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Дидактические материалы

по дисциплине «Английский язык в профессиональной деятельности»

ENGLISH FOR SPECIFIC PURPOSES

AUTOMOTIVE SERVICE

для студентов II-IVкурсов специальности «Техническое обслуживание и ремонт автомобилей»

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Данное учебно-методическое пособие предназначено для занятий со студентами II-IVкурсов специальности «Техническое обслуживание и ремонт двигателей, систем и агрегатов автомобилей» и других специальностей укрупнённой группы «Техника и технологии наземного транспорта». Оно может быть использовано как для аудиторной работы, так и для внеаудиторного чтения.

Цель учебно-методического пособия - обучить студентов профессиональной лексике, формированию коммуникативной компетенции, позволяющей общаться на английском языке на технические темы, в том числе в сфере профессиональной деятельности используя приобретённый словарный запас, формировать ОК 10, Пользоваться профессиональной документацией на государственном и иностранном языке в соответствии ФГОС по ТОП-50.

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ПОЯСНИТЕЛЬНАЯ ЗАПИСКА

Методическое пособие разработано для изучения дисциплины «Иностранный язык в профессиональной деятельности» специальности «Техническое обслуживание и ремонт двигателей, систем и агрегатов автомобилей» и других специальностей укрупнённой группы 23.00.00 «Техника и технологии наземного транспорта».

Данный материал составлен в соответствии с программой учебной дисциплины «Иностранный язык в профессиональной деятельности» и требованиями Федеральных государственных образовательных стандартов по ТОП-50.

Предлагаемое пособие ставит своей **целью** обучение студентов профессиональной лексике, формированию ОК 10, формированию коммуникативной компетенции, позволяющей общаться на английском языке на технические темы, в том числе в сфере профессиональной деятельности, используя приобретённый словарный запас, а также способствует расширению кругозора студентов и повышению их интереса к изучению английского языка.

Методическое пособие имеет **актуальное значение**, так как развивает профессиональный интерес, формирует информационную культуру, способствует овладению лексикой технической направленности, позволяет студентам применить полученный материал на практике, пользоваться профессиональной документацией на государственном и иностранном языке в соответствии ФГОС по ТОП-50.

Данный дидактический материал может быть использован как для аудиторной работы со студентами, так и для самостоятельной работы студентов. Также данный материал может быть полезен преподавателям английского языка СПО при работе со студентами специальностей укрупнённой группы 23.00.00 «Техника и технологии наземного транспорта».

Дидактический материал содержит подборку текстов и упражнений профессионально направленного содержания, что способствует овладению лексикой технической направленности. В методическое пособие включены тексты из истории появления автомобилей, устройство автомобиля, работы двигателя, виды наземного транспорта, и другие. В конце каждого раздела даны интернет-ссылки для дополнительного изучения темы. Учебные задания способствуют усвоению и запоминанию специальных терминов, связанных с автомобильными технологиями.

Методическое пособие состоит из семи разделов (Units). Включает изучение таких основных тем, как «Специальности в автомобильной индустрии», «Автомобильное производство», «альтернативные виды топлива», «Автомобильные инновации», «Проблемы, связанные с автомобилями», «Виды автомобилей» и другие.

В пособии также имеются приложения, содержащие дополнительный материал, необходимый для наилучшего понимания и усвоения данных дидактических материалов.

В первом приложении дан список профессиональных разговорных фраз, необходимых для устной и письменной беседы. Во втором приложении даны дополнительные технические тексты для самостоятельной работы студентов. И в третьем приложении дан список лексики, который содержит значительное количество слов, понимание которых необходимо для работы с текстами и упражнениями.

UNIT 1

REVISION

1. Look at the pictures and name as many external and internal car parts as you can.

I.

1.		8.	
2.		9.	
3.		10.	
4.		11.	
5.		12.	
6.		13.	
7.			

Words for reference: tires; windshield wipers; sunroof/moonroof; side marker indicators/turn signals; hood/bonnet; side turn signal lights; windows; tow hook; front bumper; fog lights; headlights; outside mirrors; doors

II.

1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.			

Words for reference: rear window wiper; rear window defroster; rear lights; boot/trunk; stop/braking light; fuel-filler door; rear view camera; antenna; rear door

III.

1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Words for reference: air cleaner; engine oil filler cap; engine drive belt location; radiator filler cap; brake and clutch fluid reservoir; engine oil dipstick; engine coolant reservoir; fuse/fusible link holder; battery; window washer fluid reservoir;

2. Label the types of car.

Words for reference: hatchback, convertible, coupe, estate car/station wagon, pick up, saloon/sedan, SUV (sports utility vehicle), limousine, sports car, truck, van

a)

b)

c)

d)

e)

f)

g)

h)

i)

k)

l)

3. Name cars that fit the description.

Which car(s)

- is/are good for driving on bad roads?
- has/have low fuel consumption?
- is/are good for transporting things?
- is/are perfect for hot, sunny weather?
- has/have lots of room for passengers?
- is/are good for a large family?
- can carry heavy loads?
- is/are ideal for small parking places?
- has/have only one passenger seat?
- is/are not suitable for everyday commuting?
- is/are not suitable for large families?
- has/have enough boot space for several suitcases?

4. What type of car would you prefer to drive in Irkutsk? Why?

5. What do you think is the best car for a big city resident? Read a few people's comments below. Do you agree with them? Can you think of some other important features of a "big city" car?

Oliver, 21, UK: *In a big city, you need something practical but I personally still need something fun. Maybe a Golf GTI would be a good choice - it's quick and fun but small enough to park in crowded streets.*

Filipp, 31, USA: *My primary cause for concern in a big city would be a lack of space (for parking, maneuverability, etc), so it would have to be a small car. So my choice in a large city would be a FIAT 500 Abarth - it's tiny, handles well and is fast enough to be fun outside of the city as well.*

6. Read the interview and answer the question: What is needed to make sure that a car is ready for fall (autumn) and winter?

- We are Best Auto Service Center here in Tannersville. Time to talk about getting your car ready for the fall and the winter, things we need to do. Joining me is Tom Sforza. Tom, when they bring their car in here, you're going to get it prepared for them, for the fall and winter driving. What are the things that you start to look for?
- Well, we want to check the wipers, the hoses, the belts, want to make sure that the tires are OK, brakes, undercarriage is safe...um...all the fluids: we want to do an oil analysis test - we'll do a free oil analysis test, make sure all the fluids are OK for the winter, antifreeze is big...um...want to check all those things and make sure the car is OK for the winter months. Battery needs to be load tested, 'cos a lot of times batteries fail and people don't know it until they go out and the car click-click...you know, they hear a click-click. So, we want to try and prevent that, you know.
- Probably one of the worst times to have your battery go is in the dead of winter...
- Ice cold, yeah...exactly.
- It's cold and you're stuck somewhere, right?

- Let's talk about that fluid analysis that you do. That is very interesting 'cause you can show them visually how their different fluids look.
- That's right. We take a spot of each fluid - power steering, brake, transmission, differential - and we show the customer right on the card if the oil is good or if the oil needs to be serviced, so they can see for themselves that it's OK...either it's OK or it needs to be serviced.
- OK. Now, we talked about tires: very important, especially for winter driving in the Poconos [1], but besides having a good tire, what about what you put in it, as far as air?
- What we like to do, George, we like to use nitrogen, 'cos...'cos nitrogen is drier. It's, uh, air contains moisture so it's going to go up faster, so it's not going to be as consistent as nitrogen, alright...the pressures go up. Also the molecules in the nitrogen are bigger, so they're not going to leak out or permeate out of the tire faster. And being that the tire is operating at the right pressure, the customer will get better fuel mileage.
- Wow, that's all good stuff. When we talk about tires, I guess wheel alignment is also something very important?
- Absolutely, that's true. Especially in the Poconos, now, you...you know, the roads [are] not the greatest, so we like to get an alignment...I would recommend at least two a year, if not more if you hit a serious pothole, it should be inspected, it should be checked, you know. So, that goes along with the tires, that...the...the alignment.
- Now, here at Best Auto Service Center you've had 0% financing for as long as I can remember...

[1] Poconos – mountains in Pennsylvania

- Yes.
- ...but let's talk about something new: no credit financing?
- Yes, George, it's new, we've had it maybe a month. [If] the customer has bad credit or no credit, OK, we can get them financing on mo[st]...most of the time we can and it's called "no credit check financing", so there's a series of things, a form we have to fill out, we submit it and then they get their car fixed.
- Wow, that's super. No reason to put off getting those car repairs that you need now.
- Absolutely not, yeah...so you...there's no excuses now, you know, we can...we do it all, like to take care of our customers.
- Now, you service, of course, brand new cars...
- Yes.
- ...used cars, it doesn't matter.
- Everything. Brand new, we can do the maintenance on the brand new vehicle, which is not a problem. We...through Run-Rite, they also, the cu...customer on a brand new car will get a warranty through Run-Rite...
- Right.
- ...on every one of their systems, you know, whether it's transmission, brake, cooling system - as long as they service it here, we have a record of it, they will be covered under Run-Rite.
- Good. Alright. For more information, how do they find out about Best Auto Service Center?
- They could reach us on the web at www.bestautoservicecenter.com or they can call us at 570-688-2378. We are also on Facebook, as well.
- And you're located?
- Uh, we're right in Tannersville, right on 611, right across from Friendly's Ice Cream. Look for the big AC Delco building.

7. Read the text again and answer the following questions:

1) What is fluid analysis? What fluids are being checked?
2) What do the mechanics put in tires? What for?
3) How often does Tom recommend having your tires aligned?
4) Can you have your car serviced if you have a bad credit history?
5) Does the shop service only brand new cars?
6) How can you find *Best Auto Service Center* online?

Further reading

http://auto.howstuffworks.com/car-parts-roundup.htm

http://en.wikipedia.org/wiki/List_of_auto_parts

UNIT 2

Careers in Automotive Industry

1. **Why did you choose to study automotive service?**

2. **Do you believe it was the right choice?**

3. **What do you know about the following jobs?**
   - Automotive Service Technician
   - Service Advisor
   - Automotive Engineer
   - Vehicle Sales Manager

4. **Working in pairs, develop a Top-5 list of auto-related jobs you think are most exciting. Then compare all the lists in the classroom and vote for the final Top-5.**

5. **Read the extract from the article published on *Jalopnik.com* and compare your final list with the one presented in the article.**

Raphael Orlove

What's The Best Job In The Automotive Universe?

You've always dreamed of getting into the car industry, but you don't know where to start. *Jalopnik* readers have found the greatest car-related jobs you should kill to get.

5) Supercar engine builder

Why it's so good: Factory work for most automakers is rather difficult in the loud conditions, and fast pace of the line. Exotic car manufacturers, by contrast, invest heavily in clean, orderly, more slow-paced factories, like the *OCD Wonderland* at McLaren. Assembling engines all day in there would be quiet, calm, and something you could enjoy.

4) Classic car restorer

Why it's so good: You spend your whole day with dream cars, bringing them back to original condition or better. Well, you don't get to spend all day, as you're self-employed. But this also means you're going to have to deal with bad customers, guys who leave their car at your shop for months and never return your calls, and take the stress of staying profitable with your own business.

3) Skunkworks[2] engineer

Why it's so good: Being an engineer in the massive bureaucracy that defines most car companies can be extremely degrading, with years going into refining out-of-sight parts.

[2] A **skunkworks project** is a project developed by a small and loosely structured group of people who research and develop a project primarily for the sake of radical innovation.

Working at a skunkworks division, like BMW M, AMG, or SRT allows you to make visible progress to a car design, and what you're doing is making some of the fastest, coolest cars in the world.

2) Car designer

Why it's so good: The starting pay is bad and you will spend your entire career fighting with corporate bosses who want to economize your designs into something less radical and expensive to produce. But it will all be worth it to see your work used by millions of people, making their lives better with good design.

1) Automotive journalist

Why it's so good: Oh, I'm sorry, I couldn't possibly borrow the Aston Martin Virage this weekend. No, not even if you drop it off at my house, I simply don't have time. Call me back when the new Vanquish comes out, I think I'll be available then.

I. Match the jobs with reasons why they are on this list.

1. Automotive journalist	a) You can avoid the noise of a large auto manufacturing plant
2. Skunkworks engineer	b) You can enjoy working with beautiful old cars
3. Classic car restorer	c) You can see the result of your work on the road one day
4. Car designer	d) You can test-drive lots of exciting cars
5. Supercar engine builder	e) You can work in a small team of really creative people

II. Would you like to try any of these jobs yourself? What about them interests you?

6. Read how employees describe their jobs. Make sure you understand the underlined words.

I'm an office worker in a large car manufacturing company. It's a **nine-to-five job** with regular working hours. I'm a secretary, so the work isn't very interesting, but I like to be able to go home at a reasonable time. I mainly **deal with** clients, answer phone calls and prepare documents. We all have to **clock in** and **clock out** every day.

I'm in computer programming. We develop software for car onboard computers. There's a system of **flex time** in my company, which means we can work when we want, within certain limits. We can start at any time before eleven, and finish as early as three, as long as we work enough hours each month. It's ideal for me as I have two young children. I **work full-time**, but some of my coworkers work only **part-time**, so they spend even less time at work.

I work in a car plant. I **work in shifts**. I may be on the **day shift** one week and the **night shift** the next week. It's difficult changing from one shift to another. When I change shifts, I have problems changing to a new routine for sleeping and eating.

I'm a journalist at a monthly automotive magazine. I work in a big city, but I prefer living in the country, so I **commute** to work every day, like thousands of other commuters – except when I'm visiting an auto show. Working from home using a computer and the Internet is becoming more and more popular and my employer is introducing **teleworking** or **telecommuting** (working remotely from home). But I like going to the office and working with other people around me.

I work for a large European automotive manufacturer. I work on car design. In fact, I **run the** design **department** and I **manage a team** of designers: 20 people work under me. It's very interesting. One of my **responsibilities** is to make sure that new model designs are finished on time. I'm also **in charge of** design budgets.

I'm an automotive service technician and I **am self-employed**: I work in a small car service shop that I run together with my brother. I arrive at work very early, around 6 a.m., because some of our **customers** prefer to bring in or pick up their cars before their workday starts. We provide basic service such as oil changes or polishing small scratches. If there is something seriously wrong with an engine, we usually **refer** our customers **to** a larger service station. I like my job very much, because I like being responsible for everything myself. There are only two **permanent employees** in our small business – my brother and I – but in spring and in autumn we have many customers wanting to change tires, so sometimes we **hire a temporary technician**. And we **outsource** the accounting.

I. Using words from the box, describe the following jobs. Use more than one word if suitable.

1) work in shifts 2)telecommute 3)be self-employed 4) work flexitime 5)deal with customers 6)clock in and out at the same time every day 7)work full-time 8)be in charge of a team 9) work part-time 10)have a nine-to-five job 11) be responsible for the budget 12) run the department 13) commute to work

a) chief engineer
b) automotive service technician
c) automotive service advisor
d) assembly line worker
e) software developer
f) engineer
g) regional manager
h) CEO (Chief Executive Officer)
i) old car mechanic
j) PR manager
k) car painter

II. Describe your ideal job in terms of working conditions. Опишите идеальные для вас условия работы. Ответьте на вопросы:

1) Would you like to work for a large multinational company, a family-run business or be self-employed?
2) Would you like to work full-time or part-time?
Use as many words from the exercises above as you can. Используйте как можно больше слов из упражнений.

Further reading

http://www.fisita.com/jobs/careers

http://www.yourfutureinautomotive.com/career-advice/what-does-automotive-engineer-really-do

UNIT 3

Automotive Industry

1. Spend a minute making a list of as many car manufacturers as you can remember. Then compare your list with the lists made by your classmates. Who's got the most? Подумайте и составьте список производителей автомобилей, которых вы помните. Затем сравните ваш список со списками ваших одногруппников.

3. Working with a partner, divide all the companies mentioned in the classroom into these major geographical areas: North America, South America, Asia, Europe. Работая в парах, разделите все названные в классе компании по географическим регионам: Северная Америка, Южная Америка, Азия, Европа.

4. What are the following departments responsible for? За что ответственны следующие отделы?

a) R&D (research and development) – отдел исследования и развития

b) Product Design – отдел проектирования

c) Purchasing - продажа

d) Sales&Marketing – отдел маркетинга и продаж

Fill in the gaps with the suitable words from the list above. Заполните пропуски подходящими по смыслу словами из списка.

1._____ is responsible for transforming market needs into features for new vehicles, as well as working together with engineers in order to ensure viability, safety, comfort and other customer-focused features of a new vehicle.

2._____ is responsible for developing strategies and tactics to bring vehicles to market and maintain the overall sales process. The earlier stages of 3._____ are responsible for developing vehicles to meet future customers' needs and selecting appropriate vehicle features to be brought to market and working with engineers and developers to introduce new vehicles. The 4._____ team is responsible for delivering vehicles to dealers, as well as providing constant support to the retail chain all throughout the sales process.

A(n) 5._____ department is responsible for innovations in design, products, and style. This department is responsible for creating innovative new products to keep companies a step ahead of the competition. Many companies also rely on the

6._____ department to improve existing consumer products, and to explore new ways of producing them.

5. Read the extract from the presentation. Прочитайте текст

Especially, SsangYong continues to develop market-leading models that better meet customer needs; models such as Actyon Sport, Korea's first major utility vehicle. By improving our brand values, employing differentiated market strategies, advancing into new and (1)**emerging markets** and upgrading our sales capability in existing markets, we will continue to reinforce our global presence. We are determined to expand our (2)**product portfolio** and create new market segments and customers by developing a new small car platform for crossover models of the future. We will also work on (3)**sustainable growth** by developing high-efficiency eco-friendly power trains and introduce new technology for future-focused products such as electric vehicles.

I. Explain the meaning of the words in bold.

a) устойчивый рост; b) новые рынки; c) ассортимент выпускаемой продукции

Further reading

http://cars.lovetoknow.com/History_of_the_Automobile_Industry

http://en.wikipedia.org/wiki/Automotive_industry

UNIT 4

HOT TOPICS: ALTERNATIVE FUELS

1. *Electrical, mechanical, heat, nuclear* …. Think of a noun that can be joined with these adjectives to make a phrase.

2. Read the following text and explain the difference between *energy* and *fuel*.

Fuels are any materials that store potential energy in forms that can be practicably released and used for work or as heat energy. The concept originally applied solely to those materials storing energy in the form of chemical energy that could be released through combustion, but the concept has since been also applied to other sources of heat energy such as nuclear energy.

The heat energy released by many fuels is harnessed into mechanical energy via an engine. Other times the heat itself is valued for warmth, cooking, or industrial processes, as well as the illumination that comes with combustion. Hydrocarbons[3] are by far the most common source of fuel used by humans, but other substances, including radioactive metals, are also utilized.

Fuels are contrasted with other methods of storing potential energy, such as those that directly release electrical energy (such as batteries) or mechanical energy (such as flywheels[4], springs, compressed air, or water in a reservoir).

3. What types of fuel do you know?

4. Fill in the gaps in the table with the words from the box.

wood	alcohols	natural gas	coal	petroleum	hydrogen

Natural Fuels	Manufactured Fuels
Solid Fuels	
1)_____	Tanbark, Bagasse, Straw (кора, выжимка сахарного тростника, солома)
2) _____	Charcoal (древесный уголь)
Oil shale (нефтеносный сланец)	Coke (кокс)
	Briquettes (прессованный уголь)
Liquid Fuels	
3) _____	Oils from distillation of petroleum
	Coal tar (угольная смола)
	Shale-oil
	4) _____
Gaseous Fuels	

[3] hydrocarbons – углеводороды
[4] flywheel – маховик

5) _____	Coal gas
	Producer gas (генераторный газ)
	Water gas
	6) _____
	Acetylene
	Blast furnace gas (доменный газ)
	Oil gas

5. Match the words with their Russian equivalents.

1) oil rig	a) углеводородное сырьё; нефтепродукты
2) refinery	b) сырая нефть
3) gasoline/petrol	c) нефтедобывающая буровая установка или платформа
4) petroleum	d) нефтеперерабатывающий завод
5) diesel	e) гидравлический разрыв (пласта)
6) crude oil	f) бензин
7) hydraulic fracturing	g) дизельное топливо

6. Which of the words from exercise 5 refer to a) places, b) types of fuel, c) technologies?

7. What types of the so-called alternative fuels do you know?

8. Can you name any models of cars that are powered by alternative fuels?

9. Can you name any hybrid cars?

10. Read the article.

The case for alternative fuels[5]

Before reading

1) Match a word from the left column with a synonym in the right column.

1) enhance	a) limited
2) significant	b) cell
3) fast	c) improve
4) restricted	d) key
5) battery	e) rapid

2) Match the adjectives in the left column with Russian equivalents in the right column.

[5] Automotive Engineering International. – October, 1, 2013. – P. 14-15. The facts and conclusions for this article were drawn from the new SAE International book, “Future Automotive Fuels and Energy Technology Profile” by Bruce Morey, published in August 2013.

1) environmentally friendly	a) гибкий
2) economical	b) инновационный
3) flexible	c) благоприятный для окружающей среды
4) efficient	d) подходящий
5) suitable	e) умный
6) intelligent	f) экономичный
7) innovative	g) с высокой производительностью; эффективный

3) Explain the meaning of the following words:

demand (n.) – спрос

supply (n.) – предложение

Reading

There should be reasons to justify switching from petroleum for transport. Why? For one, as liquids, gasoline and diesel are easy to distribute. They are also energy-dense. A gasoline or diesel tank can be filled in a few minutes and carry the vehicle hundreds of miles more conveniently than any other fuel type.

Another reason is that the petroleum infrastructure is well established. There are 7000 oil rigs worldwide. There are 150 refineries in the U.S. alone, each processing between 5000 and 500,000 bbl[6] per day. Worldwide there are more than 700 refineries pumping out about 80 to 85 million bbl per day of refined products, mostly gasoline and diesel. Oil refineries and rigs cost billions of dollars. There is understandable inertia to keep producing and using gasoline and diesel.

One good reason to switch would be if we were running out of petroleum. At least for the near future, that seems unlikely as proved oil reserves continue to grow. Oil industry professionals continue to innovate, finding ways to extract oil profitably from miles under the sea floor or shale oil formations with enhanced oil-recovery techniques such as hydraulic fracturing.

So, is there any reason to expect a rise in alternative fuels? Natural gas is growing in North America, especially in commercial vehicles, largely driven by the price difference compared to gasoline. Big automotive companies continue to invest in electrical and hydrogen fuel cell vehicles. They must have their reasons.

Here are a few likely scenarios that might drive adoption before 2035.

1) _____

[6] bbl – oil barrel

The International Energy Administration (IEA) in 2012 projected worldwide demand for petroleum rising to almost 100 million bbl per day by 2035, from its current level of about 85 million bbl per day. The agency also predicted a doubling in worldwide growth in passenger cars to 1.7 billion. Countries such as China, Brazil and India could rapidly increase their car fleets beyond the IEA projections. If the oil industry could not invest rapidly enough, the resulting high gasoline prices might cause a switch to alternatives, although this might be economical only for a short time.

2) _____

Controlling pollution on a local basis within congested cities may spur local uses of alternative energies. Many countries are researching low emission zones (LEZ), where polluting vehicles are restricted. As an example, London's LEZ primarily targets diesel vehicles with gross vehicle weight (GVW) over 7000 lb. Besides outfitting either cleaner engines or filters, the London authorities also encourage a change to alternative fuels such as natural gas (though biodiesel does not meet the cleanliness standards). LEZs seem like a natural fit for either electric or hydrogen fuel cell vehicles.

3) _____

The oil market of 2013 is a global affair, with oil shipped far and wide to refineries that re-export refined products. There are a few weak points in this distribution system. Supply problems could arise from earthquakes, hurricanes, wars, or civil disturbances in key critical areas. If this happens, the price of gasoline and diesel could rise to the point where alternatives become economical.

In some ways, the anxiety over supply is seen in countries that import more oil than others. The European Union countries, Japan, India, and South Korea all import 70-90% of their oil. Not surprisingly, some of them are investing in a number of alternative-fuels programs. India is the world's fifth and Italy is the world's sixth largest users of natural gas for transport. In 2012, 11% of Italy's new cars were natural-gas-powered vehicles.

4) _____

On an energy basis, in many areas of the world, driving on electrons is cheaper than driving on oil. One estimate by General Motors in 2008 showed that at 10 cents/kWh, it would cost a Chevrolet Volt owner only about 2 cent/mi, compared to about 12 cent/mi for gasoline at its price in 2008. While improving fuel efficiency will certainly change that ratio, the fact remains that electricity is usually cheaper. Building the initial infrastructure to deliver that electricity is also relatively cheap, easing the transition to electron mobility. If batteries could hold more, cost less, and charge faster… who knows?

I. Look through the text again and fill in the gaps with the following phrases:

- Massive disruptions in the oil market
- Demand outstrips[7] supply
- Technological breakthrough[8] in electric batteries
- Urbanization and local air quality

II. Fill in the gaps with the words from the box.

established	tank	inertia	gasoline	fuel cell

1) Liquids, _____ and diesel are easy to distribute.

2) A gasoline or diesel _____ can be filled in a few minutes.

3) The petroleum infrastructure is well _____ .

4) There is understandable _____ to keep producing and using gasoline and diesel.

5) Big automotive companies continue to invest in electric and hydrogen _____ vehicles.

II. Fill in the gaps in the table.

noun	verb	adjective/participle
	pollute	polluted
cleanliness		clean
significance	-------	
	improve	improved
	optimize	
requirement		
		achieved
efficiency	--------	
	--------	flexible
enhancement		

II. Which of the scenarios described in the article do you see as the most likely to unfold?

11. Read the article.

VW Group has big plans for low fuel consumption[9]

Before reading

[7] to outstrip – обгонять
[8] breakthrough – прорыв
[9] By Stuart Birch. Automotive Engineering International. – June, 4, 2013. – P. 15-16.

1) Match the words in the left column with their Russian equivalents in the right column.

1) fuel consumption	a) легкий дизайн
2) plug-in hybrid	b) трение
3) automatic transmission	c) управление температурным режимом
4) manual transmission	d) потребление топлива
5) light-weight design	e) подключаемый гибридный автомобиль
6) friction	f) механическая (ручная) передача
7) thermal management	g) автоматическая передача

2) What is an automated manual transmission? Scan the text in Appendix II and find out.

3) "Audi A3 e-tron" and "Audi A3 g-tron". What might letters "E" and "G" stand for?

4) Look at the picture and describe it.

Plug-in hybrids will form a major aspect of VW's alternative powertrain lineup. This is the Cross Coupe concept's configuration, using two electric motors. It incorporates the company's MQB chassis.

Reading

Chairman Prof. Dr. Martin Winterkorn announces high-output, high-pressure diesel; a 10-speed DSG automated manual; and more plug-in hybrid models.

Volkswagen's belief in the future of the diesel engine, and its potential for still greater efficiency, was underlined at the International Vienna Motor Symposium, with VW AG Chairman Prof. Dr.

Martin Winterkorn announcing that a variable-valve diesel engine delivering 100 kW (134 hp) per liter fitted with a high-pressure injection system of up to 3000 bar (34.5 ksi) is in development, as is a ten-speed

DSG (double-clutch) automated manual transmission. And all the company's car classes will eventually be available with an electrical drivetrain[10] component.

Outlining the VW Group's future drive system technology plans, he also emphasized the significance of plug-in hybrids and natural gas as an alternative fuel.

Cutting fuel consumption is a continuing campaign for the company, said Winterkorn: "Since the year 2000, we've reduced the fuel consumption of our TDI (diesel) and TSI (gasoline) engines by more than 30%. I'm convinced that by 2020 we can achieve further increases in efficiency of around 15%."

As with most OEMs[11], Winterkorn sees various drive systems in parallel production – including hybrids and pure electric vehicles. The VW Group is committed to achieve the new car fleet CO2 emissions European requirement of 96 g/km by 2020.

Although many countries at present do not have the infrastructure for it, VW regards natural gas as having great promise. "We need to make the public even more aware of the benefits of natural gas engines," Winterkorn emphasized.

He described natural gas as being environmentally friendly, economical, and suitable for everyday use. "The technology is fully developed and vehicles are already on the market," he told the symposium. Using the fuel, the company's eco-up! model achieves 79 g/km of CO2, positioning it as the world's most economical natural gas car, he said. The VW Group will offer natural gas as a fuel solution via the golf TGI BlueMotion and the Audi A3 g-tron.

Aiding the variety of drive systems for VW will be the Group-wide Volkswagen MQB modular component system and its flexible architecture; this will enable "every kind of drive system" to be integrated quickly into the new models, stated Winterkorn: "Over the coming years, we wil electrify all vehicle classes in this way and help electrically powered motoring to make the breakthrough."

As a medium-term technology, plug-in hybrid technology is the first choice for provision of an alternative drivetrain, he believes, because it delivers a purely electric range of up to 50 km (31 mi); a "high level" of suitability for everyday use thanks to recharging from a socket at home; and complete flexibility for long journeys via an efficient internal combustion engine.

[10] The **drivetrain** of a motor vehicle is the group of components that deliver power to the driving wheels. This excludes the engine or motor that generates the power. In contrast, the powertrain is considered as including both the engine or motor, and the drivetrain.

[11] **OEM** – original equipment manufacturer.

The Group's first plug-in hybrids to enter series production are a version of the Porsche Panamera and the Audi A3 e-tron. They will be followed by other models offering the technology, including the VW Golf and Passat, Audi A6, and Porsche Cayenne.

I. Indicate whether the following statements are true (T) or false (F).

1) VW plans to make all the company's cars available with an electrical drivetrain component in the future.

2) VW has already reduced the fuel consumption of their diesel and gasoline engines by 15%.

3) VW thinks that natural gas is a promising type of alternative fuel.

4) The technology for gas-powered vehicles is not fully developed yet.

5) Electric vehicles are suitable and convenient for long journeys.

6) The Porsche Panamera is now available in a hybrid version.

II. What do the following numbers refer to?

- 96 g/km
- 50 km
- 3000 bar
- 2020

III. Would you like to drive a hybrid car? List the benefits of a hybrid car.

Further reading

http://auto.howstuffworks.com/fuel-efficiency/hybrid-technology/10-alternative-fuels-on-the-road1.htm#page=0

http://auto.howstuffworks.com/fuel-efficiency/alternative-fuels/afv-pictures.htm

UNIT 5

CARS OF THE FUTURE: AUTOMOTIVE INNOVATION

1. What is innovation? Look at the definition from Merriam-Webster Online Dictionary.

in·no·va·tion

noun \ˌi-nə-ˈvā-shən\
: a new idea, device, or method

: the act or process of introducing new ideas, devices, or methods

Full Definition of INNOVATION

1
: the introduction of something new

2
: a new idea, method, or device **:** NOVELTY

— **in·no·va·tion·al** *adjective*

1. She is responsible for many *innovations* in her field.
2. the latest *innovation* in computer technology
3. Through technology and *innovation*, they found ways to get better results with less work.
4. the rapid pace of technological *innovation*

2. Can you give any examples of recent technical (non-automotive) innovations?

3. Think about recent automotive innovations. Working with a partner, make a list of all the innovations you have heard about. Then share you list with the class and make a final list of innovations. Divide them into the following categories:

- mechanical innovations (engine, brakes, etc.)
- electronic innovations (self-parking, remote control, etc.)
- safety innovations (airbags, sensors, etc.)
- ergonomic innovations (seat comfort, boot space, etc.)

4. Read the text. What type of innovation is described?

As strange as it may sound, the electric car of the future may get a boost from a new type of internal combustion engine. The free piston linear generator was developed by a team at the German Aerospace Center, tacked as a range extender for battery powered cars, producing electricity through the burning of readily accessible and quick-to-fill gas or liquid fuels for times when the grid-charged batteries have been depleted. The compact power plant features two pistons opposed to each other on either side of a single combustion chamber. Air springs that return them to center after the ignited fuel expands also act as generators that can power electric

motors directly or re-charge a car's batteries. By eliminating the need for a crank case turning an external generator, the motor is both smaller and potentially more efficient than the internal combustion engines used in current plug-in hybrids like the Chevrolet Volt and Fisker Karma. The team behind it says the production version of the tube-shaped motor could weigh as little as 125 pounds and generate up to 40 horsepower. Several would be stacked together to increase power as needed. As an added benefit, the design allows the size of the combustion chamber and its compression ratio to be infinitely adjusted without having to change parts, allowing it to run on a variety of fuels, including diesel, natural gas and hydrogen. A representative for the Center says the free piston linear generator could be in production within four or five years if an industrial partner comes on board to commercialize it. In New York, Gehr Gasteluv, Foxnews.com.

5. Read the text again. Describe the new ICE called "free piston linear generator" using the following words: *piston, combustion chamber, air spring, ignited fuel, expand*. Answer the following questions:

1) Why is such a motor smaller than a usual ICE?

2) How much does it weigh?

3) What can we do if we need more horsepower than this motor can generate?

4) When are they planning to start producing these motors?

6. What do you think cars will look like in 50 years? What will they be capable of? Look at what some people think and indicate whether you agree with them. Add your own ideas.

Oliver, 21, UK: *I don't think that cars will change that much in design. They will carry on getting bigger, as they already are, and the engines will probably be replaced with more environmentally-friendly technology but people will still want the same kind of performance.*

Filipp, 31, USA: *Considering the revolutionary changes in vehicle design that have taken place in the previous 50 years, I would anticipate cars will evolve more slowly. I do believe we will see further advances in alternative fuel technologies, as well as continued integration of technologies such as mobile phones with vehicles. Additionally, light-weight materials such as aluminum will see more widespread use (also in an attempt to increase fuel economy). As far as the cars' looks, however, I don't expect major changes.*

7. Read the article.

Plastic proliferation under the hood[12]

Before reading

1) Look at the title of the article. What do you understand it to mean?

2) Make a list of things made from plastic that you use every day.

3) What do you think about a car engine made from plastic? Do you think it would ever be feasible? What are the potential problems that have to be solved before a plastic engine becomes possible?

4) What are the main properties of plastic? Choose from the following list:

low/high density

low/high heat-resistance

low/high vibration resistance

low/high cold resistance

low/high oxidation resistance

What may be the difference between commodity plastics and engineering plastics?

5) Working in pairs, match the names of car parts with their Russian equivalents.

intake manifold	a) уплотнительное кольцо коллектор
oil pan	b) поддон картера
air filter housing	c) навинчиваемый фильтр
intake runner system	d) крепеж кулачкового зажима
throttle	e) рукоятка дросселя (регулятор подачи горючего)
spin-on filter module	f) поддон – отсекатель масла
gasket	g) впускной (всасывающий)
valve timing cam cover	h) маслоотборный патрубок
windage tray	i) кожух воздушного фильтра
drain plug	k) рабочее колесо водяного насоса
cam-lock fastener	l) система труб впускного коллектора
oil pickup tube	m) сливная пробка
water pump impeller	n) покрытие распределительного кулачкового вала

6) Choose the correct Russian equivalents using the words from the box.

плавиться	уменьшаться	осматривать	ковать	рассеивать
расширяться	проникать	поглощать	выдерживать	ломаться

[12] By Dan Carney. Automotive Engineering International. – June, 4, 2013. – P. 30-32.

закреплять	заворачивать	превосходить

1) absorb	
2) dissipate	
3) melt	
4) weld	
5) expand	
6) fasten	
7) tolerate	
8) inspect	

Reading

Part 1

Plastic has entered every aspect of our lives, displacing cardboard from box packaging, and paper from grocery bags. Even so, it must have surely seemed that parts like engine components would remain metal.

But improving plastic technology and the demand for reduced weight means that now we see plastic even in engine parts that carry some stress, such as intake manifolds and oil pans. You don't have to look that far into the past to find stamped-steel air filter housings, a practically stress-free application.

Trouble is, it is hot under the hood of a car, and there tends to be a lot of vibration when the engine's running. Of course, it can also get extremely cold. So factors that metal handles pretty well, like heat, cold, and vibration, tend to make it difficult to replace metal parts with lighter plastic ones.

Still, progress in materials and design means that plastic continues to be used in engine components. In General Motors' high-feature V6 engine, for example, replacement of aluminum with a 35% glass-filled polyamide cut between 7 and 9 lb (3.2 and 4.1 kg) of weight.

The material has a density that is less than half that of aluminum and less than a third that of stamped steel, but unsurprisingly, the plastic must be thicker than those metals, so weight is not reduced by those same margins.

I. Answer the following questions.

1) What car parts that are utilized under stress are now being made from plastic?

2) What conditions that metal can resist well are a problem for plastic?

3) Is the density of aluminum higher than that of glass-filled polyamide?

4) Why must plastic be thicker than metals?

Part 2. Not a direct substitute

Replacing a metallic intake manifold with a plastic one brings a variety of issues. For example, a cast-aluminum intake manifold can be cast as one single part, which is a rather simple process.

A plastic card, in contrast, is made of several parts that must be welded together, making plastic more complicated to use. The tooling for these multiple parts and the need to weld them together make it more expensive to make plastic manifolds than to cast metal ones.

But while that complexity adds cost, it also contributes to the ability to make plastic manifold's shape closer to ideal shape in plastic.

Additionally, air flows better through the smooth passages of molded plastic than through the rough surfaces of a cast-aluminum manifold. For the high-feature V6, GM saw a 3.5% improvement in airflow imbalance between cylinders was improved by 50% due to the plastic part's optimized shape.

The additional work that goes into making the manifolds falls on the supplier companies that provide them to automakers. In GM's case that means Sogefi SpA has to make multiple pieces and then weld them together to create the finished product. "From a parts standpoint, it is definitely more complex," Vandyke noted.

Across the Pacific, Japanese fuel-system supplier Keihin supplies the plastic intake manifold for the 1.5-L four-cylinder in the Honda Fit. The part weighs only 4.25 lb (1.93 kg) without the throttle body assembly.

Hyundai's 1.8-L "Nu" engine's plastic intake manifold contributes a 15% cost savings and 30% less mass.

I. Indicate whether the following statements are true (T) or false (F).

1) A plastic intake manifold can be cast as one single part.

2) Welding is needed for making a plastic intake manifold.

3) Plastic makes intake manifolds more expensive, but allows for better balanced intake runner system.

4) Molded plastic manifolds passages are rough.

5) Keihin supplies the plastic intake manifolds for Hyundai.

Part III. Working for the clampdown[13]

[13] clampdown – давление, сжатие

A challenge for tightly clamped plastic parts is that they can deform when hot, reducing the clamping load on the part and potentially leading to leaks. Leaks can also arise due to the differing rates of thermal expansion of plastic parts and the metallic parts to which they are fastened. Metal inserts in the plastic surrounding the fastener help to solve this problem, though they add to the complexity.

Chrysler's Pentastar V6 engine marks the first use of plastic for a variable valve timing cam cover, an application that is challenging because of the need for positional tolerance of 0.5 mm (0.02 in). Chrysler achieves this by inspecting all of the parts with a laser measurement tool at a special station on the assembly line. Switching to plastic cut 5 lb (2.3 kg) of weight from the engine.

Chrysler's Pentastar V6 features plastic covers for its variable cam timing hardware that must be positionally accurate within 0.5 mm (0.02 in).

A plastic oil filter module is made of a similar 35% glass-reinforced polyamide-6 material, but its material is modified during polymerization to increase heat resistance. The result is the ability to tolerate hot glycol at 130°C (266°F). The spin-on filter module can go directly into the engine, eliminating 148 parts, reducing weight by 43%, and cutting material cost by 60%.

I. What do the following numbers refer to?

- 2.3
- 0.5
- 60
- 130
- 148

II. What is the main risk for the tightly clamped plastic parts?

Part IV. Impact resistance

Oil pans are a good example of where plastic parts have taken on new importance. “At one point oil pans were completely non-stressed,” said Doug Skorupski, Product Marketing Manager at Volkswagen of America. “Now they are an integral part to the rigidity of the engine.”

The Dana-BASF oil pan on the Ford Super Duty pickup features a patented cam-lock drain plug that is designed to avoid the common stripped threads due to over-tightening. (BASF)

It can be tougher for a plastic part to serve as a structural member, so the surrounding metal parts must be designed to take more of the load than they would with a metal oil pan, he said: “You can’t just swap out the part without looking at the design of the motor.” The plastic part can also be reinforced with ribs to help too. Plastic oil pans are able to absorb impacts from road hazards that might crack a casting. Dana’s oil pan made with BASF Ultramid Optimized for Stone Impact thermoplastic has impact-absorbing properties. It relies on a network of ribs to dissipate impact energy. The part is used on Ford’s Super Duty pickup truck’s 6.7-L Powerstroke diesel engine.

Testing showed a plastic pan withstanding a stone fired into the pan at 60 mph (80 km/h). Additionally, a plastic pan can incorporate other parts, like a windage tray, oil pickup tube, and even the oil filter module.

The pan also addresses another routine oil pan problem: stripped threads in the hole for the oil drain plug due to over-tightening. In place of the usual steel bolt, the Super Duty’s plastic oil pan has a plastic drain plug with a cam-lock fastener that lets it be tightened by hand or with a 3/8-in socket.

Resistance to chemicals is another factor in using plastic in the hostile underhood environment. It is critical that the part maintain integrity after exposure to various chemicals. But it is also important that the part resist discoloration so it preserves acceptable appearance, he said.

Thermostat housings, water pump impellers, and still more parts are continuing the shift toward plastic.

I. Indicate whether the following statements are true (T) or false (F).

1) Plastic oil pans do not need any reinforcement.

2) Plastic oil pans are usually made from impact thermoplastic.

3) Aluminum has better impact-absorbing properties than impact thermoplastic.

4) A plastic drain plug is often over-tightened.

5) Plastic is good for use in hostile under-hood environment because of its resistance to chemicals.

8. What other (not mentioned in the text) car parts may be made of plastic?

9. Think about potential disadvantages of using plastic in car building. What are they?

Further reading

http://www.raeng.org.uk/news/publications/list/reports/Innovation_in_automotive_report.pdf

http://auto.howstuffworks.com/under-the-hood/trends-innovations/5-future-car-technologies.htm

http://www.autoalliance.org/auto-innovation/2014-innovation-report

Unit 6

CARS OF THE FUTURE: TROUBLES AND DANGERS

1. Do you think a totally computerized, driverless car is a real possibility? Would you like it to become a reality?

2. Give examples (from fiction or films, either Russian or foreign) of cars operating on their own, fully computer-controlled.

3. Working in pairs, make a list of benefits and potential dangers of driverless cars.

4. Do you think it is safe to drive an "intelligent", i.e. totally computer-controlled, car? Why? Look at what some people think and indicate whether you agree or disagree with their opinions.

Oliver, 21, UK: *Computer controlled cars will probably be perfectly good but I could never trust one. My computer goes crazy and gives me error messages just opening my emails, a Word document and iTunes at the same time. Would I really want to be in an equally unreliable metal box travelling at 90mph? Besides, I like driving.*

Filipp, 31, USA: *While I recognize the technological advances that have made driverless cars possible, for someone like myself (a "driver" vs. a "commuter") "intelligent" cars are a travesty and a nuisance rather than a convenience. I don't even like using cruise control in my cars (to say nothing of preferring manual transmissions) as it makes me feel like the car is in control more so than me - I don't like that.*

5. Read the article.

Counteracting cyber-attacks[14]

Before reading

1) Match the words with the Russian equivalents.

1) cyber-security	a) уязвимость
2) cyber-attack	b) кибербезопасность
3) automotive system (vehicle system)	c) аппаратное обеспечение
4) software	d) кибератака
5) vulnerability	e) программное обеспечение
6) hardware	f) автомобильная (компьютерная) система

2) Do the following things belong to the category of software or hardware?

graphic card, word processor, Adobe Photoshop, motherboard, sound card, AutoCAD

3) What is a CPU?

CPU is the hardware within a computer that carries out the instructions of a computer program by performing the basic arithmetical, logical, and input/output operations of the system.

[14] Automotive Engineering International. – October 1, 2013. – P. 20-22. The article is based on SAE International technical paper 2013-01-1419 by Barbara J. Czerny, System Safety Specialist, Chrysler Group LLC, with additional reporting by SAE International Assistant Editor Matthew Monaghan.

What is the Russian word for CPU?

4) Look at the picture. What is that?

A fob, or what is more commonly called a ***key fob***, is a small security hardware device with built-in authentication used to control and secure access to network services and data. The key fob displays a randomly generated access code, which changes periodically, usually every 30 to 60 seconds. A user first authenticates himself on the key fob with a personal identification number (PIN), followed by the current code displayed on the device.

Key fob is also a term used to describe a key chain and several other similar items and devices. The word fob is believed to have originated from watch fobs, which existed as early as 1888. The fob refers to an ornament attached to a pocket-watch chain. Key chains, car starters, garage door openers, and keyless entry devices on hotel room doors are also called fobs.

Do you use a key fob? What are the potential dangers of using a key fob?

Reading

As vehicle systems become more complex and interact with more internal and external elements, the potential for outside intrusion and tampering increases for both vehicles and the transportation infrastructure.

Part I.

Today's vehicles contain a number of systems designed to help improve overall vehicle safety and performance. These systems may control essential vehicle functions such as steering,

braking and/or propulsion, and much emphasis is being placed on insuring the cyber security of these critical automotive systems. A security-critical automotive system is one in which losses could occur due to vulnerabilities that could be exploited either directly or indirectly by either an external or internal individual (or group).

As awareness of cyber security in the automotive industry increases, and as vehicle systems become more complex and interact more tightly with both the physical elements of the vehicle and the physical environment around the vehicle, they are now more frequently being classified as cyber-physical systems.

In a cyber-physical system there exists a tight coupling between its computational and physical elements and the environment around the system. The systems are becoming more tightly coupled both for vehicle-to-vehicle and vehicle-to-infrastructure scenarios.

This interconnectivity creates the potential for cyber-attacks on vehicles and the transportation infrastructure supporting them and their use (e.g., Intelligent Transportation Systems). Cyber-attacks on security-critical cyber-physical automotive systems could lead to potential safety, operational, financial and privacy losses.

Safety cannot be added on to an existing design but rather must be built into it. This can be done by following and applying a well-structured and well-defined system safety engineering process.

I. Answer the following questions.

1) What is a security-critical automotive system?

2) Why are vehicle systems often classified as cyber-physical systems?

3) What is interconnectivity?

Part II. Motive for attack

Security in the general IT area is more widely known, and some of this knowledge and experience can be transferred into the automotive area; however, there are some significant cyber security differences between IT and cyber-physical automotive systems.

For example, security of cyber-physical systems needs to address sensors and actuators[15] that interact with the environment around the system; so unlike IT systems, security of cyber-physical systems must also consider the environment around the control system and cyber-physical

[15] An **actuator** is a type of motor that is responsible for moving or controlling a mechanism or system. The Russian term is «исполнительное устройство».

system. This difference leads to different security counter-measures for cyber-physical systems than for IT systems.

There are a variety of ways today's vehicles are connected to extra-vehicle media, including Bluetooth, CDs, USBs, etc. Some vehicles today, and more vehicles in the future, will not only be connected to extra-vehicle media but also to other vehicles and vehicle infrastructure. This present and future interconnectivity creates the potential for cyber-attacks on vehicles and vehicle infrastructure.

Given that potential safety, privacy, operational and financial losses may occur as the result of an attack either directly or indirectly on vehicles and/or infrastructure, it is desirable to perform activities to reduce the likelihood of a successful attack.

Examples of potential losses in each of the categories associated with attacks on vehicles include:

- Safety – a vulnerability that allows access, either directly or indirectly, to a safety-critical system
- Operational – a vulnerability that allows access, either directly or indirectly, to a non-safety-critical system that leads to a denial of service of that operation
- Financial – a vulnerability that allows multiple systems to be compromised; warranty fraud is another example
- Privacy – a vulnerability that allows personal information to be compromised or that allows personal conversations in the vehicle to be monitored.

I. Answer the following questions.

1) Is there any difference between general IT security and automotive cyber-security?
2) What exactly creates the potential for cyber-attacks on vehicles and vehicle infrastructure?
3) What kinds of vulnerabilities exist within automotive systems?

Part III. Growing concern

The topic of automotive security is not new to chip maker Infineon Technologies, which has been implementing additional security functions in some of its products since 2005 to protect the engine microcontroller against tuning.

"We are seeing now stronger awareness," said Bjorn Steurich, Senior Manager of the Automotive Systems Group at Infineon Technologies. "We started a special project that I'm leading within Infineon between our automotive business line and our chip card and security business line that goes back to mid-2011. We started talking to the OEMs[16] to better understand what are their concerns and what are the needs in the different regions. And then, we tried to map out how far they are in their differences, and we tried to understand the use cases, and then we more deeply analyzed these use cases."

[16] See the note after the article.

Steurich noted that at the outset of the program in 2011, U.S. automotive OEMs were already starting to show concern about potential cyber-attacks, while European OEMs were still mainly focused on the issue from a fraud and anti-theft standpoint, with German department estimates of annual damage to the end consumer in the €5 billion range.

As a result of its research, Infineon began classifying attacks on vehicle security controllers into four classes – manipulative, semi-invasive, observing and logical.

"There are classes of attacks where somebody could try to just observe, for example, the power consumption and can extract the secret of the parts," said Steurich. "One could even try to tamper, for example, with the power supply or the clock supply of the part to bring the part out of the normal operation. So there are different classes of attacks, and it's a matter of the investment, the equipment, that you are willing to spend for an attack. A big step in automotive is already to use this to protect against logical attacks and to use… better ECU[17] individual keys. So if you hack one, the damage is not too high."

I. Answer the following questions.

1) What does the word "awareness" mean?

2) Why did Infineon Technologies "start to talk more to the OEMs"?

3) What classes of cyber-attacks does Infineon recognize?

The increased level of interconnectivity between the ECUs in the vehicle and outside entities creates many more potential attack or threat vectors into the vehicle node than previously. (Freescale Semiconductor)

Part IV. Built-in protection

Building safety and security into a design at the outset rather than attempting to add it later to an existing design is important when addressing the topic of cyber security.

[17] An **engine control unit (ECU)**, now called the powertrain control module (PCM), is a type of electronic control unit that controls a series of actuators on an internal combustion engine to ensure optimal engine performance. The Russian term is «блок управления двигателем».

“Prior to the past five years, security wasn’t really considered in the design of the deeply embedded microcontrollers that are used in a vehicle,” said Richard Soja, Systems Engineer-Automotive MCU Division, Freescale Semiconductor. “There was very little interconnectivity, either between the ECUs in the vehicle or to outside entities; the only real interconnectivity was to the remote key fob. So that was really the only motivating factor for security at one time. But now, of course, the vehicle is just becoming a node in that system. There are many more potential attack or threat vectors into the vehicle node than there used to be. So we now have to consider other methods of preventing two things: one is unauthorized access, and the other is detecting whether anything has been changed that shouldn’t be changed.”

On its most recent microcontrollers, Freescale has implemented mechanisms that include hardware detection of flash memory tampering. Hardware security modules are also integrated into the microcontrollers that can be used to set up a root-of-trust type of architecture to verify the authenticity of any code that is executed prior to its running.

“So that means that we can detect if someone has installed bogus code and code that has some malicious behavior or properties, and prevent that code from running,” Soja said.

From a software perspective, operating system providers such as QNX Software Systems are working closely with CPU manufacturers to ensure that customers are using the CPU most effectively to protect the boot sequence, for example, from potential attack.

“The whole thing about security is not just protecting against active attacks but also to ensure that it’s very, very difficult for people to analyze the systems as well,” said Andy Gryc, Senior Automotive Product Marketing Manager, QNX Software Systems. “I don’t think that fundamentally our products will change; I think what will change probably for us is to really make sure that we do a good job of educating our customers on how to properly use our technology. Because the technology is already there and it’s already sound, but there’s no way to really guarantee that people are doing things in an appropriate way unless you actually make sure that they’re aware of the risks. I think at this point, people are aware of the risks, so that education process will be a lot easier for us now.”

I. Answer the following questions.

1) What was the only “real interconnectivity” five years ago?

2) What does QNX Software Systems do or produce?

3) Why is customer awareness important?

NOTE

OEM (*pronounced as separate letters*) is short for ***o**riginal**e**quipment **m**anufacturer*, which is a misleading term for a company that has a special relationship with computer producers. OEMs are manufacturers who resell another company's product under their own name and branding.

While an OEM is similar to a VAR (***v**alue-**a**dded **r**eseller*), it refers specifically to the act of a company rebranding a product to its own name and offering its own warranty, support and licensing of the product. The term is really misleading because OEMs are not the original manufacturers; they are the customizers.

After reading

1) Indicate whether the following statements are true (T) or false (F).

1) Most automotive systems now are designed to improve vehicle safety.

2) Safety of an existing vehicle design may be easily upgraded.

3) Potential losses resulting from a cyber-attacks on security-critical cyber-physical automotive systems include safety, operational and financial losses.

4) U.S. automotive industry realized the danger of cyber-attacks earlier than the European auto business.

5) When somebody hacks the system just to have a look at it, it is not considered to be a cyber-attack.

6) Microcontrollers can detect illegally installed codes on car computers.

7) People don't have to know the cyber-security risks as car manufacturers take care of all the risks themselves.

2) Match the following words with the definitions/synonyms.

1) unauthorized	a) built-in
2) malicious	b) threat
3) bogus	c) without permission
4) embedded	d) fake
5) hazard	e) bad, harmful

3) Give the main points mentioned in parts I-IV of the text.

Further reading

http://auto.howstuffworks.com/under-the-hood/aftermarket-accessories-customization/10-car-security-systems.htm

http://www.secunet.com/en/topics-solutions/

Unit 7

PRESENTATION OF A CAR

1. What do you absolutely need to know about a car before you buy it? And what additional non-critical things would you like to know?

2. Look at the following list of things to be considered before buying a car. Choose your own top-5. Can you add anything else to this list?

price

performance

fuel efficiency

style/design

boot space

safety

connectivity (onboard computer, satellite navigation, etc.)

color

automatic/manual transmission

make (марка автомобиля)

country of assembly

inner space

variety of available features

size (of a car)

top speed

horsepower

4. Look through a magazine's review of the Ford Focus. Fill in the gaps with the following headings:

- Reliability
- Styling
- Driving
- Running costs
- Practicality

The Ford Focus is the best-selling family hatch in the UK, and with good reason. There's a wide range of models, from basic to high-performance, while the turbo petrol and diesel engines deliver decent running costs.

This latest third-generation Ford Focus provides supreme quality, comfort and handling - a true rival for the Volkswagen Golf.

Those wanting more space have the option of the Ford Focus estate, too. Unusually, the estate version of the Ford Focus actually drives just as well as the hatch.
The Ford Focus is available in six main specifications[18] – entry-level Studio and Edge, mid-range Zetec and Zetec S and top-of-the-range Titanium and Titanium X. Meanwhile, those who want a little extra performance should opt for the excellent ST hot hatch – a great alternative to the VW Golf GTI and Renaultsport Megane.
The Ford Focus features economical diesel and smooth petrol engines. We'd opt for the popular three-cylinder turbocharged EcoBoost petrol engine, which strikes a balance between lively performance and low running costs.
1) _____
You can't call the Ford Focus pretty. The mix of angles and curves up front looks awkward when compared to the SEAT Leon, and even the Renault Megane's revised front end is more cohesive.

[18] American term – trim level

The rest of the car follows a standard hatchback template, although the roofline is slightly longer than its rivals'. At the back, designers have neatly integrated the fuel filler flap with the right-hand tail-light, although the plastic flap on our car was poorly fitted.
Inside, the Focus features a sculpted centre console with a small 3.5-inch display and a large bank of buttons below that's flanked by vertical air vents.
Overall, the Focus is well built, and the quality of the switchgear is great – we just wish there weren't so many buttons and that the sat-nav[19] screen was larger.
2) _____
The Ford Focus has clearly been designed with comfort and efficiency in mind, but having said that it's still an enjoyable ride. It's certainly more exciting to drive than a Vauxhall Astra, and definitely on par with the Volkswagen Golf thanks to sharp steering, an agile chassis and strong grip.
The Focus's 1.0-litre EcoBoost engine suits its sporty nature. The engine is settled at motorway speeds and doesn't spoil cabin comfort, while the suspension does a good job of soaking up bumps.
3) _____

When you consider how many Focuses have been sold, it appears to be a fairly reliable car. Owners aren't greatly enamoured with it, which is why the model dropped from 19th place in the Driver Power 2012 survey to 70th in 2013 – but there are no major issues that potential buyers need to be aware of. Owners like how the Focus drives and the technology it offers, although a 29th place finish for Ford's chain of 700-plus dealers isn't great.

Ford's safety technology helped the Focus earn a five-star Euro NCAP crash test rating. You get six airbags and ESP as standard, while the Zetec model includes handy extras such as heated mirrors and a Quickclear heated windscreen.

4) _____
The Focus isn't the most practical compact hatch on the market. While its dimensions are on the large side in this class, the car is small inside.
At the back, you get a 316-litre boot – 89 litres down on the Renault Megane – and this only rises to 1,101 litres with the seats flat. That's 109 litres behind the SEAT Leon, although a shallow floor makes it easy to unload big items.

Rear seat space is reasonable, although the small back windows and sloping roof line make the Ford feel tighter than its rivals. There's a decent glovebox, door bins and cup-holders.

5) _____

If you don't count the sporty Ford Focus ST, every car in the line-up emits less than 140g/km of CO2, which is pretty good if you consider how large the engine range is.

The latest Ford Focus is lighter than ever before and as a result it's cheaper to run, too. Highlights in the range include a 1.0-litre EcoBoost engine, which manages 58.9mpg and emits only 109g/km of CO2, but the reality is that you would have to drive extremely cautiously to achieve this. Standard stop-start does help, and we managed 43.4mpg on test.

[19] satellite navigation

5. What cars are named as the Ford Focus's potential competitors?

6. Match the following words with their definitions.

cost-effective	designed not to harm the natural environment
environmentally friendly	of very high quality
modern	working in a way that does not waste fuel
advanced	designed to be very fast and powerful
fuel-efficient	consistently good in quality or performance
supreme	characteristic of present and recent time
reliable	giving the most profit or advantage in exchange for the amount of money that is spent
high-performance	based on the most recent methods or ideas

7. Which things in the advert did you find the most attractive? Why?

8. Listen to the presentation on the Kia Soul. Put the following in the correct order (as it is discussed in the presentation):

- marketing
- technical details
- style
- general information about the car
- rivals

9. Match the words from the presentation with the parts of the presentation listed above:

- overview
- under the hood
- design
- competition
- commercial

10. Who are Kia Soul's target customers? And who actually buys the car?

11. Fill in the gaps in the sentences with the words from the box.

comes	successful	combine	shape	options	package	manual
unusual	available	standard	improved	premium	range	released

1) Cars in this segment 1) _____ the features of both compact hatchbacks and traditional SUVs in a smaller 2) _____.
2) It was originally 3) _____ in 2009 and was quite 4) _____.
3) Kia then 5) _____ the original car and the new Soul was introduced in 2013.
4) The Soul 6)_____ in three different trim levels.
5) Under the hood, the Soul has a choice of two four-cylinder engine 7) _____ – a 1.6L with 138 horsepower and a more powerful 2.0L with 164 horsepower.
6) Buyers can choose either a 8) _____ or an automatic transmission.

7) What made the original Soul so popular were its 9) _____ design, its boxy 10) _____ and bold colors.
8) Inside, the Soul is 11) _____ in both light and dark colors and comes 12) _____ with power windows, phone integration via Bluetooth and 13) _____ materials both in the seats and on the dashboard.
9) Its competitors 14) _____ from the traditional small cars such as the Ford Fiesta to small SUVs such as the Nissan Juke.

Further reading

http://usnews.rankingsandreviews.com/cars-trucks/Toyota_Corolla/

http://www.independent.co.uk/life-style/motoring/road-tests/motoring-review-renaults-dacia-logan-is-an-immigrant-that-even-finchy-would-admire-8899898.html

APPENDIX I

Presentation Phrasebook

Greeting your audience, introducing yourself and giving the topic of your presentation
Good morning. My name's ..... and I'm going to talk about ...
Good morning everybody. Thank you for coming to my talk today. My name is …… and I'm from ...
Hello. I'm ..... and welcome to my presentation about ...
Hello. My name's ..... and today I'm going to be talking about ...
Giving the outline of your presentation
Firstly, I'm going to look at ...
Secondly, I'll move on to the issue of ...
Then I'll move on to examine ...
Lastly/Finally, I'll look at / focus on ...
I have divided my talk into the following main areas: ...
I am going to divide my presentation into two main parts. First I'm going to describe … and then I'll move on to look at …
We'll finish off with a question and answer session.
My talk will last about ..... minutes and there'll be time at the end for questions.
At the end of my talk, which will last about ten minutes, I'll be happy to answer any questions you may have.
If you have any questions please do not hesitate to ask.

Please just put your hand up if you would like to ask a question.

Introducing your first main point

Now, I'm going to start by …
Now I'd like to focus on …
First we're going to look at …
Let's start with …

Moving on

OK, so now I'd like to turn to my next point, which is ...
Moving on, I'd like to take a look at ….
Now I'd like to move on to ...
Now let's turn to the issue of ...
I'll come back to that issue later...
I want to turn now to ...
Turning now to ...
Moving on now to ...
Having looked at ….. let's now think about ...
My next point is in regards to …
That brings me to …
My final point is in regard to…

Making conclusions and summarising your main points

To conclude my presentation, ...
In conclusion, ...
To summarise the main points of my presentation …
In view of the evidence I have presented I think it is fair to say that …
After all is said and done I think we can conclude that …
This is clearly a very complex issue but on the strength of the evidence I have seen I would say that …/it seems that …

Finishing your presentation

OK we're coming to the end of the presentation so I'd just like to thank you for listening ...
OK. That bring us to the end of my presentation.
Thank you for listening.
I hope you found it interesting.

Asking for questions

Would anyone like to ask any questions?
I'm ready to take any questions now.
If anyone has questions I'll be happy to answer them.

Answering questions

Thanks for your question ...
Good question. I think ...
That's an interesting question! As I see it ...
Yes, that's an interesting point ...

Dealing with difficult questions

Hmm, that's a good question. I don't have the information to answer that question right now, but I'd be happy to find out and get back to you later.
I don't think we have enough time to go into that right now, but I'll be happy to speak to you one-to-one after the presentation if you would like.

Asking questions to the presenter

Excuse me. Can you say a bit more about ...
Can you repeat your point about ...
Excuse me. I have a question about ...
I didn't catch what you said about .... Can you repeat it please?
Are you saying that ...?

APPENDIX II

Extra Reading

AUTOMATED MANUAL TRANSMISSION

Automated Manual Transmission (AMT, also called Freechoice) from Magneti Marelli is a electro-hydraulic mechanism for automating manual transmission which derives from Formula 1. It combines comfort of use with a reduction in consumption, and can be applied to any transmission, with production costs that are consequently lower compared to traditional automatic transmissions.

AMT is based on an electronic control unit and a hydraulic system that supervise the use of the clutch and the gear shifting, allowing the driver to change gear without using the clutch, either sequentially or fully automatically.

The device from Magneti Marelli operates on the manual transmission of a car in the same way as the driver would: it opens and closes the clutch, engages and disengages the gears and, when necessary, it also controls the choice of transmission (automatic or sequential mode for changing gear). These three control movements are ensured by three specific hydraulic actuators, controlled by hydraulic electro-valves.

All the components in the hydraulic unit are gathered together in a single kit. It is delivered to the car manufacturer sealed and ready to be installed in the gearbox. Once assembled in the gearbox, the hydraulic kit mechanically interfaces with the gear drive shaft.

The heart and intelligence of the gear control system is the TCU (Transmission Control Unit). Taking into account the driver's requirements and the operating conditions of the vehicle, it manages the gear changes by controlling the clutch, the gears and the engine.

Thanks to the electronic optimization of the gear change and the coupling with the engine control means the AMT is able to ensure less consumption than a car with manual transmission: lower consumption also means lower emissions, especially of CO2. In some of the best applications of the AMT on mass-production automobiles, a 5% reduction in fuel consumption was recorded compared to the automatic transmission version of the same automobiles, as well as a reduction in emissions equal to 5 g/km of CO2.

The latest generation of AMT is known as "mechatronic", as for the first time, it combines the electronic control part and the hydraulic actuation part of the transmission in a single kit. This allows considerable improvements to performance, both in terms of speed and comfort when changing gear. This is the latest step in the evolution of a product which was first introduced to the car market with the Ferrari 355 F1 in July 1997. The product is still undergoing "sharp" growth in performance.

CONSTRUCTION OF AN AUTOMOBILE

The primary components of a **car** are the power plant, the power transmission, the running gear, and the control system. These constitute the chassis, on which the body is mounted.

The power plant includes the engine and its fuel, the carburettor, ignition, lubrication, and cooling systems, and the starter motor.

The Engine

The greatest number of cars use piston engines. The four-cycle piston engine requires four strokes of the piston per cycle. The first downstroke draws in the petrol mixture. The first upstroke compresses it. The second downstroke—the power stroke—following the combustion of the fuel, supplies the power, and the second upstroke evacuates the burned gases. Intake and exhaust valves in the cylinder control the intake of fuel and the release of burned gases. At the end of the power stroke the pressure of the burned gases in the cylinder is 2.8 to 3.5 kg/sq cm. These gases escape with the sudden opening of the exhaust valve. They rush to a silencer (muffler), an enlarged section of piping containing expanding ducts and perforated plates through which the gases expand and are released into the atmosphere.

Greater smoothness of operation of the four-cycle engine were provided by the development of the four-cylinder engine, which supplies power from one or another of the cylinders on each stroke of the cycle. A further increase in power and smoothness is obtained in engines of 6,8,12, and 16 cylinders, which are arranged in either a straight line or two banks assembled in the form of a V.

Carburation

Air is mixed with the vapour of the petrol in the carburettor. To prevent the air and the carburettor from becoming too cold for successful evaporation of the fuel, the air for the carburettor is usually taken from a point close to a heated part of the engine. Modern carburettors are fitted with a so-called float-feed chamber and a mixing or spraying chamber. The first is a small chamber in which a small supply of petrol is maintained at a constant level. The petrol is pumped from the main tank to this chamber, the float rising as the petrol flows in until the desired level is reached, when the inlet closes. The carburettor is equipped with such devices as accelerating pumps and economizer valves, which automatically control the mixture ratio for efficient operation under varying conditions. Level-road driving at constant speed requires a lower ratio of petrol to air than that needed for climbing hills, for acceleration, or for starting the engine in cold weather. When a mixture extremely rich in petrol is necessary, a valve known as the choke cuts down the air intake, permitting large quantities of unvaporized fuel to enter the cylinder.

Ignition

The mixture of air and petrol vapour delivered to the cylinder from the carburettor is compressed by the first upstroke of the piston. This heats the gas, and the higher temperature and pressure facilitate ignition and quick combustion. The next operation is that of igniting the charge by a spark plug. One electrode is insulated by porcelain or mica; the other is grounded through the metal of the plug, and both form part of the secondary circuit of an induction system.

The principal type of ignition now commonly used is the battery-and-coil system. The current from the battery flows through the coil and magnetizes the iron core. When this circuit is interrupted at the distributor points by the interrupter cam, a current is produced in the primary coil with the assistance of the condenser. This induces a high-voltage current in the secondary winding. This secondary high voltage is needed to cause the spark to jump the gap in the spark plug. The spark is directed to the proper cylinder by the distributor, which connects the secondary coil to the spark plugs in the several cylinders in their proper firing sequence. The interrupter cam and distributor are driven from the same shaft, the number of breaking points on the interrupter cam being the same as the number of cylinders.

The electrical equipment controls the starting of the engine, its ignition system, and the lighting of the car. It consists of the battery, a generator for charging it when the engine is running, a starter and the necessary wiring. Electricity also operates various automatic devices and accessories, including windscreen wipers, directional signals, heating and air conditioning, cigarette lighters, powered windows and audio equipment.

Lubrication

In the force-feed system, a pump forces the oil to the main crankshaft bearings and then through drilled holes in the crankpins. In the full-force system, oil is also forced to the connecting rod and then out to the walls of the cylinder at the piston pin.

Cooling

At the moment of explosion, the temperature within the cylinder is much higher than the melting point of cast iron. Since the explosions take place as often as 2,000 times per minute in each cylinder, the cylinder would soon become so hot that the piston, through expansion, would «freeze» in the cylinder. The cylinders are therefore provided with jackets, through which water is rapidly circulated by a small pump driven by a gear on the crankshaft or camshaft. During cold weather, the water is generally mixed with a suitable antifreeze, such as alcohol, wood alcohol, or ethylene glycol.

To keep the water from boiling away, a radiator forms part of the engine-cooling system. Radiators vary in shape and style. They all have the same function, however, of allowing the water to pass through tubing with a large area, the outer surface of which can be cooled by the atmosphere. In air cooling of engine cylinders, various means are used to give the heat an outlet and carry it off by a forced draught of air.

The Starter

The petrol engine must usually be set in motion before an explosion can take place and power can be developed; moreover, it cannot develop much power at low speeds. These difficulties have been overcome by the use of gears and clutches, which permit the engine to work at a speed higher than that of the wheels, and to work when the vehicle is at rest. An electric starter receiving its current from the storage battery, turns the crankshaft, thus starting the petrol engine. The starter motor is of a special type that operates under a heavy overload, producing high power for very short periods. In modern cars, the starter motor is automatically actuated when the ignition switch is turned on.

The Power Transmission

The engine power is delivered first to the flywheel and then to the clutch. From the clutch, which is the means of coupling the engine with the power-transmission units, the power flows through the transmission and is delivered into the rear-axle drive gears, or differential, by means of the drive shaft and universal joints. The differential delivers the power to each of the rear wheels through the rear-axle drive shafts.

The Clutch

Some type of clutch is found in every car. The clutch may be operated by means of a foot pedal, or it may be automatic or semi-automatic. The friction clutch and the fluid coupling are the two basic varieties. The friction clutch, which depends on solid contact between engine and transmission, consists of: the rear face of the flywheel; the driving plate, mounted to rotate with the flywheel; and the driven plate, between the other two. When the clutch is engaged, the driving plate presses the driven plate against the rear face of the flywheel. Engine power is then delivered through the contacting surfaces to the transmission.

Fluid coupling may be used either with or without the friction clutch. When it is the sole means of engaging the engine to the transmission, power is delivered exclusively through an oil medium without any contact of solid parts. In this type, known as a fluid drive, an engine-driven, fan-bladed disc, known as the fluid flywheel, agitates the oil with sufficient force to rotate a second disc that is connected to the transmission. As the rotation of the second disc directly depends on the amount of engine power delivered, the prime result of fluid coupling is an automatic clutch action, which greatly simplifies the requirements for gear shifting.

Manual and Automatic Transmissions

The transmission is a mechanism that changes speed and power ratios between the engine and the driving wheels. Three general types of transmission are in current use: conventional or sliding-gear, Hydra-Matic, and torque-converter systems.

The conventional transmission provides for three or four forward speeds and one reverse speed. It consists of two shafts, each with gears of varying diameters. One shaft drives the other at a preselected speed by meshing the appropriate set of gears. For reverse speed/an extra gear, known as the idler gear, is required to turn the driven shaft in the opposite direction from normal rotation. In high gear, the two shafts usually turn at the same speed. In low, second, and reverse gears, the driven shaft turns more slowly than the driving shaft. When a pair of gears permits the driven shaft to turn more rapidly than the driving shaft, the transmission is said to have overdrive. Overdrive is designed to increase the speed of a car.

The Hydra-Matic type of transmission combines the automatic clutch provided by fluid coupling with a semiautomatic transmission. A mechanical governor, controlled by the pressure exerted on the accelerator pedal, regulates gear selection through a system of hydraulically controlled shift valves. Hydra-Matic transmission provides for several forward gears.

The torque-converter type of transmission provides an unlimited number of gear ratios with no shifting of gears. The torque converter is a hydraulic mechanism using engine power to

drive a pump, which impels streams of oil against the blades of a turbine. The turbine is connected to the drive shaft and causes it to rotate.

Both Hydra-Matic and torque-converter systems are controlled by a selector lever on the steering column, which provides also for reverse and sometimes for emergency-low gears.

The Running Gear

The running gear of the car includes the wheel-suspension system, the stabilizers, and the wheels and tyres. The frame of the car may be considered the integrating member of the running gear. It is attached to the rear axle and to the front wheels by springs. These springs, along with the axles, the control and support arms, and the shock absorbers, constitute the wheel-suspension system. In modern cars the front wheels are independently suspended from the frame in a manner that permits either wheel to change its plane without appreciably affecting the other. This type of front-wheel suspension is known popularly as independent suspension. The stabilizers consist of spring-steel bars, connected between the shock-absorber arms by levers, to decrease body roll and improve steerability.

The Control System

Steering is controlled by a hand wheel, mounted on an inclined column and attached to a steering tube inside the column. The other end of the tube is connected to the steering gear, which is designed to provide maximum ease of operation. Power steering, adapted for passenger cars in the early 1950s, is generally a hydraulic mechanism used as a booster to reduce the effort of steering.

A car has two sets of brakes: the hand or emergency brake and the foot brake. The emergency brake generally operates on the rear wheels only. The foot brake in modern cars is always of the four-wheel type, operating on all wheels. Hydraulic brakes on cars and hydraulic vacuum, air, or power brakes on lorries apply the braking force to the wheels with much less force on the brake pedal than is required with ordinary mechanical brakes. The wheel brakes are generally of the internally expanding type, in which a convex strip of material is forced against a concave steel brake drum.

TWO-STROKE AND DIESEL ENGINES

Most diesels are also four-stroke engines. The first or suction stroke draws air, but no fuel, into the combustion chamber through an intake valve. On the second or compression stroke the air is compressed to a small fraction of its former volume and is heated to approximately 440°C by this compression. At the end of the compression stroke vaporised fuel is injected into the combustion chamber and burns instantly because of the high temperature of the air in the chamber. Some diesels have auxiliary electrical ignition systems to ignite the fuel when the engine starts and until it warms up. This combustion drives the piston back on the third or power stroke of the cycle. The fourth stroke is an exhaust stroke.

The efficiency of the diesel engine is greater than that of any petrol engine and in actual engines today is slightly over 40 per cent. Diesels are in general slow-speed engines with crankshaft speeds of 100 to 750 revolutions per minute (rpm) as compared to 2,500 to 5,000 rpm for typical petrol engines. Some types of diesel, however, have speeds up to 2,000 rpm. Because diesels use compression ratios of 14 or more, they are generally more heavily built than petrol engines, but this disadvantage is counterbalanced by their greater efficiency and the fact that they can be operated on less expensive fuel.

Two-Stroke Engines

By suitable design it is possible to operate a diesel as a two-stroke or two-cycle engine with a power stroke every other stroke of the piston instead of once every four strokes. The efficiency of such engines is less than that of four-stroke engines, and therefore the power of a two-stroke engine is always less then half that of a four-stroke engine of comparable size.

The general principle of the two-stroke engine is to shorten the periods in which fuel is introduced to the combustion chamber and in which the spent gases are exhausted to a small fraction of the duration of a stroke instead of allowing each of these operations to occupy a full stroke.

In the simplest type of two-stroke engine, the valves are the openings in the cylinder wall that are uncovered by the piston at the end of its outward travel. In the two-stroke cycle the fuel mixture or air is introduced through the intake port when the piston is fully withdrawn from the cylinder. The compression stroke follows and the charge is ignited when the piston reaches the end of this stroke. The piston then moves outward on the power stroke, uncovering the exhaust port and permitting the gases to escape from the combustion chamber.

DIRECT-CURRENT (DC) GENERATORS

If an armature revolves between two stationary field poles, the current in the armature moves in one direction during half of each revolution and in the other direction during the other half. To produce a steady flow of unidirectional, or direct, current from such a device, it is necessary to provide a means of reversing the current flow outside the generator once during each revolution. In older machines this reversal is accomplished by means of a commutator (коллектор) — a split metal ring mounted on the shaft of the armature. The two halves of the ring are insulated from each other and serve as the terminals of the armature coil. Fixed brushes of metal or carbon are held against the commutator as it revolves, connecting the coil electrically to external wires. As the armature turns, each brush is in contact alternately with the halves of the commutator, changing position at the moment when the current in the armature coil reverses its direction. Thus there is a flow of unidirectional current in the outside circuit to which the generator is connected. DC generators are usually operated at fairly low voltages to avoid the sparking between brushes and commutator that occurs at high voltage. The highest potential commonly developed by such generators is 1500 V. In some newer machines this reversal is accomplished using power electronic devices, for example, diode rectifiers.

Modern DC generators use drum armatures that usually consist of a large number of windings set in longitudinal slits in the armature core and connected to appropriate segments of a multiple commutator. In an armature having only one loop of wire, the current produced will rise and fall depending on the part of the magnetic field through which the loop is moving. A

commutator of many segments used with a drum armature always connects the external circuit to one loop of wire moving through the high-intensity area of the field, and as a result the current delivered by the armature windings is virtually constant. Fields of modern generators are usually equipped with four or more electromagnetic poles to increase the size and strength of the magnetic field. Sometimes smaller interpoles are added to compensate for distortions in the magnetic flux of the field caused by the magnetic effect of the armature.

DC generators are commonly classified according to the method used to provide field current for energizing the field magnets. A series-wound generator has its field in series with the armature, and a shunt-wound generator has the field connected in parallel with the armature. Compound-wound generators have part of their fields in series and part in parallel. Both shunt-wound and compound-wound generators have the advantage of delivering comparatively constant voltage under varying electrical loads. The series-wound generator is used principally to supply a constant current at variable voltage. A magneto is a small DC generator with a permanent-magnet field

AC MOTORS

Two basic types of motors are designed to operate on alternating current: synchronous motors and induction motors. The synchronous motor is essentially a three-phase alternator operated in reverse. The field magnets are mounted on the rotor and are excited by direct current, and the armature winding is divided into three parts and fed with three-phase alternating current. The variation of the three waves of current in the armature causes a varying magnetic reaction with the poles of the field magnets, and makes the field rotate at a constant speed that is determined by the frequency of the current in the AC power line.

The constant speed of a synchronous motor is advantageous in certain devices. However, in applications where the mechanical load on the motor becomes very great, synchronous motors cannot be used, because if the motor slows down under load it will «fall out of step» with the frequency of the current and come to a stop. Synchronous motors can be made to operate from a single-phase power source by the inclusion of suitable circuit elements that cause a rotating magnetic field.

The simplest of all electric motors is the squirrel-cage type of induction motor used with a three-phase supply. The armature of the squirrel-cage motor consists of three fixed coils similar to the armature of the synchronous motor. The rotating member consists of a core in which are imbedded a series of heavy conductors arranged in a circle around the shaft and parallel to it. With the core removed, the rotor conductors resemble in form the cylindrical cages once used to exercise pet squirrels. The three-phase current flowing in the stationary armature windings generates a rotating magnetic field, and this field induces a current in the conductors of the cage. The magnetic reaction between the rotating field and the current-carrying conductors of the rotor makes the rotor turn. If the rotor is revolving at exactly the same speed as the magnetic field no currents will be induced in it, and hence the rotor should not turn at a synchronous speed. In operation the speeds of rotation of the rotor and the field differ by about 2 to 5 per cent. This speed difference is known as slip.

Motors with squirrel-cage rotors can be used on single-phase alternating current by means of various arrangements of inductance and capacitance that alter the characteristics of the single-phase voltage and make it resemble a two-phase voltage. Such motors are called split-phase motors or condenser motors (or capacitor motors), depending on the arrangement used. Single-

phase squirrel-cage motors do not have a large starting torque, and for applications where such torque is required, repulsion-induction motors are used. A repulsion-induction motor may be of the split-phase or condenser type, but has a manual or automatic switch that allows current to flow between brushes on the commutator when the motor is starting, and short-circuits all commutator segments after the motor reaches a critical speed. Repulsion-induction motors are so named because their starting torque depends on the repulsion between the rotor and the stator, and their torque while running depends on induction. Series-wound motors with commutators, which will operate on direct or alternating current, are called universal motors. They are usually made only in small sizes and are commonly used in household appliances.

APPENDIX III

VOCABULARY

accident/ crash авария
accident report протокол дорожного происшествия
air conditioning кондиционер
auto mechanic автомеханик
auto mechanic shop станция техобслуживания

back door задняя дверь
be licensed to drive иметь водительские права
bearing подшипник
bend крутой поворот
block/ hold-up in the traffic задержка в движении
bottle-neck in the traffic сужение дороги
brake тормоз
brake fluid тормозная жидкость
break down сломаться
break in the traffic перерыв в движении

car accident дорожное происшествие
chain lock цепочка на двери

checkbook чековая книжка
car registration регистрация автомобиля
change gears переключать передачу скоростей
check the oil проверить масло
collide (with) столкнуться
comply with the traffic rules соблюдать правила дорожного движения
cost of repair стоимость ремонта
crossroad перекрёсток

damage a car повредить автомобиль
dashboard приборная доска
direct the traffic направить движение
driver's license водительские права
driving regulations правила вождения автомашины
driving violation нарушение правил вождения

engine двигатель
enter (merge into) highway въезжать на шоссе
exceed the speed limit превышать скорость
exit the highway съезжать с шоссе

fender бампер
fill out an accident report заполнять протокол дорожного происшествия
flat tire спущенное колесо
foot brake ножной тормоз
fork разветвление
freeway, expressway автострада
front door передняя дверь

gain on нагонять, догонять
garage гараж
gear передача скоростей
gearshift рычаг передачи скоростей
get a flat tire проколоть шину
get stuck застрять

hand brake ручной тормоз
have the car repaired ремонтировать автомобиль
headlights передний свет
heavy traffic большое движение
highway шоссе
hold up traffic задерживать движение
hood капот
horn гудок

identification papers, I.D. удостоверение личности
ignition system зажигание
insurance company страховая компания
international Driver's License международное водительское удостоверение
intersection т-образный перекрёсток
jam in the traffic транспортная пробка

key ключ
keep to the right держаться правой стороны

knock down сбить

left-sided traffic левостороннее движение
level of alcohol in blood уровень алкоголя в крови
license plate номерной знак
lights фары
light traffic мало транспорта
lock замок
lock the door запирать дверь на замок
Lost and Found бюро находок

main road главная дорога
make a U-turn развернуться
mileage километраж

offense правонарушение
oil масло
one-way traffic одностороннее движение
overtake, pass обгонять; обгон
overtake / to overhaul/ to outstrip a car обгонять машину

park a car ставить машину на стоянку
parking стоянка
parking lights габаритные огни
parking ticket извещение об уплате штрафа
peephole глазок в двери
police officer полицейский
police station полицейский участок
purse, handbag, pocketbook кошелёк
put air in the tire накачать шины

rearview mirror зеркало заднего вида
repair ремонт
report an accident сообщать о дорожном происшествии
rest stop, emergency parking стоянка на обочине
road дорога
road accident дорожное происшествие
roadside обочина дороги
run into/over наехать

seat belt ремень безопасности
secondary road второстепенная дорога
service road дорога-“дублёр”
service station авторемонтная мастерская
side road второстепенная дорога
slow down замедлить движение
shoulder, side of the road асфальтовая обочина дороги
spark plugs свечи
speed скорость
speed limit предельная скорость
steering рулевое управление
steering wheel руль
step on the brake затормозить

tail lights задний свет
take a driving test держать экзамен на права
tire шина
traffic circle круговое движение
traffic is blocked up/ jammed движение заблокировано
traffic is heavy/ congested движение интенсивное
traffic jam, hold-up, tie-up дорожная пробка
traffic lights светофор
traffic safety дорожная безопасность
traffic signs, road signs дорожные знаки
turn off the engine выключить двигатель
turn on headlights включить передние фары
turn signal, "blinkers" сигнал поворота
turning поворот
two-way traffic двустороннее движение

violate the traffic rules нарушать правила

wheel колесо
windshield ветровое стекло
wipers «дворники»

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