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# DETERMINATION OF THE MAIN INDICATORS OF THE ENGINE COOLING SYSTEM

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**Abstract**
The engine cooling system plays a very important role in ensuring the main operational properties of agricultural machines, and the reliability of the machines largely depends on the ability of the engine to work continuously. During the design of agricultural machines, the choice of the engine cooling system is the initial and initial process, that is, the ability to choose the type of cooling system actually goes back to the choice of the main indicators of the engine cooling system.

**Keywords**: Cooling system, cooling surface area, air flow consumption.

## Introduction

The main indicator of the cooling system is the amount of heat, which is necessary to exclude from the engine in order to ensure the previously assigned thermal state of the main details. This amount of heat under the conditions of the settled temperature path is numerically equal to the amount of heat coming into the heat carrier. In a liquid cooling system, a heat carrier is a cooling fluid that provides heat removal from the details, and when cooled by air – a flow of air. The amount of heat required to be removed from the engine is equal to the amount of $Q_{oxl}$ heat, which is numerically depending on the coolant, as well as having a kDj/s unit [1-9].

## The Main Part

The liquid contour of the cooling system is characterized by the mass consumption of the coolant GV per kg/s unit, or *V* – volume units per l/min unit, as well as the high-low (difference) of the temperature of the heat carrier liquid at the outlet and inlet in ℃ units $\Delta t_V = t_{V2}-t_{V1}$. While predicting the value of the temperature difference, it is taken into account that the increase in the temperature difference in the cooling fluid leads to large irregularities in the cooling of the engine in the event of a reduction in fluid consumption. In the cooling systems of diesel engines, the high-low temperature of the coolant is accepted within the limits of 5...8 ℃ [10-21]. Another indicator of the temperature of the liquid contour is the temperature of $t_{V2}$ obtained in units of ℃ at the outlet of the cooling fluid from the cooling heap. This indicator of temperature is functional and is provided by the cooling system. The marginal or sharp value of $tV_{cr}$ taken in ℃ units of coolant temperature is equal to the boiling start temperature of the liquid, depending on the *p* pressure obtained in MPa units in the cooling system, as well as determined by the following formula [1,3,4]:

$$t_{Vcr} = t_{Vboil}\sqrt[4]{p} \qquad (1)$$

$$t_{V\text{кр}} = t_{V\text{қай}}\sqrt[4]{p}$$

Here $t_{Vboil}$ – the temperature at which the liquid begins to boil under normal conditions, for water $t_{Vboil}$ = 100 ℃.

The temperature of the coolant in the system is lower than the boiling point ($t_{V2} < t_{Vcr}$) it is necessary.

In the double-circuit cooling system, the second heat-carrying fluid is air flow, which is evaluated in units of mass consumption GW in kg/s or volume units W in $m^3/h$. Air consumption is determined by the production efficiency of the ventilator adopted. The temperature indicators of the air passing through the engine's cooling radiator depend on the ambient temperature, as well as the presence of other radiators and heat exchangers in the air path in front of the radiator [21-36]. The engine cooling radiator is characterized by the area of the cooling surface or the cooling surface F in $m^2$ units, and the heat transfer ability of the radiator is determined by the heat transfer coefficient $k_T$ and depends on the thermal technical characteristics of the materials used to make the radiator [37-45].

## Conclusion

The temperature of the cooling liquid at the outlet of the engine is $t_{V2}$, which is a practically used indicator of the cooling system. The temperature of the liquid in the cooling system of the auto tractor engine should be $t_{V2}$ < 100 ℃ and 93...98 ℃, and the temperature of the liquid for a short period of time not exceeding 20 minutes in the direction of the maximum torque is 105 ℃ is allowed. In a single-circuit system of air cooling, the air flow, consumption, the area of the engine's rib surface, and the temperature of the lubricating oil or the temperature of the superheated part serves as evaluation indicators.

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