НАВЧАЛЬНО-НАУКОВИЙ ЦЕНТР
ГУМАНІТАРНОЇ ОСВІТИ

Кафедра «Іноземні мови»

МЕТОДИЧНІ ВКАЗІВКИ

з розвитку навичок читання
та комунікативної компетенції
для студентів 2 курсу спеціальності
«Локомотиви»

(англійська мова)

Харків 2013

Методичні вказівки розглянуто та рекомендовано до друку на засіданні кафедри “Іноземні мови” 25 лютого 2011 р., протокол № 7.

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Метою методичних вказівок є подальший розвиток навичок перекладу оригінальних та адаптованих текстів за спеціальністю, систематизація та розширення словникового запасу з теми “*Локомотиви*”. При складанні методичних вказівок використовувались тексти з Інтернету та спеціалізованих періодичних видань, що ознайомлюють з різними типами локомотивів та їх класифікацією.

Методичні вказівки призначені для студентів 2 курсу механічного факультету.

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Кафедра “Іноземні мови”

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UNIT 1

payload capacity – вантажопідйомність
self-propelled – самохідний, саморушний
payload – корисний вантаж
to haul – перевозити, транспортувати
unpowered – без механічного приводу
power car – вагон-електростанція
idle – непрацюючий, холостий
obsolescence – застарівання
vehicle – транспортний засіб

1 Match the words with their definitions.

vehicle	the load carried by a vehicle exclusive of what is necessary for its operation
to haul	a means of carrying or transporting something
self-propelled	the process of becoming obsolete or the condition of being nearly obsolete
obsolescence	to exert traction on
payload	containing within itself the means for its own propulsion

2 Fill in the blank spaces with:
noise, flexible, vehicle's, safety, capacity, power, payload, replace, freight, to haul.

1 The truck is carrying a … of 2,580 pounds. 2 Does he have the … to handle this job? 3 The … driver was severely injured in the crash. 4 The company has a fleet of trucks that are used … freight. 5 He made some suggestions about how to improve airline … . 6 This computer program has to be … to meet all our needs. 7 The … arrived by steamboat. 8 We closed the windows to block out the traffic … . 9 Will computers ever completely … books? 10 After the emperor died, … passed to his eldest son.

3 Translate the word combinations from the text into Russian.

Stationary steam engine, self-propelled payload-carrying vehicles, payload space, push-pull operation, motive power assets, payload-hauling cars, multiple unit operation.

4 Read the text. Express the main idea of the text.

What is locomotive?

A locomotive is a railway vehicle that provides the motive power for a train. The word originates from the Latin *loco* – "from a place", and is a shortened form of the term *locomotive engine*, first used in the early 19th century to distinguish between mobile and stationary steam engines. A locomotive has no payload capacity of its own, and its sole purpose is to move the train along the tracks. In contrast, some trains have self-propelled payload-carrying vehicles. These are not normally considered locomotives, and may be referred to as multiple units, motor coaches or railcars. The use of these self-propelled vehicles is increasingly common for passenger trains, but rare for freight. Vehicles which provide motive power to haul an unpowered train, but are not generally considered locomotives because they have payload space or are rarely detached from their trains, are known as power cars. Traditionally, locomotives pull trains from the front. Increasingly common is push-pull operation, where a locomotive pulls the train in one direction and pushes it in the other, and can be controlled from a control cab at the other end of the train.

Advantages of locomotives

There are many reasons why the motive power for trains has been traditionally isolated in a locomotive, rather than in self-propelled vehicles.

Ease

Should the locomotive fail, it is easy to replace it with another. Failure or maintenance of the motive power unit does not require taking the entire train out of service.

Maximum utilization of power cars

Idle trains waste costly motive power resources. Separate locomotives enable costly motive power assets to be moved around as needed.

Flexibility

Large locomotives can be substituted for small locomotives where the grades are steeper and more power is needed. A 'passenger' locomotive can also be used for freight duties if needed, and vice versa.

Obsolescence cycles

Separating the motive power from payload-hauling cars enables one to be replaced without affecting the other. At times locomotives have become obsolete when their cars were not, and vice versa.

Safety

In case of an accident, the locomotive may act as buffer zone for the rest of the train. If an obstacle is encountered on the line, the heavier mass of a locomotive is less likely to be deviated from its normal course. Also it may be safer in the event of fire especially with diesel locomotives.

Noise

A single source of tractive power, which means only motors in one place, means that the train will be quieter than with multiple unit operation, where one or more motors are located under every carriage. The noise problem is particularly present in DMUs.

5 *Answer the questions.*

1 What does a locomotive provide for a train?
2 What is the purpose of a locomotive?
3 What are multiple units?
4 What trains are they used for?
5 Why is the motive power isolated in a locomotive?
6 Name the advantages of locomotives.
7 Why are locomotives flexible in use?
8 How may the locomotive act in case of an accident?
9 Can locomotives be separated from payload-hauling cars?
10 Why are locomotives quieter than multiple units?

6 *Translate the following sentences, paying attention to the Passive Voice:*

1 The engine oil is cooled in heat exchangers. 2 The power plant of the locomotive is installed on a welded main frame and consist of diesel engine and a hydraulic transmission. 3 The internal spaces of the frame are sealed and are used as air ducts for ventilation of the traction motors. 4 Superstructures of steel bridges were erected by using the so-called falsework, which is a support which serves during construction on the principle of free erection and using cranes dependent on the conditions and ground configuration. 5 The engine is started electrically by means of a starter-generator supplied from the accumulator battery.

7 Read the following text. Give the name to the text. Make a plan and retell the text.

Railways were the first form of mass transportation on land and until the development of the motorcar in the early 20th century had an effective monopoly on land transport. Railway companies in Europe and the United States used streamlined trains since 1933 for high speed services with an average speed of up to 130 km/h (81 mph) and top speed of more than 160 km/h (99 mph). Both streamlined steam locomotives and high-speed EMUs were used for high speed services. In 1957, the Odakyu Electric Railway in Greater Tokyo launched its Romancecar 3000 SE. This set a world record for narrow gauge trains at 145 km/h (90 mph), giving Japanese designers confidence they could safely and reliably build even faster trains at standard gauge. Desperate for transport solutions due to overloaded trains between Tokyo and Osaka, Japan, the idea of high speed rail was born. The world's first contemporary high volume capable (initially 12 car maximum) "high-speed train" was Japan's Tōkaidō Shinkansen, which officially opened in October 1964, with construction having begun in April 1959. In Europe, high-speed rail started in Munich in June 1965, when DB Class 103 hauled a total of 347 demonstration trains at 200 km/h between Munich and Augsburg.

UNIT 2

heritage – спадщина
shunting – маневровий
internal combustion engine – двигун внутрішнього згоряння
prime mover – первинне джерело енергії
propulsion – двигун, силова установка
igniting – запалення, спалахування
temporary – тимчасовий
regenerative braking – регенеративне гальмування
hydrocarbon – вуглеводень
current – струм
alternator – генератор змінного струму
gear – привод

1 Match the words with their definitions.

to ignite	the rigging of a ship or boat
alternator	to cause (a fuel) to burn
gear	to switch (as a train) from one track to another
prime mover	a heat engine in which the combustion that generates the heat takes place inside the engine proper instead of in a furnace
shunt	an electric generator for producing alternating current
internal combustion engine	a powerful tractor or truck usually with all-wheel drive

2 Fill in the blank spaces with:
engine, batteries, diesel, transmission, fuel, ignited, current, propulsion, hybrid, temporary.

1 The car has a four-cylinder … . 2 The equipment is used for the … of television signals. 3 Sailboats use wind as their source of …. 4 The paper … on contact with sparks. 5 The settlers built … shelters. 6 The circuit supplies … to the saw. 7 Does your car take … or gasoline?

8 The band plays a … of jazz and rock. 9 I had the … pump replaced on my car. 10 I bought new … for the flashlights.

3 Translate the word combinations from the text into Russian.

Outside source of electricity, public transport system, all-year-round timetable, steam-powered trains, high altitude rail lines, internal combustion engine, power transmission system, diesel railroad propulsion development, hydraulic and mechanical power transmission system, lower operational costs, battery-powered locomotives.

4 Read the text. Express the main idea of the text.

Locomotive classifications

Motive power

Locomotives may generate their power from fuel (wood, coal, petroleum or natural gas), or they may take power from an outside source of electricity. It is common to classify locomotives by their source of energy. The common ones include:

Steam

By the end of the 20th century, almost the only steam power still in regular use in North America and Western European countries was on heritage railways largely aimed at tourists and/or railroad hobbyists, known as ‘railfans’ or ‘railway enthusiasts’, although some narrow gauge lines in Germany which form part of the public transport system, running to all-year-round timetables retain steam for all or part of their motive power. Steam locomotives remained in commercial use in parts of Mexico into the late 1970s. Steam locomotives were in regular use until 2004 in the People’s Republic of China, where coal is a much more abundant resource than petroleum for diesel fuel. India switched over from steam-powered trains to electric and diesel-powered trains in the 1980s, except heritage trains. In some mountainous and high altitude rail lines, steam engines remain in use because they are less affected by reduced air pressure than diesel engines. Steam locomotives remained in routine passenger use in South Africa until the late 1990s, but are now reserved to tourist

trains. In Zimbabwe steam locomotives are still used on shunting duties around Bulawayo and on some regular freight services.

Gasoline

Gasoline locomotives have been produced since the early 1900s.

Diesel

As is the case with any vehicle powered by an internal combustion engine, diesel locomotives require some type of power transmission system to couple the output of the prime mover to the driving wheels. In the early days of diesel railroad propulsion development, electric, hydraulic and mechanical power transmission systems were all employed with varying degrees of success. Of the three, electric transmission has proved to be most popular, and although diesel-hydraulic locomotives have certain advantages and are continuously used in some European countries, most modern diesel-powered locomotives are diesel-electric.

Electric

The electric locomotive is supplied externally with electric power, either through an overhead pickup or through a third rail. While the capital cost of electrifying track is high, electric trains and locomotives are capable of higher performance and lower operational costs than steam or diesel power. Electric locomotives, because they tend to be less technically complex than diesel-electric locomotives, are both easier and cheaper to maintain and have extremely long working lives, usually 40 to 50 years – there are many examples of electric locomotives operating for more than half a century with minimal overhaul, and it is not unusual for electric locomotives to be operating close to their centenary. Some electric locomotives can also operate off battery power to enable short journeys or shunting on non-electrified lines or yards. Battery-powered locomotives are used in mines and other underground locations where diesel fumes or smoke would endanger crews, and where external electricity supplies cannot be used due to the danger of sparks igniting flammable gas. Battery locomotives are also used on many underground railways for maintenance operations, as they are required when operating in areas where the electricity supply has been temporarily disconnected.

Hybrids

The main reason why hybrid locomotives have been invented is because this eliminates the need for a mechanical transmission. Otherwise, a gearbox would be needed which is large, complicated and inefficient. A hybrid locomotive allows the internal combustion engine to run at a constant speed, turning an electrical generator which in turn powers an electrical engine. Besides hybrid locomotives which use only a fuelled power source (i.e. internal combustion engine, and an electrical engine, there are also hybrids that use a fuelled power source, battery and electrical engine. Here, the battery acts as a temporary energy store, allowing e.g. the implementation of regenerative braking and switching off the hydrocarbon engine when idling or stationary (as used in automobiles such as the Toyota Prius). Steam-diesel hybrid locomotives have been tried in Britain, Russia and Italy but with only limited success.

Gas turbine-electric

A gas turbine-electric locomotive, or GTEL, is a locomotive that uses a gas turbine to drive an electrical generator or alternator. The electric current thus produced is used to power traction motors. This type of locomotive was first experimented with in 1920 but reached its peak in the 1950s to 1960s. The turbine (similar to a turboshaft engine) drives an output shaft, which drives the alternator via a system of gears. Gas turbine locomotives are very powerful, but also tend to be very loud. After the 1973 oil crisis and the subsequent rise in fuel costs, gas turbine locomotives became uneconomical to operate, and many were taken out of service. This type of locomotive is now rare.

Fuel cell-electric

In 2002 the first 3.6 tonne, 17 kW hydrogen (fuel cell)-powered mining locomotive was demonstrated in Val-d'Or, Quebec. In 2007 the educational mini-hydrail in Kaohsiung, Taiwan went into service. The Railpower GG20B finally is another example of a fuel cel-electric locomotive.

5 Answer the questions.

1 What way do locomotives take power?

2 Where are steam locomotives still used?
3 Why were steam locomotives in regular use in China until 2004?
4 What kind of diesel-powered locomotives are the most modern?
5 How is electric locomotive supplied with electric power?
6 Why are electric locomotives easier and cheaper to maintain than diesel-electric locomotives?
7 Why are battery-powered locomotives used in mines and underground locations?
8 What is the main reason to invent hybrid locomotives?
9 What power source does hybrid locomotive use?
10 How does the battery act in hybrid locomotive?

6 Translate the following sentences, paying attention to the Modal verbs:

1 Depending on the conditions of operation, the control posts can be installed for either right-hand or left-hand running. 2 For especially dusty conditions, the locomotive should be provided with an additional internal air-cleaning stage for the air supplied to the engine. 3 When supplied to countries having a hot and tropical climate, the locomotive must be manufactured with a more effective cooling system and with anticorrosive surface finishes. 4 When the route was drawn, its alignment had to be adjusted to fit in the system of four water storages intended for large hydroelectric power plants. 5 The locomotive could be operated in two units with control from the cab of either unit.

7 Read the following text. Give the name to the text. Make a plan and retell the text.

There are a number of different definitions for high-speed rail in use worldwide and there is no single standard. Additionally, lower speeds can be required by local constraints. EC Directive 96/58 defines high-speed rail as systems of rolling stock and infrastructure which regularly operate at or above 250 km/h on new tracks, or 200 km/h on existing tracks. In the United States high-speed rail is defined as having a speed above 110 mph (180 km/h). In Japan high speed Shinkansen lines use standard gauge track rather than narrow gauge track used on other Japanese lines. These travel at speeds in excess of

260 km/h (160 mph) without level crossings. In China there are two grades of high speed lines. Firstly slower lines that run at speeds of between 200 and 250 km/h (120 and 160 mph) and have freight as well as passenger trains. Secondly, passenger dedicated high speed rail lines operate at top speeds of up to 350 km/h (220 mph).

UNIT 3

slug – допоміжний
drone – радіокерований
fuel storage – зберігання палива
remote control – дистанційне керування
switching operation – комунікаційна передача
bulk – основна маса, об'єм
load-out – розвантажування
fail-safe – надійний, безпечний

1 Match the words with their definitions.

fail-safe	control (as by radio signal) of operation from a point at some distance removed
fuel	having no chance of failure
storage	a material used to produce heat or power by burning
remote control	space or a place for storing

2 Fill in the blank spaces with:
safe, remote control, transmitters, additional, bulk, storage, signal, equipment, load, crew.

1 We need to get our furniture out of …. 2 The bomb was detonated by …. 3 Despite his …, he's a very fast runner. 4 He lifted the … onto his shoulders. 5 We watched the fireworks from a … distance. 6 A construction … will begin work on the house next week. 7 The photographer came early to set up his …. 8 Larger windows will require … work, but the light they will provide may be worth the extra

trouble. 9 The teacher gave us the … to finish what we were working on and hand in our tests. 10 Mosquitoes are the main … of the disease.

3 Translate the word combinations from the text into Russian.

Non-powered unit, braking capability, own traction motors, additional fuel storage, remote control radio transmitter, hump yard operations, one-person crew, traditional switching operations, remote control equipment, lead locomotive.

4 Read the text. Express the main idea of the text.

Slug or Drone

A slug or drone locomotive is a non-powered unit attached to a diesel-electric locomotive to provide additional traction and braking capability. The slug has traction motors but no engine, power being supplied by the attached locomotive (known as a 'mother'). At slow speeds, a diesel-electric prime mover can potentially produce more power than can be usefully used by its own traction motors; a slug increases the number of traction motors available to use the power more effectively.

Slugs are mainly used in rail yards for switching duties, in which case they are normally built without a cab. Other slugs, designed for use on service trains, may be fitted with a cab, which can control the whole consist, and may also provide additional fuel storage for the mother locomotive. In recent years, conventional locomotives have been used in place of slugs on service trains, remotely controlled from the lead locomotive configuration.

Remote control locomotive

In the second half of the twentieth century remote control locomotives started to enter service in switching operations, being remotely controlled by an operator outside of the locomotive cab. A remote control locomotive is a railway vehicle that provides the motive power for a train that differs from a conventional locomotive in that remote control radio transmitter and receiver system is used to operate it, by a person not physically located at the controls within the confines of the locomotive cab. They have been in use for many years in the railroad

industry, including industrial applications such as bulk material load-out, manufacturing, process and industrial switching. The systems are designed to be fail-safe so that if communication is lost the locomotive is brought to a stop automatically. In the United States remotely controlled locomotives have been used since the 1980s, with the Occupational Safety and Health Administration issuing a Hazard Information Bulletin in 1988 regarding their use. By 1999 Canadian National had 115 locomotives with remote control equipment, covering 70% of flat-yard switching and all of its hump yard operations, with savings estimated at $20 million a year. In 1997 Wisconsin Central Transportation moved to extend the use of remote control operations and one-person crews, but the United Transportation Union demanded that the Federal Railroad Administration ban remote control on the Wisconsin Central and all other US railroads. Unions such as the Brotherhood of Locomotive Engineers and Trainmen have expressed concerns about remote control locomotives due to job losses. They cite remote control locomotives are not as efficient as traditional switching operations while being more dangerous. In 2001, the Federal Railroad Administration (FRA) recommended minimal guidelines for the operation of remote control locomotives.

The Union Pacific Railroad has developed Control Car Remote Control Locomotives, which are stripped down locomotives fitted with remote control equipment. When coupled up to a standard locomotive they permit units have not been equipped with RCL to be remotely operated. Loconrol is a product of GE Transportation Systems that permits locomotives to be distributed throughout the length of a train (distributed power). It is installed on more than 8,500 locomotives around the world, sending signals from the lead locomotive and via radio control to the remote units. Users of the system include BHP Iron Ore, Westrail and Queensland Rail in Australia.

5 Answer the questions.

1 What is slug locomotive?
2 What are they used for?

3 Where are slugs mainly used?
4 What locomotives have been used in place of slugs?
5 When did remote control locomotives start to enter service in switching operations?
6 How is a remote control locomotive operated?
7 Where have remote control locomotives been in use?
8 What happenes if communication with locomotive is lost?
9 When did the United States begin to use remotely controlled locomotives?
10 What is locontrol?

6 Translate the following sentences, paying attention to the Perfect Tense:

1 The control system involving unmanned stations has been developed. 2 The design of the locomotive includes a great number of serial units and aggregates whose reliability has been checked in many years of service on other models of locomotives. 3 The traction generator has forced ventilation from an axial-flow fan driven by the engine. 4 The concept of multiple unit has entered the horizon of the Chinese since the 6th Speed-up Campaign of China Railways in 2007. 5 Experience has shown that trains of significantly different speeds cause massive decreases of line capacity.

7 Read the following text. Give the name to the text. Make a plan and retell the text.

A definitive aspect of high speed rail is the use of continuous welded rail which reduces track vibrations and discrepancies between rail segments enough to allow trains to pass at speeds in excess of 200 km/h (120 mph). Depending on design speed, banking and the forces deemed acceptable to the passengers, curves radius is above 4.5 kilometers, and for lines capable for 350 km/h running, typically at 7 to 9 kilometers. There are also a number of characteristics common to most high-speed rail systems. Almost all are electrically driven via overhead lines and have in-cab signaling as well as no level crossings, although there are some exceptions like the Great Western Main line in United Kingdom. Advanced switches using very low entry and frog angles are also often used. Magnetic levitation trains fall under the

category of high-speed rail due to their association with track oriented vehicles; however their inability to operate on conventional railroads often leads to their classification in a separate category.

UNIT 4

multiple unit – складова одиниця
coupling – зчеплення
carriage – вагон
gearbox – коробка передач
hydraulic transmission – гідравлічна передача
wire – дріт
semi-permanent – напівпостійний

1 Match the words with their definitions.

multiple	a wheeled vehicle
coupling	consisting of, including, or involving more than one
carriage	metal in the form of a usually very flexible thread or slender rod
wire	a device that serves to connect the ends of adjacent parts or objects

2 Fill in the blank spaces with:
permanent, unit, single, multiple, component, electricity, carriages, denote, term, wire.

1 He suffered … injuries in the accident. 2 They rode to the city in …. 3 The dollar is the principal … of American currency. 4 A telephone … had fallen on the road during the storm. 5 The museum's … collection includes works of art from the 18th century. 6 The … went off during the storm. 7 “I had the feeling that I had been there before.” “The … for that is ‘déjà vu.’” 8 It costs $10 for a … glass of wine! 9 The word “derby” can … a horse race or a kind of hat. 10 The interview is a key … in the hiring process.

3 Translate the word combinations from the text into Russian.

Self-propelling train unit, passenger trainset, multiple-unit operation, multiple-unit train control, rapid-transit system, diesel electric multiple unit, rapid transit rolling stock, high-speed rail rolling stock.

4 Read the text. Express the main idea of the text.

Multiple unit

The term multiple unit or MU is used to describe a self-propelling train unit capable of coupling with other units of the same or similar type and still being controlled from one cab. The term is commonly used to denote passenger trainsets that consist of more than one carriage, but single self-propelling carriages, or railcars, can be referred to as multiple units if capable of operating with other units. Multiple units are of three main types: Electric multiple unit (EMU), Diesel multiple unit (DMU), Diesel electric multiple units (DEMU).

Two coupled ICE 3 on the Cologue-Frankfurt high-speed rail line near Montabaur

A sign at a light rail stop in Stuttgart, Germany which includes pictorial information advising passengers whether services will be formed of single or double / twin multiple-unit light rail vehicles.

History and description

Multiple-unit operation was made possible by the development of multiple-unit train control by the American inventor Franklin J. Sprague, apparently, even though electric multiple-unit trains had been deployed on the Liverpool Overhead Railway four years before his “invention”. This allowed electrically-powered rapid transit trains to be operated from a single driving position. The first successful test of an MU on a working rapid-transit system was in Chicago, on the South Side “L”, now part of the CTA Green Line. Most MUs are powered either by a diesel engine driving the wheels through a gearbox or hydraulic transmission (DMU), or by traction motors, receiving their power through a live rail or overhead wire (EMU). Diesel electric multiple units (DEMUs) have a diesel engine that drives a generator producing electricity to drive traction motors in a similar fashion to a diesel-electric locomotive. A multiple-unit trainset has the same power and traction components as a locomotive, but instead of the components being concentrated in one carbody, they are spread out on each car that makes up the set. These cars can only propel themselves when they are part of the set, so they are semi-permanently coupled. For example, a DMU might have one car carry the prime mover and traction motors, and another the engine for head end power generation; an EMU might have one car carry the pantograph and transformer, and another car carry the traction motors.

Virtually all rapid transit rolling stock, such as ones used in subway systems, are multiple-unit trainsets, usually EMUs. Many high-speed rail rolling stocks are also multiple-unit trainsets, such as the Japanese Shinkansen and the German ICE 3 high-speed trains.

5 *Answer the questions.*

1 What does the term multiple unit mean?
2 How is multiple unit controlled?
3 What are the types of multiple units?
4 Where was the first successful test of an MU?
5 How are most Mus powered?
6 Where can traction components in multiple-unit trainset be found?
7 What is the role of diesel engine in diesel electric multiple units?
8 Where is rapid transit rolling stock used?

6 Translate the following sentences, paying attention to the '-ing'-forms of the verbs:

1 Multiple unit trains have been running on all major cities' metro lines in China. 2 Depending on the construction conditions, different modern construction methods were used, the combined solutions prevailing. 3 The locomotive has various modifications meeting special requirements of customers. 4 In Japan most passenger train vehicles including the high-speed Shinkansen are multiple unit type except for small numbers of overnight sleeper trains – very few passenger trains are now locomotive type. 5 The electronic industry and scientific research institutes, following a program of automation of train operations, have been continuously developing their manufacturing and technological potentials.

7 Read the following text. Give the name to the text. Make a plan and retell the text.

In both Japan and France the initial impetus for the introduction of high speed rail was the need for additional capacity to meet increasing demand for passenger rail travel. By the mid-1950s, the Tōkaidō Main Line in Japan was operating at full capacity, and construction of the

first segment of the Tōkaidō Shinkansen between Tokyo and Osaka started in 1959. The situation for the first line in Japan was different than the subsequent lines. The route was already so densely populated and rail oriented that highway development would be extremely costly and one single line between Tokyo and Osaka could bring service to over half the nation's population. In 1959 that was nearly 45 million people; today it is well over 65 million. The Tōkaidō Shinkansen line is the most heavily traveled high speed line in the world and still transports more passengers than all other high speed rail lines in the world combined. In France the main line between Paris and Lyon was projected to run out of capacity by 1970. In both cases the choice to build a completely separate passenger-only line allowed for the much straighter higher speed lines. The dramatically reduced travel times on both lines, bringing cities within three hours of one another, caused explosions in ridership. It was the commercial success of both lines that inspired those countries and their economies to expand or start high speed rail networks.

UNIT 5

nimble – рухливий
gradient – схил
dead weight – постійне навантаження
bulky – великогабаритний
ratio – коєфіцієнт, співвідношення
failure – ушкодження, відмова
axle load – навантаження на вісь
rigid – жорсткий
flexible – гнучкий
jerk – поштовх, ривок
drop – зниження

1 Match the words with their definitions.

gradient	a ship's load including the total weight of cargo, fuel, stores, crew, and passengers
bulky	a fixed bar or beam with bearings at its ends on which wheels (as of a cart) revolve
dead weight	a single quick motion of short duration
axle	a part sloping upward or downward
jerk	having great volume in proportion to weight

2 Fill in the blank spaces with:
acceleration, weight, purpose, failure, efficiencies, rigid, destination, frequent, ratio*.*

1 The company is trying to lower costs and improve …. 2 Her … is 105 pounds. 3 What is the length-to-width …? 4 The car delivers quick …. 5 The accident was caused by engine …. 6 He is a … disciplinarian. 7 The car started with a *jerk*. 8 She was a … visitor to the museum. 9 The package reached its … two days later. 10 The … of the new resort is to attract more tourists.

3 Translate the word combinations from the text into Russian.

Energy-efficient, power-driven wheels, weight-per-seat value, turnaround times, suburban commuter rail services, axle loads, side-effect, reduced track wear, locomotive-hauled trains.

4 Read the text. Express the main idea of the text.

Comparison to locomotive-hauled trains

Polish class EN57 EMUs waiting for service in Poznań

Advantages

Multiple units have several advantages over locomotive-hauled trains:

- *Energy efficiency* — MUs are more energy-efficient than locomotive-hauled trains. They are more nimble, especially on gradients, as much more of the train's weight (sometimes all of it) is carried on power-driven wheels, rather than the train having to haul the dead weight of unpowered hauled coaches. In addition, they have a lower weight-per-seat value than a locomotive-hauled train since they do not have a bulky locomotive that does not itself carry passengers, but contributes to the total weight of the train. This is particularly important where train services make frequent stops, since the energy consumed for accelerating the train increases significantly with an increase in weight.
- *Higher acceleration rate* — Because of the energy efficiency, higher power-to-weight ratio and higher adhesive-weight-to-total-weight ratio values, Mus generally have higher acceleration ability than locomotive-type trains and are favored in urban trains and subway (metro) systems for frequent start/stop routines.
- *No need to turn locomotive* — Most Mus have cabs at both ends, resulting in quicker turnaround times, reduced crewing costs, and enhanced safety. The faster turnaround time and the reduced size (due to higher frequencies) as compared to large locomotive-hauled trains, has made the MU a major part of suburban commuter rail services in many countries. Mus are also used by most rapid transmit systems. However, this is no longer a problem for locomotive-hauled trains due to the increasing use of push-pull trains.
- *Makeup can be changed mid-journey* — Mus may usually be quickly made up or separated into sets of varying lengths. Several multiple units may run as a single train, then be broken at a junction point into shorter trains for different destinations.
- *Reliability* — Due to having multiple engines, or motors, the failure of one engine does not prevent the train from continuing its journey. A locomotive-drawn train typically only has one power unit, whose failure will disable the train. However, some

locomotive-hauled trains may contain more than one power unit and thus be able to continue at reduced speed after the failure of one.

The latest example of a Swiss EMU, a Siemens Desiro, on the Zűrich S-Bahn line S8

- *Axle load* — Multiple units have lighter axle loads, allowing operation on lighter tracks, where locomotives may be banned. Another side-effect of this is reduced track wear, as traction forces can be provided through many axles, rather than just the four or six of a locomotive.
- *Easy and quick driving* — Multiple units generally have rigid couplers instead of the flexible ones often used on locomotive-hauled trains. That means that brakes or throttle can be more quickly applied without an excessive amount of jerk experienced in passenger coaches.
- *Allowance for accurate performance calculations for timetabling purposes* — In a locomotive-hauled train, if the number of cars is increased in order to meet the demand, acceleration and braking performance drops. This calls for performance calculations to be done taking the heaviest train composition into account. This may sometimes cause some trains in off-peak periods to be overpowered with respect to the required performance. When two or more multiple units are coupled, train performance remains almost unchanged. However, in locomotive-hauled train compositions, using more powerful locomotives when a train is longer can solve this problem.

5 Answer the questions.

1 Why are multiple units more nimble on gradients?
2 Do MUs have a bulky locomotive?
3 Why do MUs have higher acceleration?
4 Why is MU a major part of suburban commuter rail services?
5 Can MU be broken into shorter trains?
6 Does the failure of one engine prevent the train from its journey?
7 What axles do MUs have?
8 What kind of couplers are typical for Mus?
9 What may cause some trains in off-peak periods to be overpowered?
10 Name the advantages of multiple units.

6 Translate the following sentences, paying attention to the Infinitive:

1 To prevent fogging of the panes and their icing in cold weather provision is made for blowing warm air over them with the aid of two fans. 2 The frame is designed to resist tensile and compressive loads up to 250 ton. 3 To upgrade the safety during railway operations to the required level, control systems are envisaged to be used for checking the suitability and reliability of the facilities and of the railway itself. 4 To ensure the timeliness of information in a great number of cases it is necessary to undertake the permanent circulation of information. 5 For semi-automatic retarding, it is necessary to install one retarder per eight tracks and radar equipment for speed changing.

7 Read the following text. Give the name to the text. Make a plan and retell the text.

In the United States in the decades after World War II, improvements in automobiles and aircraft, anti-trust restrictions on railroads, and government subsidization of highways and airports made those means practical for a greater portion of the population than previously. In Europe and Japan, emphasis was given to rebuilding the railways after the war. In the United States, emphasis was given to building a huge national interstate highway system and airports. Urban mass transport

systems in the United States were largely eschewed in favor of road expansion. The U.S. railway had been less competitive as a means of transportation for several reasons: The vast size of the United States made airline travel more favorable in America, which was not an issue for the geographically smaller European countries; the government had an incentive to favor road construction as most of the world's automobile production was in America, centered around Detroit; and the lower population density in the USA allowed easier construction of a national highway network, but mass highway construction would not have been as easy in the high population densities of the European nations and Japan. But as energy costs continue to increase, rail ridership is now increasing across the United States.

UNIT 6

maintenance – ремонт
relevance – важливість, відповідність
collision – зіткнення
shunting – маневровий
gangway – прохід
to substitute – заміняти
couchette – спальне місце (у вагоні)
supplemental – додатковий
to dedicate – призначений для чогось
density – густина

1 Match the words with their definitions.

to substitute	devoted to a cause, ideal, or purpose
feature	the mass of a substance per unit volume
dedicated	to put or use in the place of another
density	something offered to the public or advertised as particularly attractive

2 Fill in the blank spaces with:

supplemental, compared, maintenance, noise, density, add, collision, resource, replacement, evacuated.

1 The building has suffered from years of poor …. 2 The car was destroyed in the …. 3 We were surprised by the fog's …. 4 She receives a … income every month from the government. 5 We need a … for our old vacuum cleaner. 6 During World War II, children were … from London to the country. 7 I … several bicycles before buying one. 8 Oil is essentially their only …. 9 I couldn't hear him over all the …. 10 … one cup of sugar to the mixture.

3 Translate the word combinations from the text into Russian.

Self-propelled cars, the train's power system, level-crossing accident, motive power resources, high-speed coupled sets, driving console, high population density, payload-carrying cars.

4 Read the text. Express the main idea of the text.

Comparison to locomotive-hauled trains
Disadvantages

Multiple Units do have some disadvantages as compared to locomotive hauled trains:

- *Maintenance* – It may be easier to maintain one locomotive than many self-propelled cars.
- *Safety* – In the past it was often safer to locate the train's power systems away from passengers. This was particularly the case for steam locomotives, but still has some relevance for other power sources. A head on collision or level-crossing accident involving a multiple-unit (with passengers potentially right at the front of the train) is likely to result in more casualties than one with a locomotive (where the heavy locomotive would act as a 'crumple zone').
- *Easy replacement of motive power* – If a locomotive fails, it can be easily replaced with minimal shunting movements. There would be no need for passengers to evacuate the train. Failure of

a multiple unit will often require a whole new train and time-consuming switching activities; also passengers would be asked to evacuate the failed train and board another one.

- *Efficiency* – Idle trains do not waste expensive motive power resources. Separate locomotives mean that the costly motive power assets can be moved around as needed and also used for hauling freight trains. A multiple – unit arrangement would limit these costly motive power resources for use in passenger transportation.
- *Gangways* – It is difficult to have gangways between coupled sets, and still retain an aerodynamic leading front end. Because of this fact, frequently there is no passage between high-speed coupled sets. In such instances more crew resources may be required, as, for example, ticket inspectors, should be present in all of them. This leads to higher crew costs and lower utilization of crew resources. In a locomotive – hauled train, one single crew can serve all the train regardless of the number of cars in the train unless limits of individual workload are not exceeded. Likewise, in such instances, buffet cars and other shared passenger facilities may need to be duplicated in each train set, reducing efficiency.
- *Flexibility* – Large locomotives can be substituted for small locomotives when more power is needed. Also, different types of passenger cars (such as reclining-seats, compartment cars, couchettes, sleepers, restaurant cars, buffet cars etc.) can be easily added to or removed from a locomotive-hauled train. However, it is not so easy for a multiple unit since individual cars can be attached or detached only in a maintenance facility. This also allows a loco – hauled train to be flexible in terms of number of cars. Cars can be removed or added one by one, but in multiple units two or more units have to be coupled. This is not so flexible.
- *Noise and vibration* – The passenger environment of a multiple unit is often noticeably noisier than that of a locomotive-hauled train, due to the presence of underfloor machinery. The same applies to vibration. This is a particular problem with DMUs.

- *Obsolescence cycles* – Separating the motive power from the payload-carrying cars means that either can be replaced when obsolete without affecting the other.

Features

The Transwa Prospector DEMU capable of up to 200 km/h provides a passenger service between Perth, West Australia and the mining town of Kalgoorlie

It is not necessary for every single car in an MU set to be motorized. Therefore MU cars can be motor units or trailer units. Instead of motors, trailing units can contain some supplemental equipment such as air compressors, batteries, etc. In some MU trains, every car is equipped with a driving console, and other controls necessary to operate the train. Therefore every car can be used as a cab car whether it is motorized or not, if on the end of the train. This is the case with NJ Transit Arrows, Metro-North Railroad (New York) EMUs. However, other EMUs can be driven/controlled only from dedicated Cab cars. Among such EMUs are the former Russian ER2, ER9, German classes 423-426, etc. Well-known examples of MUs are the Japanese Shinkansen and the last generation German ICE. Most trains in the Netherlands and Japan are MUs, making them suitable for use in areas of high population density. A new high-speed MU, the AGV, was unveiled by France's Alstom on February 5, 2008. It has a claimed service speed of 360 km/h.

5 Answer the questions.

1 What are the disadvantages of multiple units as compared to locomotive-hauled trains?
2 Is it easy to repair MUs?
3 Why are MUs not safe on collision?
4 What would multiple-unit arrangement limit?
5 Why is there no passage between high-speed coupled sets?
6 What leads to higher crew costs and lower utilization of crew resources?
7 Why are MUs not so flexible as large locomotives?
8 What is a particular problem of DMUs?
9 Can obsolete car be replaced without affecting the other in MUs?
10 . Why can every car be used as a cab car?

6 Translate the following sentences, paying attention to the Passive Voice:

1 The bonnet roof is divided into four removable sections which ensures free extraction of the equipment for repairs. 2 Air is sucked through the sections by three eight-blade motor fans. 3 The air for operation of the engine is purified in two-stage oil filters with a degree of purification of 98%. 4 On customer's request the locomotive was also provided with electrodynamic brakes. 5 The locomotive is painted with enamels intended for tropical conditions, the colours used being selected with a view to customer's requests.

7 Read the following text. Give the name to the text. Make a plan and retell the text.

Travel by rail becomes more competitive in areas of higher population density or where gasoline is expensive, because conventional trains are more fuel efficient than cars when ridership is high, similar to other forms of mass transit. Very few high-speed trains consume diesel or other fossil fuels but the power stations that provide electric trains with power can consume fossil fuels. In Japan and France, where the most extensive high speed rail networks exist, a large proportion of electricity comes from nuclear power. Even using electricity generated from coal or oil, trains are more fuel efficient per passenger per kilometer traveled than the typical automobile because of economies of scale in generator technology. Rail networks, like

highways, require large fixed capital investments and thus require a blend of high density and government investment to be competitive against existing capital infrastructure for aircraft and automobiles. Urban density and mass transit have been key factors in the success of European and Japanese railway transport, especially in countries such as the Netherlands, Belgium, Germany, Switzerland, Spain and France.

UNIT 7

driving trailer – причіпний вагон з постом керування
flatcar – вагон-платформа
to recapture – повертати
feasible – здійснимий
software – програмне забезпечення
interior – внутрішній
versatility – експлуатаційна гнучкість

1 Match the words with their definitions.

flatcar	the act of retaking
to recapture	capable of being done or carried out
software	a railroad freight car without permanent raised sides, ends, or covering
feasible	the entire set of programs, procedures, and related documentation associated with a system and especially a computer system

Fill in the blank spaces with:
to communicate, freight, containers, control, concepts, usage, traffic, cargo, coaches, steam.

1 The … arrived by steamboat. 2 Airlines saw a decrease in passenger … this year. 3 The small boy could not … the big dog. 4 In those days, people usually traveled long distances in …. 5 The shipment of tools arrived at the dock in cargo … yesterday. 6 This word occurs in casual …. 7 The two computers are able … directly with one another.

8 The ship was carrying a … of crude oil. 9 She is familiar with basic … of psychology. 10 The boat runs on ….

3 Translate the word combinations from the text into Russian.

Self-propelled flat car, container truck, push pull mode, automatic 5-speed gearbox, power output, computer modules, promotional trips, tri-weekly service, integral part.

4 Read the text. Express the main idea of the text.

Freight multiple units

A new concept is to use the multiple unit idea for freight traffic, such as carrying containers or for trains used for maintenance. The Japanese M250 series train has four front and end carriages that are EMUs, and has been operating since March 2004. The German CargoSprinter have been used in three countries since 2003.

Steam

The United Kingdom had various examples of Autotrain on branch lines, whereby a steam locomotive could be controlled by driving trailers at the opposite end of the train, or in the middle. This avoided the need to run around the locomotive at the terminals. These autotrains were limited to about two carriages, however the Great Western Railway's Autotrain system allowed a locomotive to be placed in the middle of a four coach train and controlled from the cab of either of the two outside carriages (Autocoaches). The *CargoSprinter* is a multiple unit (or articulated) freight car; it could also be thought of as a container truck that runs on rails. Built by the German company Windhoff, it is in effect a self-propelled flatcar for containers. It is intended to recapture some of the freight market back from road trucks, by making it economically feasible to carry small amounts of freight to the individual sidings of warehouses and businesses, without the complications and overhead of conventional locomotive-hauled trains. The unit consists of two driving and power units, each fitted with a full width cab and two Volvo truck engines for propulsion, which operate in a push pull mode, with up to seven trailers in between. The drive train is hydraulic via an automatic 5-speed gearbox, and has a maximum speed of 120 km/h. The complete

train has a total power output of 4 x 265 - 1060 kilowatts and weighs 118 tons.

Control system

The computer system in the CargoSprinter is based around a computer running the Linux operating system, with software written in C and in Pascal. The computer modules communicate over TCP/IP across a LAN.

Usage

In Australia the CRT Group introduced the first CargoSprinter to Australia in February 2002. After a number of promotional trips, the CargoSprinter operated a tri-weekly service from Melbourne to Wodonga in 2003, followed by a port shuttle from the Port of Melbourne to Altona from September 1 that year, before being put into storage.

Power car

A power car is a railroad vehicle that is closely related to the locomotive. What differentiates the two is their construction or their use. A true locomotive can be physically separated from its train and does nothing but provide propulsion (and electricity for passenger trains). A power car, on the other hand, is frequently an integral part of its train. Some of its interior space may be used for holding passengers or cargo. Power cars are limited to passenger trains as their relative lack of versatility makes them unsuitable for hauling freight. Nearly all high speed trains use power cars, frequently at both ends. An example of these are the Acela trainsets in use by Amtrak; which are built by Bombardier in Canada using technology licensed from France's Alstom, the twenty Acela trainsets operate between

Washington, D.C. and Boston, Massachusetts, each trainset consists of six passenger cars and two power cars. Another traditional example would be the older Intercity 125, made for and used by British Rail and several subsequent privatised bodies like Virgin Trains.
Multiple units (diesel or electric) usually have a mix of power cars and trailers, often with one of each in a pair which can be coupled to other pairs to form a larger train.

5 Answer the questions.

1 How could a steam locomotive be controlled?
2 How many carriages can autotrains have?
3 How are they controlled?
4 What is CargoSprinter?
5 Where was it built?
6 What does the unit include?
7 What is its maximum speed?
8 When was the first CargoSprinter introduced to Australia?
9 What is a power car?
10 What trains use power cars?

6 *Translate the following sentences, paying attention to the Perfect Passive:*

1 Most long distance trains in Japan had been operated by locomotives until the 1950s, but by utilizing and enhancing the technology of short distance urban MU trains. 2 Locomotive type trains have been regarded as slow and inefficient, and their use has significantly decreased in Japan. 3 The driver's cab has been carried forward to ensure better vision of the truck in front, is provided with thermal and sound insulations and is separated from the engine compartment by the high-tension chamber. 4 In Northern Ireland the majority services have been operated by diesel multiple units since the mid-1950s. 5 The forces have been measured at axle box level.

7 Read the following text. Give the name to the text. Make a plan and retell the text.

In France, the cost of construction (which was €10 million/km (US$15.1 million/km) for LGV Est - an extension to the French high-speed rail network, connecting currently Vaires-sur-Marne (near Paris) and Baudrecourt (near Metz and Nancy), and later Vaires-sur-Marne and Vendenheim (near Strasbourg) is minimised by adopting steeper grades rather than building tunnels and viaducts. However, in mountainous Switzerland, tunnels are inevitable. Because the lines are dedicated to passengers, gradients of 3.5%, rather than the previous maximum of 1–1.5% for mixed traffic, are used. Possibly more expensive land is acquired in order to build straighter lines which minimize line construction as well as operating and maintenance costs. In other countries high-speed rail was built without those economies so that the railway can also support other traffic, such as freight. Experience has shown however, that trains of significantly different speeds cause massive decreases of line capacity. As a result, mixed-traffic lines are usually reserved for high-speed passenger trains during the daytime, while freight trains go at night. In some cases, night-time high-speed trains are even diverted to lower speed lines in favour of freight traffic.

МЕТОДИЧНІ ВКАЗІВКИ

з з розвитку навичок читання та комунікативної компетенції
для студентів 2 курсу спеціальності
Локомотиви

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