

ADVANTAGES AND DISADVANTAGES OF LIQUID AND AIR COOLING SYSTEMS

Kravchenok I.A., student

Scientific supervisor – Tsimafeyeva-Moran Yu.V., senior lecturer

English Language Department №1

Belarusian National University of Technology

Minsk, Republic of Belarus

When the tractor is running, it is necessary to maintain the optimal engine temperature, otherwise the engine will overheat. When overheating, the wear rate of parts (cylinders, pistons, etc.) increases and this happens due to the fact that engine parts begin to interact with hot gases, as a result of which the lubricant of the parts burns out, as well as fuel consumption increases.

The negative consequences of overheating can be avoided if the hot engine parts are cooled [1, 2].

Engine cooling eliminates overheating problems, but the engine must not be overcooled. If the engine is overcooled, engine power and heat is lost.

At low temperatures, fuel is difficult to ignite and does not burn well. Furthermore, overcooling increases wear [1, 2]. Liquid and air cooling system is used to maintain the optimum engine temperature at all times [1, 2, 3].

A *water cooling system* uses antifreeze or water as a coolant. There are two types of water systems, which are distinguished according to the method of water circulation: *thermosiphon* and *forced cooling systems*. In a *thermosiphon cooling system*, water circulation occurs due to the different densities of hot and cold water. T

he advantages of such a system are simplicity of construction and effective engine warm-up at start-up. Such a system is used on starting engines PD-10U, P-350, P-23. In a *forced cooling system* water circulation occurs due to the action of the water pump, which distributes water through the water distribution channel into the engine jacket. The heated water flows into the radiator, where it is cooled and returns back to the pump. This system is used on D-36, D-24 and D-14 engines [1, 3, 4].

The essence of the *air cooling system* is that the cylinders are designed in such a way that their heads are marked with ribs that are located along the direction of air flow. Thanks to the ribs, the area of the heated surface that comes into contact with the air increases, so the heat output is better. The ribs can be positioned both along and across the cylinder. The air system has advantages and disadvantages. The strength of this system is that it is simple and reliable, because this whole system is a ribbed cylinder.

However, despite its simplicity, there are significant disadvantages of this system. They are low efficiency and impossibility of its use on powerful engines, the reason for which is the low heat capacity of air and for that reason poor heat dissipation. T-25A and T-40 M tractor engines use the air cooling system [1, 2].

Water cooling increases heat transfer, resulting in lower heat stress of parts, better filling of cylinders, pistons can be installed with less clearance, which reduces oil consumption, but at the same time *air cooling* is used more frequently than water cooling.

Air-cooled engines have smaller dimensions and weight, as in this system there are no parts of water cooling (radiator and engine jacket), easier to maintain, the engine is more wear-resistant, as it warms up quickly after start-up and is more sensitive to changes in ambient temperature; in addition, the starting qualities of the engine with a good warming of the air sucked into the cylinders is better. Hence, air-cooled motors are beginning to be used on tractors [2, 3, 4].

References

1. Tractor engine cooling system [Electronic resource] – Mode of access: <http://texnika.megapetroleum.ru/sistema-oxlzhdeniya-dvigatelya-traktora>. – Date of access: 20.03.2024.
2. Cooling system of tractor engine [Electronic resource] – Mode of access: <https://stroy-technics.ru/article/sistema-okhlazhdeniya-dvigatelya-traktora>. – Date of access: 20.03.2024.
3. About the MTZ-80 and MTZ-82 tractor cooling system [Electronic resource] – Mode of access: <http://www.smoltra.ru/sistema-oxlajdeniya-mtz>. – Date of access: 20.03.2024.
4. Tractor cooling system [Electronic resource] – Mode of access: <https://traktorspec.ru/traktora/sistema-ohlazhdeniya-traktora.html>. – Date of access: 20.03.2024.