What is a compressor station

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The compressor station is a product in full factory readiness for supplying the enterprise with compressed air, including all necessary equipment at the customer's request: (compressor units, air treatment system, capacitive equipment, automation system, power supply system, fire alarm system, ventilation system, piping with condensate drainage system). The compressor station can be manufactured in various versions: in a block box; on a base frame, with installation in the customer's premises; mobile on the basis of a cargo trailer.

Applications: Various types of enterprises where compressed air is required for the technological process:

Sandblasting and painting works
Pneumatic actuators of machines and mechanisms, pneumatic actuators of instrumentation
Starting systems of drilling rigs, conveyors and much more.
Variants of compressor stations
The compressor station is designed as a block box. All the main equipment is located in a modular room. The station is a metal frame sheathed with sandwich panels, calculations that are carried out during design and the corresponding requirements that are met during production allow the station to be operated in various climatic and seismically active zones in compliance with the necessary requirements and rules. The station is equipped with all necessary life support systems.

Advantages:

Easy transportability, overall dimensions allow you to transport the station by any means of transport;
It does not require capital installation costs, it is enough to unload from vehicles, install on a flat area, supply electric power and connect to a compressed air consumer;
The possibility of connecting the station to the customer's heating. The heat generated by the compressors can be directed to heating the existing customer's premises.

compressor station in block-box design
the room of the compressed air compressor station

Execution on a trailer. All equipment is located in a block box with all life support systems. The box unit, designed for loads during movement, is mounted on a trailer frame. This design is advantageous when the customer's compressed air consumption occurs periodically and with different territorial reference.

mobile metal compressor station on a trailer
mobile metal compressor station on a trailer
The design of the compressor station on the frame. The main equipment is located on a base frame with all life support systems and is installed in the existing customer's premises. When installing the station, in this version, the customer must independently resolve the issue of ventilation. And in particular, the issue of removing the heat generated by the compressor and how to supply air for cooling the compressor unit.

Advantages:

The cheapest version of the station
Compact arrangement of equipment
There is no need to conserve the heat generated by the compressors. All heat can be directed to heating the customer's premises
Disadvantages:

Choosing the right place to install the station is the responsibility of the customer
A heated room is required for installation
compressor station on the frame
Compressor units and air treatment systems were described earlier, at the request of the customer, we can use any type of compressors and suitable elements of the air treatment system for them.

Heating and ventilation system. During the operation of compressors, significant heat generation occurs, therefore, ventilation ducts are installed to regulate the supply of thermal energy to the exhaust window of the compressor. These boxes are equipped with two ventilation grilles (inlet/outlet blinds). The first grid is responsible for the release of heat inside the station and maintaining a set temperature regime, the second grid for the release of heat beyond its limits. These grids are equipped with an electric drive that opens or closes them. These drives are controlled by the ventilation control cabinet. The main component of the control cabinet is a temperature sensor, it monitors the temperature inside the station. In this case, the station is heated during compressor operation without turning on the electric heaters. Electric heaters are used to maintain the necessary, positive temperature inside the station when the equipment is not working. The station is equipped with supply and exhaust ventilation to create the necessary air exchange.

The Power Supply System. The system responsible for powering the entire station. It consists of an introductory power distribution cabinet, shields for working lighting of the central heating system, emergency lighting of the central heating system and outdoor lighting of the central heating system are provided. At the request of the customer, it is possible to provide the first, second or third category of reliability of power supply

The consumers are:

automation cabinet;
electric motors and compressor controllers;
controllers of related equipment
heating and ventilation systems of the block-container;
automation of security and fire alarm system;
lighting devices.
Automation system. MKS group of companies has developed its own control cabinet, which allows to control the station operation both locally and remotely. This system is a complex customizable equipment, as it is necessary to link the operation of compressors, to receive from the compressor controller signals about operation, load, failure, to provide communication with instrumentation and all this set of information to the controller of the automated control system.

The main indicator for the operation of compressor station automation is the outlet pressure. The compressors are set to a certain pressure range (upper and lower). If the pressure in the system has reached the upper limit, the pressure sensor detects it and transmits the value to the ACSP system, the compressor stops pumping air, if the pressure has reached the lower limit, due to compressed air withdrawal by the customer, the compressor is switched on and works until the pressure reaches the upper limit.

The system can also detect compressor runtime and switch operation between compressors, if any (if there is a standby compressor in the circuit). The customer can choose the controller manufacturer at his own discretion, based on the existing automated control system at the enterprise.

At the customer's request, the station can be equipped with a fire alarm system (OPS), this system monitors the occurrence of fire in the station or unauthorized entry and notifies the operator.

Fire extinguishing system. This system is used for fire extinguishing, basically in ISS compressor stations, manual powder fire extinguishers are used as fire extinguishing system. Optionally, automatic fire extinguishing systems can be ordered, they work in conjunction with the ACS and fire alarm system. The systems can be powder or gas:

Automatic powder fire suppression system: the most common and cheapest way to get rid of a fire source. When a fire occurs, the OPS picks this up and signals the powder module to activate. The module triggers and sprays powder around the entire perimeter of the station, blocking the access of oxygen to the source of fire. The number of modules is calculated based on the area of the station, the number and type of equipment.

Advantages:

Cheap and common automatic fire extinguishing system
compact design and easy installation.
Disadvantages:

In case of actuation, the powder spreads over the entire area of the station, getting inside the equipment and control cabinets. It is practically impossible to clean the equipment from powder in case of system operation.
Automatic gas fire extinguishing system. The principle of operation is the same as that of the powder system, except that gas is used to eliminate the source of ignition, displacing oxygen outside the station. The number of gas modules and the type of gas is calculated based on the area of the station, the number and type of equipment.

Advantages:

The most effective method of fire extinguishing
after the fire is knocked down, the equipment, which is not affected by the fire, remains operational.
Disadvantages:

More expensive than powder fire extinguishing system
requires additional space for installation of gas modules (gas cylinders). Heavier installation.
The piping is used to transfer compressed air from the source to the consumer, passing through the air treatment system. The piping system includes:

Condensate extraction system. When compressed air passes through the cyclone separator and main filters, the air is cleaned and condensate is formed. The filters and separators are equipped with condensate drains to prevent condensate from flowing further into the network. The condensate is discharged under pressure into a special tank. Upon customer request, it is possible to install a condensate purification unit, this device allows to purify the condensate by separating water from oil, the oil remains inside the device, retained by filters, and water accumulates in the tank.

No less important component of the piping is the shut-off and control valves, it includes ball valves, valves and pressure regulators. They are responsible for

controlling the flow of the working medium by changing the bore diameter. At the customer's request, they can be manually controlled or remotely controlled.

Pipeline material and bore diameters are selected based on the composition of the pumped medium, its pressure and capacity.

Pneumatic scheme of the station
Example of pneumatic scheme, compressor station, without capacitive equipment.

pneumatic diagram of compressor station without capacitive equipment
Example of pneumatic diagram of compressor station with capacitive equipment.

pneumatic scheme of compressor station with capacitive equipment.