

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ ПЕРМСКОГО КРАЯ  
Государственное бюджетное профессиональное образовательное  
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**ОБРАЗОВАТЕЛЬНЫЙ ПРОЕКТ**  
**по дисциплине иностранный язык**

**Автоматизация в нефтяной и газовой**  
**промышленности**  
**(Automation in oil and gas industry)**

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## The Abstract

Automation is the system of manufacture performing certain tasks, previously done by people, by machines only. The sequences of operations are controlled automatically. The most familiar example of a highly automated system is an assembly plant for automobiles or other complex products.

The term automation is also used to describe nonmanufacturing systems in which automatic devices can operate independently of human control.

Automation is an important engineering, covering technical methods, concepts and tools of regulation and control of automated manufacturing.

New technologies of automation are widely used in oil and gas industry. The research is connected with the role of automation in this field.

The used methods are:

- analysis of special literature;
- descriptive survey (questionnaire)

I came to the conclusion that automatic devices reduce production time, increase manufacturing flexibility, reduce costs and eliminate human error.

The results of the research are especially useful for future oil and gas specialists.

The project will help the students in extending their knowledge about new technologies of automation in oil and gas industry and also in getting skills in reading of professionally oriented texts in English.

Keywords: automation, automated manufacturing, an integrated system of production, nonmanufacturing system, the feedback principle.

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## The Introduction

I am glad to study at the Perm Petroleum College. Established in 1938 Perm Petroleum College is the special secondary educational institution providing training for oil and gas industry specialists. My speciality is Technological Processes and Production Automation.

The purpose of the research is to prove the importance of automation in oil and gas industry.

I define the following tasks:

- to collect theoretical material and to study statistics on the problem.
- to establish the importance of automation in oil and gas industry.
- to make a survey of new technologies in this field.

The object of the work is the modern market of automation.

The subject of the work is its role and place in oil and gas industry.

My hypothesis is that automation has a great influence on the areas of the economy.

I used such methods as:

- analysis of special literature;
- descriptive survey (questionnaire).

I believe that these methods are effective for understanding of role of automation in oil and gas industry. I suppose the topic is actual today because our life depends on automation.

During the preparation for the research work I used special literature and Internet. Lesokhina T.B. stresses that many industries are highly automated or use automation technology in some part of their operation (1, p.8). But Maksimova M.E. and Ravich I.M. write that not all industries require the same degree of automation (2, p.12). Sales, agriculture, and some service industries

are difficult to automate, though agriculture industry may become more mechanized, especially in the processing and packaging of foods.

My speciality is connected with automation and it was interesting for me to find out some new information from the articles, especially about new technologies in this field.

# **The Fundamental part**

## **History of automation**

Automation is the system of manufacture performing certain tasks, previously done by people by machines only. The sequences of operations are controlled automatically. The term automation is also used to describe nonmanufacturing system in which automatic devices can operate independently of human control (2, p. 5).

Automated manufacturing had several steps in its development. Mechanization was the first step necessary in the development of automation. The simplification of work made it possible to design and build machines that resembled the motions of the worker. These specialized machines were motorized and they had better production efficiency.

In the 1920s the automobile industry for the first time used an integrated system of production. This method of production was adopted by most car manufacturers and became known as Detroit automation.

The feedback principle is used in all automatic-control mechanisms when machines have ability to correct themselves. The feedback principle has been used for centuries. An outstanding early example is the flyball governor, invented in 1788 by James Watt to control the speed of the steam engine. The common household thermostat is another example of a feedback device.

Using feedback devices, machines can start, stop, speed up, slow down, count, inspect, test, compare, and measure. These operations are commonly applied to a wide variety of production operations.

Computers have greatly facilitated the use of feedback in manufacturing processes. Computers gave rise to the development of numerically controlled machines.

## **Different reasons to automate**

There are many different reasons to automate. Increased productivity is normally the major reason for many companies desiring a competitive advantage. Automation also offers low operational variability. Variability is directly related to quality and productivity. Other reasons to automate include the presence of a hazardous working environment and the high cost of human labor. Some businesses automate processes in order to reduce production time, increase manufacturing flexibility, reduce costs, eliminate human error, or make up for a labor shortage. Decisions associated with automation are usually concerned with some or all of these economic and social considerations.

## **Types of automation**

Although automation can play a major role in increasing productivity and reducing costs in service industries—as in the example of a retail store that installs bar code scanners in its checkout lanes—automation is most prevalent in manufacturing industries. In recent years, the manufacturing field has witnessed the development of major automation alternatives. Some of these types of automation include:

- ⤴ Information technology (IT)
- ⤴ Computer-aided manufacturing (CAM)
- ⤴ Numerically controlled (NC) equipment
- ⤴ Robots
- ⤴ Flexible manufacturing systems (FMS)
- ⤴ Computer integrated manufacturing (CIM)

Information technology (IT) encompasses a broad spectrum of computer technologies used to create, store, retrieve, and disseminate information.

Computer-aided manufacturing (CAM) refers to the use of computers in the different functions of production planning and control. CAM includes the use of numerically controlled machines, robots, and other automated systems for the manufacture of products. Computer-aided manufacturing also includes

computer-aided process planning (CAPP), group technology (GT), production scheduling, and manufacturing flow analysis. Computer-aided process planning (CAPP) means the use of computers to generate process plans for the manufacture of different products. Group technology (GT) is a manufacturing philosophy that aims at grouping different products and creating different manufacturing cells for the manufacture of each group.

Numerically controlled (NC) machines are programmed versions of machine tools that execute operations in sequence on parts or products. Individual machines may have their own computers for that purpose; such tools are commonly referred to as computerized numerical controlled (CNC) machines. In other cases, many machines may share the same computer; these are called direct numerical controlled machines.

Robots are a type of automated equipment that may execute different tasks that are normally handled by a human operator. In manufacturing, robots are used to handle a wide range of tasks, including assembly, welding, painting, loading and unloading of heavy or hazardous materials, inspection and testing, and finishing operations.

Flexible manufacturing systems (FMS) are comprehensive systems that may include numerically controlled machine tools, robots, and automated material handling systems in the manufacture of similar products or components using different routings among the machines.

A computer-integrated manufacturing (CIM) system is one in which many manufacturing functions are linked through an integrated computer network. These manufacturing or manufacturing-related functions include production planning and control, shop floor control, quality control, computer-aided manufacturing, computer-aided design, purchasing, marketing, and other functions. The objective of a computer-integrated manufacturing system is to allow changes in product design, to reduce costs, and to optimize production requirements.

## **Automation in oil and gas industry**

New technologies of automation are widely used in oil and gas industry, especially in electrodrilling, drilling by flame, destruction of rock using ultrasound, erosion jet drilling. Electrodrilling is the one which can have practical application in the next years. (Appendix 1)

An electrical swivel is fixed under the swivel, to transmit electric power to the bottom hole motor. The fluid is circulated through the drill pipes.

Electrodrilling has technical and economic advantages over both, rotary and turbodrilling:

1. Energy is transmitted to the bottom of the hole regardless of either the depth of the well or quantity and quality of the circulating fluid.
2. Since the drill pipes do not rotate and fluid pressure is not high, the life of pipes is considerably increased and, hence, steel consumption per one meter of drilling is decreased. High pressure pumps are not required.
3. Automation of the process is simplified; feeding of the bit is mechanized: a bottom hole inclinometers fixed over the drill makes it possible to measure constantly inclination of the well.
4. Application of both heavy mud or air for well circulation is possible.

Our college cooperates with the international company Schlumberger. The representatives of this company come to our college and tell about the company. Schlumberger is famous for its training system. According to the data of statistical reporting of Perm Petroleum College, 4% of our graduates work in the international company Schlumberger.

Schlumberger is a full provider of technology services to the global petroleum exploration and production industry.

Schlumberger is well-known for it's research centers which develop new technologies of automation.

The company consists of the primary business segments: Schlumberger Oilfield Services. Western Geco and other.

Schlumberger Oilfield Services consists of two product groups Reservoir Evaluation & Development and Schlumberger Information Solutions.

Reservoir Evaluation & Development consists of the following service segments (product lines):

- Western Geco (WG)
- Reservoir Evaluation Wireline (REW)
- Drilling and Measurement (D&M)
- Well Services (WS)
- Well Completion and Productivity (WGP)
- Integrated Project Management (IPM)

- Western Geco evaluates reservoirs using advanced technologies and special equipment. It provides seismic acquisition, seismic reservoir imaging, processing and interpretation.

- REW evaluates reservoirs in operated and cased wells, does the well perforation and the exploitation. Wireline provides borehole imaging, borehole seismic, cased-hole formation, cement and casing-corrosion evaluation, sidewall coring and fluid sampling, open hole formation evaluation, perforating, pipe recovery, production logging.

- D&M provides different drilling services such as directional drilling, measurement while drilling and logging while drilling.

- WS deals with well cementing, core tubing drilling and well stimulation.

- WCP provides engineering solutions to increase oil recovery. The services are the following: artificial lift systems, drillstem testing, reservoir monitoring and control, sand-control hardware, slickline operations, subsea well control, subsurface safety systems

- IPM provides the best management of oil and gas projects. IPM can

maximize your production rates and recovery factors, increasing your return on investment. It deals with facilities operation and maintenance, production services and engineering, project management, multipurpose service vessels, reservoir evaluation and optimization, well construction and intervention.

**Functions of automation are:**

- Minimization of expenses of raw materials.
- Improvement of quality of production.
- Control and management.
- Accumulation and storage of information.

**Automated production processes are:**

- Loading/unloading of oil and gas products in road tankers.
- Metering of oil and gas products
- Filling the tankers with oil.
- Pouring oil in road tankers.

Automatic devices reduce production time, increase manufacturing flexibility, reduce costs and eliminate human error (Appendix 2).

## **The Practical part**

### **The questionnaire and it's results**

I also think that it would be interesting to learn ideas of our students about their future profession in its present state and role of automation in oil and gas industry. That is why I made a questionnaire among the students of our speciality (Appendix3).

Forty students answered several questions. From my data I concluded that:

- All students have made a right choice of profession.
- People need specialists in this profession.
- All students believe that it is important to choose the profession according to one's character and taste.
  - There's a professional tradition in the family for 20% of respondents.
  - Most of students suppose that the role of automation in oil and gas industry is great and they want to know more about new technologies in this field.
  - 95% of respondents will work in this field after graduating from the college.

## **The Conclusion**

From the research I made a conclusion:

Our hypothesis was confirmed completely. Automation has a great influence on the areas of the economy.

It's very interesting job allows you to realize your abilities and skills, your full potential. I suppose each industry has its own concept of automation that answers its particular production needs. At the present time the specialist should possess professional skills, modern technologies, computer software and foreign languages.

The results of the research are especially useful for future oil and gas specialists. It is important to organize more meetings with successful specialists in the field of automation. It is necessary to break down the barriers between education and business. The students should take part in business activities and pay more attention to leaning modern technologies.

## **The Literature**

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Automatic drilling key ADK-4

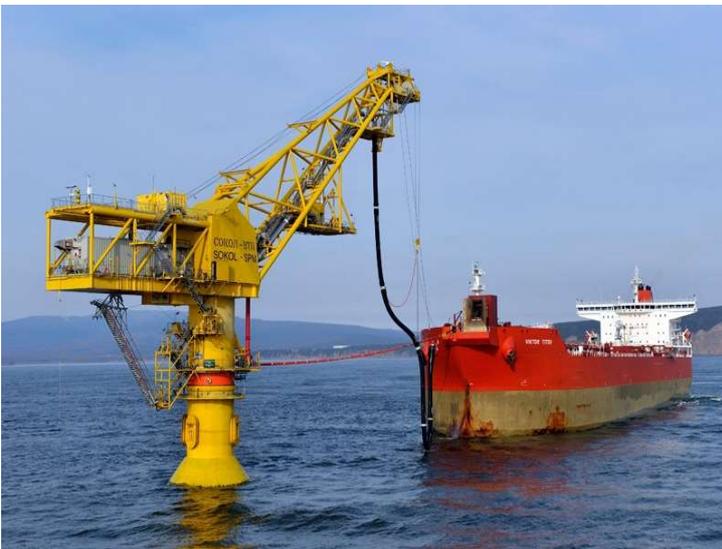


DP 618™ Mud Cleaner

## Appendix 2



Metering of oil and gas products



Filling the tankers with oil



Pouring oil in road tankers



Loading/unloading of oil and gas products in road tankers

## Questionnaire

- 1) Have you made a right choice of a profession?
- 2) Is it important to choose the profession according to one's character and taste?
- 3) Do people need specialists in this profession?
- 4) Is there a professional tradition in your family?
- 5) Is the role of automation in oil and gas industry great? Do you want to know more about new technologies in this field?
- 6) Will you work in this field after graduating from the college?

