

EDUCATIONAL SYSTEM IN THE FIELD OF UGS

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Background

The issues of professional education of the staff for underground storages (UGS) system exist all over the world.

The UGS sector has been a part of the gas industry for approximately 100 years and its operations are characterized by some specific peculiarities. For example, gas field exploitation causes a constant and gradual decrease in working pressure and a relatively constant withdrawal rate, which is not the case in UGS surface facilities or in their reservoirs. This requires additional efforts for the overhaul and ongoing repair of UGS assets, for diagnostics and for geotechnological inspection. Besides the alternation of maximum and minimum allowable reservoir pressures throughout the year, the mobility and the direction of gas-water contact movement requires the coordination of well construction and overhaul activities with UGS exploitation regimes, and monitoring activity. This means that UGS staff needs specialized knowledge and skills in addition to having standard geological and engineering capabilities.

Underground storage facilities are mostly located close to gas consumers and inhabited districts, and operate with high pressures and gas flow rates generating specific demands for industrial and environmental safety. Modern UGS installations are expensive and complicated industrial facilities. They are equipped with integrated systems, incorporating subsurface and surface technological and geological processes simulation systems in order to allow for fast system analysis and improved performance prognosis. High levels of UGS automation also imply the need for minimal level of staffing.

Aims

No high school trains licensed specialists who might satisfy the broad professional, technical and managerial requirements of a UGS staff member. As a rule UGS companies have to employ specialists with a standard industry educational background: geological, geophysical, drilling, development of oil and gas fields, engineering and process systems, etc. The knowledge of any of these specialists is very specific. At best, they have experience in gas field development and operation.

In Russia the issue has been addressed with an initiative to build specific curricula dedicated to underground gas storage (UGS) competencies.

Since 2006 successive creation of educational programs and training appliances has been going on. They are to provide all-round training, retraining and raising the level of skills for the employees in the field of UGS.

Methods

JSC Gazprom has considerable more than a half century experience in UGS construction and operation and, since 2006, has used this experience to offer curricula designed to provide all-round training and retraining as well as to raise the skill level of UGS staff. Curricula have been developed by JSC Gazprom's Transportation, Underground Storage and Gas Utilisation Department under the control of Professor, Doctor of Sciences O.E. Aksiutin and Candidate of Sciences S.A. Khan. A.E. Arutiunov, adviser general director

“Gazprom UGS” Ltd is also taking an active role. The coordinator of the project is the Head of JSC Gazprom’s Department of Staff Management, E.B. Kasian.

The curricula are jointly designed by JSC Gazprom and organisations which have scientific, intellectual and teaching potential, and which also have appropriate experience and staff to take on the work. Leading educational and scientific centers are involved such as Gubkin Russian State University of Oil and Gas, Gazprom VNIIGAZ Ltd and the Institute of Fuel-Energy Complex Staff Development Issues (ISD FEC).

The following curricula are currently offered:

- A Master’s 2 year program in UGS from Gubkin University’s Gas Technology and UGS Department (with certain studies at Gazprom VNIIGAZ Ltd);
- A program of complementary professional education (about 1,200 hours) leading to a qualification as a specialist in the field of UGS, (ISD FEC);
- A program “Creation and Operation of UGS”. The course of 592 hours was ran by ISD FEC in 2011;
- Two independent programs for raising the level of skills (each comprising 72 hours of tuition) which are taught separately at Gubkin University and Gazprom VNIIGAZ Ltd.

Every curricula is aimed to a specific initial educational level of the students. Lecturers are high skilled specialists from gas industry scientific and industrial organizations Gazprom, VNIIGAZ, Gazprom UGS, Podzemgazprom, ISD FEC, Russian Academy of Science.

These curricula are considered as multiskilled vocational training. The students get experience and knowledge in different lines in the field of UGS.

The students groups are collected according to the requests which come from companies and other organizations operating in the UGS industry. It may be centralized organizations such as “Gazprom UGS”. It unites most of the UGS objects and so all their stuff. It may be a scientific research center the employees of which need specific knowledge.

The nowadays experience shows that having a structured and collected in one curricula disciplines we may take specialists in different fields in one group. And as a result of a rather long period of education, 1-2 years, their knowledge become intrinsic. Particularly it is seen at the thesis defense.

Mostly it’s caused thanks to the curricular order of the disciplines. They follows gradually one after another. The student comes from the basic knowledge in the fundamental hydrodynamics and geology objects to the experience in designing UGS objects and hydrodynamic simulation using modern software.

Certainly it was necessary to have experience of organizing the educational process of the first students groups. The curricula were revised periodically from one group of graduates to another.

Every professor guarantees continuous renewal of his materials at the lectures and other classes. That is provided by every curriculum. So up to 30% of framework curriculum may be changed in order to cover the field of up-to-date geology-technological problems. In its turn 100% of the study at the personnel development courses are to be devoted to the information that is new for the students, to the practical work with modern technical and soft tools.

Evidently the masters in the field of UGS are aimed to scientific research work in scientific and design institutes. Some graduates of the courses are already teaching the next generation of the students themselves.

The courses of complementary professional education and “Creation and Operation of UGS” courses provide the UGS objects with qualified staff, the management offices, engineering centers, dispatcher services. They are the specialists who can make engineering calculations, and accept managerial decisions.

Courses for raising the level of skills help to solve the issue of everyday education. Their aim is to provide the employees of the industry with new knowledge in the techniques and technologies. The two week period of study doesn’t let pay much time to basic

fundamental knowledge. It is considered that students at the courses have secondary special or high education and that they all are the employees of the UGS system. They aren't scientists.

The students groups are collected according to the coming requests. Therefore the organizers reserve the right to limit the minimum and the maximum quantity of students in a group. The continuation of one period the students come to the courses for resident period of education is called "module" and it goes on for two weeks. It's convenient as during this period the main intensive communication with professors is going on and students make current tasks, pass tests after some disciplines, are listening lectures and have classes in laboratories and at the seminars. As a rule between the modules there are two or three months. That time they fulfill tasks and have self-work with literature, communicate with professors via Internet.

It should be noted that there are two kinds of test control for each discipline course. They are intermediate and final tests. They are given by the professors themselves and special commissions are formed for State Final Certifying Examination.

The first information about the courses utility and quality is given by the students themselves, except the masters' courses. The survey may take place after each two week module of study by two survey systems drawn up:

1. by educational supervisors of Gubkin University;
2. by the specialist of JSC Gazprom for quality rating of continuous professional authorized education.

All courses are resulting in thesis defense. Now it's possible to make a conclusion that most successful thesis are those had practical implications and could be realized by the students-graduates in practice.

Many of those who received education in the field of UGS were recommended to continue their education at the post graduate courses. Some of the thesis work results were presented to be put into practice or to be published.

After one has graduated the courses he continues his activities at his place of employment.

Results

In 2008 the first group of specialists graduated the courses and received diplomas as specialists in UGS. Now there are 10 specialists who have graduated as engineers in the field of UGS and 17 Masters have obtained degree in accordance with the program "Underground gas storage". Every year about 25 employees of gas industry who come in touch with UGS issues study at the personnel development courses.

In 2013 thirteen study-method materials for the main 13 disciplines to be prepared by the professors who are realizing the curriculums. This work is going under the editorship of Aksiutin O.E., Doctor of Science, member of the Management Committee, Head of the Gas Transportation, Underground Storage and Utilization Department.

Further development

The development of the professional educational staff system promote to rise the safety and reliability of all the UGS complex.

First of all the interest to the education in the field of UGS is attracted by the employees of this branch of gas industry. Hence age and gender within the group is defined by the current compound of available cadres.

Middle age of the personnel at the Russian UGSs is 40 years old. Young employees under 35 years old inclusive are about 37 %. For the last 4 years there is a tendency of the increase in categories of the personnel under 30 years old and from above 50 years old and the reduction of the personnel at the age from 30 years old till 50 years old.

We are looking forward to organize some courses for groups of specialists formed on the base of mutual interests. These courses will differ from the multiskilled vocational training. It means that one lay or one discipline may be represented for such a group. For example, it may be design of service equipment or geology-hydrodynamic simulation of UGS. The study process will take in account the initial education of the students of the group, so some plane of initial skills and knowledge is to be primary defined.

Such kind of courses is to promote to spread the gathered experience, to introduced modern technologies in a specific field.

The curricula are dedicated to specialists from the CIS and neighboring countries which cooperate with JSC Gazprom. Courses have been developed with a pragmatic approach and students have to know Russian or be ready to study it.

Russian may be taught at the Russian language department of Gubkin University. Furthermore, an International Master's program has been proposed in cooperation with a European university. All lectures will be in English then.

The gas recovery industry is highly developed in Russia. The specialists training for different level is going on in different educational institutions. Employment is status there. It engages much youth. This is important difference from that we have in most of fossil hydrocarbon importing countries.

Experience of international cooperation

Gas transportation system is a transnational and even transcontinental infrastructure with high risks of failure of industrial and environmental safety. It unites many countries with different regulations and norms concerning UGS design, construction and operation. Therefore courses to be organized are not to be only national and professional training. Curricula are to help information exchange with peculiarities in the field of UGS in different countries. The aim of these courses is to receive skills of joint work and to get knowledge which may be specific for each country, to study nowadays approach to the professional issues in different countries.

It's obvious that these arrangements shouldn't be like scientific conferences or work shops but nevertheless the curricula are to contain more about specific international cooperation, for example: legislation controlling activity in different countries, modern technologies being put into practice of the gas supply system. It's possible to say that such kind of courses looks like the courses "over interests". It's important when choosing students for the curricula to know foreign language, English, the field of professional activity, age. The last criteria, the age, is to help students to get familiar and to establish personal relations at the "horizontal" level of professional connections. There courses are more mobile and their curricula can't be considered as exact scheme. They may be systematic or occasional. They may be organized by specialists from different countries together. The place may be chosen as to be comfortable and to satisfy financing.

In 2011 international courses were organized by the countries that are members of the International Gas Union. It was decided to organize IGU WOC2 Young Employees Exchange Programme after the meeting of WOC2 in Saint-Petersburg, Russia, June 2010. The Program was worked out in cooperation with Dr V.Onderka (Czech Republic) who is the leader of Study Group 2.3 "Skills and competencies for UGS activities" WOC2. Courses have started in Moscow on June 20, 2011. All the students weren't older than 30 years and they were employees of UGS from different countries. The first group of students from Germany, Czech Republic, Poland, Slovakia and Russia has gotten Lectures on geological approaches for UGS creation and operation in Russia, each one student was graduated through a final test. After two weeks in Moscow an anonymous survey was made. All the attendees marked that the information received at the courses would help in their work and in developing their professional skills. They took a course of lectures, participated at seminars and visited Kasimov UGS.

Conclusions

It's possible to conclude that firstly the curricula can be classified in accordance with their aims:

- general education – many self coordinated disciplines;
- raising the level of skills – learning of nowadays knowledge and experience in the field of UGS.

They both may be as national so international. There will be requirements how to choose students following the aims of the courses in each of the over named occasions.

The five year Russian experience in realizing professional education system in the field of UGS and the results of the IGU WOC2 Exchange program showed that this field of gas industry needs specific curriculums focused on different educational levels and on different peculiarities of UGS operation and design.

Thus the curricula developed by Gazprom for preparing specialized staff for UGS design, construction and operation could be a part of common system for the manpower development needed to serve the united Eurasian gas supply system.