

THE FIRST HIGHER TECHNICAL UNIVERSITY IN RUSSIA



MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION
Federal State Budgetary Educational Institution of Higher Education
"Saint-Petersburg Mining University"



Approved by
Vice-Rector for Educational Activity
Prof. V.A. SHPENST



01/12/2016

Professional training program

«Automated control systems of technological objects of gas transportation»

Specialty: 220700 – «*Automatization of technological processes*»

Attendance: full-time

Training manager: _____

N. Koteleva, Assistant of
Technological Process Automation and
Production Department

ST. PETERSBURG
2016

1. Short course description:

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|-----------------------|---|
| Training goal: | Familiarization of foreign gas industry specialists with Russian approach in control of technological objects of gas transportation |
| Audience: | Gas industry experts and other special-purpose technical specialists |
| Duration: | 72 hours |
| Training mode: | 8 hours per day |
| Attendance: | Full-time |

2. Curriculum:

| № | Topics | Total, hr | Including | | Final assessment |
|----|--|-----------|-----------|--------------------|------------------|
| | | | Lecture | Practical training | |
| 1. | Introduction | 1 | 1 | - | - |
| 2. | Module 1. The basics of automated control systems of technological objects of gas transportation | 7 | 7 | - | - |
| 3. | Module 2. Automation equipment for technological objects of gas transportation | 10 | 6 | 4 | - |
| 3. | Module 3. The modern software for automated control systems of technological objects of gas transportation | 28 | 14 | 14 | - |
| 5. | Module 4. IT technology for automated control systems of technological objects of gas transportation | 8 | 4 | 4 | - |
| 6. | Module 5. Energy Management and Energy Savings | 8 | 6 | 2 | - |
| 7. | Module 7. Physiological aspects of innovation of automated control systems | 8 | 3 | 5 | - |
| | Total hours: | 70 | | | |
| | Final assessment: | 2 | | | Test |
| | Total, hr: | 72 | 41 | 29 | |

3. Course achievement level:

Advanced training was elaborated for foreign gas industry specialists. Advanced training can help them to perfect the following professional competences:

- The ability to provide the necessary resilience means and systems automation, control, diagnosis and management of change in the external factors that reduce the efficiency of their operations and planning for continuous improvement of the quality of automation systems
- The ability to perform analysis of the dynamics and functioning of automation equipment and systems, monitoring, diagnostics and quality control, metrology and regulatory support of production, standardization and certification with appropriate modern techniques and analysis tools
- The ability to adapt modern version control systems to the specific conditions of production on the basis of international standards

- The ability to use technical means to measure the main parameters of technological processes and manufactures
- The ability to use modern information technology to manage information using the applications; use of network computer technology, database, and application packages in their subject area
- The ability to participate in activities for the development of automatic and automated control systems, diagnostics and control of their technical, algorithmic and software
- The ability to practically implement automation means and systems monitoring and diagnostics of automated process control
- The ability to develop terms of reference for the modernization and automation of existing production and technological processes and productions, means and systems automation, control, monitoring and diagnostics
- The ability to prepare and adjust the description of the operating principles of devices and existing and projected technical means and systems automation, control, monitoring and diagnostics of technological processes and manufactures
- Willingness to participate in the study of objects and systems of technological processes and manufactures
- Willingness to study scientific and technical information, domestic and foreign experience in the development, implementation and operation of automated control systems
- The ability to control the operating modes of the equipment facilities
- Ability to analyze the process as a control object
- The ability to determine the valuation of the main production resources
- The ability to synthesize, analyze, process information, goal setting and selection of ways to achieve it
- Ability to organize the work of the group of performers, decision-making in terms of performing a variety of opinions to determine the order of execution of works
- The ability to perform the valuation of the main production resources, intellectual activity
- The ability to organize and synthesize information on the formation and use of resources of the enterprise

4. Detailed curriculum

| № | Topics | Total, hr | Including | | Final assessment |
|-----|---|--------------|-----------|-----------------------|---------------------|
| | | | Lecture | Practical training | |
| 1. | Introduction | 1 | 1 | - | - |
| 2. | Module 1. The basics of automated control systems of technological objects of gas transportation | 7 | 7 | - | Test |
| 2.1 | General principles of automated control systems of technological objects of gas transportation | 2 | 2 | - | - |
| 2.2 | Cost-effectiveness analysis of automated control systems of technological objects of gas transportation | 1 | 1 | - | - |
| 2.3 | Integration of parts of automated control systems | 2 | 2 | - | - |
| 2.4 | ISO 9001:2008 basic principles and concepts | 2 | 2 | - | - |
| 3. | Module 2. Automation equipment for | 10 | 6 | 4 | Test |

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|-----|--|-----------|-----------|-----------|-------------|
| | technological objects of gas transportation | | | | |
| 3.1 | Basic technological characteristics of a Automation equipment | 2 | 2 | - | - |
| 3.2 | Hardware reliability of Automation equipment: solving and diagnostics, test, methods of ensure and elevation | 4 | 2 | 2 | - |
| 3.2 | Measurement assurance principle | 4 | 2 | 2 | - |
| 4. | Module 3. The modern software for automated control systems of technological objects of gas transportation | 28 | 14 | 14 | Test |
| 4.1 | Review, programmable principle and operation activity of PLC | 4 | 2 | 2 | - |
| 4.2 | Typical architecture, programming principle and operation activity of SCADA-systems. | 4 | 2 | 2 | - |
| 4.3 | Classification, typical architecture, programming principle, operation activity and integration of DCS, MES and ERP-systems of technological objects of gas transportation | 4 | 2 | 2 | - |
| 4.4 | Automation Systems Engineering | 4 | 2 | 2 | - |
| 4.5 | Machine vision systems | 4 | 2 | 2 | - |
| 4.6 | Geographic information systems | 4 | 2 | 2 | - |
| 4.7 | Review of main operator training simulators | 4 | 2 | 2 | - |
| 5. | Module 4. IT technology for automated control systems of technological objects of gas transportation | 8 | 4 | 4 | Test |
| 5.1 | Industrial Data Management and Industrial communication | 4 | 2 | 2 | - |
| 5.2 | Data protection and cyber security of automated control systems | 4 | 2 | 2 | - |
| 6. | Module 5. Energy Management and Energy Savings | 8 | 6 | 2 | Test |
| 6.1 | Energy Management and Energy Savings principles in gas industry | 4 | 4 | - | - |
| 6.2 | Renewable energy sources | 1 | 1 | - | - |
| 6.3 | Using of Variable-frequency electric drive in automated control systems of technological objects of gas transportation | 3 | 1 | 2 | - |
| 7. | Module 6. Physiological aspects of innovation of automated control systems | 8 | 3 | 5 | Test |
| 7.1 | Innovation in the technological processes | 2 | 1 | 1 | - |
| 7.2 | Innovation profiles: Push, pull and clash | 3 | 1 | 2 | - |
| 7.3 | Leadership & innovation | 3 | 1 | 2 | - |
| | Total hours: | 70 | | | |

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|--|--------------------------|-----------|-----------|-----------|-------------|
| | Final assessment: | 2 | | | Test |
| | Total, hr: | 72 | 43 | 27 | |

5. Center of Continuing Professional Education

| № | Name | Education | Professional experience |
|------------------|------------------|---|---|
| Training manager | | | |
| 1 | Blinov Alex | St. Petersburg State Politechnical University, 2000, MSc in scientific fields «Information and Control Systems» | Head of Advanced training center of Mining university, PhD in ec., 13 years of experience, author more than 20 scientific works |
| 2 | Makhovikov Alex | Baltic State Technical University, 1994, Engineer, Automated control of rocket-and-space objects | Head of IT –technological department |
| 3 | Khokhlov Sergey | National University of Mineral Resources «Mining», 1997, Engineer, mining engeneering | Head of the research quality department |
| 4 | Koteleva Natalia | National University of Mineral Resources «Mining», 2007, Engineer, «Automatization of technological process and production» | Assistant of department of technological process and production Automatization of Mining university, PhD in Eng., 6 years of experience, author more than 25 scientific works |
| 5 | Ivanov Pavel | National University of Mineral Resources «Mining», 2005, MSc in scientific fields «Metallurgical» | Assistant of department of technological process and production Automatization of Mining university, PhD in Eng., 8 years of experience, author more than 15 scientific works |
| 6 | Zhukovskiy Yuriy | National University of Mineral Resources «Mining», 2003, MSc in scientific fields «Electrical engineering » | Assistant of department of Electrical Engineering of Mining university, PhD in Eng., 10 years of experience, author more than 40 scientific works |

6. Course facilities

Course facilities: special Educational and Laboratory Complex of the Center of Continuing Professional Education of the Mining University and industrial facility of Gazprom company.