МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
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TURBINES AT WORK

**Методичні вказівки з англійської мови
для студентів I–II курсів спеціальності
"ЕНЕРГЕТИЧНЕ МАШИНОБУДУВАННЯ"**

Рекомендовано Методичною радою НУК

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К44 Turbines at Work : методичні вказівки з англійської мови для студентів I–II курсів спеціальності "Енергетичне машинобудування" / Т. В. Кисельова, О. Б. Давиденко. – Миколаїв : НУК, 2019. – 40 с.

Метою вказівок є формування системи знань для читання спеціальної літератури, розвиток навичок розуміння та аналізу оригінальних текстів, накопичення словникового запасу, а також розвиток навичок усного мовлення.

Призначено для студентів I–II курсів спеціальності "Енергетичне машинобудування".

УДК 621.565:811.111(076)

UNIT 1
ARE TURBINES FOR KIDS?

Active vocabulary

1. Translate the words and word combinations.

Simple way, stage, easy to explain, to feel the force of water, reaction turbine, impulse turbine, catch energy, useful, make electricity, moving liquid, propeller, turn generator, hide, coal, tap, the same job, capture energy, turn into

2. Read the text, pay attention to the words in bold.

How do you explain something as complex as a turbine in a **simple way**? Everything about **reaction** versus **impulse** turbines, **stages**, swimming backwards, and so on is bound to confuse... isn't it?

Actually it's **easy to explain** turbines very simply – and here's how you do it. Take a person into a bathroom or kitchen and get him to hold his hand under a cold tap. Turn on the water a little bit (just a trickle). Now, to their surprise, turn it on really hard and get them to keep his hand there.

"Can you feel the **force of the water** hitting your hand? The moving water has a lot of **energy** and **power** in it. Imagine you are a machine that could catch the energy and use it to do something **useful**, like **making electricity**. That's what a turbine is. It's a machine that catches energy from a moving liquid (like water) or gas (like air)

and helps us do something useful. So a wind turbine is just a machine that catches air with its **propeller**, turns a generator **hidden** inside, and makes electricity. The more energy there is in the air, the more power a wind turbine can make. It's just like the water. The harder it's hitting your hand, the more energy it has, so the more energy you could catch **and turn into power**. A wind **turbine is built** very **high up in the air** because the wind (the air) moves much faster there. That's like turning the **tap** on harder. It means the wind turbine can catch and make more power for us. Different types of turbines catch different types of fluids (liquids or gases). So while a wind turbine or a windmill catches air, a steam turbine catches hot steam made from burning something like **coal**, and a water wheel (which is just a water turbine) catches water. All turbines do **the same job**: they capture energy (the energy in the moving liquid or gas) and **turn** it **into** a form we can use (movement in a machine or electricity). Turbines are energy-catching machines."

3. Find examples of imperative sentences. Pay attention to their translation.

4. Look at the The… the construction in the given sentence: The more energy there is in the air, **the more** power a wind turbine can make. **Find one more example of this construction in the text.**

5. Make up 5 sentences using the…the construction.

6. A wind **turbine is built** very high up in the air because the **wind (the air) moves** much faster there. **Which part of the sentence is active and which one is passive? Explain the difference.**

UNIT 2
TURBINES

Active vocabulary

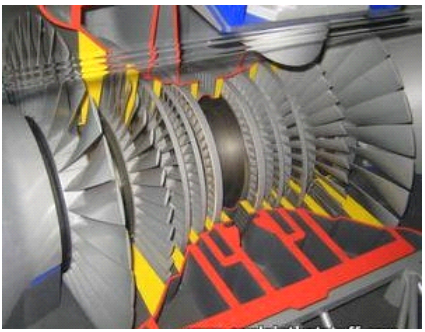
1. Translate the words and word combinations.

Windmill, hydroelectric dam, transatlantic jet, to have in common, curved blades, flutter, spin, to power the ship's propeller, push the plane through the sky, vast majority, driven by steam, power plant, to produce renewable energy, human needs

2. Read and translate the text, paying attention to the words in bold.

Question: What does a windmill standing on a sandcastle have in common with a massive ocean liner, a hydroelectric dam, or a transatlantic jet?

Answer: They all use **turbines!**



Turbines are machines that **capture energy** from a moving liquid or gas. In a sandcastle windmill, the **curved blades** are designed to **catch the wind's energy** so they **flutter** and **spin**. In an ocean liner or a jet, hot burning gas is used **to spin metal blades** at high speed – capturing energy that's used **to power the ship's propeller** or **push** the plane through the sky. Turbines also help us make the **vast majority** of our electricity: turbines **driven by steam** are used in virtually every major **power plant**, while wind and water turbines help us to produce **renewable energy**.

Wherever energy's being harnessed **for human needs**, turbines are usually somewhere nearby.

3. Find examples of active and passive sentences. Pay attention to their translation.

4. What is common between a jet, a ship, and a windmill?

5. Give examples of renewable energy.

6. Make a presentation about pros and cons of renewable energy.

UNIT 3
TYPES OF TURBINES

Active vocabulary

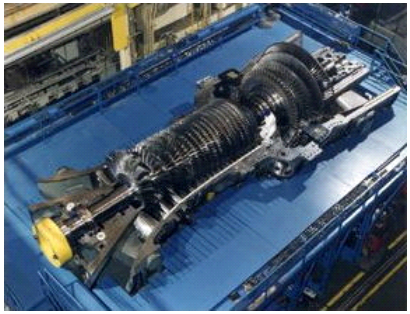
1. Translate the words and word combinations.

To blow, kinetic energy, to rotate, to remove, to convert, to turn, to supply, to add, to change, to realize, to catch the wind, set of blades, shaft, axle, to attach, propeller-like blades, to power, wooden slats.

2. Pay attention to the verbs in the box. Which of them are regular and irregular? Consult your dictionary.

3. Read the text, pay attention to the words in bold.

As you know, a windmill is the simplest kind of turbine: a machine **designed** to capture some of the energy from a **moving fluid** (a liquid or a gas) so it can be put to use. As the wind **blows** past a windmill's sails, they **rotate**, **removing** some of the wind's **kinetic energy** (energy of movement) and **converting** it into mechanical energy that **turns** heavy, rotating stones inside the mill. The faster the wind blows, the more energy it contains; the faster the sails spin, the more energy is **supplied** to the mill. Adding more sails to the windmill or changing their design so they catch the wind better can also help to capture more of the wind's energy. Although you may not **realize** it, the wind blows just a bit more slowly after it's passed by a windmill than before – it's given up some of its energy to the mill!



The key parts of a turbine are a set of **blades** that **catch the moving fluid**, a **shaft** or **axle** that **rotates** as the blades move, and some sort of **machine** that's driven by the axle. In a modern wind turbine, there are typically three **propeller-like blades** attached to an axle that **powers an electricity generator**. In an ancient waterwheel, there are wooden slats that **turn** as the water flows under or over them, turning the axle to which the wheel is attached and usually powering some kind of milling machine.

4.What is the simplest example of a turbine?

5. Name the key parts of a turbine.

6. What is the function of any turbine?

UNIT 4
IMPULSE AND REACTION TURBINES

Turbines work in two different ways described as **impulse** and **reaction** – terms that are often very confusingly described when people try to explain them. So what's the difference?

Impulse turbines

Active vocabulary
1. Translate the words and word combinations.

Impulse turbine, narrow nozzle, bucket–shaped turbine blades, to catch and direct the fluid, angle, the most efficient transfer of energy, to be forced to hit, high speed, wheel, constant energy impulse, to conserve energy, law of conservation of energy, to gain energy, to be equal, law of motion

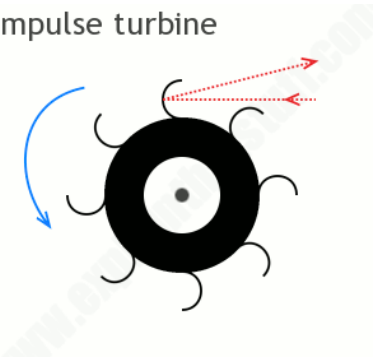


Photo: Left: A Pelton water wheel is an example of an impulse turbine. It spins as one or more high-pressure water jets

fire into the buckets around the edge. This one was originally used in a power plant.

Artwork: Right: An impulse turbine like this works when the incoming fluid hits the buckets and bounces back again. The exact shape of the buckets and how the fluid hits them makes a big difference to how much energy the turbine can capture.

2.Read the text, pay attention to the words in bold.

In an **impulse turbine**, a fast-moving fluid is fired through a **narrow nozzle** at the turbine blades to make them spin around. The **blades** of an impulse turbine are usually **bucket-shaped** so they **catch** the **fluid** and **direct** it off at an **angle** or sometimes even back the way it came (because that gives the **most efficient transfer of energy** from the fluid to the turbine). In an impulse turbine, the fluid **is forced to hit** the turbine at high speed.

Imagine trying to make a wheel like this turn around by kicking soccer balls into its paddles. You'd need the balls to hit hard and bounce back well to get the wheel spinning – and those **constant energy impulses** are the key to how it works. The **law of conservation of energy** tells us that the energy the wheel **gains**, each time a ball strikes it, is **equa**l to the energy that the ball loses – so the balls will be traveling more slowly when they bounce back. Also, Newton's second **law of motion** tells us that the momentum gained by the wheel when a ball hits it is equal to the momentum lost by the ball itself; the longer a ball touches the wheel, and the harder (more forcefully) it hits, the more momentum it will transfer.

Water turbines are often based around an impulse turbine (though some do work using reaction turbines). They're simple in design, easy to build, and cheap to **maintain**, not least because they don't need to be contained inside a **pipe** or **housing** (unlike reaction turbines).

3. Match the words to get word combinations:

1) Law of	a) nozzles
2) Energy	b) energy
3) Impulse	c) motion / conservation of energy
4) Transfer of	d) turbine
5) Narrow	e) impulse

4. What is the function of blades? Describe their shape.
5. What are the advantages of impulse turbines?

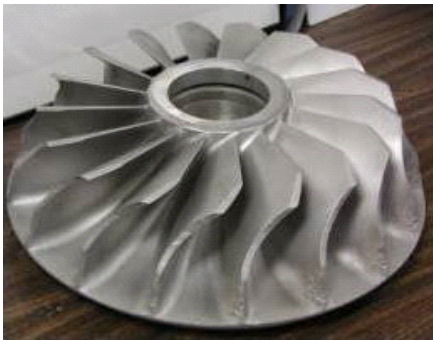
Reaction turbines

Active vocabulary

1. Translate the words and word combinations.

volume of fluid, to turn around, to flow, fluid flow, to change direction, to push, to achieve, to transfer, fast-flowing water, to supply energy, to touch the blades smoothly, bounce, to go with the flow, drastically

2. Read the text, pay attention to the words in bold.



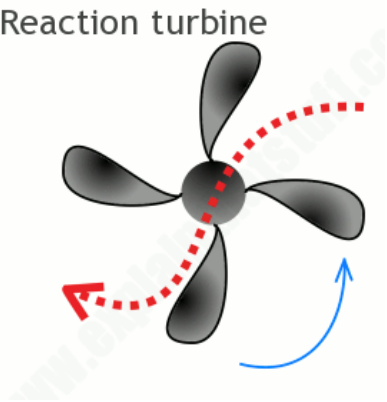


Photo: Left: A typical reaction turbine from a geothermal power plant. Water or steam flows past the angled blades, pushing them around and turning the central shaft to which they're attached. The shaft spins a generator that makes electricity. Photo by Henry Price courtesy of US Department of Energy/National Renewable Energy Laboratory (DOE/NREL).

Artwork: Right: A reaction turbine like this is much more like a propeller. The main difference is that there are more vanes in a turbine (I've just drawn four blades for simplicity) and often multiple sets of vanes (multiple stages), as you can see in the photos of the steam and gas turbines at the top of this page.

In a **reaction turbine**, the blades sit in a much larger **volume of fluid** and **turn around** as the fluid flows past them. A reaction turbine doesn't **change the direction of the fluid flow** as **drastically** as an impulse turbine: it simply **spins** as the fluid pushes through and past its **blades**. Wind turbines are perhaps the most familiar examples of reaction turbines.

If an impulse turbine is a bit like kicking soccer balls, a reaction turbine is more like swimming – in reverse. Let me explain! Think of how you do freestyle (front crawl) by hauling your arms through the water, starting with each hand as far in front as you can reach and ending with a "follow through" that throws your arm well behind you. What you're trying to **achieve** is to keep your hand and forearm pushing against the water for as long as possible, so you **transfer** as much energy as you can in each stroke. A reaction turbine is using the same idea in reverse: imagine **fast-flowing water** moving past you so it makes your arms and legs move and **supplies energy** to your body! With a reaction turbine, you want the water to **touch the blades smoothly**, for as long as it can, so it gives up as much energy as possible. The water isn't hitting the blades and **bouncing** off, as it does in an impulse turbine: instead, the blades are moving more smoothly, "**going with the flow**".

3. Look at the <u>As</u>… <u>as</u> construction in the given sentence:
A reaction turbine doesn't change the direction of the fluid flow **as** drastically **as** an impulse turbine.

4. Make up 5 sentences using <u>as</u>…<u>as</u> construction.

5. How does the reaction turbine work?

6. Is swimming similar to the working principle of a reaction turbine? In what way?

UNIT 5
THINKING BACKWARDS

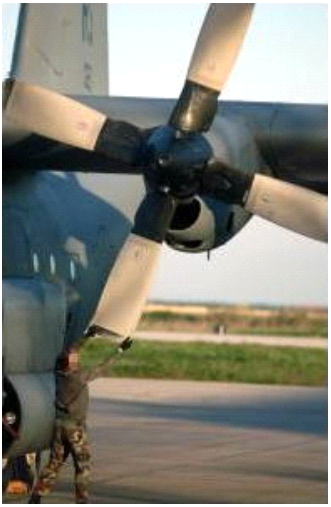


Photo: Turbines and propellers work in exactly opposite ways. Propellers use energy to make a fluid move (air, in the case of a plane, or water, in a ship or submarine); turbines harness energy when a moving fluid flows past them. Left: Propeller photo by Tech. Sgt. Justin D. Pyle courtesy of US Air Force. Right: Turbine blades are shaped in a similar way to propeller blades but are typically made from high-performance alloys because the fluid flowing past them can be very hot. Photo of a turbine blade exhibited at Think Tank, the science museum in Birmingham, England.

Active vocabulary

1. Translate the words and word combinations.

Giant propeller, to work in reverse, engine, high speed, to create backward –moving draft of air, to push, to propel, pump, spinning paddle wheel, to suck, to throw, internal, impeller

2. Read the text, pay attention to the words in bold.

You might have noticed that wind turbines look just like **giant propellers –** and that's another way to think of turbines: as propellers **working in reverse**. In an airplane, the **engine** turns the propeller at **high speed**, the propeller **creates** a **backward-moving draft of air**, and that's what **pushes-propels** – the plane forward. With a propeller, the moving blades are driving the air; with a turbine, the air is driving the blades.

Turbines are also similar to **pumps** and **compressors**. In a pump, you have a **spinning paddle wheel** that **sucks** water in through one pipe and **throws** it out from another so you can move water (or another liquid) from one place to another. If you take a water pump apart, you can see the **internal** paddle wheel (which is called an **impeller**) is very similar to what you'd find inside a water turbine. The difference is that a pump uses energy to make a fluid move, while a turbine captures the energy from a moving fluid.

3.How do wind turbines look? How do they work?

4.What is similar between pumps, turbines and compressors?

5. Look at these two sentences: Explain the difference in grammar forms.

a) The engine **turns** the propeller at high speed.

b) The moving blades **are driving** the air.

6. Make up your own sentences with Present Simple and Present Continuous.

UNIT 6
TURBINES IN ACTION

Active vocabulary

1. Translate the words and word combinations

Broadly speaking, to divide, according to, the same way,different, to produce, high-pressure, safety reasons, huge,high temperature, resilient alloys, to extract energy

2. Read the text, pay attention to the words in bold.

Broadly speaking, we **divide** turbines into four kinds **according to** the type of fluid that drives them: water, wind, steam, and gas. Although all four types work in essentially **the same way** – spinning around as the fluid moves against them – they are subtly **different** and have to be engineered in very different ways. Steam turbines, for example, turn incredibly quickly because steam is **produced** under **high-pressure.** Wind turbines that make electricity turn relatively slowly (mainly for **safety reasons**), so they need to be **huge** to capture decent amounts of energy. Gas turbines need to be made from especially **resilient alloys** because they work at such **high temperatures**. Water turbines are often very big because they have **to extract energy** from an entire river, dammed and diverted to flow past them. They can turn relatively slowly, because is water is heavy and carries a lot of energy (because of its high mass) even when it flows at low speeds.

3. What are the four types of turbines?

4. How are they similar and how are they different?

5. Why water turbines are often huge?

UNIT 7
WATER TURBINES

Active vocabulary

1. Translate the words and word combinations.

date back, hydroelectric power plant, hydroelectric power, to dam a river, to harness energy, to fall through a height, head, to pick up speed, potential energy, to convert, to channel through a pipe, penstock, bucket-like impulse turbines, to choose, to extract energy

2. Read the text, pay attention to the words in bold.

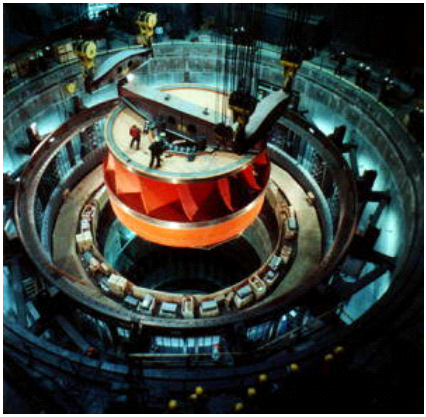


Photo: A giant Francis reaction turbine (the orange wheel at the top) being lowered into position at the Grand Coulee Dam in Washington State, USA. Water flows past the angled blades, pushing them around and turning the shaft to which they're attached. The shaft spins an electricity generator that makes power. Photo by courtesy of US Bureau of Reclamation.

Water wheels, which **date back** over 2000 years to the time of the ancient Greeks, were the original water turbines. Today, the same principle is used to make electricity in **hydroelectric power plants**. The basic idea of **hydroelectric power** is that you **dam** a river **to harness** its energy. Instead of the river flowing freely downhill from its hill or mountain source toward the sea, you make it **fall through**

a height (called a **head**) so it **picks up speed** (in other words, so its **potential energy** is **converted** to **kinetic energy**), then **channel** it through a **pipe** called a **penstock** past a turbine and generator. There are three steps of energy conversion:

· The river's original *potential energy* (which it has because it starts from high ground) is turned into *kinetic energy* when the water falls through a height.

· The *kinetic energy* in the moving water is converted into *mechanical energy* by a water turbine.

· The spinning water turbine drives a generator that turns the *mechanical energy* into *electrical energy*.

Different kinds of water turbines are used depending on the geography of the area, how much water is available (the **flow**), and the distance over which it can be made to fall (the head). Some hydroelectric plants use **bucket-like impulse turbines** (typically Pelton wheels); others use Francis, Kaplan, or Deriaz reaction turbines. The type of turbine is **chosen** carefully **to extract** the maximum amount of **energy** from the water.

3. What principle is used to make electricity in hydroelectric power plants?

4. What are the stages of energy conversion?

5. Why should engineers pay much attention when choosing a turbine?

UNIT 8
STEAM TURBINES

Active vocabulary

1. Translate the words and word combinations.

To evolve, to burn, to release heat, to boil, piston, cylinder, to power a machine, (in)efficient, to waste energy, reason, power plant, to generate electricity, furnace, to heat water, high-speed turbine, single rotating turbine, stage, sequence, pipe

2. Read the text, pay attention to the words in bold.

Steam turbines **evolved** from the steam engines that changed the world in the 18th and 19th centuries. A steam engine **burns** coal on an open fire to **release the heat** it contains. The heat is used to **boil** water and make steam, which pushes a **piston** in a **cylinder to power a machine** such as a railroad locomotive. This is quite **inefficient** (it **wastes energy**) for a whole variety of **reasons**. A much better design takes the steam and channels it past the blades of a turbine, which spins around like a propeller and drives the machine as it goes.

Steam turbines were pioneered by British engineer Charles Parsons (1854 –1931), who used them to power a famously speedy motorboat called *Turbinia* in 1889. Since then, they've been used in many different ways. Virtually all **power plants generate** electricity using steam turbines. In a coal-fired plant, coal is burned in a **furnace** and used **to heat water** to make steam that spins **high-speed turbines** connected to electricity generators. In a nuclear power plant, the heat that makes the steam comes from atomic reactions.

Unlike water and wind turbines, which place a **single rotating turbine** in the flow of liquid or gas, steam turbines have a whole series of turbines (each of which is known as a **stage**) arranged in a **sequence**

inside what is effectively a closed **pipe**. As the steam enters the pipe, it's channeled past each stage in turn so progressively more of its energy is extracted. If you've ever watched a kettle boiling, you'll know that steam expands and moves very quickly if it's directed through a nozzle. For that reason, steam turbines turn at very high speeds – many times faster than wind or water turbines.

3. Who invented a steam turbine?

4. Where were they used?

5. What is more efficient a steam engine or a steam turbine? Why?

6. Make a presentation on famous engineers of the past and present.

UNIT 9
THE GAS TURBINE CYCLE

Active vocabulary

1. Translate the words and word combinations.

To extract energy, chemical fuel, internal combustion engine, intake, compression, combustion, to inject, to burn, to expand, to exhaust, gaseous energy, to drive the compressor, reduction gear, high pressure, stationary vanes, rotating blades, static pressure, airfoil, smooth flow, to enter, to accelerate, convergent duct, velocity, optimum angle, to achieve maximum efficiency, tip shroud, to occur

2. Read the text, pay attention to the words in bold.

The basic principle of the airplane turbine engine is identical to any and all engines that **extract energy** from **chemical fuel**. The basic 4 steps for any **internal combustion engine** are:

1. **Intake** of air (and possibly fuel).
2. **Compression** of the air (and possibly fuel).
3. **Combustion**, where fuel is **injected** and **burned** to convert the stored energy.
4. **Expansion** and **exhaust**, where the converted energy is put to use.

The turbine converts the **gaseous energy** of the air/burned fuel mixture out of the combustor into mechanical energy **to drive the compressor**, driven accessories, and, through a **reduction gear**, the propeller. The turbine converts gaseous energy into mechanical energy by expanding the hot, **high-pressure** gases to a lower temperature and pressure.

Each stage of the turbine consists of a **row** of **stationary vanes** followed by a row of **rotating blades**. This is the reverse of the order in the compressor. In the compressor, energy is added to the gas by the rotor blades, then converted to **static pressure** by the stator vanes. In the turbine, the stator vanes increase gas velocity, and then the rotor blades extract energy.

The vanes and blades are **airfoils** that provide for **a smooth flow** of the gases. As the airstream **enters** the turbine section from the combustion section, it is **accelerated** through the first stage stator vanes. The stator vanes (also called nozzles) form **convergent ducts** that convert the gaseous heat and pressure energy into higher **velocity** gas flow. In addition to accelerating the gas, the vanes "turn" the flow to direct it into the rotor blades at the **optimum angle**.

As the mass of the high velocity gas flows across the turbine blades, the gaseous energy is converted to mechanical energy. Velocity, temperature, and pressure of the gas are sacrificed in order to rotate the turbine to generate power.

The efficiency of the turbine is **determined** by how well it extracts mechanical energy from the hot, high-velocity gasses. Since air flows from a high-pressure zone to a low-pressure zone, this task is **accomplished** easily. The use of properly positioned airfoils allows a smooth flow and expansion of gases through the blades and vanes of the turbine.

All the air must flow across the airfoils **to achieve maximum efficiency** in the turbine. In order to ensure this, seals are used at the base of the vanes to minimize gas flow around the vanes instead of through the intended gas path. In addition, the first three stages of the turbine blades have **tip shrouds** to minimize gas flow around the blade tips.

The materials used in the turbine section of the engine limit the maximum temperature at which a gas turbine engine can operate. The

first metal the hot gases from the combustion section strike is the turbine inlet. The temperature of the gas stream is carefully monitored to ensure that over temperature does not **occur**.

1. What are the stages of any combustion engine?

2. Finish these sentences:

a) The turbine transforms the gaseous energy into _____.

b) Every stage of the turbine consists of_____.

c) The efficiency of the turbine is depends on_____.

d) To get maximum efficiency the air should_____.

e) Gas temperature is watched to make sure that_____.

5. Make a presentation on the development of turbines from ancient times to the present.

GRAMMAR REFERENCE

Present simple or present continuous?

Compare the uses of the present simple and present continuous:

We use the present simple:	We use the present continuous:
for habitual and repeated events/actions: *It **rains** a lot here.*	for actions in progress at the moment of speaking: *Oh no! It**'s raining!***
with adverbs of frequency (e.g. *always, never),* to say how often something happens: *I **always get up** at 6 a.m.*	with *always,* to show that something happens often and is surprising or annoying: ***I'm always losing** my keys!*
for situations/states that are true at the present time or usually true (permanent): *1 **live** in Berlin. My brother **goes** to college in York.*	for situations/states that are true for a limited period (temporary): ***I'm living** in Hamburg **at the moment.** He**'s doing** a work placement **this month.***
for facts that are always true: *The sun **rises** in the east.*	for situations/states that are changing: *Our summers **are getting** hotter.*

I. Are the underlined verbs right or wrong? Correct them where necessary.

1. Water boils at 100 degrees Celsius.
2. The water boils. Can you turn it off?
3. Look! That man tries to open the door of your car.
4. Can you hear those people? What do they talk about?
5. The moon goes round the earth in about 27 days.

6. I must go now. It gets late.
7. I usually go to work by car.
8. 'Hurry up! It's time to leave.' 'OK, I come.'
9. I hear you've got a new job. How do you get on?
10. Paul is never late. He's always getting to work on time.
11. They don't get on well. They're always arguing.

II. Put the verb into the correct form, present continuous or present simple.

1. Let's go out. It (not / rain) now.
2. Julia is very good at languages. She (speak) four languages very well.
3. Hurry up! Everybody (wait) for you.
4. ' (you / listen) to the radio?' 'No, you can turn it off.'
5. ' (you / listen) to the radio every day?' 'No, just occasionally.'
6. The River Nile (flow) into the Mediterranean.
7. The river (flow) very fast today - much faster than usual.
8. We usually (grow) vegetables in our garden, but this year we (not / grow) any.
9. A: How's your English?
   B: Not bad. I think it (improve) slowly.
10. Rachel is in London at the moment. She (stay) at the Park Hotel. She always (stay) there when she's in London.
11. Can we stop walking soon? I (start) to feel tired.
12. A: Can you drive?
    B: I (learn). My father (teach) me.
13. Normally 1 (finish) work at five, but this week I (work) until six to earn a little more money.
14. My parents (live) in Manchester. They were born there and have never lived anywhere else. Where (your parents / live)?
15. Sonia (look) for a place to live. She (stay) with her sister until she finds somewhere.

16. A: What (your brother / do)?
B: He's an architect, but he (not / work) at the moment.
17. *(at a party)* I usually (enjoy) parties, but I (not / enjoy) this one very much.

III. Finish B's sentences. Use always -ing.

1. A: I've lost my pen again.
B: Not again! You're always losing your pen.
2. A: The car has broken down again.
B: That car is useless. It …… .
3. A: Look! You've made the same mistake again.
B: Oh no, not again! I …… .
4. A: Oh, I've forgotten my glasses again.
B: Typical!

State verbs

Verbs that describe states are not usually used in the continuous form. Common state verbs include:

Mental/Thinking verbs	agree, believe, know, remember, think, understand
Attitude verbs	hate, like, love, need, prefer, want, wish .
Sense/Perception verbs	hear, see, smell, taste
Appearance, qualities	appear, look (= seem), seem, sound
Being, possession	be, belong, contain, have, own
Other verbs	cost, fit, mean, owe

Past simple

We use the past simple to talk about past actions or states, often with time expressions like *yesterday, last week, a year ago, when I was young, etc.: I saw Mull yesterday. We were in France two weeks ago.*

I. Complete the sentences using the following verbs in the correct form:

buy catch cost fall hurt sell spend teach throw write

1. Mozart ..... more than 600 pieces of music.
2. 'How did you learn to drive?' 'My father.....me.'
3. We couldn't afford to keep our car, so we .....it.
4. Dave..... down the stairs this morning and..... his leg.
5. Jim..... the ball to Sue, who.....it.
6. Ann..... a lot of money yesterday. She.....a dress which ..... £100.

II. You ask James about his holiday. Write your questions.

Hi. How are things?
Fine, thanks. I've just had a great holiday.

1. Where did you go?
   To the U.S. We went on a trip from San Francisco to Denver.
2. How.....,..... ? By car?
   Yes, we hired a car in San Francisco.
3. It's a long way to drive. How long..... ?
   Two weeks.
4. Where..... ? In hotels?
   Yes, small hotels or motels.
5. .....?
   Yes, but it was very hot - sometimes too hot.
6. ..... the Grand Canyon?
   Of course. It was wonderful.

III. Complete the sentences. Put the verb into the correct form, positive or negative.

1. It was warm, so I... off my coat. (take)
2. The film wasn't very good. I … it very much. (enjoy)

3. I knew Sarah was very busy, so I .....her. (disturb)
4. I was very tired, so I.....the party early. (leave)
5. The bed was very uncomfortable. I.....very well. (sleep)
6. The window was open and a bird.....into the room. (fly)
7. The hotel wasn't very expensive. It.....very much. (cost)
8. I was in a hurry, so I .....time to phone you. (have)
9. It was hard carrying the bags. They.....very heavy. (be)

Past simple and past continuous

– We use the past continuous to talk about an action or situation in progress at a particular time in the past: *I **was working** at eight o'clock last night.*

– We also use the past continuous to describe the background scene in a story: *The sun **was shining** and I **was walking** along the High Street.*

– When a short action interrupts an action in progress, we use *when* before the action in the past simple and ***while/when*** before the action in the past continuous: *When he **arrived**, I **was working.** My car **broke down while/when I was driving** home.*

– When one action happens after another, we use the past simple: *When Sam **arrived**, I **cooked** a meal. (= Sam arrived and then I cooked a meal.)*

– We don't usually use state verbs in continuous tenses: *When I met her, she **seemed** upset.* (Not ~~*she **was seeming** upset*~~*)*

I. What were you doing at these times? Write sentences as in the examples. The past continuous is not always necessary (see the second example).

(at 8 o'clock yesterday evening) ……....
(at 5 o'clock last Monday) ……
(at 10.15 yesterday morning) …….....

(at 4.30 this morning) …….....
(at 7.45 yesterday evening) …….....
(half an hour ago) ……...…

II. Use your own ideas to complete the sentences. Use the past continuous.

1. Matt phoned while we ……
2. The doorbell rang while I …….....
3 We saw an accident while we …….
4. Ann fell asleep while she …….
5. The television was on, but nobody ……

III. Put the verb into the correct form, past continuous or past simple.

1. Jenny (wait) for me when I (arrive).
2. 'What (you / do) at this time yesterday?' 'I was asleep.'
3. ' (you / go) out last night?' 'No, I was too tired.'
4. How fast (you / drive) when the accident (happen)?
5. Sam (take) a photograph of me while I (not / look).
6. We were in a very difficult position. We (not / know) what to do.
7. I haven't seen Alan for ages. When I last (see) him, he (try) to find a job.
8. I (walk) along the street when suddenly I (hear) footsteps behind me. Somebody (follow) me. I was scared and I (start) to run.
9. When I was young, I (want) to be a pilot.
10. Last night I (drop) a plate when I (do) the washing up. Fortunately it (not / break).

Present perfect for recent events

• We use the present perfect to talk about an action that happened at some time in the recent past. We don't say when it happened because this isn't important. We are thinking about the present result

of the action: *I'**ve met** Tom.* (= I know him now.) *He'**s broken** his leg.* (= His leg is broken now.)

• We use the past simple (not the present perfect) to talk about an action that happened at a specific time in the past. We usually say when it happened: *I met Tom **last year**. He **broke** his leg **two years ago**. She **passed** her driving test **yesterday.***

• To emphasise that something happened in the very recent past, we can use *just, recently* (= a short time ago), *already* (= before now or before a particular time) or *yet* (= up to now). Note that we can't use *just* at the end of a sentence: *Sophie'**s just left. Have** you **seen** Molly **recently?** Jack'**s already left. Have** you **already eaten?** The film'**s started already.** I **haven't read** that book **yet.** Have you finished **yet?***

• We use the past simple (not the present perfect) to give more details about recent events: *'Have you heard? Mary's had a baby!' 'When **did** she **have** it?' 'Last night!'*

I. Read the situations and write sentences. Use the following verbs:

arrive break fall go up grow improve

1. Tom is looking for his key. He can't find it.
He.....

2. Margaret can't walk and her leg is in plaster.
She.....

3. Last week the bus fare was 80 pence. Now it is 90. The bus fare.....

4. Maria's English wasn't very good. Now it is better. Her English.....

5. Dan didn't have a beard before. Now he has a beard.
He.....

6. This morning I was expecting a letter. Now I have it.
The letter.....

7. The temperature was 20 degrees. Now it is only 12. The.....

II. Read the situations and write sentences with just, already or yet.

1. After lunch you go to see a friend at her house. She says, 'Would you like something to eat?'

You say: No thank you. .....(have lunch)

2. Joe goes out. Five minutes later, the phone rings and the caller says, 'Can I speak to Joe?'

You say: I'm afraid..... .(go out)

3. You are eating in a restaurant. The waiter thinks you have finished and starts to take your plate away. You say: Wait a minute! ..... (not / finish)

4. You are going to a restaurant tonight. You phone to reserve a table. Later your friend says, 'Shall I phone to reserve a table.'

You say: No,..... (do it)

5. You know that a friend of yours is looking for a place to live. Perhaps she has been successful.

Ask her. You say: ..... ? (find)

6. You are still thinking about where to go for your holiday. A friend asks, 'Where are you going for your holiday?'

You say: ..... (not /decide)

7. Linda went to the bank, but a few minutes ago she returned. Somebody asks, 'Is Linda still at the bank?'

You say: No..... (come back)

III. You are asking people questions about things they have done. Make questions with ever using the words in brackets.

1. (ride / horse?) .....
2. (be / California?) Have.....
3. (run / marathon?) .....
4. (speak / famous person?) .....

5. (most beautiful place / visit?) What's.....

IV. Complete the sentences using today / this year / this term etc.

1. I saw Tom yesterday, but.....,...

2. I read a newspaper yesterday, but I ....today.

3. Last year the company made a profit, but this year .....

4. Tracy worked hard at school last term, but ....

5. It snowed a lot last winter, but.....

6. Our football team won a lot of games last season, but we.....

V. Read the situations and write sentences as shown in the example.

1. Jack is driving a car, but he's very nervous and not sure what to do.

You ask: *Have you driven a car before?*

He says: *No, this is the first time I've driven a car.*

2. Ben is playing tennis. He's not good at it and he doesn't know the rules.

You ask: Have.....

He says: No, this is the first.....

3. Sue is riding a horse. She doesn't look very confident or comfortable.

You ask: .....

She says: .....

4. Maria is in London. She has just arrived and it's very new for her.

You ask: .....

She says: .....

The passive

• In an active sentence, the subject of the sentence is the 'doer' who performs the action of the verb. In a passive sentence, the object of the active verb becomes the subject. We use the passive only with verbs that take an object. Compare:

•

	Subject	Action	Object
Active	He	**has painted**	the house.
Passive	The	house has been painted.	

• We use the passive when:

– *we want to focus on the action, not the doer of the action: The house has been* ***painted. It looks great!***

– the doer is not known or not important: ***Oh no! My bag's been stolen!*** (= I don't know who stole it.) ***This house was built in 1970.*** (= Somebody built it. It's not important who.)

– the doer is obvious or 'people in general': ***He was arrested.*** (Obviously, the police arrested him.) ***The show is watched all over the world.***

• If we want to mention the doer of the action, we use ***by*** + agent (= the person/thing that does the action): ***I was hit by a car.***

• The passive is more common in writing than speech.

• We form the passive with an appropriate form of ***be*** + past participle.

I. Complete the sentences using one of these verbs in the correct form, present or past:

cause damage hold invite make
overtake show surround translate write

1. Many accidents …. by dangerous driving.
2. Cheese … from milk.
3. The roof of the building … in a storm a few days ago.

4. You … to the wedding. Why didn't you go?

5. A cinema is a place where films … .

6. In the United States, elections for president … every four years.

7. Originally the book … in Spanish, and a few years ago it … into English.

8. Although we were driving quite fast, we … by a lot of other cars.

9. You can't see the house from the road. It … by trees.

II. Write questions using the passive. Some are present and some are past.

1. Ask about glass. (how/make?)

2. Ask about television. (when / invent?)

3. Ask about mountains. (how / form?)

4. Ask about Pluto *(the planet*). (when / discover?)

5. Ask about silver. (what / use for?)

III. Put the verb into the correct form, present simple or past simple, active or passive.

1. It's a big factory. Five hundred people (employ) there.

2. (somebody / clean) this room yesterday?

3. Water (cover) most of the earth's surface.

4. How much of the earth's surface (cover) by water?

5. The park gates (lock) at 6.30 p.m. every evening.

6. The letter (post) a week ago and it (arrive) yesterday.

7. The boat hit a rock and (sink) quickly. Fortunately everybody (rescue).

8. Richard's parents (die) when he was very young. He and his sister (bring up) by their grandparents.

9. I was born in London, but I (grow up) in Canada.

10. While I was on holiday, my camera (steal) from my hotel room.

11. While I was on holiday, my camera (disappear) from my hotel room.

12. Why (Sue / resign) from her job? Didn't she enjoy it?

13. Why (Bill / sack) from his job? What did he do wrong?

14. The company is not independent. It (own) by a much larger company.

15. I saw an accident last night. Somebody (call) an ambulance but nobody (injure), so the ambulance (not / need).

16. Where (these photographs / take)? In London?
(you / take) them, or somebody else?

17. Sometimes it's quite noisy living here, but it's not a problem for me – I (not / bother) by it.

IV. Rewrite these sentences. Instead of using somebody, they, people etc., write a passive sentence.

1. Somebody cleans the room every day. The room ……
..... .

2. They cancelled all flights because of fog. All ……..…..

3. People don't use this road much. ……..…....

4. Somebody accused me of stealing money. I ……
……

5. How do people learn languages? How ……

6. Somebody warned us not to go out alone. ……....……

V. Write these sentences in another way, beginning in the way shown.

1. They didn't give me the information I needed.
I *wasn't given the information I needed.*

2. They asked me some difficult questions at the interview.
I ……

3. Linda's colleagues gave her a present when she retired.
Linda ……..…..

4. Nobody told me about the meeting.
I wasn't ……...

5. How much will they pay you for your work?
How much will you ……....……

6. I think they should have offered Tom the job.
I think Tom ……..……

7. Has anybody shown you what to do?
Have you …….

VI. Complete the sentences using being + the following (in the correct form):

give invite keep knock down stick treat

1. Steve hates … waiting.
2. We went to the party without … .
3. I like giving presents and I also like …them.
4. It's a busy road and I don't like crossing it. I'm afraid of … .
5. I'm an adult. I don't like … like a child.
6. You can't do anything about … in a traffic jam.

VII. Complete the sentences using get/got + the following verbs (in the correct form):

ask damage hurt pay steal sting stop use

1. There was a fight at the party, but nobody …….....
2. Alex ……. by a bee while he was sitting in the garden.
3. These tennis courts don't ……. very often. Not many people want to play.
4. I used to have a bicycle, but it ….. a few months ago.
5. Rachel works hard but doesn't ……. very much.
6. Last night I … by the police as I was driving home. One of the lights on my car wasn't working.
7. Please pack these things very carefully. I don't want them to ……..... .
8. People often want to know what my job is. I often …….that question.

COMMON ENERGY TERMS

Base Bill: A charge calculated through multiplication of the rate from the appropriate electric rate schedule by the level of consumption.

Base Load: The minimum energy level an electric plant must provide you on a constant basis.

Base Load Capacity: The generating equipment normally operated to serve loads on an around-the-clock basis.

Basic Services: Services that are necessary for the physical delivery of service, including generation, transmission and distribution.

Capability: The maximum load that a generating unit, generating station, or other electrical apparatus can carry under specified conditions for a given period of time without exceeding approved limits of temperature and stress.

Capacity: The amount of electric power delivered or required for which a generator, turbine, transformer, transmission circuit, station, or system is rated by the manufacturer.

City Gate: The location where natural gas transfers from the interstate gas pipeline to the local utility's distribution system.

Demand: The amount of electricity that a customer uses at any given moment or averaged over period of time. Demand is usually in expressed in kilowatts or Megawatts. The primary source of demand is the power-consuming equipment of customers.

Electric Power Plant: A station containing prime movers, electric generators, and auxiliary equipment for converting mechanical, chemical, and/or fission energy into electric energy.

Electricity: A property of matter created by the movement of electrons. This "movement" is initiated usually by a generator fueled by any number of energy resources such as coal, uranium, water (hydropower), or directly converted from solar radiation in photovoltaic cells. Electricity is not energy per se, but the "carrier" of energy that originates in fossil fuel and renewable energy sources.

Energy: Energy is the capacity for doing work. Energy has several forms, some of which are easily convertible and can be changed to another form useful for work. Most of the world's convertible energy comes from fossil fuels that are burned to produce heat that is then used as a transfer medium to mechanical or other means in order to accomplish tasks. Electrical energy is usually measured in kilowatt-hours, while heat energy is usually measured in British thermal units.

Energy Source: The primary source that provides the power that is converted to electricity through chemical, mechanical, or other means. Energy sources include coal, petroleum and petroleum products, gas, water, uranium, wind, sunlight, geothermal, and other sources.

Fuel: Any substance that can be burned to produce heat; also, materials that can be fissioned in a chain reaction to produce heat.

Gas: A fuel burned under boilers and by internal combustion engines for electric generation. These include natural, manufactured and waste gas.

Turbine: An engine in which steam, water, gas or air is made to spin a rotating shaft by pushing on angled blades, like a fan. Turbines are among the most powerful machines. Steam turbines drive generators in power stations and ships' propellers; water turbines spin the generators in hydroelectric power.

Wind Energy: The kinetic energy of wind converted into mechanical energy by wind turbines (i.e., blades rotating from a hub) that drive generators to produce electricity.

Wind Turbine: Windmill of advanced aerodynamic design connected to an electricity generator and used in wind power installations. Wind turbines can be either large propeller-type rotors mounted on a tall tower or flexible metal strips fixed to a vertical axle at top and bottom.

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TURBINES AT WORK
Методичні вказівки з англійської мови для студентів I–II курсів спеціальності "Енергетичне машинобудування"

(*англійською мовою*)

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