Air Ion Technology –
the foundation for a new generation of "hot" servers

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All existing air cooling systems of data centers operate on the basis of the same thermodynamic model of heat transfer, within which the efficiency of removal of heat excess is limited by the permissible frequency of occurrence of electrostatic discharges. This situation is postulated by the TIA-942 standard (and the ASHRAE-2011 directive, as its development), which operates with a classic instrument for electrostatics control - cooling air humidification.

This approach has limited effectiveness both in terms of proper protection of equipment (up to 25% of failures of electronic devices are associated with electrostatic discharges, since the main protective component - an electroconductive water film does not form on hot and hydrophobic surfaces), and in part of energy efficiency - every 4th kilowatt in the energy balance of the data center is consumed by refrigeration equipment, i.e. "Heats the sky."

In addition, the performance of air-cooling technology has a "thermodynamic limit" associated with the complex setting of the cooling flow rate, its temperature and relative humidity.

BASIS OF AIR ION TECHNOLOGY - EXTENDED THERMODYNAMIC MODEL OF HEAT TRANSFER IN COOLING IT-EQUIPMENT

In the development of Air Ion Technology, we succeded to replace the limited effective mechanism of indirect control of electrostatic charges of triboelectric nature for the direct controlled deionization process. The appearance in the thermodynamic model of cooling of a new component, the forced controlled (in terms of the polarity and concentration of air ions) ionization of the cooling air, allowed to modify the requirements for the three basic thermodynamic parameters of the cooling air: the cooling flow rate, its relative humidity and temperature. Within the framework of the new model, these parameters became mutually independent, which allowed to modify (expand) significantly the requirements for their admissible values: 1. The cooling flow rate is no longer limited by tribo-electric effects, but only by the mechanical strength of the elements of the electronic device. 2. The relative humidity of the cooling air is limited only by the upper boundary (correlation with the dew point for protection against short circuit through the water film), the lower limit is "removed". 3. The temperature of the cooling air works as an independent (from relative humidity) airflow parameter, which allows it to expand its (temperature) operating range to the limits of the "thermal strength" of the element base of electronic equipment.

"... - Is it true that Air Ion Technology makes it possible to create" hot "servers without loss in reliability and performance?
- Yes, its true.
- And you can even make an air-cooled supercomputer?
- Yes, you can!.."

ADVANTAGES OF AEROION TECHNOLOGY OF COOLING IT-EQUIPMENT

Expansion of operating ranges and independent control of the cooling flow rate and temperature provide **an increase in the efficiency of the heat excess removal to 600%.**

The mechanism of direct controlled deionization provides **complete protection of IT equipment from electrostatic discharges of triboelectric nature.**

Cooling air dehumidification, the use of bipolar ionization and ozonation **minimizes the damage from atmospheric and biological corrosion.**

TECHNICAL AND TECHNOLOGICAL FEATURES OF "HOT" SERVER OF NEW GENERATION

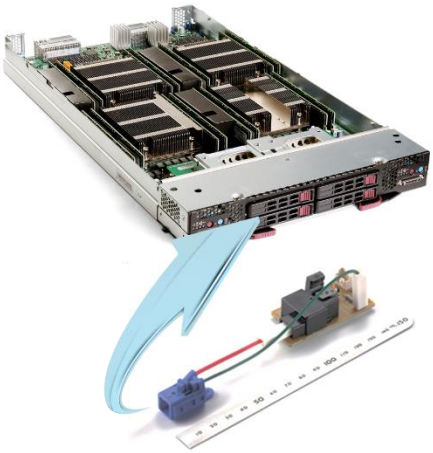
As already noted, when using the of Air Ion Technology in the IT-equipment cooling system, the cooling flow rate can be multiply increased. For the same reason, the upper limit of the cooling air temperature can be increased at the outlet of the cooled device. The temperature of the flow at the entrance to the device, depending on the problem being solved, can be either increased (when using the year-round freecooling mode) or reduced (to stimulate heat transfer in energy-loaded servers and other similar devices). The coordinated, but functionally independent control of the cooling flow temperature and rate makes it possible to realize the required heat transfer efficiency within the servers. During the experiments, it was confirmed that the energy-loaded components of IT equipment can be cooled by an air flow with a temperature of up to + 45 ° C without an increase in the failure rate.

The executive device for Air Ion Technology is the ionion generator - **IONOTRON**. To date, we have worked out typical variants of layout solutions for a single server as well as for the data center as a whole (see illustrations).

Own consumption of **IONOTRON** in such cooling systems - no more than **0.5 W** per **1000 W** of heat dissipation of server equipment.

COMPETITIVE ADVANTAGES AND PERSPECTIVE DIRECTIONS FOR INTRODUCING AIR ION TECHNOLOGY

The unique high power efficiency of cooling systems for IT equipment based on Aeroion technology allows:
place the data center with direct IT-equipment cooling installations in virtually any region of the planet;
create energy-loaded super servers and supercomputers without the use of complex and expensive liquid cooling systems.
The introduction of physical mechanisms of direct control over the formation and accumulation of electrostatic charges into the cooling process makes it possible to achieve almost 100% protection of REA from discharges of triboelectric nature. The increase in reliability and availability both the main equipment of data centers and engineering support systems is a weighty argument for introducing Air Ion Technology into state, corporate and commercial data centers with high accessibility requirements; hardware control systems of nuclear power plants, fuel and energy complex, etc.; military hardware systems.



Installation of an ionion generator IONISSIMO (MURATA, Japan) into the channel for air intake of the server

Hardware implementation of IONOTRON for installation in a server cabinet

INTELLECTUAL PROPERTY PROTECTION

"Electronic equipment cooling method and system for its implementation"

Patent Russian Federation 2498427
Priority 05/16/2012

Declaration of conformity
ТС № RU Д-RU.АТ15.В.00114
ТР ТС 004/2011
"On the safety of low-voltage equipment"
ТР ТС 020/2011
"Electromagnetic compatibility of technical means "