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THE ADVANTAGES OF USING TEXTILE AIR DUCTS TO PROVIDE A MICROCLIMATE OF PREMISES

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The article is about textile ducts and diffusers. Textile ducting from the moment of production is also the diffuser. The calculation of the textile diffusers, as well as modeling of air flow, produced with the help of a program PRIHODASW. The verification obtained in the computer simulation results with tests in the blanket experimental chamber is carried out.

Ventilation should provide the required climatic and sanitary conditions, especially in the working area. In practice, however, most often take the supply of clean air to the upper zone where it is superheated and saturated with gas and dust hazards, and from there transports them then in the working area. The upper distribution of supply air generally excludes the possibility of reliable maintaining the necessary purity of the atmosphere in the working area.

When choosing the method of air distribution into account direction of heat flow and areas of premises with a maximum flow of heat or moisture.

Textile ducts and diffusers are a relatively new concept in ventilation technology [1]. The method of distribution of the air in the system with textile ducts is different from standard systems as systems with textile ducts don't have diffusers or grilles installed in metal ducts. Textile ducting from the moment of production is also the distributor.

In ventilation systems, air conditioning and air heating with the use of textile air ducts can be selected from the following air distribution:

– ventile fabric,
– microperforation,
– perforation,
– small nozzle,
– large nozzle.

Textile ducts can be manufactured from ventile and airproof fabric. In most cases, ventile fabric used not as a method to supply air to the serviced space, and as a means of preventing condensation on the surface of the duct.

The microperforation is made through from holes the size of 0.2-0.4 mm, which are made in the duct at the factory with a laser machine. Perforation is made from through holes with a diameter from a few millimeters to several centimeters.

To ensure standardized values of microclimate parameters in the catchment area, you can specify the distribution direction of the air flow through the perforation and microperforation, to adjust the number of rows and the diameter of the perforation with the use of the software.

Small nozzles can have a diameter of 20, 30 or 40 mm, the diameter of the large nozzles is approximately 80-100 mm. Large nozzles allow maximum range of the air stream. There are 3 varieties of large nozzle: fixed nozzle, adjustable nozzle, directed nozzle.

Taking into account the distance from the working area until the textile of the valve, the pressure value at the beginning of the duct and the required air velocity in the working area, you can select the most suitable method of air distribution:

– microperforation 0°–360° (over diffuser),
– microperforation 90°–270° (in lower section),
– microperforation 270°–90° (in lower section),
– the ranks of directed perforation,
– the ranks of directed small nozzle.

For each of the selected methods of air distribution diagram of air flow was conducted for each of the three temperature regimes:

1) $t_n = t_в$ (isothermal process);
2) $t_n < t_в$ (the process of conditioning or air cooling in the room);
3) $t_n > t_в$ (process air heating in the room),

where t_n – the temperature of supply air, °C; $t_в$ – the normalized temperature of the internal air, °C.

Thus, combining every method of air distribution with each temperature regime produced 15 different models of air flow.

The calculations of the textile diffusers, as well as modeling of air flow were made using the program PRIHODASW. PRIHODASW is software of a Czech company-manufacturer of textile ducts designed for creating textile air distribution systems. Calculations produced by the program can be output in pdf-format.

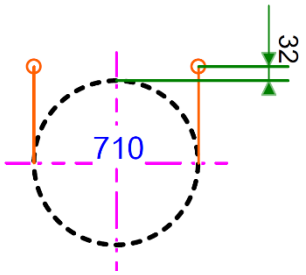
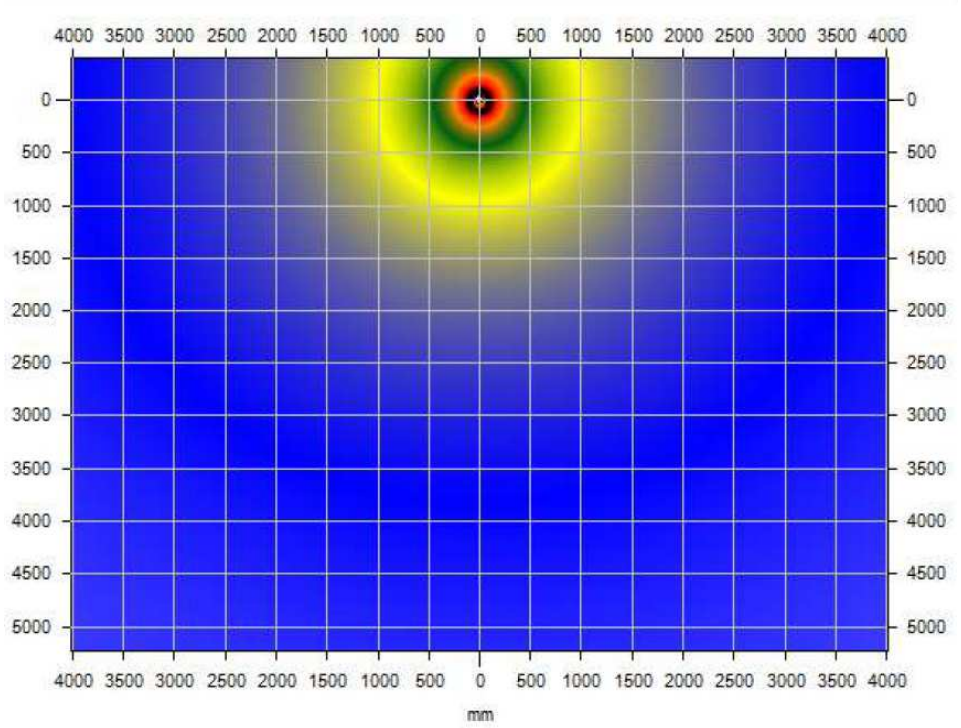
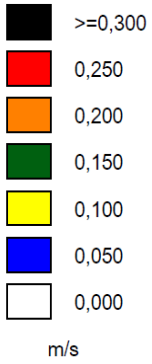
In addition, the program PRIHODASW also allows simulation of air flows at the exit of the textile air ducts.

Verification obtained in the computer simulation results were produced in the course of the internship based on the company Prihodas.r.o. (Czech Republic) testing in the blanket experimental chamber.

The results of computer simulation for each experiment are presented in table 1 with the indication input data for modeling air flow, type and scheme of air distribution, distribution graphs, and type codes.

Table 1 – The results of computer modeling experience №1

<table>
<tr><td>Basis of design for modeling:

L = 10000 m^3/h = const
P_{system} = 200 Pa = const
d = 710 mm
l = 20 long meter
t_n = +18 °C
$t_в$ = +18 °C</td><td>The type of air distribution:
microperforation 0°–360°
The scheme of air distribution:
 
</td></tr>
<tr><td colspan="2">Diagram of distribution of the air flow in the room
 
</td><td>Type Codes:
 
</td></tr>
</table>

The resulting diagram of the air flow is confirmed by tests in the experimental blanket camera (Fig. 1).

Description of the resulting diagram (experiment 1).

As can be seen from the diagram, when $t_n = t$ (isothermal process) and microperforation 0°–360° (over the duct), the distribution of the air flow has a uniform character in all directions.

Recommendations for use (experiment 1).

In general, the microperforation is applied in cases when the duct is located a short distance from the work area. This method of air distribution allows to distribute the air in the room without disturbing the normalized values of air flow in the working area. In most cases, sent to the micro. The micro is the same for all of the square duct is used in those cases when the total length of the diffuser is not enough to distribute in the room the

entire volume flow with the necessary speed. Most often, this method of air distribution is found in premises with mass stay of people and low ceilings (shops of different profile, cafe), and some production facilities with a limited amount of space.

Fig. 1. Tests in the experimental blanket camera (experiment 1)

As an example of this type of air distribution at a given temperature regime given shop cheese products Volkovysk JSC "Bellakt" and specialty store football club FC Slavia (Prague).

Similar studies were conducted for 15 of the experiments, which allows to develop General guidelines for application of each individual method of air distribution at a given temperature regime and propose to use them in specific areas of public buildings and workshops of industrial enterprises.

In addition, one important factor is the economic effect of the application of the textile air ducts. Comparative analysis by criteria such as purchase price, installation cost, delivery cost and commissioning works, designed for both metal and textile air ducts, showed that the reduction of load bearing building constructions of the building is about 97%, and the estimated cost of construction is reduced by 30–40%.

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