



Case Story | Mayakprint Wallpaper factory

Chiller systems with Danfoss Turbocor[®] oil-free technology enhances wallpaper industry process



Large factories consume an enormous amount of electricity, thus the energy bills can amount to millions of rubles per month. Moreover, there are expenses on raw materials, wages, operational costs, etc. The final price of the consumer product as well as its competitiveness and profitability depend on the total costs of the factory. That's why every manufacturer is interested in the implementation of various measures to increase his economic performance. Special attention is paid to energy consumption. Oil-free system efficiency, simplification, reduced maintenance and associated downtime reduction were the key factors to opt for Danfoss Turbocor technology ar Mayakprint LLC.

Mayakprint LLC is part of the Mayak holding and specializes in the production of vinyl wallpapers with paper and non-woven base.

Mayakprint is one of the oldest manufacturers in the pulp and paper industry in Russia, founded in 1850. The number of employees reaches 1600 people and for many years in a row the company has been among the top 3 most efficient companies in the Penza reaion. mayak-penza.ru



The fourth wallpaper printing line called «Olbrich» was launched on February 28, 2020. This implementation allows to increase revenue from production by more than 1.2 billion rubles per year (about 15 M€ / 18 MUS\$) and expand the product line. Additionally, 20 new jobs were created.



Wallpaper production is a complex technological process. At each stage, you have to comply with the specified parameters, such as the precise pattern repeats, the speed of a shaft, or the temperature conditions at different stages of production.

A large coil of a non-woven base is installed in a special device at the very beginning of the line. The non-woven fabric passes through the dryer to evaporate excess moisture and then is fed to the first printing section. In it, a special vinyl paste (plastisol) is applied to the non-woven base using a stencil shaft. After that, the cloth is fed to the oven, where it is dried at a temperature of about 200 °C. That's how vinyl base on which the pattern will be printed is created.

Before you feed the cloth to the next printing sections, it must be cooled down so that the paint lies evenly.

Only a part of the initial design is laser-etched into a print roller. The shaft spins, partially sinking into the paint, and transfers the image onto the paper. Each cylinder layers is in a different colour. If the pattern has 5 different colours, then 5 different cylinders are required to print it.

After applying all the colours, the paper is dried and heated in the oven, and then it proceeds to the embossing unit. Here the heavy embossing roller applies texture to the heated, soft vinyl. After embossing, the wallpaper needs to be cooled down once again.

Next, the blades cut the edges and cut the wallpaper into rolls. Afterwards, the rolls are packaged and delivered to customers.

"The cooling system is a very important part of wallpaper production and is essential to ensure its continuous operation and high quality of final products, which is strictly monitored at the factory" – Dmitry Ageykin, Chief Engineer, Mayakprint LLC.

The entire complex of work on the design, installation, and commissioning of the cooling system of the new wallpaper printing line was carried out by the Thermocool company.

Thermocool is one of the leading Russian companies in the field of engineering systems, from consulting and system engineering to supplying, installation, commissioning, and maintenance of the equipment of cooling, air conditioning and automation systems for a wide range of industrial and civil constructions. thermocool.ru

The heart of the refrigeration system is the Engie Quantum chiller with a cooling capacity of 455 kW. It cools the water down to 14°C, which then proceeds to the «Olbrich» wallpaper printing line. The cooling water is supplied inside special rollers, that are in contact with the wallpapers.

(which is a part of Thermocool Group of Companies), an authorized distributor of Engie Refrigeration.

Trade Group is one of the pioneers of presale, supply, and maintenance of systems based on Danfoss Turbocor® compressors in Russia. The company's portfolio includes municipal and federal facilities, the total cooling capacity of the delivered units amount to more than 85 MW.

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A key feature of the chiller is the compact Danfoss Turbocor® centrifugal compressors.

Danfoss Turbocor[®] compressors are designed using advanced technologies to achieve high efficiency and low noise. These are the first of its kind oil-free compressors with magnetic bearings. The motor shaft rotates in a magnetic field, and special sensors automatically stabilize its position in case of the slightest deviations.



Oil-free, magnetic

bearings and integrated variable speed drive delivers industry leading efficiency with no performance degradation over the life of the compressor.



The paint is applied using special gravure printing shafts.

The chiller was delivered by the Trade Group company

The oil-free technology reduces the chiller's power consumption and simplifies maintenance. Permanent magnet motors and builtin frequency inverter provide unsurpassed performance at full and part-load conditions.

The compressors are equipped with an automatic control system that allows you to monitor the operation of the main components and nodes every second. The data is displayed on the chiller's LCD screen

"This chiller, based on two Danfoss Turbocor® TTS300 inverter compressors, is a highly efficient refrigeration system that operates without the use of compressor oil, which is conventionally used to lubricate moving parts and components of the refrigeration circuit. Due to the absence of an oil system, the design and maintenance of the chiller are significantly simplified, and since there are no friction pairs in the compressor, its mechanical wear is eliminated. For the same reason, there is no efficiency loss due to the friction forces, whereas a similar screw compressor loses about 10 kW in terms of performance. Furthermore, the starting current of the Turbocor° compressor does not exceed 5 A", -Andrey Yegorov, Technical director, Thermocool Group.

Stepless capacity regulation of compressor is carried out taking into account the actual values of the heat load and ambient temperature. By changing the rotor speed, the cooling capacity of each compressor can vary between 30 and 100%. This allows you to adapt the chiller performance to the required load and significantly reduce the power consumption of the cooling system. Due to the wide capacity modulation, the precise temperature of the cooled water is accurately maintained, and therefore compliance with regulations of the technological process is ensured.

> Permanent magnet synchronous motor provides high efficiency and enables compact design.

Two stage compression

design provides flexibility to use for water-cooled and air-cooled chiller applications.

The average annual power consumption of a chiller with Danfoss Turbocor[®] compressors is 30-35% lower than that of a fixed speed screw chiller. More importantly, this high level of efficiency can be maintained over the life of the compressor since there is no oil or mechanical wear to degrade performance.

Along with high energy efficiency, the excellent noise characteristics of the chiller became a very important factor for the customer, since the system had to be placed in the neighborhood to office premises. Despite the high speed of the shaft, the Danfoss Turbocor® compressors produce a lower sound level. Moreover, they lack the high-frequency noise of screw compressors, which occurs as a result of friction in the sliding bearings.



Due to the compact size of the compressors and the absence of an oil system, the dimensions of a chiller with Turbocor[®] compressors are 30-40% smaller than the dimensions of chillers of similar capacity with other types of compressors. This played a key role in this project as well, as it allowed the chiller to fit into the already operating mechanical room. A free cooling mode was implemented at the facility for additional energy savings. It automatically turns on when the ambient temperature falls below +4 °C. In this case, the water cools down in the intermediate heat exchanger and not in the evaporator. The water in the Heat Exchangers is cooled by glycol, which in turn cools down in a dry cooler placed outdoors. In summer, the glycol circuit is used to remove the heat of condensation of the refrigerant in the chiller's condenser.

Depending on the performance of the wallpaper-printing line, the payback period of the cooling system is between three and five years.

"The number of systems with Danfoss Turbocor® compressors in Russia and the CIS countries is growing year by year. They prove their industry-leading efficiency in air conditioning, IT cooling, and industrial applications. Furthermore, the Danfoss Turbocor® product line is being constantly expanded, thus widening its application range. We offer full support to our customers, so one of the priorities now is the development of the maintenance service market in cooperation with our partners. We're working on the constant availability of spare parts and education of service specialists" – Artem Maksimov, Product Sponsor of Danfoss Turbocor® in Russia and the CIS countries, Danfoss LLC.

Besides Turbocor[®] compressors and line components of the refrigerant circuits, some other Danfoss products were installed in a new "Mayakprint" line. Among them are three-way valves VF3 and two-way valves VFM2 with AME 655 drives, balancing and shut-off valves for water and glycol circuits, VLT frequency converters for hydraulic modules and dry cooler fan speed controllers.

Danfoss Turbocor[®] – great alternative to screw technology High efficiency Low maintenance Oil-free system Low noise ~ 9 dB(A) quieter **Stable compressor Oil-free**, less 30-35% lower energy No noise at performance over maintenance consumption high frequency compressor lifetime

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