnace
b) To oxidize impurities such as silicon, manganese, phosphorus, sulfur, and carbon
c) To increase the carbon content in the steel
d) To decrease the chromium content in the steel
3. How does the AOD process differ from the BOF process?
a) The AOD process does not use oxygen in refining.
b) The AOD process requires a higher temperature for refining.
c) The AOD process uses argon-oxygen tuyeres for refining.
d) The AOD process has a shorter refining time compared to the BOF.
4. What is the purpose of the argon-oxygen tuyeres in the AOD process?
a) To provide heat for the refining process
b) To release impurities from the molten steel
c) To introduce oxygen and inert gas into the converter
d) To cool down the temperature of the converter
5. How many converter shells and trunnion rings are typically found at a blowing station in most shops?
a) One converter shell and one trunnion ring
b) Two converter shells and one trunnion ring
c) Three converter shells and one trunnion ring
d) Four converter shells and two trunnion rings

2. Answer the questions:

1. How does the process of converter steelmaking differ from other steelmaking methods, such as the electric arc furnace (EAF) process?

2. What are some potential challenges or drawbacks associated with using oxygen injection to lower carbon levels in the production of stainless steel and high-alloy grades?
3. Can you explain the role of quicklime in the converter steelmaking process and how it contributes to the removal of impurities from the molten metal?
4. In the AOD process, why is a refractory-lined converter utilized, and how does it contribute to the refining of stainless steel?
5. What are some factors that influence the lifespan of the lining in the AOD converter, and how do these factors impact the overall efficiency of the steelmaking process?

3. True/false:

1. The AOD process requires a refractory-lined converter similar to the BOF process.
2. Oxygen injection in converter steelmaking can lead to the oxidation of alloying elements such as chromium
3. Converters in steelmaking utilize oxygen or air blowing to reduce impurities such as silicon, manganese, phosphorus, sulfur, and carbon.
4. The lifespan of the lining in the AOD converter is typically longer than in other converters due to the low temperatures required for refining.
5. Regular maintenance of converters includes refractory repairs, lance maintenance, and slag management to ensure optimal performance and efficiency.

4. Match the words with their definitions:

Convertor Component	Definition
Refractory Lining	A device for injecting oxygen into the converter for refining purposes.
Lance	A material used to line the converter and protect it from high temperatures.
Tuyeres	A component used for introducing argon gas into the converter.
Trunnion Ring	A device for tilting the converter during the steelmaking process.
Converter Shell	A mechanism for removing impurities from the molten metal in the converter.

5.Role play. *Sarah and Mark have been invited to discuss the issues and propose solutions to improve a convertor performance. Complete the dialogue:*

Sarah: We've identified several issues, including …...

Mark: Well, I believe we need to prioritize refractory maintenance to address the lining damage and prevent further deterioration. This will involve conducting thorough ….. to ensure the refractory linings are in optimal condition.

Sarah: how can we address the lance malfunctions and slag buildup issues?

Mark: For the lance malfunctions, we need to…..

Sarah: What about slag builtup?
Mark: As for the slag buildup, we may need to…...

6. **Speaking.** Using the platform Genially https://genial.ly/ create infographics on «Evolution of steelmaking equipment» and comment on it (dates, inventors, types of furnaces should be mentioned).
7. **Writing.** Complete the maintenance report on a converter based on the sample. Pay attention to the verbs used in it:

Verify
Record
Install
Check
Drill
Conduct
Provide
Utilize
Clean
Remove
Inspect
Monitor
adjust

Maintenance Report: Open-Hearth Furnace	
Date: [Insert Date]	**Location:** [Insert Location]
Equipment: Open-Hearth Furnace (OHF)	
Maintenance Summary:	
1. Refractory Maintenance:	
- Inspected refractory linings for signs of wear, erosion, and thermal shock damage.	
- Conducted repairs using hot patching and gunning techniques to address localized damage.	
- Scheduled full relining of the furnace lining due to extensive wear and degradation.	
2. Lance Maintenance:	
- Inspected oxygen lance equipment for proper functioning and cleanliness.	
- Cleaned lance nozzles and replaced worn components to ensure efficient oxygen injection.	
3. Slag Management:	
- Removed accumulated slag from the furnace and disposed of it in designated waste management areas.	
- Implemented measures to minimize slag buildup during steelmaking operations.	
4. Lining Repair and Replacement:	
- Conducted hot repairs to address localized damage and maintain lining integrity.	
- Scheduled replacement of refractory bricks and linings in critical areas to prevent heat loss and ensure furnace performance.	

5. Converter Shell Inspection:	
- Inspected the converter shell for signs of wear, corrosion, or structural damage.	
- Identified areas requiring repair or reinforcement to maintain structural integrity and prevent leaks.	
6. Temperature and Gas Monitoring:	
- Monitored converter operating parameters, including temperature, gas flow rates, and pressure.	
- Adjusted control settings to optimize steelmaking efficiency and quality.	
7. Dust and Emissions Control:	
- Implemented dust collection systems and emission control technologies to minimize air pollution.	
- Conducted regular maintenance of control systems to ensure effective dust and emissions control.	
8. Safety Inspections and Training:	
- Conducted safety inspections of equipment and work areas to identify hazards and ensure compliance with safety protocols.	
- Provided training to operators on safe handling procedures, emergency protocols, and proper use of personal protective equipment (PPE).	
9. Predictive Maintenance:	
- Utilized predictive maintenance techniques, such as vibration analysis and thermography, to anticipate equipment failures and schedule proactive repairs.	
- Analyzed oil samples to detect signs of equipment wear and degradation.	
10. Process Optimization:	
- Implemented process optimization initiatives to increase productivity and reduce energy consumption.	
- Reviewed operational procedures and identified areas for improvement to enhance furnace performance.	
Conclusion:	
The OHF maintenance activities conducted during the reporting period were essential for ensuring the reliability, efficiency, and safety of furnace operations. Continued adherence to maintenance schedules and proactive identification of issues will contribute to the long-term performance and longevity of the equipment.	
Maintenance Technician: [Insert Name]	**Supervisor:** [Insert Name]

Final Test

Choose a correct answer:

1. Which part of a blast furnace is responsible for injecting air and fuel into the furnace?
    a) Tuyeres
    b) Hearth
    c) Stoves
    d) Stack
2. What component of a continuous casting machine is responsible for controlling the flow of molten metal into the mold?
    a) Tundish
    b) Ladle
    c) Mold oscillator
    d) Withdrawal system
3. Which type of furnace uses rollers to shape and compress metal products?
    a) Electric arc furnace
    b) Blast furnace
    c) Rolling mill
    d) Induction furnace
4. What part of a forging machine applies force to shape the metal workpiece?
    a) Anvil
    b) Die
    c) Ram
    d) Crankshaft
5. Which component of a ladle furnace is responsible for heating and maintaining the temperature of the molten metal?
    a) Heating elements
    b) Tundish
    c) Refractory lining
    d) Lid cover
6. In a rolling mill, what part is responsible for guiding and shaping the metal workpiece?
    a) Rollers
    b) Mandrel
    c) Roll stands
    d) Collars
7. What is the purpose of a quenching tank in metallurgical equipment?
    a) Heating metal workpieces
    b) Cooling metal rapidly to increase hardness
    c) Removing impurities from metal
    d) Lubricating machine parts
8. Which component of a continuous casting machine prevents air from entering the mold cavity?
    a) Mold oscillation system

b) Mold powder
c) Mold level control
d) Mold copper plates

9. What is the primary function of a ladle turret in steelmaking?
    a) Pouring molten metal into molds
    b) Transporting ladles between different furnace stations
    c) Preheating ladles before use
    d) Filtering impurities from molten metal
10. Which type of furnace uses an electric current to heat and melt metal?
    a) Blast furnace
    b) Electric arc furnace
    c) Cupola furnace
    d) Reverberatory furnace
11. What is the purpose of a ladle slide gate mechanism in steelmaking?
    a) Controlling the flow of molten metal from the ladle
    b) Supporting the ladle during transportation
    c) Heating the ladle before pouring
    d) Cleaning the ladle lining
12. Which component of a rolling mill is responsible for adjusting the gap between the rollers?
    a) Roll stand
    b) Screwdown mechanism
    c) Guide rollers
    d) Backup roll
13. What part of an electric arc furnace is responsible for conducting electricity to the electrodes?
    a) Roof
    b) Hearth
    c) Refractory lining
    d) Conductive electrode arms
14. What is the function of a de-scaling unit in a rolling mill?
    a) Removing oxides from metal surfaces
    b) Lubricating the rollers
    c) Preheating metal workpieces
    d) Cooling metal after rolling
15. In a continuous casting machine, what part supports the mold and helps cool the newly formed metal strand?
    a) Secondary cooling zone
    b) Mold oscillation system
    c) Segment guide
    d) Withdrawal straightener
16. What is the primary purpose of a preventative maintenance program for metallurgical equipment?
    a) To repair equipment after it breaks down
    b) To extend the lifespan of equipment and prevent unexpected downtime

c) To improve the performance of equipment during operation
d) To reduce the need for spare parts inventory

17. Which of the following is NOT typically included in a routine maintenance checklist for metallurgical equipment?
    a) Lubrication of moving parts
    b) Inspection of wear and tear on machine components
    c) Calibration of temperature and pressure sensors
    d) Replacement of damaged refractory lining
18. What is the role of a service technician in the maintenance of metallurgical equipment?
    a) To operate the equipment during production runs
    b) To troubleshoot and diagnose equipment issues
    c) To oversee the installation of new equipment
    d) To design modifications for improving equipment performance
19. How does regular maintenance contribute to the safety of metallurgical equipment operation?
    a) By reducing the risk of equipment failure and accidents
    b) By increasing the speed of production processes
    c) By decreasing the need for personal protective equipment (PPE)
    d) By improving the quality of finished metal products
20. Which factor should be considered when scheduling maintenance tasks for metallurgical equipment?
    a) The availability of spare parts
    b) The time of day when production demand is lowest
    c) The preferences of equipment operators
    d) The length of the manufacturer's warranty period

Answers:

1. a) Tuyeres
2. a) Tundish
3. c) Rolling mill
4. c) Ram
5. a) Heating elements
6. a) Rollers
7. b) Cooling metal rapidly to increase hardness
8. b) Mold powder
9. b) Transporting ladles between different furnace stations
10. b) Electric arc furnace
11. a) Controlling the flow of molten metal from the ladle
12. b) Screwdown mechanism
13. d) Conductive electrode arms
14. a) Removing oxides from metal surfaces
15. c) Segment guide
16. b) To extend the lifespan of equipment and prevent unexpected downtime
17. c) Calibration of temperature and pressure sensors
18. b) To troubleshoot and diagnose equipment issues
19. a) By reducing the risk of equipment failure and accidents
20. a) The availability of spare parts

APPENDICES

GLOSSARY OF TERMS IN MACHINE BUILDING

1. **anvil - наковальня**
2. ash catcher – золоуловлювач
3. **adjust –** настроювати, регулювати
4. **amplifier** – підсилювач
5. **bleed** – сопло
6. **backup roll** – резервний вал
7. **blast furnace** – відомчата піч
8. **conductive electrode arms** – провідні електродні важілці
9. **continuous casting machine** – машина для безперервного лиття
10. **converter** – конвертер
11. **converter gas recovery plant** – установка для відновлення конвертерного газу
12. **cupola furnace** – купольна піч
13. **calandria** – випарний апарат
14. **capacity** – місткість, об’єм
15. **capacitor** – конденсатор;
16. **clamp** – затискач
17. **coolant** – охолоджувач
18. **control unit** – панель управлення
19. **conductivity** – електропровідність
20. **circuit of installation** – схема монтажу
21. **chamber dryer** – сушарка камерна
22. **de-scaling unit** – установка для видалення шлаків
23. **die** – матриця
24. **drop hammer** – кувальний молот
25. **electric arc furnace** – електродугова піч
26. **emergency state –** аварійний режим
27. **energy utilization efficiency** – коефіцієнт корисного використання енергії;
28. **energy efficiency** – енергоефективність;
29. **energy efficiency increase** – збільшення ефективності
30. **energy saving operation of a power system** – енергоощадне функціонування енергосистеми
31. **endurance test** – випробування на витривалість;
32. **fault location** – визначення місця пошкодження;
33. **fuel rods** – стрижні палива
34. **forge machine** – кувальний верстат
35. **forging press** – кувальний прес
36. **hearth** – топка
37. **heating elements** – елементи нагріву
38. **gear** – шестерня;
39. **national grid** – державна електроенергетична система

40.**irreversible process** – необоротний процес
41.**jet cooling** – струменеве охолодження
42.**Laval nozzle** – насадка Лаваля
43.**lightning conductor** – блискавковідвід;
44.**line circuit-breaker** – головний вимикач;
45.**load recovery** – відновлення навантаження;
46.**load**-breaking isolator – вимикач навантаження;
47.**lubricant** – мастило;
48. **ladle furnace** – плавильна піч
49.**ladle slide gate mechanism** – механізм засувки ковша
50.**ladle tilt drive system** – система нахилу ковша
51.**maintenance** – обслуговування
52.**mold** – литво
53.**mold copper plates** – мідні плити литви
54.**manual drive** – ручний привод;
55.**maintenance expenses** – вартість технічного обслуговування
56.**malfunction** – збій
57.**multi-terminal circuit** – багатополюсник;
58.**measuring relay** – вимірювальне електричне реле;
59.**nuclear power station** – атомна електростанція;
60. **opening, tripping** – вимикання, розмикання;
61.**on-off switch** – вимикач;
62.**operational earthing** – експлутаційне заземлювання;
63.**output terminals of a network** – вихідні затискачі схеми;
64.**output** – потужність;
65.**overhaul** – капітальний ремонт
66.**pit drying stove** – піч-сушарка
67.**power system dispatching** – диспетчерське керування енергосистемою;
68.**polyphase** circuit – багатофазне коло;
69.**primary voltage** – первинна напруга;
70.**pulverized coal** – вугільна пил
71.**pit drying stove** – піч-сушарка
72.**preventative maintenance** – профілактичне обслуговування
73.**quenching tank** – резервуар для затвердіння
74.**ram** – ковш
75.**refractory lining** – вогнетривке облицювання
76.**reverberatory furnace** – відбивна піч
77.**rolling machine** – вальцювальний верстат
78.**rolling mill** – вальцювальний стан
79.**rollers** – валики
80.**run out** – закінчуватися;
81.**reciprocating compressor** – поршневий компресор
82.**saturated steam** – насичена пара
83.**specific heat capacity** – питома теплоємність
84.**screwdown mechanism** – механізм для затискання

85.**segment guide** – сегментний напрямок
86.**stack** – димар
87.**stoves** – печі нагрівальні
88.**tuyeres** – трубчасті пальники
89.**tundish** – ливарне відро
90.t**hrottling** – дроселювання
91.**sampling test** – вибіркове випробування;
92.**secondary winding** – вторинна обмотка;
93.**sealed transformer** – герметичний трансформатор;
94.**short circuit** – коротке замикання;
95.**stable mode** – усталений режим;
96.**standby mode** – режим очікування;
97.**standby power** – енергоспоживання в режимі очікування;
98.**transmit** – передавати, посилати;
99.**trim** – підлаштовувати;
100. **TRS** – транзистор;
101. **winding –** обмотка
102. **withdrawal system** – система виведення

COMMON PHRASES USED IN ACADEMIC TEXTS

Актуальний up-to-date (важливий/популярний сьогодні), relevant, pressing, urgent (нагальний), …is/are of great

importance today, is/are currently of great interest (*типова помилка:* actual; *уникайте:* topical)

Актуальність significance, importance, relevance (*уникайте:* actuality, topicality)

Анотація abstract

Важливий significant, important

Визначити define (дати дефініцію), determine (дату тощо),

identify, indicate, outline, specify (особливості)

Виконувати (див. “здійснювати")

Виникнення the rise, emergence, appearance, origin (походження)

Висвітлити (тему, проблему) cover, describe, report on, highlight

Висновки conclusion

Виявити identify (визначити), show, find out, reveal, discover

(відкрити щось нове)

Відзначати note, stress (наголосити на ...)

Відповідний relevant

Вітчизняний (тобто український) Ukrainian (*типова помилка:* native, domestic)

Вплив impact (сильний вплив), effect (effects), influence (довготривалий)

Вивчено... The article explores (examines) … *Можливий варіант у пасивному стані:* ... is/are explored (examined)

Визначено особливості... The specific features of … are outlined

Визначити основну думку (причини) identify the main argument (the causes)

Висвітлено проблему ... The issue concerning … is highlighted

Виходячи з досвіду ... Judging by the experience of … On the basis of …

Виявлено... … is/are found out

Відповідно, ... Accordingly, …

В контексті ... within **(**in) the context of …, from the perspective of …, in relation to …

В умовах … in/under the conditions of …

Головну (основну) увагу приділено... Particular (special) attention is paid (drawn) to… The author focuses on …

Даний (цей) **...** this …, the present …, the current

Діяльність activities (*типова помилка:* activity, це – активність)

Дозволити (дати можливість) make it possible to …, enable, permit

Доповідь report

Дослідження research (наукове вивчення взагалі)**,** study

(конкретна наукова розвідка, наукова стаття), case study (конкретне дослідження)

Досліджувати study, analyze, explore, examine (*типова помилка:* research)

Досягнення (у значення "прогрес") advances in …

Детально описано … is/are described in detail

Доведено факт ... The author has established the fact that …

Доведено, що... it is shown that … The author shows (demonstrates) that … The author argues that …

Досліджено... The paper/author explores… (examines …, studies…, investigates…, describes …, considers …). *Можливий варіант у пасивному стані:* ... is/are explored (examined, etc.)

Зазначено, що... The author states (shows, points out, explains, indicates, develops the view) that … It is claimed that …

За цих умов (обставин) under these conditions (circumstances)

Звернути увагу на ... draw attention to …

Здійснене дослідження the study, this study (*типова помилка:* the conducted study)

Здійснювати дослідження conduct a study

Зображено... is shown (demonstrated)

З позиції ... from the standpoint of …

Зроблено спробу визначити .... An attempt is made at identifying (defining) …

Закономірності laws, regularities, a regular pattern

Застосовувати apply (метод, правило, теорию), use (використовувати: наприклад, матеріал)

Збірник (наукових праць) journal

Здійснювати perform (оцінювання), conduct (дослідження, аналіз)

Значення (важливість) importance, significance, implications, relevance

Зокрема more specifically, particularly

Ключові слова keywords (key words)

Коло проблем a number of issues, a whole range of, wide variety of

Конкретний specific, particular

Лежати в основі underlie

Наведено аналіз ... The article provides an analysis of … The article provides a detailed examination of …

Наведено дані про ... Data are given about …

Наведено приклади ... This article provides examples of … …gives examples showing…

Наведено характеристику... … is/are described

На підставі (на основі, на базі)... considering …, drawing on

…, proceeding from …, having analyzed …, … is based on …

На початку / наприкінці (80-х. рр. XX ст.) in the early / late 80s of the 20th century (1980s)

На прикладі (на матеріалі ...) the case of, by …ing, proceeding from, having analyzed …, … is based on …, using … as an example (*Типова помилка:* by the example of …)

На сучасному етапі at present

Наголошувати emphasize, stress

Назва (статті) (research paper) title

Напрям line, trend, direction, research area (напрям наукових досліджень), the main activities, the area of activities (напрям діяльності), policy

Обґрунтований justified

Обґрунтовувати justify**,** give a rationale for …, substantiate

Обґрунтування main arguments, justification, motivation

Обсяг (матеріалу, роботи) the scope

Огляд overview (огляд проблем), survey, the literature review (огляд літератури)

Окреслити (намітити) outline

Описати describe

Опитування survey

Основний main, principal, major, key

Особливості characteristic (specific, distinctive) features, characteristics (peculiarities означає "щось незвичне")

Охарактеризувати describe (описати, дати характеристику), identify (визначити), characterize as … (охарактеризувати як ...)

Охоплювати cover (певний обсяг роботи з наголосом на повноту охоплення), encompass (певні теми з наголосом на додатковий характер інформації)

Окреслено коло питань стосовно ... is/are … highlighted

Окреслено характерні риси... Characteristic features of … are outlined

Описано ... The paper/author describes (offers a description of…). *Або:* ... is/are described

Особливу увагу приділено ... Particular (special) attention is paid to… The paper concentrates on … focuses on ... Extensive coverage is given to … Much attention is given to …

Охарактеризовано... The author explores (describes, examines, analyzes)… is/are described (identified)

Питання (проблеми) issues, problems (*типова помилка:* questions)

Підхід до approach to

Повідомлення, повідомляти report

Показати show, demonstrate, indicate

Поняття concept

Попередні дослідження previous research, research publications

Постановка проблеми problem statement, research justification

Пояснення (наукове) interpretation

Пояснити explain, demonstrate, illustrate, argue, explicate, elucidate, interpret

Праця (наукова) study, paper, research publication, work (не про свою роботу)

Представити present, provide

Причина cause (те, що спричинило щось), reason (підстава, мотив)

Проаналізувати analyze, explicate

Проблеми problems (те, що потребує вирішення), issues (теми, що розглядаються)

Прокоментувати interpret (матеріал, дані)

Пропозиція suggestion (ідея для розгляду),

Пропонувати suggest (ідею для розгляду), offer (щось конкретне), propose

Піднімати питання ... raise the issue of …

Показано вплив... The influence (impact, effect) of … on … is shown

Показано значення... The importance (significance) of .. for …is stressed

Показано на прикладі (проілюстровано**) ...** is exemplified by

Пояснити на прикладі ... illustrate by …ing

Представлено огляд.... This paper presents a review of …

Проаналізовано особливості... characteristic (specific, distinctive) features of ... are analyzed. *Або:* The author analyzes … (presents/provides an analysis of …)

Проблему розглянуто шляхом ... The study investigates this issue by examining …

Проведено (здійснено) дослідження... (*див.* **Досліджено**)

Розв'язати проблему find a solution to the problem

Розглядаються проблеми.... The issues addressed are …

Розглянуто... (У статті розглянуто....) The paper deals with …This article discusses the issue of... The study is concerned with … The paper describes … The paper is concerned with … The author considers … *Або:* … is (are) described (discussed, considered, etc.)

Реалізувати ідею implement an idea

Результати results, findings, outcomes

Резюме (короткий виклад змісту статті) summary

Розглядати discuss, describe, consider, study, explore, cover, investigate, view (treat)… as … (розглядати щось як...) метод

Розкрити show, describe, find, demonstrate, explain, unfold, reveal (*помилка:* disclose)

Розробити develop (теорію), design (план)

Розробка research, study (наукова діяльність, праця), development, elaboration (ідеї)

Розуміння insight into… (розуміння наукове), scientific interpretation (розуміння проблеми)

Світогляд world-view, world outlook

Світоглядний world-view, relating to world outlook, philosophical, ideological

Соціокультурний socio-cultural

Специфіка specific features (nature, character) (*типова помилка:* specificity)

Спостерігати observe, study

Стан дослідження state of research

Стаття (наукова) article, paper, study

Стосовно relating to

Суттєвий considerable

Сучасне суспільство contemporary society

Сучасний present, present-day, current (нинішній), modern, up-to-date (такий, що відповідає вимогам часу), contemporary (того ж часу, про який ідеться)

Сучасність our time (*уникайте:* contemporaneity)

Систематизовано й узагальнено... … is/are systematized and summerized

Стаття присвячена питанням... The article is devoted to…

The article deals (is concerned) with… The paper touches upon the issue of… The study addresses the problems of … *уникайте:* dedicated to …)

Стисло описано ... is/are described in short

Сфера досліджень the field (area) of research

Творчість creative work (творча діяльність), works (доробок науковця, митця, письменника)

Тези доповідей conference reports, summaries, abstracts of reports

Тези доповідей (збірник) proceedings of the … conference

Тлумачення explanation

Узагальнити generalize (отримані результати), summarize (інформацію з попереднього досвіду, з прочитаної літератури)

Установити find out (з'ясувати), identify, demonstrate, prove

Установлено місце та роль... The position (place) and role of … are identified

Установлено факт … The author has established the fact that…

Уточнено... is/are specified

Характеристика (опис) description, outline

Характерний specific

Характерні риси (див. "особливості")

Явище phenomenon (множина: phenomena. *Типова помилка:* phenomenons)

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Навчально-методичне видання

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