Proceedings of International Scientific Conference on Multidisciplinary Studies
Hosted online from Moscow, Russia
Date: 11th August, 2023
ISSN: 2835-5733 **Website:** econferenceseries.com

ANALYSIS OF HEAT ENERGY PRODUCTION AND ITS CONSUMPTION DURING DRILLING OPERATIONS.

Juraev R. U.
Doctor of Technical Sciences, prof., Navoi State
Mining and Technology University, Navoi, Uzbekistan

Raikhanov Sh. Z.
The Almalyk branch of Tashkent State Technical University,
Almalyk, Uzbekistan

Annotation

Improving the operational energy efficiency of drilling equipment, reducing the time for exploration and exploration of mineral deposits, and reducing fuel and energy costs for exploration has great scientific and practical importance.

This article presents an analysis of the production of energy in the form of heat released during the operation of the internal combustion engine of a diesel power plant used in drilling operations and its consumption.

Keywords: Diesel power plant, heat, utilization, internal combustion engine, fuel-energy, energy losses, drilling, thermoelectric generator, flue gases, energy losses.

Today, with the increase in the weight of drilling operations, the need for energy resources of drilling equipment and process equipment has also increased. In the cold seasons of the year, along with electricity, heat energy is also consumed in large quantities.

The duration of the period with low temperatures (–5÷10 ^{0}C) averages 4-5 months (November-February), during this period the consumption of energy resources used for heat production increases significantly, that is, more than 25-30 % of the electricity generated by diesel power plants is consumed by heating appliances. That is, the bulk of the generated heat is used to heat the drilling fluid, it is observed that the drilling fluid freezes at low air temperatures, its viscosity increases, or its elements lose their properties. This, in turn, leads to a decrease in drilling efficiency. Another significant part of the generated heat is spent on heating technological and utility buildings during drilling, where it is used to heat the sleeping places of drilling

ISSN: 2835-5733 Website: econferenceseries.com

personnel, generate hot water for their consumption, and maintain the temperature of process equipment.

The electricity required for drilling operations in areas remote from the centralized power supply system is generated by autonomous mobile diesel power plants. Thermal energy is generated by using coal or other combustible products in small heating devices. However, in most cases, electric heaters are used due to problems with providing drilling sites with combustible products (mainly related to transportation, lack of coal and firewood, and other problems).

Despite the ease of use of electric heaters, this leads to the fact that drilling operations exceed energy costs, since the price of diesel fuel from diesel power plants that generate electricity is high, and their efficiency in most cases does not exceed 30-35 %, which makes the use of electric heaters inefficient, used for heating during drilling operations.

Analysis of heat consumption of drilling and technological equipment during drilling operations in cold weather. At the same time, the one-day heat consumption of the drilling site with 8 personnel working in 3 shifts was studied, and the results are presented in table 1.

Table 1.

Heat capacity of technological processes of drilling operations

№	Type of heat consumption	Conditional character	Total consumption per day (kW)
1	Energy consumption for heating residential buildings	E_{Heat}	192
2	Energy consumption for hot water supply	E_W	48
3	Energy consumption to ensure temperature regimes of technological equipment	E_{TE}	120
4	Energy consumption for heating washing liquids	E_{WL}	240
5	Energy consumption for other types of heat	$E_{other.}$	20

ISSN: 2835-5733 Website: econferenceseries.com

Figure 1 shows the amount of electricity used by the drilling site for obtaining heat energy for various purposes in the form of a diagram.

E_{Heat} - energy consumption for heating residential buildings (kW); E_W - energy consumption for hot water supply (kW); E_{TE} - energy consumption for ensuring the temperature regimes of technological equipment (kW); E_{HD} - electricity consumption for heating detergents (kW); $E_{other..}$ - energy consumption for obtaining other types of heat (kW).

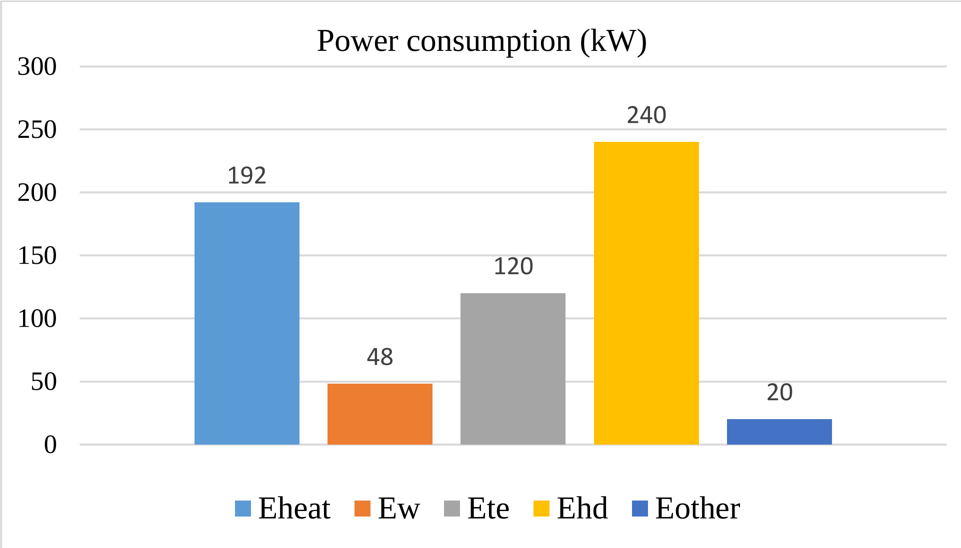


Figure 1. The amount of energy used in a day to generate heat in drilling operations.

As can be seen from the diagram of the amount of energy used for obtaining heat in the mechanical work, presented in figure 1 above, a large amount of energy is needed to heat the washing liquid and the air in the cold circuit, to heat the residential and other buildings, and also to ensure the technological temperature regime equipment. When carrying out drilling operations in hard-to-reach areas, two types of heating systems are mainly used for heating residential and technological buildings, as well as for obtaining hot water for technological purposes, water heating and steam. These heaters use a significant amount of fuel to produce high water or steam temperatures. In most cases, due to the difficulty or shortage of coal and other fuel materials, electric heaters are used.

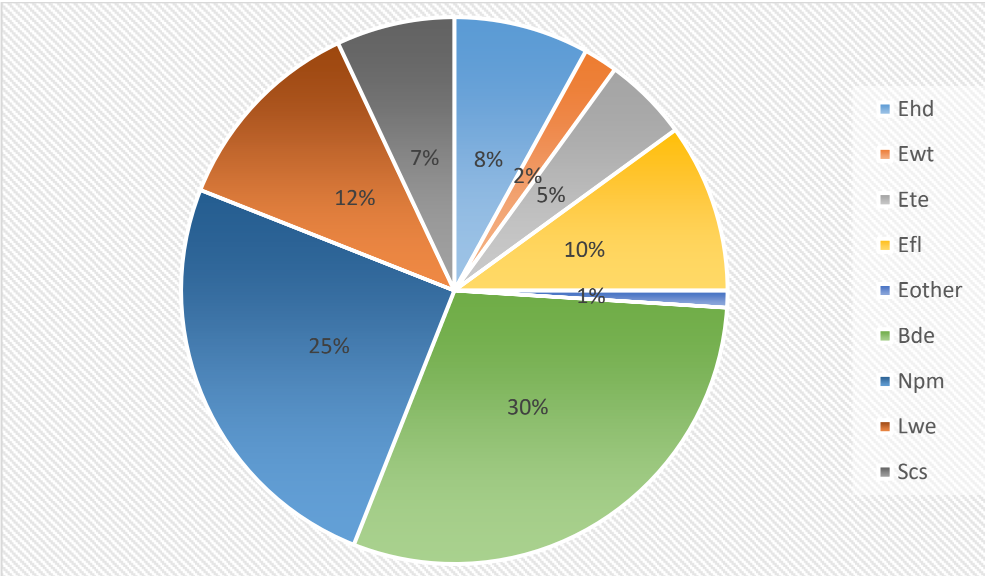
When cleaning and drilling wells with flushing fluids, special heaters are used to heat them so that flushing fluids do not freeze at low air temperatures, and their

ISSN: 2835-5733 **Website:** econferenceseries.com

viscosity does not increase as a result of cold, which also leads to an increase in energy consumption, as mentioned above.

As can be seen from the results of the above analysis, resource savings can be achieved by reducing the energy resources used for the above purposes.

When drilling in hard-to-reach areas, in most cases, an autonomous power plant the brand of DES-100 with a capacity of 100 kW is used for energy supply. During the low-temperature (–5÷10 °C) period of the year, on average, about 25–30% of the electricity generated by a diesel power plant is spent on heating, and the remaining 70–75% is used to provide electricity for transportations and other equipment. On fig. 2 shows the share of total energy resources used in drilling operations, in percent.



E_{HD} - energy consumption for heating domestic buildings (8%); E_{WS} - energy consumption for hot water supply (2%); E_{TE} - energy consumption for ensuring the temperature regimes of technological equipment (5%); E_{FL} - energy consumption for heating the flushing liquid (10%); $E_{other.}$ - energy consumption for other types of heat (1%); B_{DE}.-energy intensity of the engine of drilling equipment (30%); N_{PM}.- energy consumption of the pump motor (20%); L_{WE}.-energy intensity of the winch engine (12%); S_{CS}-energy intensity of the washing liquid circulation system (7%).

As shown in Figure 2 above, the share of energy resources used in drilling operations shows that about 30% of the total energy resources used to operate drilling equipment during the transition period of wells is used to generate thermal energy. This, in turn, leads to an increase in energy consumption for the operation of drilling equipment by 30%. By saving or reducing the share of energy resources used to generate thermal energy during drilling operations, it will be possible to reduce the fuel and energy costs for drilling operations and thereby achieve the efficiency of drilling equipment.

References

1. Джураев Р.У., Меркулов М.В. О возможности применения вихревых труб при бурении геологоразведочных скважин // Известия Вузов. Геология и разведка. Москва. 2013. №3. С.76-78.
2. Джураев Р.У., Меркулов М.В. Нормализация температурного режима скважин при бурении с продувкой воздухом // -Навоий. «А. Навоий», 2016.
3. Головин С.В. Повышение эффективности разведочного бурения путем оптимизации теплоутилизационных систем автономных энергетических комплексов // Дисс. …канд. техн. наук. – Москва. 2016. – 174 с.
4. Джураев Р.У., Меркулов М.В. Утилизация теплоты ДВС привода компрессора и избытков воздуха при бурении геологоразведочных скважин с продувкой воздухом // Горный информационно-аналитический бюллетень - ГИАБ, №7. Москва. 2016 г. С. 186-192.
5. Джураев Р.У., Меркулов М. В., Косьянов В. А., Лимитовский А. М. Повышение эффективности породоразрушающего инструмента при бурении скважин с продувкой воздухом на основе использования вихревой трубы // Горный журнал. – Изд. «Руда и металлы». – Москва, 2020. – №12. С. 71-73. DOI: 10.17580/gzh.2020.12.16
6. Merkulov M.V., Djuraev R.U., Leontyeva O.B., Makarova G.Y., Tarasova Y.B. Simulition of thermal power on bottomhole on the bases of experimental studies of drilling tool operation // International Journal of Emerging Trends in Engineering Research. Volume 8, No.8, 2020. – pp. 4383-4389.
7. Меркулов М.В. Косьянов В.А. Теплотехника и теплоснабжение геологоразведочных работ: Учебное пособие. – Волгоград. Ин-фолио, 2009. – 272 с.