

COMPUTER COOLING SYSTEM

Computer cooling systems is a set of means for heat dissipation from computer components that are heated during operation.

The main sources of computer heat are: processor; video card; motherboard elements (chipset, CPU power); Power Supply.

Mid-range processors can generate from 65 to 135 watts of heat. The usual video card of game level in the course of work can warm up to 80-90 °C. The power supply can be easily heated up to 50 °C. A chipset on a motherboard can also heat up to 50-60 °C. Heat dissipation of other elements is much lower compared to the above.

The design of the housing must ensure the free passage of air through the system unit. It is also necessary to check whether the housing has a sufficient number of vents and seats for fans (the more, the better).

Air cooling systems

The principle of operation is the direct transfer of heat from the heated component to the radiator due to the thermal conductivity of the material or through heat pipes. The radiator radiates heat into the surrounding space with thermal radiation and transfers heat by thermal conductivity to the surrounding air, which causes the natural convection of ambient air.

Liquid cooling systems

The principle of operation is the transfer of heat from the component of the heated radiator by means of the working fluid circulating in the system. Distilled water is most often used as a working fluid, sometimes oil, antifreeze, liquid metal, or other special fluids.

Freon installations

Refrigeration unit is the evaporator which is installed directly on the cooled component. Such systems allow to obtain negative temperatures on the cooled component during continuous operation. It is necessary for extreme overclocking of processors.

Waterchillers

The systems combine liquid cooling and Freon installations. In such systems, the antifreeze circulating in the liquid cooling system is cooled by a Freon unit in a special heat exchanger. These systems allow the use of negative temperatures achievable with the help of Freon units for cooling several components (in conventional Freon units, cooling several components is difficult). The disadvantages of such systems include structural complexity and high cost, as well as the need for thermal insulation of the entire liquid cooling system.

Open evaporation systems

Installations use dry ice, liquid nitrogen or helium as the working fluid, which evaporates in a special open container mounted directly on the cooled element. It is used mainly by computer enthusiasts in cases of equipment extreme overclocking. It allows

receiving the lowest temperatures, but has limited working time (demand constant replenishment of glass with refrigerant)

Systems with Coat elements

The Thermoelectric Cooler for cooling computer components is never used on its own due to the need to cool its hot surface. Typically, the Thermoelectric Cooler is installed on the cooled component, and the rest of its surface is cooled by another cooling system (usually air or liquid). As the component can be cooled to temperatures below ambient temperature, condensate control measures must be taken. Compared to Freon units, the Thermoelectric Cooler is more compact and does not create noise and vibration, but is noticeably less efficient.

Conclusions

1. Efficient adaptive cooling systems must be used to ensure the reliable operation of modern computers.
2. The choice of cooling system method depends on the conditions of use, taking into account energy consumption, air pollution, restrictions on noise levels and housing size.
3. It is recommended to consider the criterion of "price-quality" of the product when designing computer cooling systems.

REFERENCES

1. *Scott Mueller* "Upgrading and Repairing PCs." - 17 species. - M.: "Williams", 2007. - P. 1299-1328. -[ISBN 0-7897-3404-4](#)
2. https://elearning.sumdu.edu.ua/free_content/lectured:fe14c425ee98949440c8a0fefb3fa44c30863b75/latest/101607/index.html#p3
3. <http://kryothermtec.com/technology.html>
4. <https://www.pcgamer.com/best-cpu-coolers/>
5. <https://www.intel.com/content/www/us/en/gaming/resources/pc-cooling-the-importance-of-keeping-your-pc-cool.html>