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THE LOOP WITH HEAT RECOVERY OF DIESEL GENERATOR LUBRICATION SYSTEM

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ЦИКЛ С РЕКУПЕРАЦИЕЙ ТЕПЛА СИСТЕМЫ СМАЗКИ ДИЗЕЛЬНЫХ ГЕНЕРАТОРОВ

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Abstract. In recent years, with the increasing severity of energy problems, more and more energy–saving technologies and enhanced heat transfer methods have been valued. Pulsating flow enhanced heat transfer technology as a branch of enhanced heat transfer, has a wider application background in industrial production and living areas.

In the research process of this paper, an experimental platform is built according to the requirements of pulsating enhanced heat exchange and dual-circuit cooling. Through the experimental research on the double-loop air cooling of the fluid in the tube with pulsation, the influence of various parameters and pulsating characteristics of the pulsating fluid on the enhanced heat transfer is analyzed; the temperature of the inlet and outlet of the device under normal conditions and the flow of the fluid under the condition of pulse are measured through a temperature sensor. The outlet temperature was compared with the analysis, and the measurement data was calculated and analyzed.

Experimental results show that the pulsation of the fluid has a significant effect on the heat transfer effect, and the effect of the flow rate on the pulsation enhanced heat transfer is significant. When the flow rate is small, the phenomenon that the fluid does not generate pulsation or pulsation is relatively weak, which cannot cause strong disturbance of the fluid in the heat exchange section, so that the heat exchange cannot be enhanced, and even the heat exchange is weakened; as the flow rate gradually increases, the heat transfer coefficient is enhanced.

Аннотация. В последние годы с ростом серьезности энергетических проблем было оценено много энергосберегающих технологий и усовершенствованных методов теплопередачи. Технология теплопередачи с пульсирующим потоком как отрасль повышенной теплопередачи имеет более широкое применение в промышленном производстве и жилых помещениях.

В процессе исследования в работе построена экспериментальная платформа в соответствии с требованиями пульсирующего расширенного теплообмена и двухконтурного охлаждения. Проанализировано влияние различных параметров и пульсирующих характеристик пульсирующей жидкости на усиленный теплообмен путем экспериментального исследования охлаждения воздуха в трубе с пульсированием двойного контура; температура входа и выхода устройства в нормальных условиях и поток жидкости в условиях импульса измеряются через температурный датчик. Температура на выходе сравнивалась с анализом, и данные измерений были рассчитаны и проанализированы.

Экспериментальные результаты показывают, что пульсация жидкости оказывает значительное влияние на эффект теплопередачи, и влияние скорости потока на улучшенную теплопередачу при пульсации является значительным. Когда скорость потока мала, жидкость не генерирует пульсации или пульсации относительно слабые, что не может вызвать сильное возмущение жидкости в секции теплообмена, так что теплообмен не может быть усилен, и даже теплообмен ослаблен; по мере увеличения скорости потока коэффициент теплопередачи постепенно увеличивается.

Keywords: diesel generators, pulsation, double-loop, enhanced heat transfer.

Ключевые слова: дизель-генераторы, пульсация, двойной цикл, повышенная теплопередача.

Introduction

During the operation of an automobile engine, due to changes in the ambient temperature, the combined effects of the use of a maintenance kit, operation, and load, as well as the limitations of the cooling water pump that can only operate with the operation of the engine, it is easy to cause the engine to warm up slowly, Blue smoke, overheating, etc. In the transportation process, automobile engines frequently mutate from heavy load to idling. At this time, the cooling system of the traditional engine is limited by the crankshaft drive, the speed is low, and it does not dissipate heat, which can easily lead to overheating of the engine [1-4].

In order to solve the above problems, In view of the widespread preheating of domestic truck engines, the serious environmental pollution caused by exhaust emissions, and the overheating problems that occur during low-speed and high-load conditions, the article changes the traditional single-circuit cooling system of the engine to a Double-loop cooling system for cylinder heads and cylinders. The temperature was separately controlled, and the cooling system's drive and control methods were improved and explored [5].

Material and research methods

Through the experimental research on the double-loop air cooling of the fluid in the tube with pulsation, the influence of various parameters and pulsating characteristics of the pulsating fluid on the enhanced heat transfer is analyzed; the temperature of the inlet and outlet of the device under normal conditions and the flow of the fluid under the condition of pulse are measured through a temperature sensor [6-8]. The outlet temperature was compared with the analysis, and the measurement data was calculated and analyzed. The following Figure 1 shows the structure of the entire device [9-12].

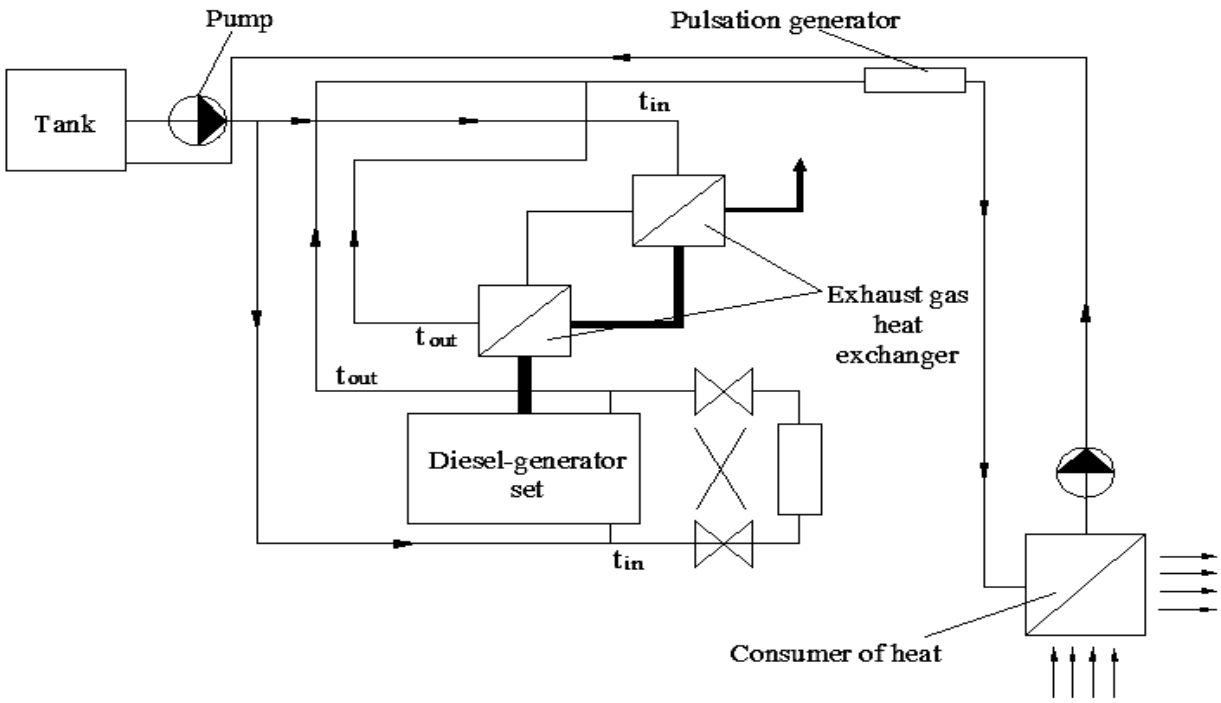

Figure 1. Structure of Double-loop air cooling of diesel electric-power generator with the pulse regimen.

Results and discussion

Figure 2 is the comparison curve of the outlet temperature of the engine water jacket under normal operating conditions and with a pulse mechanism.

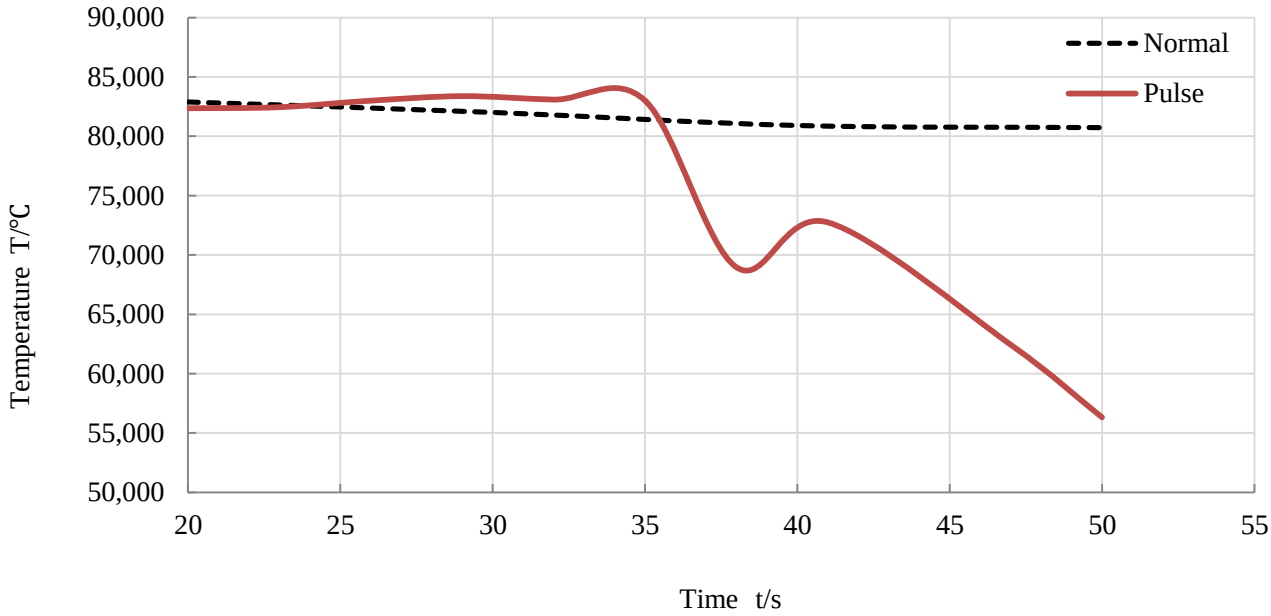

Figure 2. The outlet tmeperature of engine water jacket.

Figure 3 is the comparison curve of the inlet temperature of the engine water jacket under normal operating conditions and with a pulse mechanism.

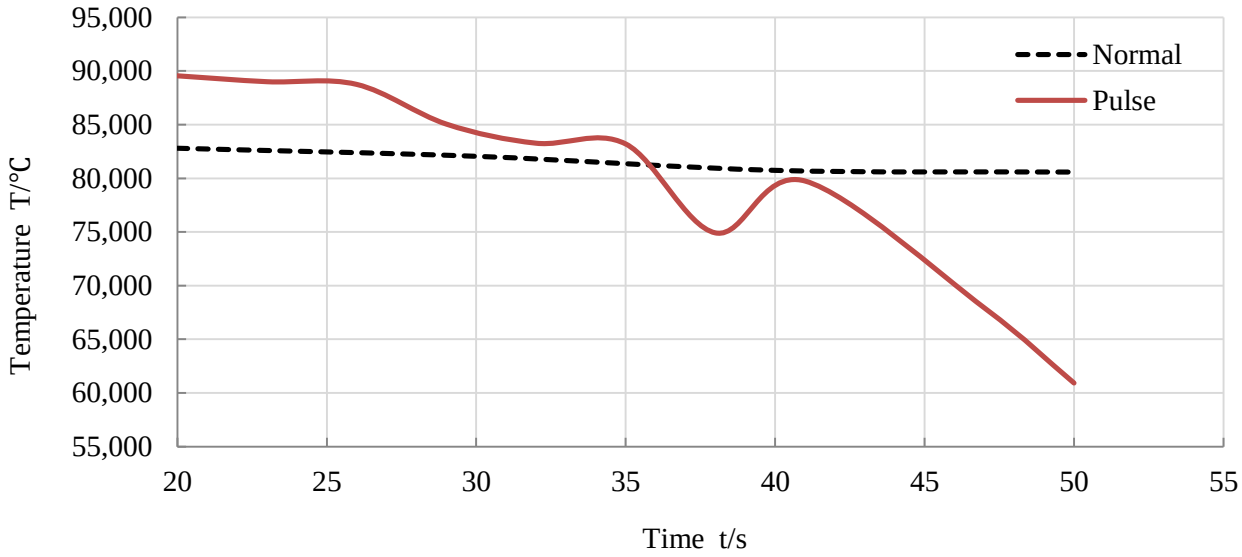

Figure 3. The outlet tmeperature of exhaust gas heat exchanger.

Figure 4 is the comparison curve of the outlet temperature of the exhaust gas heat exchanger under normal operating conditions and with a pulse mechanism.

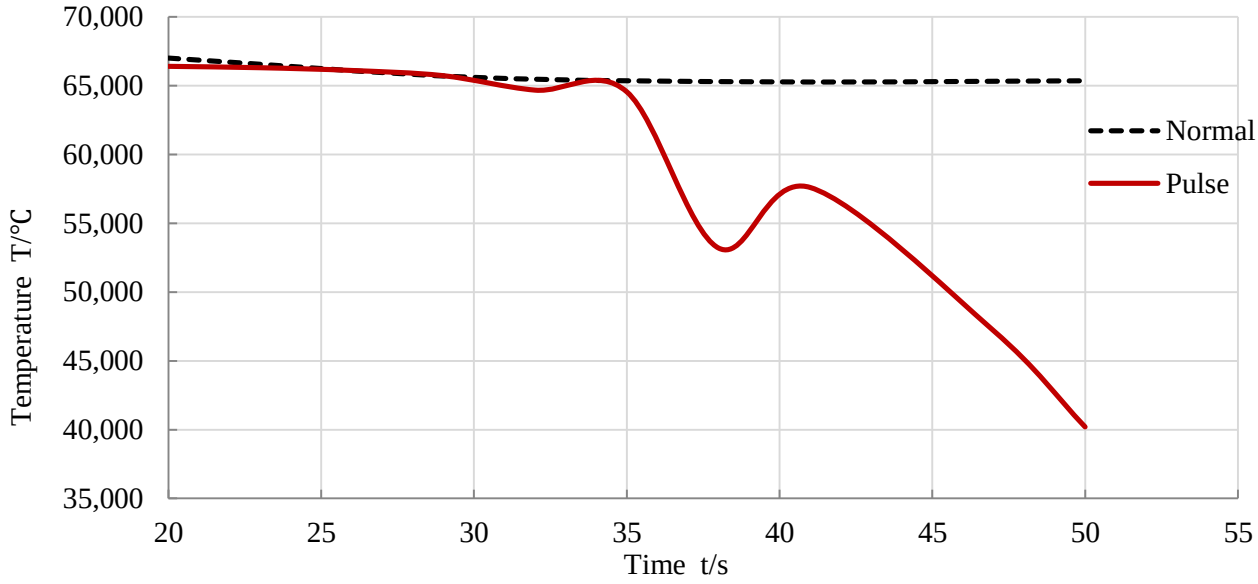

Figure 4. The inlet tmeperature of exhaust gas heat exchanger.

Figure 5 is the comparison curve of the inlet temperature of the exhaust gas heat exchanger under normal operating conditions and with a pulse mechanism.

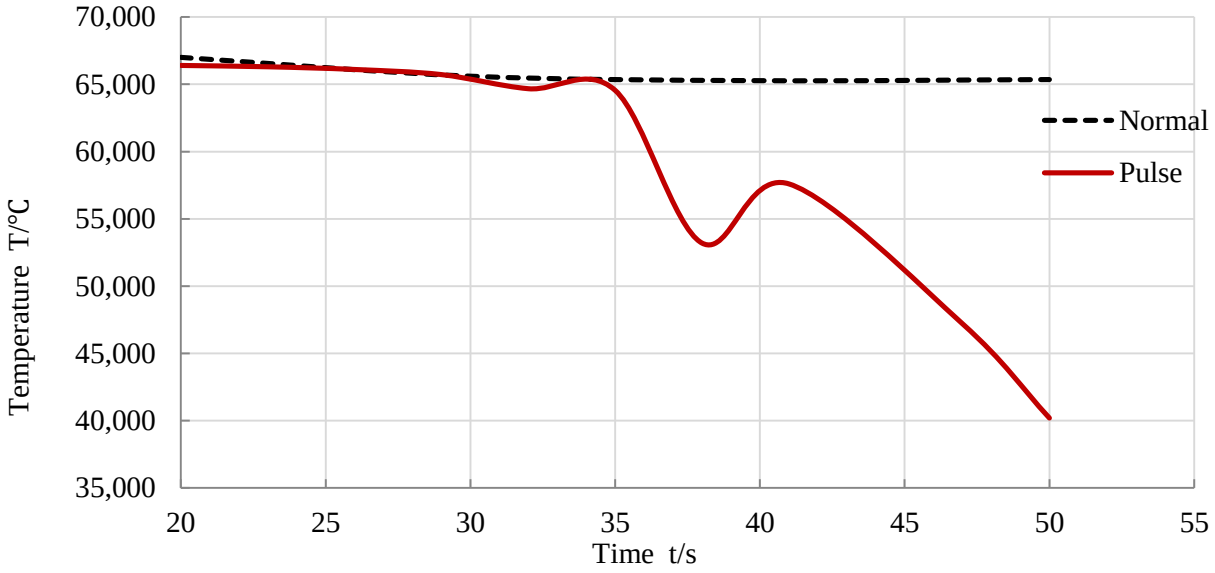

Figure 5. The inlet tmeperature of exhaust gas heat exchanger.

Conclusions

1. When the flow rate is small, the phenomenon that the fluid does not generate pulsation or pulsation is relatively weak, which can not cause strong disturbance of the fluid in the heat exchange section, so that the heat exchange cannot be enhanced, and even the heat exchange is weakened;

2. As the flow rate increases, the heat transfer coefficient increases and the heat exchange effect becomes more pronounced. The pulsation of the fluid has a significant effect on the heat transfer effect, and the effect of the flow rate on the pulsation enhanced heat transfer is significant.

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