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FEATURES OF SCALE FORMATION IN THE COOLING SYSTEM OF AUTOTRACTOR ENGINES IN DRY HOT CLIMATES

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Annotation: *this article shows that in the conditions of a dry, hot climate in the cooling systems of automobile and tractor engines, the coolant used as a coolant is mainly very hard water. In the composition of very hard water, the resulting decomposition of bicarbonate salts is accompanied by the intensive release of bicarbonate salt ions, and the formation of iron bicarbonate and its effect on the performance of the cooling system.*

Key words: *hardness, very hard, water, salt cooling system, ions, bicarbonate, corrosion, scale, rodator, forgotten tubes.*

A distinctive feature of the operating conditions of automotive vehicles in our country with a dry, hot climate is the high hardness of the water used for the engine cooling system. As a rule, the water used is hard (8... 12 mg.eq./l) and very hard (more than 12 mg.eq../l).

The systematic use of such water is accompanied by intense scale formation, with a thickness of 2...3 mm or more.

Our studies have shown that the process of scale formation when using very hard water has significant distinctive features.

Firstly. The decomposition of very hard water salts is accompanied by the intense release of bicarbonate salt ions (HCOs) and the formation of iron bicarbonate (ICOs)2. Under these conditions, scale formation is a process of intense electrochemical corrosion with a predominant content of iron compounds (80...90%).

Secondly. Intensive scale formation in the engine block is accompanied by chipping of scale products and clogging of the radiator tubes of the engine cooling system.

To identify the intensity and quantitative assessment of this phenomenon, we carried out a correlation analysis of the relationship between the operating time (X) of ZIL-154 automobile engines and D-240 tractor engines and the number of clogged radiator tubes of the cooling system (U). It has been revealed that there is a fairly close relationship.

The correlation coefficient, respectively, is a straightforward relationship between these parameters. The coupling equation has the form: Node=C,CCC276X – C,7884 и Уд=C,C34X – 6,79.

Clogging of the tubes leads to disruption of the engine cooling system. The hydraulic resistance of the radiator increases, accompanied by an increase in the pressure drop in it and the power consumption to drive the circulation pump. Heat dissipation becomes uneven and the efficiency of the cooling system decreases.

Thus, when using very hard water, the efficiency of the cooling system is reduced both due to scale formation on surfaces washed by water (due to the very low thermal conductivity of scale) and due to clogging of the radiator tubes.

The conducted research allows us to draw the following conclusions:

1. The peculiarity of the chemical composition of scale formation products requires the development of a fundamentally new method for cleaning radiator tubes, since traditional chemical and mechanical methods are not effective.

2. From the above equations it follows that clogging of radiator tubes begins when the engine runs in a manner consistent with the TO-2 periodicity, which means that flushing of the cooling system must be included in its volume.

3. Radiators of “southern” cars must have detachable tanks to allow periodic cleaning of the tubes and devices to prevent their clogging.

4. The presence of the phenomenon of intense clogging of radiator tubes is a significant factor in the economic justification for the need for year-round use of liquids that does not lead to scale formation.

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