VAPOR-COMPRESSION HEAT PUMP

Description
The heat pump converts a large amount of low-potential heat (5–40 °C) into heat that can be used for heating and hot-water supply (55–85 °C). This is an energetically efficient process because each kW h of electric energy consumed to drive the heat-pump compressor allows obtaining of 3–5 kW h of useful heat. The sources of low-potential heat can be water from artesian wells, waste-disposal plants, drinking water pipelines, water-recycling systems, and process fluids from industry, etc.

Technical specifications
The vapor-compression heat pump consists of two compressors, water-cooled condenser, evaporator, regenerator, subcooler, control board, control panel, and locking and regulating fitting.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Weight, kg</td>
<td>600</td>
</tr>
<tr>
<td>Size, mm</td>
<td>1800×1100×1000</td>
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<tr>
<td>Thermal performance, kW</td>
<td>60</td>
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<tr>
<td>Power consumption, kW</td>
<td>15</td>
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<tr>
<td>(for a mass flow rate through the evaporator equal to 10 m³/h with an input temperature of 15 °C and heat-carrier heating up to 62 °C)</td>
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<tr>
<td>Coolant</td>
<td>R134a and other ozone-safe freons and their mixtures.</td>
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</table>

Technical appraisal and economic benefits
The heat pump:
− combines the refrigerator and heat-pump functions within one unit;
− is assembled as a single unit ready for use;
− automatically controls temperature regimes.

Application area
The vapor-compression heat pump HT-400 is a self-supporting, environmentally appropriate source of heat with thermal performance of 400 kW. It can also be used as a refrigerator. The heat pump is designed for high-efficiency conversion of large amounts of low-potential heat
(5 – 40 °C) into heat with a higher temperature potential (over 60 °C), employed for heat-carrier heating in hot-water heating and supply systems.

The vapor-compression heat pump HT-700 with thermal performance of 700 kW is designed for heating, hot-water supply, and conditioning of technological units, housing and communal services, and central heating.

**Development stage**
The technology has been successfully implemented at the Novosibirsk Municipal Water Plant (“Gorvodokanal”) for self-supporting, environmentally appropriate heating, ventilation, and hot-water supply of the sewage-pump station operating on crude sewage water.

**Patent situation**
No patent was obtained.

**Commercial offers**
Development of the technology, fabrication and delivery of pilot equipment.

**Estimated cost**
To be discussed.

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