Advances in Economics, Business and Management Research, volume 47
International Scientific Conference "Far East Con" (ISCFEC 2018)

Bachelors' Training in the Field of Building Engineering Systems in Conditions of Extremely Low Temperatures

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***Abstract*— Experience of bachelors' training in heat, gas supply and ventilation in the Republic of Sakha (Yakutia) is considered in the article. Operation of engineering systems in the region is characterized by severe climate conditions: permafrost, difference in temperature from - 71°C (winter period) to 38 °C (summer period), daily fluctuations of temperature, strong winds up to 50 m/s. Such special conditions impose the increased requirements to reliability and efficiency of house and public utilities. Training in special disciplines at NEFU is divided into three broad categories: theory, scientific activity and work practice. This article describes content and conditions of educational and scientific activity; level of applied equipment and material resources; results of students' scientific conferences, exhibitions and competitions; cooperation with employers and production structures.**

Keywords*— *training of bachelors, engineering, extreme climate conditions, engineering systems of buildings and constructions, heat and gas supply, ventilation

I. INTRODUCTION

Operation of various engineering constructions, buildings and communications in the conditions of the Republic of Sakha (Yakutia) is complicated by sharply continental climate: low temperatures of winter and high temperatures of summer, big scope of annual and daily amplitudes. Air temperature in settlements of Yakutia is in range from – 50 + 30 °C. Absolute amplitudes of air temperature change in Tiksi from 84,8 degrees to 104 degrees to Verkhoyansk. Such specific climatic conditions request increased requirements to the systems of housing-and-municipal gas economy, power consumption and energy saving. Modern engineering systems must provide not only trouble-free operation, but also a possibility of consumption control of hot and cold water, gas, thermal energy as in general on the building, and in each apartment, office and room. The solution of similar technical tasks is possible only on the basis of fundamental knowledge of hydraulics, thermodynamics, heat exchange, heating, ventilation, gas supply, air conditioning and other disciplines which are taught by the Department of heat and gas ventilation. Training of the bachelors on this direction always remains demanded for ensuring comfortable activity of people in the North.

The main special disciplines related to the internal engineering systems of buildings are "Heating", "Ventilation", "Air conditioning and cold supply". From the schedule it is clearly seen that on discipline "Heating" the average score is higher than 74, thus we can characterize that heating in northern conditions plays vital role. Students constantly show great interest to this discipline. Additionally, they gain a lot of knowledge during their educational and production practices. Increasing of scores on discipline "Conditioning and cold supply" is caused by introduction of new technologies and equipment, so deep interest to study such discipline is explained by this fact. Discipline "Ventilation" is essential one in curriculum because of practical, scientific and laboratory researches. So, various conditions, problems of engineering systems in special climatic conditions are studied and investigated [1-5]. The analysis of students' performance on special disciplines gave us the following results (See Fig. 1).

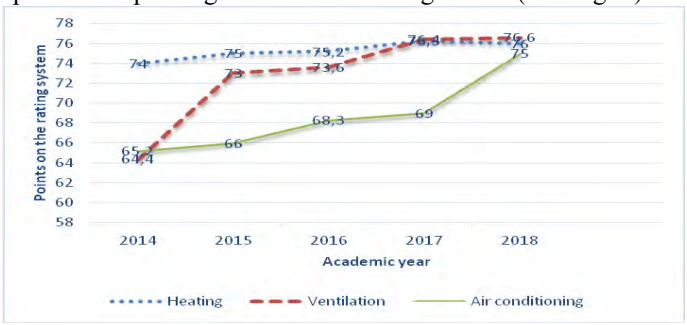

Fig. 1. Indicators of the studied disciplines

There are two educational laboratories at the department training bachelors in heat, gas supply and ventilation: hydraulics, aerodynamics and energy audit. Both laboratories have modern equipment to perform works on basic courses and pilot studies. Small innovative enterprise "Teplokomfort" is in charge for scientific and practical activity. Its activities include engineering improvement of houses, installation of heating systems and water supply, water disposal and alternative energy sources, power inspections and development of power passports of various buildings in districts of the republic and in Yakutsk, thermo vision inspection of buildings and constructions, solution of problems connected with operation of engineering systems in the conditions of extremely low temperatures.

All students gain invaluable knowledge of the chosen future profession through practice work: they conduct various researches, make complex calculations and analyses of the studied objects. Besides students participate in various conferences, exhibitions and competitions of regional and Russian scale. Important current problems of energy saving,

and energy efficiency of buildings are touched including experience of foreign countries [6-15].

CONCLUSIONS

The department pays special attention to expansion of a framework of partnership with the enterprises. Regional housing and public utilities and JSC Sakhatransneftegaz are basic employers of our specialists. More than 400 graduates of the department –Heat and gas ventilation" work in housing sector across all territory of the republic. JSC Sakhatransneftegaz is the largest republican company, its primary activity is transportation of gas through the main gas pipelines, operation of gas-distributing networks in cities and settlements. It occupies one of the key positions in social and economic development of Yakutia. Forms of cooperation between employer and the department are various. We have signed contracts on cooperation, our bachelors have an opportunity to pass work practice at enterprises in housing and public utilities sector. Excursions and workshops at the enterprises of various profile are very widespread. Seminars give the chance to get new important information and exchange of experience [16-20]. Joint cooperation increases the level of employment of graduates, their faster adaptation to production life. Thus, the directed preparation on special disciplines gives the necessary level of knowledge and skills for future bachelors of heat, gas supply and ventilation in their professional activity.

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