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International Toktomamatov University in Jalal-Abad
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This is a compilation of the materials of the V International Scientific-Practical Conference "Integration of the Scientific Community to the Global Challenges of Our Time", that was held in Tokyo, Japan, on February 12-14, 2020.

Submissions cover a wide range of issues, primarily the problem of improving management, sustainable economic development and introduction of innovative technologies, improved training and enhancement of the development of "human capital", interaction between the individual and society, psychological and pedagogical foundations of innovative education.

Materials addressed to all those interested in the actual problems of management, economy and ecology, social sciences and humanities.

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SECTION II / СЕКЦИЯ II

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EXACT SCIENCE, TECHNIQUE AND TECHNOLOGY AT THE PRESENT STAGE / ТОЧНЫЕ НАУКИ, ТЕХНИКА И ТЕХНОЛОГИИ НА СОВРЕМЕННОМ ЭТАПЕ

2.1. An Experimental Plant for Cooling the Condenser with Effective Radiation

Alexandr Tsoy
Candidate of Technical Science, Almaty Technological University
(Kazakhstan, Almaty)
Alexandr Titlov
Doctor of Technical Sciences, Professor.
National Academy of Food Technologies
(Ukraine, Odessa)
Rita Jamasheva
Doctoral Candidate, Almaty Technological University
(Kazakhstan, Almaty)
Inara Kim
Candidate of Technical Science. Almaty Management University
(Kazakhstan, Almaty)
Janbubi Karataeva
Lecturer. Almaty Technological University
(Kazakhstan, Almaty)

The energy efficiency of the refrigeration system depends on the schematic solution and climatic conditions when using natural cold.

An important element in the refrigeration system is the condenser. The use of condensers with water or air cooling of refrigeration systems is the most common way to remove the heat of condensation. The results of the analysis and research of air and water condensers can also be found in such works by the authors as: Guidi T.K., Fumo N., Carvalho M., Eidan A.A., Timofeevsky L.S., Danilova G.N., V.A. Maksimenko [1, 2, 3, 5, 6, 7]. Exist cases of joint use of air and water condensers in combined cooling schemes. This allows us to reduce the total annual cost of electricity and water in comparison with the well-known classical schemes in which only one type of condenser is used [13]. One of the first who proposed the use of combined cooling of the condensation unit was E.T. Petrov [11]. In his work, he notes that the most important task in the design process of refrigeration units with an air-cooled condenser is the choice of the schematic solution of the cooling node and refrigerant condensation. The effectiveness of combined cooling has been proven in the works of such authors as Bulatova D.A., Kabakov A.N., Maksimenko V.A., Fot A.N. [8, 9, 10]. To increase the efficiency of the refrigeration unit, it is proposed to install a liquid-cooled condenser in series with the air-cooled condenser [18]. To date, little attention has been paid to the influence of the input parameters of the steam on the efficiency of the apparatus. With an increase in the condensation pressure in the summer period, steam overheating at the inlet to the apparatus can have a significant effect on the nature of the condensation process and on the overall performance of the refrigeration unit. The results of researches on this issue can be found in [12]. The condensation temperatures recommended in the known works have a limited range of joint solutions for water and air-cooling condensers and give different values of the recommended design condensation temperatures, which is unacceptable for a combined scheme of condenser cooling. In researches [13] are given the possibilities of increasing the efficiency of combined systems of condenser cooling.

However, the known methods do not allow at the design and operation stages to determine the most effective structural and operational parameters of the refrigeration system, which is associated with the uncertainty of the calculated value of the condensation temperature [13].

In the above works, the installation for cooling the water (liquid) of the condenser is not sufficiently investigated. In this regard, a study is being conducted on a liquid cooling system that uses effective radiation and convective heat removal by the surrounding cold air. [14,15]. At night, when the air temperature is lower than the daytime by 10-150 C, the coolant is cooled (propylene glycol, water) with cold air and effective radiation (radiation cooling). To study the possibility of improving the efficiency of a steam compression refrigeration machine, a scheme of an experimental installation was developed, presented in figure 1.

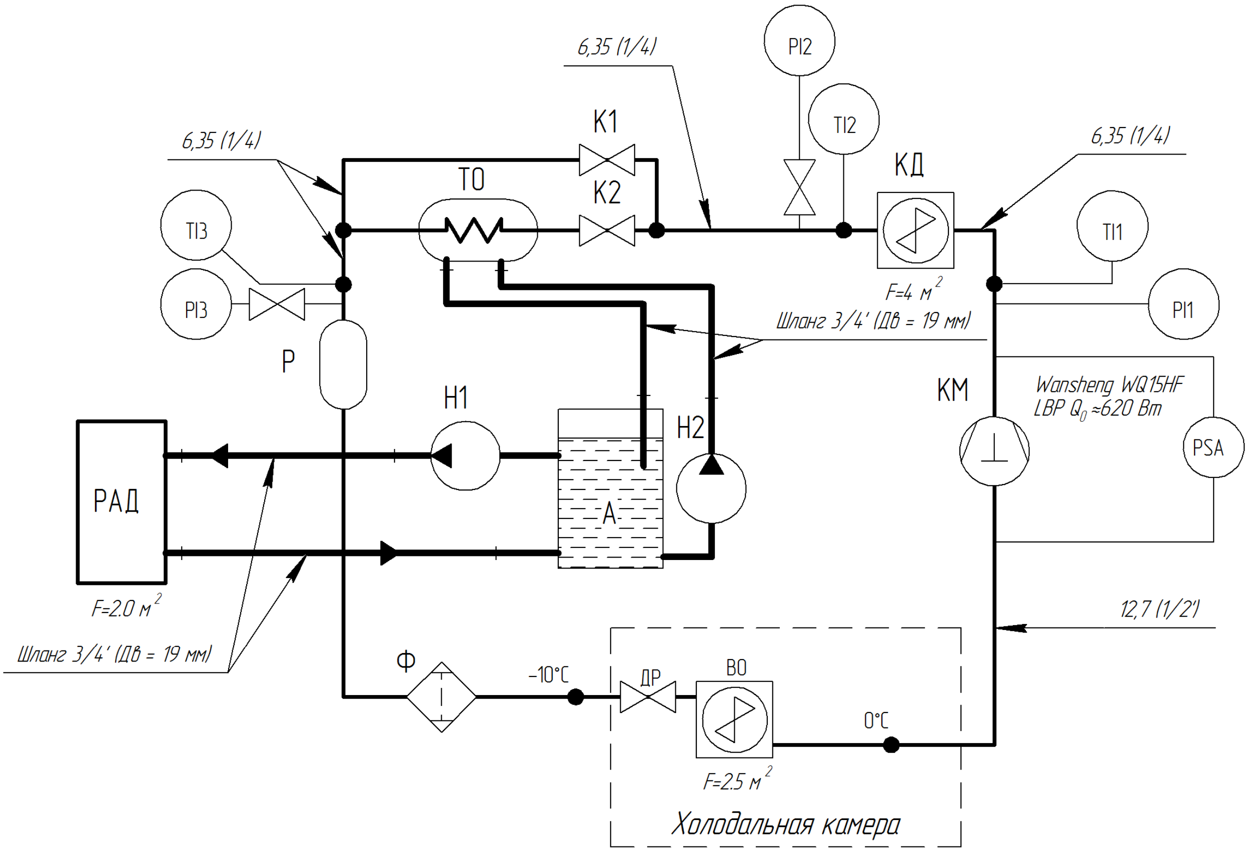

Figure 1 – Diagram of the experimental installation: A – cold storage; BO – air cooler; ДР – throttling device (capillary tube) K1, K2 – ball valves; КД – air cooling condenser; KM – compressor; H1, H2 – circulation pumps; P – linear receiver; РАД – radiator; Ф – filter-dryer; PI1...PI3 – pressure gauge; TO1 – heat exchanger (liquid cooling condenser); TI1...TI3 – thermometer; PSA – double-block pressure switch

An experimental installation using radiation cooling consists of a radiator (РАД), a cold storage battery (A), a liquid cooling condenser (TO), an air cooler (BO) for removing heat from the cooled object, as well as pumps (H1, H2) and pipelines for moving the coolant.

At night, the coolant is pumped through the radiator, where it is cooled. After that, it is fed to the cold storage battery (A), where it is stored until its subsequent use. During the period with the highest temperature of atmospheric air, the coolant is fed to the liquid cooling condenser (TO). It is especially important to use the accumulated stock of the cooled coolant during the peak period to remove the heat of condensation. The installation of such a design can be used to obtain relatively low condensation temperatures depending on climatic conditions. In a hot summer climate [16,17] there is a problem associated with an increase in the condensation pressure in steam compression refrigerating machines (SCRM), which in turn causes a decrease in the cooling coefficient and an increase in the energy consumption of the compressor. Reducing the condensation pressure will also reduce the risk of shutting down the refrigerating machine due to high condensation pressure.

Thus, it is assumed that in the daytime the condensation temperature will be maintained at 35...40°C (figure 2), while in the absence of a liquid cooling condenser, it can rise to 50°C or more. In addition, the ability to change the ratio of thermal loads between air and liquid cooling condensers allows you to increase the cooling capacity of the installation in the summer.

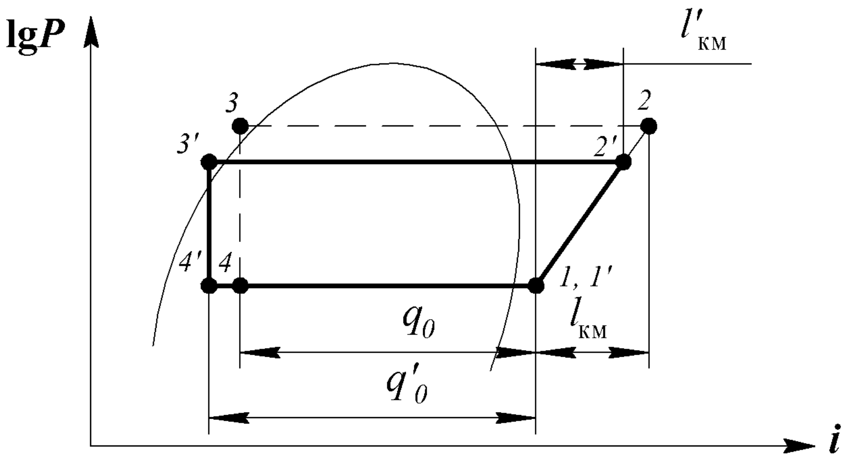

Figure 2 – The cycle of a low-temperature condensing refrigeration machine with radiation cooling

Figure 2 shows the cycle of a refrigerating machine with an air-cooling condenser; 1', 2', 3', 4' – cycle with low temperature condensation due to radiation cooling.

Also, at different temperatures of the cooling media, it is possible to switch the sequence of passage of the condensing refrigerating agent through the air and liquid cooling devices. At different values of the outdoor air temperature and the coolant temperature, the air and liquid cooling condensers operate in different sequences. This ensures more reliable and cost-effective operation of the installation.

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2.2. Mineral-Primary Import Substitution in Ceramic Granite Production

Begen O. Yessimov
Doctor of Geological-Mineralogical Sciences, Professor, Head of "Technology of Cement, Ceramic and Glass" Chair, M. Auezov South Kazakhstan State University (Shymkent, Kazakhstan)
Bekzhan O. Adyrbayev
PhD Student of "Technology of Cement, Ceramic and Glass" Chair, M. Auezov South Kazakhstan State University (Shymkent, Kazakhstan)
Zhaksylyk T. Kalmat
Master Student Of "Technology of Cement, Ceramic and Glass" Chair, M. Auezov South Kazakhstan State University (Shymkent, Kazakhstan)
Seksenali K. Aldaberganov
Master in Geochemistry, Head of Laboratory of ZERDE-Ceramics LLP (Shymkent, Kazakhstan)

Ceramic granite in the Republic of Kazakhstan is among the priority activities for the production of non-metallic mineral products, as a new type of competitive building material with high added value [1].

Ceramic granite belongs to the class of ceramic materials, however, the features of production and appearance, as well as high performance characteristics allow to talk about it as a separate kind of coatings. It is even called an artificial stone.

Compared to classic ceramic tiles, ceramic granite has higher wear resistance, resistance to mechanical and climatic influences, frost resistance, and resistance to ultraviolet radiation. It is characteristic that the material has extremely low water absorption, which is explained by its dense structure. Ceramic granite does not respond to acids and alkalis, even in concentrated form. Its highest mechanical strength allows to use the material in difficult conditions. Ceramic granite prevents the spread of fire.

The production of ceramic granite is a high-tech process. It is obtained from kaolin, white-burning clays, feldspars and quartz sands.

Currently, ZERDE-Ceramics LLP plant, equipped with the latest technology from the Italian company Barbieri & Tarozzi, is the only ceramic granite producer in Kazakhstan. Its production capacity is about 2 million square meters of ceramic granite per year, which is about 40 percent of the total needs of the country [1].

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