

**MODULE: CUTTING TOOLS**  
**UNIT 1**  
**CUTTING TOOLS AND THEIR CLASSIFICATION**

**PART 1. CUTTING TOOLS IN EVERYDAY LIFE AND INDUSTRY**

**LEAD-IN**

**1** Look at the pictures showing different kinds of cutting instruments and answer the questions below.



What can you do with these tools?

What do these tools have in common?

What properties should they have?

What is their role in our life?

What other tools do you know?

**READING 1**

**2** Read the text about tools and choose the correct item below it.

Once Mr. Winston Churchill cried “Give us the tools and we will finish the job” he may not have realized that he was echoing the cry of early engineering inventors.

Man has been using various cutting tools during the whole (1)\_\_\_\_\_. Besides his teeth and (2) \_\_\_\_\_, given him by mother nature, it were digger sticks, arrows, knives and other tools that were created for hunting animals, ploughing (3)\_\_\_\_\_ and slaughtering his troublesome neighbours. These tools have always been and are reliable helpmates in all fields of his activity.

Of course, cutting tools have been changing in order to function more efficiently. New materials and production (4) \_\_\_\_\_ made them easier in use and greatly influenced their performance and service life. Thus today they don't look much like their remote (5) \_\_\_\_\_. But still you can find them everywhere: a man always has something to cut, slice, shape, saw and so on.

We got used to apply these tools and it may seem that their (6) \_\_\_\_\_ has stopped, but, nevertheless, it is still going on, and it is especially noticeable in metal cutting (7) \_\_\_\_\_. So if one is familiar with domestic tools they will find out that industrial cutting tools are based on the same principles and share the same mechanical (8) \_\_\_\_\_.

|   |             |              |              |
|---|-------------|--------------|--------------|
| 1 | A century   | B story      | C history    |
| 2 | A nails     | B feet       | C shoulders  |
| 3 | A grass     | B land       | C lawn       |
| 4 | A managers  | B facilities | C techniques |
| 5 | A ancestors | B relatives  | C prototypes |
| 6 | A invention | B promotion  | C evolution  |
| 7 | A shop      | B society    | C industry   |
| 8 | A actions   | B properties | C appliances |

3 ***Discuss the following points in pairs, using information from the text.***

1st pair of students

- ***Cutting tool development is so obvious.***

2d pair of students

- ***A bad workman always blames his tools. (words of wisdom)***

3d pair of students

- ***An evolution of any tool you like since its early employment till nowadays.***



***fig.1 drills***



***fig.2 hand thrown projectiles***



***fig.3 arrow***

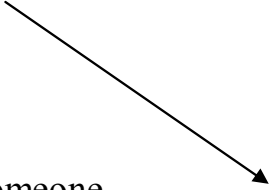
**VOCABULARY PRACTICE**

**4** Fill in the correct word from the list below. Use the words only once.

*Digger, land, inventors, mother, industry, neighbours, reliable, remote*

|                       |                             |
|-----------------------|-----------------------------|
| 1. _____ nature;      | 5. _____ sticks;            |
| 2. troublesome _____; | 6. cutting _____;           |
| 3. _____ ancestors;   | 7. _____ helpmates;         |
| 4. ploughing _____;   | 8. early engineering _____; |

**5** Read the meanings of the verbs you met in the text and match the verbs in the right column with their definitions in the left.

- |                                                                                                                                 |                 |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 1. To divide smth into two or more pieces using a sharp tool such as a knife;                                                   | a) TO SAW       |
| 2. To turn over the earth so that seeds can be planted;                                                                         | b) TO CUT       |
| 3. To have or use smth at the same time;                                                                                        | c) TO SHARE     |
| 4. To repeat an idea or opinion because you agree with it;                                                                      | d) TO INVENT    |
| 5. To make, design, or produce something new for the first time;                                                                | e) TO PLOUGH    |
| 6. To have an effect on the way someone or something develops, behaves, thinks etc without directly forcing or commanding them; | f) TO ECHO      |
| 7. To divide wood, metal etc. with a tool that has a flat blade with a row of V-shaped metal teeth;                             | g) TO INFLUENCE |
- 

**6** Complete each sentence with a suitable word from the list.

|                                                       |
|-------------------------------------------------------|
| axe file needle razor scissors sword corkscrew hammer |
|-------------------------------------------------------|

pin saw screwdriver spanner spade

- a) You can cut that plank in half with this \_\_\_\_\_.
- b) You need a \_\_\_\_\_ to open this bottle of wine.
- c) I've split my trousers. Do you have a \_\_\_\_\_ and thread?
- d) I can't open the back of the television without a special \_\_\_\_\_.
- e) You can make the edges smooth with a \_\_\_\_\_.
- f) I've cut myself shaving again. I think I'll buy an electric \_\_\_\_\_.
- g) We could chop this tree down if we had a sharp \_\_\_\_\_.
- h) Until I can sew this, I'll fix the edges together with a \_\_\_\_\_.
- i) I was going to dig the garden but I can't find the \_\_\_\_\_.
- j) Oh bother! I've hit my thumb with the \_\_\_\_\_ instead of the nail!
- k) You can cut this cardboard if you have some sharp \_\_\_\_\_.
- l) This nut is impossible to undo. I need a larger \_\_\_\_\_.
- m) The pen is mightier than the \_\_\_\_\_.

**GRAMMAR PRACTICE**

**7** *Fill in the correct prepositions, then choose any three and make sentences.*

the cry \_\_\_\_\_ early engineering inventors; to use cutting tools \_\_\_\_\_ the whole history; to give \_\_\_\_\_ mother nature; to create \_\_\_\_\_ hunting animals; \_\_\_\_\_ all fields \_\_\_\_\_ his activity; to change \_\_\_\_\_ order \_\_\_\_\_ function; to be noticeable \_\_\_\_\_ metal cutting industry.

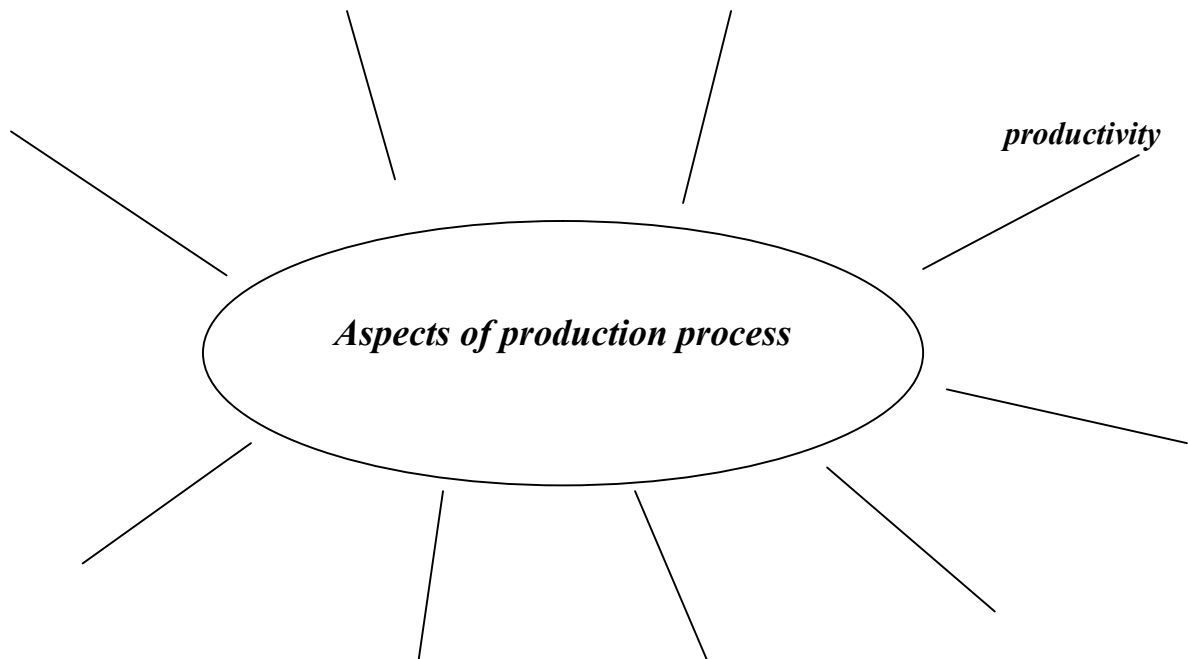
**8** *Fill in the table with the derived words and translate them.*

| Noun                | Verb   | Adjective | Adverb |
|---------------------|--------|-----------|--------|
| ?                   | apply  | ?         | --     |
| Inventor, invention | ?      | ?         | ?      |
| ?                   | create | ?         | ?      |
| ?                   | ?      | various   | ?      |
| industry            | ?      | ?         | ?      |
| activity            | ?      | ?         | --     |
| ?                   | ?      | remote    | ?      |

**READING 2**

**LEAD-IN**

**9** *Cutting tools play an important role in industrial process. What aspects of production process do they influence? Fill in the diagram.*



**10** *Read the text about cutting tools in industry. Choose the most suitable heading from the list A-E, for each paragraph (1-5).*

- A Cutting tools' perfection is the main purpose
- B Requirements to modern coatings
- C Technological progress in manufacture of tools
- D Importance of cutting tools' choice
- E Any situation must be taken into account



*fig.1*

## ***CUTTING TOOLS IN INDUSTRIAL APPLICATION***

|          |  |
|----------|--|
| <b>1</b> |  |
|----------|--|

Aspects of quality and economy of industrial production processes are to a high degree determined by the selection and the design of the appropriate cutting tool. For many manufacturing operations, especially for the processing of metallic materials, machining with geometrically specified cutting tools is required. The goal is to reduce costs, boost productivity, and minimize cycle time.

|          |  |
|----------|--|
| <b>2</b> |  |
|----------|--|

The cutting tool is the component most stressed, and therefore limits the performance in machining operations. Among various stresses, thermal and mechanical loads affect the cutting tool edges in a continuous or intermitting way. As a result, good wear resistance, high thermal stability and high mechanical strength are the properties required for cutting materials. Thus, new materials and advanced coatings are being developed to prolong tool life.

|          |  |
|----------|--|
| <b>3</b> |  |
|----------|--|

Enhancing the performance of cutting tools is an economically important goal; for achieving that, diverse cutter design technologies may contribute in varying ways. Advanced computing tools like 3-D simulation and finite element analysis (FEA) help manufacturers and researchers at universities to predict cutting tool performance and deploy the most suitable tools for application. Total system design, simulation, and process control are leading the R&D<sup>1</sup> efforts for cutting tools.

|          |  |
|----------|--|
| <b>4</b> |  |
|----------|--|

A comprehensive system design in cutting tool technology extends beyond the tool geometry, workpiece material, and machining parameters to include a tool's inherent characteristics dependent on its substrate and coating. For instance, a coating applied to a given substrate may be expected to deliver predefined cutting characteristics. However, once heat and force in a machining operation enter the equation, reactions between the workpiece material and coating become unpredictable.

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|          |  |
|----------|--|
| <b>5</b> |  |
|----------|--|

Continuous improvement of cutting tools is more than an industry buzzword; it is the lifeblood of any profitable metalworking shop. Learning how to optimize the use of cutting tools can be the key to lower cycle times and longer tool life.

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<sup>1</sup> R&D – research and development

**11 Discuss the following questions in small groups.**

1. Why is it important to choose the appropriate cutting tool for industrial process?
2. What properties must coatings of cutting tools have?
3. How do computer programs help to design cutting tools? What computer programs for tool designing do you know?
4. How do heat and force influence the behaviour of workpiece material and cutting tool material?
5. How do you understand the following sentence from the text “Continuous improvement of cutting tools is more than industry buzzword; it is the lifeblood of any profitable metalworking shop.” Do you agree with it?

**VOCABULARY PRACTICE**

**12 Fill in the blanks with the suitable words, without consulting the text you've read.**

*improvement*  
*reaction*  
*geometrically*  
*goal*

*coatings*  
*operations*  
*wear*  
*properties*

*tool*  
*unpredictable*  
*workpiece*

- 1 For many manufacturing \_\_\_\_\_ machining with \_\_\_\_\_ specified cutting tools is required.
- 2 The \_\_\_\_\_ is to reduce costs and boost productivity.
- 3 The \_\_\_\_\_ which are necessary for cutting materials are good \_\_\_\_\_ resistance, high thermal stability and high mechanical strength.
- 4 New materials and advanced \_\_\_\_\_ are being developed to prolong \_\_\_\_\_ life.
- 5 If heat and force in a machining operation enter the equation, \_\_\_\_\_ between the \_\_\_\_\_ material and coating become \_\_\_\_\_.
- 6 Continuous \_\_\_\_\_ of cutting tools is the lifeblood of any profitable metalworking shop.

**13 Find the following English equivalents in the text.**

До высокой степени; соответствующий режущий инструмент; обработка металлических материалов; сократить цены; увеличить производительность; различные напряжения; непрерывный способ; износостойкость; продлить стойкость инструмента; важная цель; разнообразные технологии; 3-мерное моделирование; метод конечных элементов; подложка; становиться непредсказуемым; завод, приносящий прибыль.

**14 Use the word in capitals at the end of each line to form a word that fits in the space in the same line.**

*How does the video work?*

|                                                                                                                                              |           |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| When I was young, I always dreamed of becoming a famous (1) .....                                                                            | SCIENCE   |
| (2)....., and then become a millionaire by inventing a wonderful new (3) .....                                                               | ENGINE    |
| which would make the world a better place. Unfortunately, I wasn't very good at technical subjects. Any time I operate any kind of (4)....., | PRODUCE   |
| something terrible happens. Machines which use (5).....,                                                                                     | EQUIP     |
| such as computers or televisions, always seem to give me a (6)..... shock. The instruction booklets are always                               | ELECTRIC  |
| (7)..... They never help me at all. Nowadays you need to have (8) .....                                                                      | POWER     |
| knowledge just to turn on the video. To my great (9) .....                                                                                   | USE       |
| it is always a child of six who helps me out of my (10) .....                                                                                | SPECIAL   |
|                                                                                                                                              | EMBARRASS |
|                                                                                                                                              | DIFFICULT |

### **GRAMMAR PRACTICE**

**15** *All these parts of sentences are taken from the text “Cutting tools in industrial application”. Read them and say what grammar phenomenon it is.*

..... *machining with geometrically specified cutting tools*.....;  
 .....*required properties for cutting materials* .....

..... *advanced coatings are being developed to prolong*.....;  
 .....*a coating applied to a given substrate*.....;  
 ..... *to deliver predefined cutting characteristics*.....;  
 .....*applied force in a machining operation* .....

**Translate them.**  
**16** *Connect the following sentences using the linking words. You may miss some words or parts of sentences.*

**Such as**

1. We use cutting tools every day. They are scissors, knives, saws etc.

**On the one hand..... on the other hand**

2. All cutting tools are necessary and play a very important role. They are sharp and dangerous.

**Besides**

3. Remote ancestors had knives and digger sticks. They also had arrows for hunting animals.

**For the first sight but nevertheless**

4. We can say that evolution of cutting tools has stopped. It is still going on, especially in metal cutting industry.

**That's why**



5. New advanced coatings are required. The tools' coatings must be wear and thermal resistant.

**However**

6. Various techniques which simplify the machining of metals appear. The machining of metal workpieces is a very complicated process.

## ***WRITING (home task)***

***Write an abstract (1500 – 2000 signs). Use more sources of information (web-sites, encyclopedia, etc.). Choose one of the following topics.***

1. History of cutting tools.
2. Evolution of cutting tools.
3. The cutting tools we face every day.
4. Our life is impossible without cutting tools.
5. Cutting tools in the industrial process.

*fig.1*

### **Some helpful hints for writing an abstract:**

Read the original texts to get an impression of its contents.

- Highlight the main points as you read.
- Leave out less important information.
- You may use direct quotations.
- Don't forget about linking words.
- Follow the structure:

***Introduction***

***Main body***

***Conclusion***

### **Sources of information for you to help:**

1. "Technology of machine tools": Kraar , Oswald – 1995
2. [www.wikipedia.com](http://www.wikipedia.com)
3. [www.howstuffworks.com](http://www.howstuffworks.com).
4. The new Encyclopedia Britannica. Chicago, 1994



***than 2 books,***