

**НАВЧАЛЬНО-НАУКОВИЙ ЦЕНТР  
ГУМАНІТАРНОЇ ОСВІТИ**

**Кафедра іноземних мов**

**МІЙ ФАХ – РУХОМИЙ СКЛАД ТА СПЕЦІАЛЬНА  
ТЕХНІКА ЗАЛІЗНИЧНОГО ТРАНСПОРТУ  
(ЛОКОМОТИВИ)**

**МЕТОДИЧНІ ВКАЗІВКИ  
з розвитку навичок комунікативної компетенції  
(англійська мова)**

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Основна мета методичних вказівок – навчання різних видів читання науково-технічної літератури та розвиток навичок усного мовлення за спеціальністю.

Методичні вказівки призначені для студентів 2 курсу механічного факультету.

Укладач  
викл. О.М. Харламова

Рецензент  
доц. С.М. Донець

МІЙ ФАХ – РУХОМИЙ СКЛАД ТА СПЕЦІАЛЬНА ТЕХНІКА  
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(англійська мова)

Відповідальний за випуск Харламова О.М.

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**УКРАЇНСЬКА ДЕРЖАВНА АКАДЕМІЯ  
ЗАЛІЗНИЧНОГО ТРАНСПОРТУ**

**НАВЧАЛЬНО-НАУКОВИЙ ЦЕНТР ГУМАНІТАРНОЇ ОСВІТИ  
Кафедра “Іноземні мови”**

**МЕТОДИЧНІ ВКАЗІВКИ**

**«Мій фах – рухомий склад та спеціальна техніка  
залізничного транспорту (Локомотиви)» з розвитку навичок  
комунікативної компетенції для студентів 2 курсу  
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# UNIT 1

## MY ACADEMY AND MY FACULTY

### Exercise 1

a) try to explain the choice of your speciality answering the following questions.

- 1 What higher educational establishment do you study at?
- 2 What faculty do you study at?
- 3 What year are you in?
- 4 How long does the course of studies last?
- 5 What general and special subjects do you study at the Academy?
- 6 When will you graduate from the Academy?
- 7 What qualification will you get?
- 8 Where can you work after graduating from the Academy?
- 9 When have you begun making plans for the future?
- 10 Did anybody help you to make the choice?
- 11 What is your aim?
- 12 Where do you plan to work?
- 13 What career is possible for people with your qualification?
- 14 Which of your skills and qualities are most likely to impress an employer?

b) now you are studying at Ukrainian State Academy of Railway Transport and in some years you'll be a qualified specialist. You have chosen one out of five faculties. What do you know about your faculty and your future speciality?

<i>I know that...</i>	<i>I want to know...</i>
<i>1</i>	<i>1</i>
<i>2</i>	<i>2</i>
<i>3</i>	<i>3</i>

c) study the list of things which are important in a job and choose three which are the most and the least important for you.

**Explain your choice. Compare your answers with a partner and discuss them.**

- Opportunities for promotion
- Comfortable working conditions
- Status and respect
- Interesting and satisfying work
- A good salary and holidays
- Colleagues I like
- Training opportunities

**Exercise 2. Read the explanation of the word *engineering*. Translate the combinations of the word with the underlined nouns.**

The term *engineering* is a modern one. The New Merriam-Webster Dictionary gives the explanation of the word *engineering* as the practical application of scientific and mathematical principles. Nowadays the term *engineering* means, as a rule, the art of designing, constructing, or using engines. But this word is now applied in a more extended sense. Engineering is divided into many branches. The most important of them are: mechanical, electrical, nuclear, civil, mining, military, marine, transport and sanitary engineering.

**Exercise 3 Memorise the following words.**

*railway engineering* – залізничний транспорт, залізнична техніка

*heat and power engineering* - теплоенергетика

*maintenance and repair* – експлуатація та ремонт

*bachelor's degree* – ступінь бакалавра

*master's degree* – ступінь магістра

*mechanical engineer* – інженер-механік

*rolling stock* – рухомий склад

*locomotive engineer* – машиніст

*to operate the locomotive* – керувати локомотивом

*to perform* – виконувати, здійснювати

*performance* – виконання, здійснення

*to provide safety* – забезпечувати безпеку

*to be responsible for* – відповідати за  
*to leave the station* – відправлятися від станції  
*thoroughly* – ретельно  
*to assess* – оцінювати, *syn to evaluate*  
*a throttle* – тяга локомотива  
*air brake* – пневматичне гальмо  
*to measure the speed* – визначати швидкість  
*amperage* – електрична сила струму (в амперах)  
*air pressure* – тиск повітря  
*battery charge* – заряд акумуляторної батареї  
*general railroad rules* – загальні правила на залізниці  
*to interact* – взаємодіяти  
*delay* – затримка  
*accident* – аварія, катастрофа  
*damage* – пошкодження  
*development* – розробка, розвиток  
*effectiveness* – дієвість, продуктивність  
*locomotive body* – кузов локомотива  
*fluid dynamics* – динаміка рідини  
*to behave* – поводитися  
*software tools* – програмне забезпечення  
*applied mechanics* – прикладна механіка  
*theoretical fundamentals of electrical engineering* – теоретичні основи електротехніки  
*study of materials* – матеріалознавство  
*strength of materials* – опір матеріалів  
*internal combustion engines* – двигуни внутрішнього згорання  
*forecasting* – прогнозування  
*to focus on* – зосереджуватися на  
*to have a deep understanding of* – мати глибоке розуміння  
*data acquisition system* – система збору даних  
*to carry out calculations* – проводити розрахунки  
*to prove* – доводити  
*robotics* – робототехніка  
*second engineer* – помічник машиніста  
*sphere of activity* – сфера діяльності  
*wages* – заробітна плата  
*job satisfaction* – задоволення від роботи

*to defend a diploma* – захищати диплом  
*to be proficient in smth*– бути досвідченим у чомусь  
*graduate* – випускник  
*to take decisions* – приймати рішення  
*enterprise* – (виробниче) підприємство, фірма  
*to obtain* – одержувати  
*apply for* – подавати заяву на

**Exercise 4 Find synonyms among the following verbs and translate them.**

- |               |                      |
|---------------|----------------------|
| 1 to operate  | a) to be late        |
| 2 to perform  | b) to evaluate       |
| 3 to delay    | c) to learn          |
| 4 to provide  | d) to depart         |
| 5 to focus on | e) to carry out      |
| 6 be obtain   | f) to get            |
| 7 to leave    | g) to test           |
| 8 to study    | h) to ensure         |
| 9 to prove    | i) to drive          |
| 10 to measure | j) to concentrate on |

**Exercise 5. State the meaning of the modal verbs and translate the sentences.**

1 We are to measure the entire line to determine the distance between the rail and the wire. 2 Current transformers are used wherever high voltage current has to be metered. 3 Special measures to increase the reliability of power supply devices must have been taken by your department. 4 Diesel engines are to be widely used for shunting service. 5 Each engine must have some means for cooling cylinders. 6 Fuel is to be delivered with a pump.



**Exercise 6. Find antonyms among the following words and translate them.**

- |                    |                  |
|--------------------|------------------|
| 1 highly-qualified | a) graduate      |
| 2 simple           | b) ignorance     |
| 3 enter            | c) fixed         |
| 4 developing       | d) complicated   |
| 5 knowledge        | e) dependent     |
| 6 moving           | f) low-qualified |
| 7 advantage        | g) degrading     |
| 8 independent      | h) discontinuous |
| 9 constant         | i) disadvantage  |

### **MY SPECIALITY**

To start with I'd like to introduce myself and the Academy I study at. I am a second-year student of Ukrainian State Academy of Railway Transport. I am proud of my Academy because it is one of the oldest higher educational institutions in Ukraine: it was founded in 1930 and has long history and reach traditions. It provides high quality modern training in every branch of railway engineering. It trains specialists not only for our country but also for other countries.

The Academy counts five departments. They are Mechanical Department, Railway Operation and Management Department, Transport Economics Department, Construction Department and Automation, Telemechanics and Communication Department. I have chosen the Mechanical faculty. It is the oldest faculty in our Academy. It was founded the same year as the Academy. This faculty offers training in the following specialties: Electric Systems and Transport Facility Complexes, Electric Transport, Heat and Power Engineering, and Rolling Stock and Specialized Machinery of Railway Transport which includes two specializations: Locomotive Production, Maintenance and Repair and Railway Car Production, Maintenance and Repair. Besides, bachelor's degree students can choose Quality, Standardization and Certification.

My specialization is Locomotive Production, Maintenance and Repair and after graduation I will get a qualification of mechanical engineer of rolling stock.

Training for a locomotive career will include learning how to operate diesel-electric and electric locomotives, how to solve engineering problems, how to perform necessary repairs of locomotives and their equipment, how to provide safety for both passenger and freight trains.

The locomotive engineer is responsible for operating the train. He uses a throttle and air brakes and must monitor devices that measure speed, amperage, air pressure and the battery charge. He must also interpret the train signals, orders and general railroad rules. Locomotive engineers must have a special license to operate a train, and must be able to understand how trains and rail systems interact with each other in conjunction with other factors, such as the number of cars being pulled, types of cars, types of cargo, etc.

The locomotive engineer must inspect a train thoroughly before leaving the station. He must assess the mechanical condition of the train and whether current issues require any additional help. If there are minor adjustments or repairs that are needed, he should carry them out.

If there are any delays, accidents, or damage during the trip, the locomotive engineer must make a note and include it in a report. With so many technical elements and the number of hours on the tracks, reports are an important way to document records and keep supervisors informed about what has been happening with the train and any events that they should be aware of.

Mechanical engineering is a branch of the engineering profession that focuses on design, development and understanding of mechanical issues.

The analyst engineers work on the effectiveness of new mechanisms. They use a variety of software tools to evaluate mechanical designs, fluid dynamics, modelling systems and other simulation products, to determine how the design will behave under regular working as well as extreme conditions.

The test engineers focus on evaluating performance of an actual product. They have a deep understanding of sensors, data acquisition systems, design of experiments and development of tests which can

evaluate and characterize performance of a product under regular and extreme conditions.

Students of our faculty study various general and special subjects: Theoretical Mechanics, Engineering Drawing, Strength of Materials, Study of Materials, Theory of Mechanisms and Machines, Internal Combustion Engines, Mathematics, Physics, Foreign Languages, Philosophy, Informatics, etc.

During the course of studies students carry out calculations of locomotive design and special equipment, engineering forecasting and logistics, robotics, technical diagnostics, management and marketing, learn how to take engineering and economic decisions. Students go through a practice at railway transport enterprises of railway divisions, at locomotive building and repair factories. At the end of the practice students receive qualification of mechanic in rolling stock maintenance and second engineer of locomotive.

The sphere of activity of our specialists is rather broad. The graduates of our department work in railway departments, locomotive building and repair factories, production enterprises, educational establishments, etc.

My aim is to obtain bachelor's degree and then to apply for specialist or master courses, successfully defend my diploma and to find a good well-paid job in the sphere of railway engineering where I can apply all my knowledge and skills obtained at the Academy.

### **Exercise 7. Answer the following questions to the text.**

1 When was the Mechanical Faculty founded? 2 How many faculties are there in the Academy? 3 What specialities and specializations does the Mechanical Faculty offer? 4 What is the sphere of activity of a mechanical engineer? 5 What knowledge must a future mechanical engineer have? 6 Where can the graduates of the department work? 7 Is the profession of a railway engineer important? Why? 8 What duties of a mechanical engineer? 9 What is one of the most important problems facing a mechanical engineer? 10 Why did you choose this department? 11 What general-educational and specialized subjects do the students study? 12 What qualification will you get after graduation? 13 Where do the students have their lectures

and practice? 14 What does traffic regulation concern with? 15. What profession can one get after graduating from the Mechanical Faculty?

**Exercise 8. Complete the following sentences.**

1 A locomotive engineer is ... . 2 ... is responsible for operating the train. 3 If there are any delays, accidents or damage during the trip, locomotive driver should ... . 4 Mechanical engineering is a branch of ... . 5 Test engineers serve perform the following tasks: ... . 6 At the end of their practice students get ... . 7 The graduates of our department can work on ... . 8 While choosing a job many factors should be taken into consideration. They are ... . 9 The safety of ... is of great importance to locomotive engineers. 10 Students go through a practice at ... . 11 My ultimate goal is to get ... .

**Exercise 9. Open brackets and put verbs into the appropriate form.**

1 The Mechanical Faculty (*to found*) the same year as the Academy. 2 Each faculty (*to train*) specialists with profound knowledge of railway engineering. 3 The Academy (*to have*) very interesting history and reach traditions. 4 In the Academy (*there be*) five faculties. 5 Each faculty (*to train*) the students in several specialities. 6 The students of senior courses (*to study*) specialized subjects. 7 The curriculum of each faculty (*to include*) a lot of various subjects.

**Exercise 10. Translate the following attributive groups.**

Railway station, railway development, railway operation, railway electrification, locomotive driver, locomotive cabin, train movement, train control, power station, station power, power unit, unit power, centre cabin, cabin centre, front locomotive, locomotive front, passenger locomotive production, railway transport development, freight train weight, test track construction plan, passenger car characteristics improvement, railway transport development program.

**Exercise 11. Give English equivalents for the Ukrainian words and word combinations given in brackets.**

1 I specialize in the field of (*організація експлуатації та ремонту рухомого складу*). 2 We are delivered such general educational subjects as (*теоретична механіка, прикладна механіка, теоретичні основи електротехніки та ін.*). 3 My speciality is (*локомотиви та локомотивне господарство*). 4 A locomotive engineer is a person who drives (*електровоз, тепловоз, газотурбовоз з електричною передачею*). 5 The locomotive engineer is responsible for (*керування потягом*). 6 A locomotive engineer uses (*тягу локомотива та пневматичне гальмо*) and must monitor instruments that measure speed, amperage, air pressure and the battery charge. 7 A locomotive engineer must (*перевірити гальма складу*) thoroughly before leaving the station. He must (*оцінити механічний стан локомотива*) and whether current issues require any additional help.

**Exercise 12. Translate the sentences paying attention to the predicates.**

1 The first steam locomotives were to haul passenger trains as well as freight ones. 2 The students of all faculties study general–educational and specialized subjects. 3 Specialized subjects are studied by the third and fourth-year students, depending on their speciality. 4 Steam locomotives were built for many different tasks but they were not able to haul very heavy trains at high speeds. 5 Every year scientific conferences are held here. 6 Steam locomotives could not work for a long period without visiting a depot.

**Exercise 13. Tell about your faculty and speciality using the following word combinations**

A second-year student, to be founded, to train engineers, departments, to be taught, to master a foreign language, according to the academic plan, job opportunities.

**Exercise 14. Look through the following conversational formulas and try to memorize them. Use these expressions in your own flashes of conversation.**

- How are you?
- How have you been?
- How are you getting on?
- For all I know
- I'll be in touch
- Excuse my curiosity
- It depends
- By the way
- Any time you like
- Nice to see you
- Haven't seen you for ages.
- No complaints
- What a pleasant surprise
- Never expected to meet you here.
- Nothing to boast of.

**Now role play the following dialogue. A first year student and a graduate of the Mechanical faculty meet quite accidentally in a café. The first year student wants to learn more about his future job/speciality.**

- Hello!
- Hello, my name is Misha.
- Nice to meet you, Misha. My name is Andrey.
- I'd like to know more about my future profession. Could you tell me about it?
- Yes, of course. What are your questions?
- You have graduated from Ukrainian State Academy of Railway transport, haven't you?
- Yes, I have. I graduated from Ukrainian State Academy of Railway transport last year with Master's Degree.
- Where do you work?
- Now I work at the Luganskteplovoz plant.
- What types of equipment are you deal with?

- I mostly deal with electrical equipment. We produce and maintain electrical instrument.

- Do you need to have knowledge in electronics or mechanics for your work?

- Of course, it is very useful for a mechanical engineer to have knowledge in different branches of engineering. It may give a person a chance to get a quick promotion. So, I advise you to study hard and make every effort to become a qualified specialist in the field. I can assure you it is very interesting and challenging job.

- Thank you for answering my questions. It is really useful. Now I see how important to study hard from the very beginning.

- Welcome any time.

### **Exercise 15. Compose a dialogue according to the plan.**

**A.** Ask your friend where he/she studies.

**B.** Say that you study at the Mechanical Faculty of Ukrainian State Academy of Railway Transport.

**A.** Tell him/her that you know something about it: it is one of the oldest higher institutions in Kharkov and has 5 faculties.

**B.** Agree. Name the date your Academy was founded and enumerate its faculties.

**A.** Ask him/her what faculty he/she studies at.

**B.** Answer. Tell your friend what is interesting at your faculty.

**A.** Show that you are surprised because you also want to study at this faculty. Ask what general-educational and specialised subjects are studied at this faculty.

**B.** Answer your friend's question. Tell him/her about your favourite subjects and subjects that you don't like very much. Give reasons.

**A.** Say that it was very interesting to get some information about the Academy.

**B.** Say you hope that your friend will also get a chance to study here.

**Exercise 16. Study the adjectives in the box and divide them into three groups: 1) those which describe people; 2) those which describe jobs; and 3) those which describe both people and jobs.**

enthusiastic, secure, confident, challenging, dynamic,  
flexible, stressful, patient, boring, reliable, creative,  
conscientious, trustworthy, worthwhile, ambitious

<b>jobs</b>	<b>people</b>	<b>both</b>
challenging	enthusiastic	creative

**Use the adjective and describe: 1) a job of locomotive driver; and 2) your group mate.**

**Exercise 17. Put the verbs in brackets into the right form.**

1 The railway transport faculty (*to train*) the students in several specialities. 2 Each vehicle (*to divide*) into a number of units and parts. 3 The structure of a vehicle (*to study*) by the students in details. 4 Each locomotive (*to consist*) of body, wheels, brakes, springs and so on. 5 The students (*to study*) the structure of a wagon both theoretically and practically. 6 Each student (*to know*) foreign and homemade models of locomotives. 7 Besides, the students of the faculty (*to study*) locomotive maintenance, operation and repair. 8 After graduating from the Academy the graduates (*to offer*) the work at various transport enterprises. 9 The faculty (*to train*) also the specialists for traffic regulation. 10 It (*to deal*) with planning and control of traffic. 11 Traffic characteristics, regulations and traffic-control devices (*to teach*) at the faculty. 12 Knowing classification of railroads, railway traffic regulations and signals (*to connect*) with the qualification. 13 (*There be*) different types of railroad signals. 14 The students of this speciality also (*to concern*) with operation and maintenance of high speed trains.

**Exercise 18. Match the personal characteristics to the questions.**

creative	Do you always do what you say you'll do?
decisive	Are you good at getting other people to agree with you?
flexible	Are you good at making your mind up quickly?



organized	Are you able to plan ahead successfully?
persuasive	Are you able to cope with last-minute changes?
reliable	Are you good at coming up with imaginative solutions?

**Exercise 19. Translate the word combinations. Mind the translation of the words *carry* and *meet*.**

To carry a load, to carry freight, to carry out investigations, to carry on experiments, to carry an electric current, to carry the traffic, to meet a friend, to meet at the station, to meet with an accident, to meet demands, to meet requirements.

**Exercise 20. Make two dialogues on the following situations.**

- 1 Your acquaintance is going to enter Ukrainian Academy of Railway Transport this year. He doesn't know which faculty to chose. Ask about his likes and dislikes. Tell about you faculty, subjects it offers and opportunities after graduation.
- 2 A group of American students is visiting the Academy. They are interested in every faculty. Tell them about the Mechanical Faculty, its foundation, students' life, research work of the students, etc.

**Exercise 21. Finish the sentences choosing the endings from the right column.**

The engineer profession has become popular ....	a) The products' performances.
He makes a great contribution...	b) in the 20 <sup>th</sup> century
His main functions are..	c) deals with the automation of production processes
The engineer also analyzes.....	d) to progress
So he can work in...	e) the analytical frame of mind and imagination
At present the engineer...	f) designing, developing and testing the products
The work of the engineer requires...	g)the designing office, in the lab and in the production field of

**Exercise 22. Read and translate the dialogue.**

- Hello, Bob!
- Oh, Peter, glad to see you. Haven't seen you for a long time. What have you been busy with and what are you doing now?
- I'm a student of the Kyiv University. And what about you?
- You know, when I received my college certificate, I decided to work at a plant and get skills for my working speciality.
- What speciality have you got?
- I am a fitter now, I get good wages and I can support my mother. And now that I have become a skilled worker I think I can combine my job with studies.
- What institute do you want to enter: in Dnepropetrovsk, Donetsk or Kharkov?
- I have thought about Ukrainian State Academy of Railway transport, but I haven't decided yet. I'd like to become an mechanical engineer.
- Is it really interesting for you?
- Oh, yes, of course. I know that studying at the Mechanical faculty will help me to understand the structure of mechanisms and today's problems of modern railway system.
- Do you know what the basic railway problem is?
- I think I do. The central problem of railway system is to determine the most efficient way to decrease the cost of entire life cycle of locomotives.
- Now I understand you and I hope you will enter the Academy and become a very good engineer mechanic.
- Well, I am a bit hungry, why don't we have a snack together?
- Good idea. Let's go and have a snack in the café.

**Exercise 23. Choose one of the following themes and write a composition.**

- 1 My present studies and my future profession.
- 2 The right person for the right job.
- 3 Famous people who graduated from our Academy.
- 4 Say what it means to be a good specialist.
- 5 Imagine that you are a few years older and have applied for a job. Your prospective employer asks two people to write the truth about your character and abilities. One of these people thinks a lot of you; the others do not. Write these letters.

**Use the expressions and active vocabulary to help you:**

I wonder if you have ever thought ...

First of all, let me draw your attention to ...

If we try to look at the problem from another point of view ...

Have you ever thought of ...

What do you think was the starting point of the whole thing?

I might be wrong, of course ...

On the one hand ...

There are two points ...

I'd like to make ...

In my opinion ...

nowadays people generally ...

It goes without saying that ...

To face the truth ...

As I see it ...

**Exercise 24. Give your own opinion concerning the following statements:**

- a) an engineer does not finish his/her education when he/she receives his/her diploma.
- b) there is a close cooperation between industry and education.
- c) higher education today: fashion or necessity?

**Exercise 25. Make a short presentation of your faculty and your speciality using the following expressions.**

Introduction

- *My presentation is about ...*

- *I think everybody has heard about ..., but hardly anyone knows a lot about it.*
- *I want to give you a short presentation about ...*

*Introducing sub-topics*

- As I already indicated ...
- As you probably know, ...
- You might have seen that already.

*Final thoughts on a sub-topic*

- The reason is that ...
- In other words, ...
- I want to repeat that ...
- I'd (just) like to add ...

*Conclusion*

- ...has really impressed me.
- I hope that one day ...
- We should not forget ...
- Summing up / Finally it can be said that ...
- That was my presentation on ...
- I am now prepared to answer your questions.
- Do you have any questions?

**Exercise 26. Study the resume and covering letter of a graduate of your department. Compose your own application package according to the example.**

**Kiril Zakharov  
 Lenin ave. 167 app.54  
 Kharkov, Ukraine  
 home (057)747-86-34  
 (095)38564837**

*Job Objective*    Management position in railway engineering sphere

*Profile*            An energetic and skilled communicator, with a record

of leadership and initiative, well-organized, flexible

*Education*

**1998 – present**

Ukrainian State Academy of Railway Kharkov

Feyerbakh sqr.7 Kharkiv

Mechanical Department

Speciality: Rolling Stock and Specialized Machinery

Specialization: Locomotive Production, Maintenance and Repair

will complete Master's Degree this year

1988 – 1998

comprehensive school # 243 in Kharkov, honours

**2002** (three months)

typing computer courses

**1998– 2000**

Language Courses (English, German), certificate

*Experience*

**2001** (3 months)

Lugansk Locomotive Building plant, trainee

- assisted in preparing mechanical construction drawings in conjunction with the architectural, structural and electrical design team;

- assisted senior level engineers in designing and developing power equipment and systems, industrial process-control systems and micro-electronic systems;

**1999 – 2000** (3 months)

Poltava locomotive repair factory, assistant master

- assisted in preparing technical documentation (manuals, operating procedures and project proposals);

- assisted in providing support in areas of commissioning and operation of electrical and electronic equipment and systems;

- assisted in composing technical specifications, schedules and technical reports.

*Computer Skills*      AutoCAD, 3D Studio Max, MS Office

References furnished upon request

Dear Mr. Jones

I would like to express my interest in a full-time position at staff within *Portec Rail Products*. I have learnt a lot about your company before, and the announcement in *IRJ* (May, 2002) has captured my attention. I am last year student of Ukrainian State Academy of Railway Transport located in Kharkov. I specialize in Rolling Stock and Specialized Machinery of Railway transport with the major in Locomotive Production, Maintenance and Repair.

I am currently searching for an opportunity to start a career within a large railway engineering company. I expect that my educational background and interpersonal skills excellently match with your requirements. I would like to be part of a reputable and worldwide organization such as *Portec Rail Products*.

My education enables me to treat with different aspects of railway engineering. I would like my future work to be directly connected with rolling stock, because I think it would help me to realize my dreams and aspirations. My energy, flexibility and teamwork skills combined with my analytical frame of mind would meet your expectations. Please see my resume for more details.

Thank you for your time and consideration. I am looking forward to hearing from you soon.

Yours sincerely,  
Kiril Zakharov

## UNIT 2

### FUNDAMENTALS OF DIESEL LOCOMOTIVE

**Exercise 27. Study the words and try to memorise them.**

*self-contained* – автономний  
*electric drive* – електричний двигун  
*auxiliary system* – допоміжна система  
*alternator* – генератор  
*to require* – вимагати  
*to comprise* – складатися з  
*drive shaft* – колінчастий вал  
*generating station* – електростанція  
*fuel tank* – паливний резервуар  
*cylinder block* – блок циліндрів  
*to rotate* – обертатися  
*to convert* – перетворювати(ся)  
*radiator fan* – вентилятор радіатора  
*traction motor* – тяговий електродвигун  
*direct current (DC)* – постійний струм  
*to rectify* – випрямлювати  
*3-phase AC* – трифазний змінний струм  
*control cubicle* – високовольтна шафа  
*maintenance management system* – система керування технічним обслуговуванням  
*portable or hand-held computer* – портативний або кишеньковий комп'ютер (КПК)  
*reasonable forward view* – достатній огляд за напрямом руху  
*full width bodies* – кузов вагонного типу  
*motor with air blowing* – електродвигун з повітряним охолодженням  
*loco frame* – головна рама локомотива

*to lubricate* – змащувати

*ignition* – запалювання

*exhaust gas* – вихлопні гази

*fuel consumption per freight unit* – витрата палива на одиницю вантажу

*overhaul of traction motors* – капітальний ремонт тягових електродвигунів

*welding* – зварювання

## TEXT

The modern diesel locomotive is a self-contained version of the electric locomotive. Like the electric locomotive, it has electric drive, in the form of traction motors driving the axles and controlled with electronics. It also has many of the same auxiliary systems for cooling, lighting, heating, braking, and hotel power for the train. It can operate over the same routes and can be operated by the same drivers. It differs principally in that it carries its own generating station around with it, instead of being connected to a remote generating station through overhead wires or a third rail. The generating station consists of a large diesel engine coupled to an alternator producing the necessary electricity. A fuel tank is also essential. It is interesting to note that the modern diesel locomotive produces about 35% of the power of a electric locomotive of similar weight. Basically, the locomotive consists of following main components:

### **Diesel Engine**

This is the main power source for the locomotive. It comprises a large cylinder block, with the cylinders arranged in a straight line or in a V. The engine rotates the drive shaft at up to 1,000 rpm and this drives the various items needed to power the locomotive. As the transmission is electric, the engine is used as the power source for the electricity generator or alternator, as it is called nowadays.

### **Main Alternator**

The diesel engine drives the main alternator which provides the power to move the train. The alternator generates AC (alternating current) electricity which is used to provide power for the traction motors mounted on the trucks (bogies). In older locomotives, the



alternator was a DC (direct current) machine, called a generator. It produced direct current which was used to provide power for DC traction motors. Many of these machines are still in regular use. The next development was the replacement of the generator by the alternator but still using DC traction motors. The AC output is rectified to give the DC required for the motors.

### **Auxiliary Alternator**

Locomotives used to operate passenger trains are equipped with an auxiliary alternator. This provides AC power for lighting, heating, air conditioning, dining facilities etc. on the train. The output is transmitted along the train through an auxiliary power line. In the US, it is known as 'head end power' or 'hotel power'. In the UK, air conditioned passenger coaches get what is called electric train supply (ETS) from the auxiliary alternator.

### **Rectifiers/Inverters**

The output from the main alternator is AC but it can be used in a locomotive with either DC or AC traction motors. DC motors were the traditional type used for many years but, in the last 10 years, AC motors have become standard for new locomotives. They are cheaper to build and cost less to maintain and, with electronic management can be very finely controlled. To convert the AC output from the main alternator to DC, rectifiers are required. If the motors are DC, the output from the rectifiers is used directly. If the motors are AC, the DC output from the rectifiers is converted to 3-phase AC for the traction motors.

### **Electronic Controls**

Almost every part of the modern locomotive's equipment has some form of electronic control. These are usually collected in a control cubicle near the cab for easy access. The controls will usually include a maintenance management system of some sort which can be used to download data to a portable or hand-held computer.

### **Batteries**

Just like an automobile, the diesel engine needs a battery to start it and to provide electrical power for lights and controls when the engine is switched off and the alternator is not running.

## **Cab**

Most US diesel locomotives have only one cab but the practice in Europe is two cabs. US freight locos are also designed with narrow engine compartments and walkways along either side. This gives a reasonable forward view if the locomotive is working 'hood forwards'. US passenger locos, on the other hand have full width bodies and more streamlined ends but still usually with one cab. In Europe, it is difficult to tell the difference between a freight and passenger locomotive because the designs are almost all wide bodied and their use is often mixed.

## **Traction Motor**

Since the diesel-electric locomotive uses electric transmission, traction motors are provided on the axles to give the final drive. These motors were traditionally DC but the development of modern power and control electronics has led to the introduction of 3-phase AC motors. There are between four and six motors on most diesel-electric locomotives. A modern AC motor with air blowing can provide up to 1,000 hp (horsepower) .

## **Fuel Tank**

A diesel locomotive has to carry its own fuel around with it and there has to be enough for a reasonable length of trip. The fuel tank is normally under the loco frame and will have a capacity of say 1,000 imperial gallons (UK Class 59, 3,000 hp) or 5,000 US gallons in a General Electric AC4400CW 4,400 hp locomotive. The new AC6000s have 5,500 gallon tanks. In addition to fuel, the locomotive will carry around, typically about 300 US gallons of cooling water and 250 gallons of lubricating oil for the diesel engine. Air reservoirs are also required for the train braking and some other systems on the locomotive. These are often mounted next to the fuel tank under the floor of the locomotive.

## **Air Compressor**

The air compressor is required to provide a constant supply of compressed air for the locomotive and train brakes. In the US, it is standard practice to drive the compressor off the diesel engine drive shaft. In the UK, the compressor is usually electrically driven and can

therefore be mounted anywhere. The Class 60 compressor is under the frame, whereas the Class 37 has the compressors in the nose.

### **Radiator and Radiator Fan**

The radiator works the same way as in an automobile. Water is distributed around the engine block to keep the temperature within the most efficient range for the engine. The water is cooled by passing it through a radiator blown by a fan driven by the diesel engine.

### **Turbo Charging**

The amount of power obtained from a cylinder in a diesel engine depends on how much fuel can be burnt in it. The amount of fuel which can be burnt depends on the amount of air available in the cylinder. So, if you can get more air into the cylinder, more fuel will be burnt and you will get more power out of your ignition. Turbo charging is used to increase the amount of air pushed into each cylinder. The turbocharger is driven by exhaust gas from the engine. This gas drives a fan which, in turn, drives a small compressor which pushes the additional air into the cylinder. Turbo charging gives a 50% increase in engine power.

The main advantage of the turbocharger is that it gives more power with no increase in fuel costs because it uses exhaust gas as drive power. It needs additional maintenance, however, so there are some types of lower power locomotives which are built without it.

**Exercise 28. Complete the sentences using information from the text above.**

- 1 The modern diesel locomotive is ...
- 2 It also has many of the same auxiliary systems for ...
- 3 The engine is used as the power source for ...
- 4 In older locomotives, the alternator was ...
- 5 Locomotives used to operate passenger trains are ...
- 6 DC motors were the traditional type used for ...
- 7 Almost every part of the modern locomotive's equipment has ...
- 8 Most US diesel locomotives have only one cab but ...
- 9 Since the diesel-electric locomotive uses electric transmission, traction motors are ...

- 10 Air reservoirs are also required for ...
- 11 The amount of fuel which can be burnt depends on ...
- 12 The main advantage of the turbocharger is ...

**Exercise 29. Answer the following questions on the text.**

1 What main components does a locomotive consist of? 2 The engine is the source of power that makes the wheel go around and the car move, isn't it? 3 What is the purpose of the locomotive fuel tank? 4 What is the air compressor required for? 5 What do you think which traction motor is more modern: DC or AC? 6 What determines the power obtained from a cylinder in a diesel engine? 7 What is the main advantage of the turbocharger?

**Exercise 30. Translate the word combinations. Mind the translation of the words *add* and *operate* and their derivatives.**

To add some cars, the cars added to, the addition of extra cars, an additional power unit, in addition to cars, to put into operation, the operator of the machine, a remotely operated locomotive, to operate the machine, to operate efficiently.

**Exercise 31. Translate the following attributive groups.**

British-built trains, specially designed equipment, greatly improved designs, newly built air-conditioned cars, fully equipped long-distance trains, new aircraft type gas-turbine engine, high-speed welded rail test track, jet airliner type passenger car interior, fully suspended motors, greatly increased bearing diameters, automatically changed brake forces, constantly cooled cylinder pistons, individually controlled passenger car light.

## ***SUPPLEMENTARY READING***

### **M62 MODERNIZATION IN UKRAINE**

Ukrainian Railways decided to modernize locomotives in order to solve the problems of big fleet of old ones. Modernization means equipping locos with new modern diesel engines, energy saving equipment and new electric cabinets. Idea of modernization is supported with actual data showing 23% reduction in specific fuel consumption per freight unit shipped, and 38% as growth of average daily performance of the locomotive.

At the end of October the locomotive depot Darnitsa of South-Western Railway hosted a meeting of the interdepartmental commission for the acceptance testing of upgraded locomotive M62-1361. The commission included the First Deputy Director General of Ukrainian Railways (UZ) Mr. Mykola Sergiyenko, head of Main Locomotive Directorate of Ukrainian Railways Mr. Yuri Belous, representatives of the Lviv Railway and railway research institutions.

The modernized M62 loco was visible from afar even being placed inside the depot. It was shining with burgundy and yellow colours. The first impression – the locomotive looks like a brand new modern vehicle just from the plant.

Currently the Ukrainian railways own 48 units of M62 series locomotives. Thirty five are assigned to perform regular service. Those locomotives have already crossed the life-time line set by the original manufacturer. Diesels of 14D40 type are old and out of operation.

The shortage of operational locomotives needed to be solved. For these reasons the Main Locomotive Directorate of UZ developed a document with technical requirements for M62 series locomotives modernization with world known companies' equipment installation. The document was approved by UZ scientific council, the meeting was held at the end of 2009. Also there was an agreement with the

State Railway Research Center of UZ for developing a feasibility study on modernization.

UZ specialists were also interested in economic feasibility study. There was a testing operation lasting one month involving regular M62 and M62M from Poland Railway Company equipped with General Motors diesel.

The Lviv Railway signed a modernization agreement on M62 series locomotives. Besides that there was an agreement signed with the Kovel locomotive depot for works.

This October the Kovel locomotive depot hosted a work-group meeting to evaluate a prototype towards complying with the technical requirements document, with technical reference document and modernization design project. The modernization of M62-1361 locomotive included major overhaul of traction motors and wheel pairs with modernization of motor-bearing axis. The body frames were strengthened and locomotive life-time accepted to be extended for 20 years. Locomotive body was re-aligned and unnecessary windows closed. Locomotive main frame was also modernized by welding additional supports for diesel, alternator, air compressor and other auxiliary equipment. The new diesel-alternator has injector-type, micro-processor control and diagnostic system. From now on, the modernized locomotive will have dynamic brakes, coolant pre-heating system, modern driver's panel and air-conditioning system with climate-control function. There is also safety system ALSN-MU and HF/UHF radio.

It is worth mentioning that the discussion over M62 modernization results was very prompt. It seemed that specialists were pointing out only minor things. They were simulating situations that might arise during the operation of rolling stock. At first look, there were too much minor unnecessary questions, but specialists from rolling stock operation, from labor and fire safety departments were common in understanding that there are no minor things in railway safety.

## **FORMULA 1 TECHNOLOGY OFFERS LIGHT RAIL ENERGY SAVINGS**

Alstom has signed an agreement with Williams Hybrid Power to adapt energy storage technologies originally developed for the 2009 Williams Formula One car for use on light rail vehicles.

As part of its Formula 1 programme, Williams redesigned a stationary Magnetically Loaded Composite (MLC) flywheel weighing more than a tonne into a compact lightweight unit capable of withstanding the extreme environment of Grand Prix racing, including heavy vibration and high temperatures, as well as unrelenting high-power duty cycles. The MLC has since found its way into a range of mobile applications, including London buses, and will be tested next year on an Alstom Citadis LRV.

In common with other flywheels, the MLC flywheel can operate at extreme ambient temperatures, an advantage over chemical batteries and supercapacitors, and incorporates a number of innovations. Instead of using discrete permanent magnets to form the rotor of a flywheel's integrated motor / generator, magnetic powder is mixed into the composite matrix. After the flywheel has been manufactured using filament winding, flash magnetization of the integrated magnetic particles generates the required field configuration forming the rotor.

Williams says that with no large metallic structures in the MLC flywheel rotor, eddy current losses and heating are negligible, which results in very high electrical efficiencies. The lack of rotor heating means MLC flywheels can be continuously deep-cycled at high power without compromising performance or reducing the life of the unit.

Alstom says the MLC offers potential traction energy savings of up to 15 % and is ideally suited to the stop-start operating patterns of light rail.

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