RELIABILITY ASSESSMENT OF WATER COOLING TOWER MODEL

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ABSTRACT

In modern heat exchange units, the greatest thermal resistance of heat transfer is observed in the front part of the wall. The rate of heat transfer is exceeded when the boundary layer is thinned or broken.

Keywords: Temperature change, space, Heat flow, Calculation scheme.

The methodology for determining the criteria of thermal hydrodynamic efficiency of the water cooling unit is based on the fundamental principles of M.V. Kirpichyov. The energy efficiency of the water cooling unit is characterized by the ratio of the transferred heat Q to the energy spent to overcome the hydraulic resistance - N:

$$E_o = \frac{Q}{N}$$

The larger this E value is, the better the design of the water cooling device and the faster the water cooling process. However, the relatively simple expression (3.16) is not used in practice. Because the main drawback of the expression is the coefficient E_o for the speed of the working environment; to the heat transfer coefficient; It has a number of changes in temperature range and others.

When the speed of the working medium increases, the value of E decreases, because the energy consumption is proportional to the cube of the speed.

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But such acceleration leads to an increase in hydraulic resistance and an increase in energy consumption for its elimination. Cooling of water on flat, rectangular surfaces is observed when the fluid velocity is increased, and at the same time the hydraulic resistance increases according to the Reynolds analogy.

On complex curved surfaces, the Reynolds analogy breaks down. In particular, the relationship between heat transfer and hydraulic resistance changes as a result of increasing the speed of liquid washing of corrugated surfaces. Compared to flat surfaces, complex-shaped surfaces cause a sharp increase in heat transfer with low energy consumption. Water cooling in the channels has a positive effect of accelerating the shape of the surface, when the shape strongly renews the particles of the liquid in the boundary layer, and such a complex shape of the surface improves the thermal energy qualities.

The acceleration efficiency can be calculated using the following relation:

$$E = \frac{\alpha}{N_o^m}$$

To eliminate the influence of external parameters, the calculation of the coefficient should be carried out under the same external parameters or equal comparison conditions.

The standard mode of comparing water cooling devices is adopted and is shown below:

-Working environments (heated and cooled water in adjacent canals), water characteristics are taken at an average of 50 ºC.

The higher the efficiency number for a specific design device, the higher the thermal energy quality of the water cooling surface and the higher the efficiency of the water cooling device.

The obtained results are especially useful for comparing the complex surfaces of plate water cooling devices, as there is a wide choice of shape and size.

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