

How to avoid overheating problems in compressed air stations.

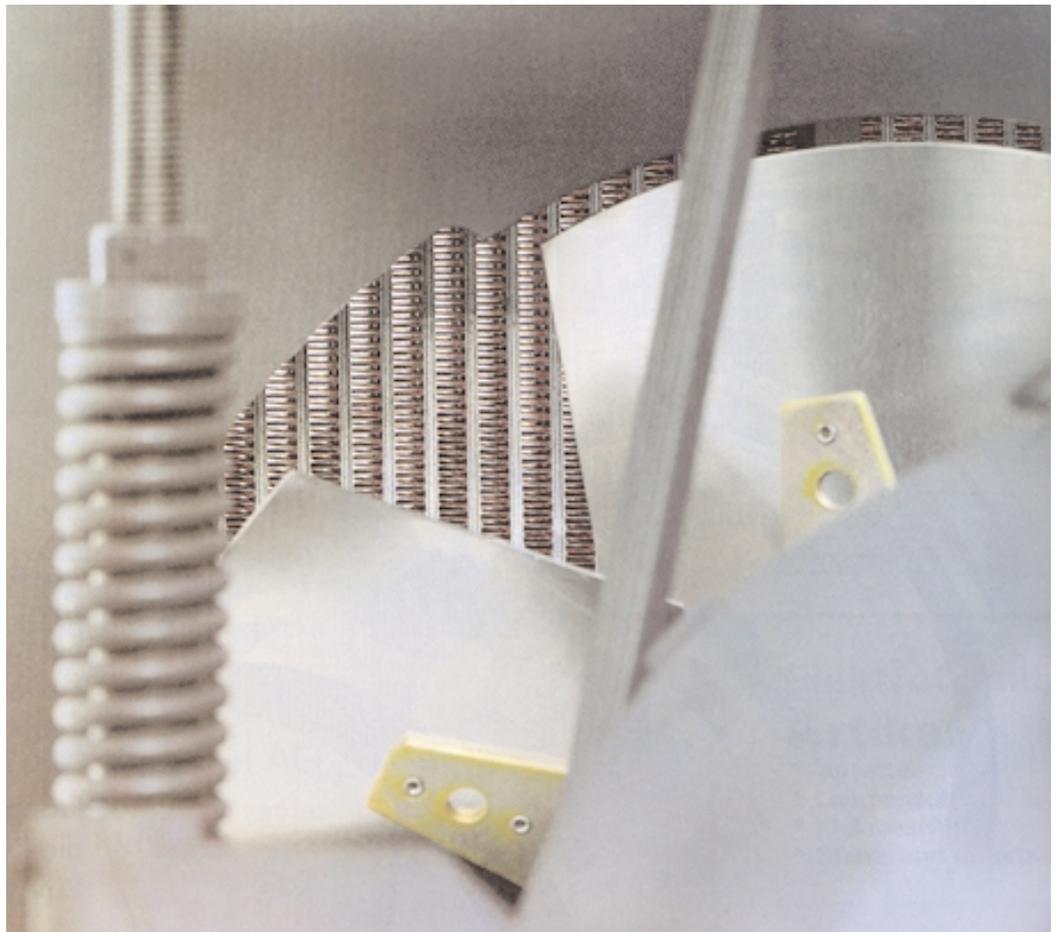
Next Summer Will Surely Come!

Soaring summer temperatures bring sweat to the brows of many production managers. It's not just the hot sticky air in their office or factory but the anticipation of problems with their compressed air systems. This is because improperly sized or installed compressors and air treatment plant can respond to extremely high ambient temperatures with failures leading to expensive production downtime.

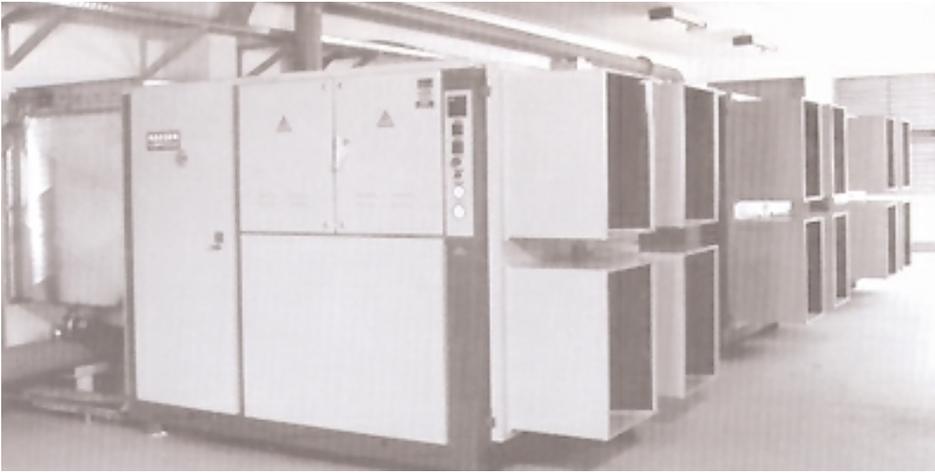
by ERWIN RUPPELT

Everyone who has used a bicycle pump knows that heat is generated during the compression of air but the real amount is often underestimated. Air compressors actually convert 100% of the electrical power they draw into heat. Even in a small 22kW compressor this represents enough heat for a family home. The heat of compression has to be carried away by some form of cooling system that must function reliably throughout the year to ensure trouble-free operation of the machine. The best solution is for the cooling system not to simply dissipate the heat but to put it to some useful purpose. In the case of screw compressors ninety-four percent of the heat of compression is recoverable in this way.

For economic and ecological reasons cooling water



The cooling fan should be positioned directly upstream of the cooler to ensure sufficient airflow through the cooler even if the enclosure doors are not completely closed.



The compressor room must be properly ventilated with apertures for inlet and exhaust air large enough and well located.

systems are avoided by most factories these days and preference given to air-cooled machinery, which is then often subjected to extremes of ambient temperature. Even water-cooled machines experience fluctuations in the temperature of the cooling water that is influenced by ambient conditions.

Correct thermal dimensioning of compressors is a design fundamental and so it is difficult to understand why some manufacturers still design for an ambient of 35°C. A warm summer soon shows these machines to be preprogrammed for operational failure and production downtime. An ambient temperature of 40°C should be taken as standard for compressors designed for use in Central Europe as only then can trouble-free operation be ensured year round.

Correct design is seen in the size of apertures in the package housing for inlet and outlet cooling air, by the size of the cooling surfaces themselves and the volume of air flowing over them. The fan should be positioned directly upstream of the cooler (fig. 1), subjecting it to maximum air flow and reducing the adherence of

dirt which decreases cooler efficiency. It must be accepted however, that even with the fan positioned as described the cooler will become contaminated and need cleaning from time to time. This is easily done if the cooler is of the swing-out type (fig. 2) and intervals between cleaning can be extended with the use of filter mats on the inlet aperture (fig. 3) which keep the whole of the package interior cleaner.

Optimum cooling arrangements of the compressor package alone are not sufficient and site conditions also have to be right. Apertures in the walls of the compressor room for inlet of fresh air and exhaust of used cooling air must be large enough and well located (fig. 4). If ducting is used it will create a resistance to air flow and care must be taken that this is not greater than the compressor fan can handle.

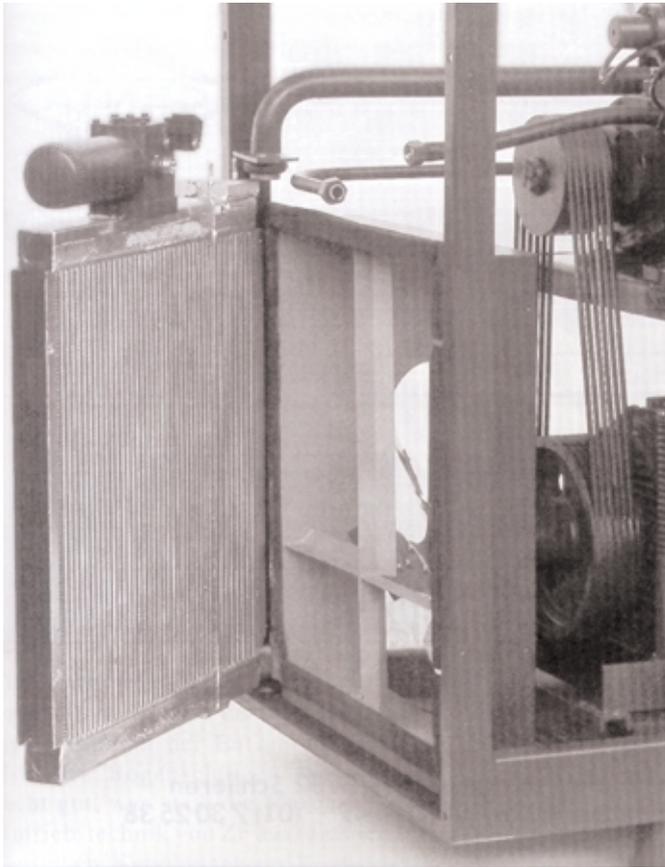
Heat is also radiated by the motor and aircend and this must be dissipated properly by appropriate ventilation (fig. 5) or overheating of electrical parts could lead to failure of the total package.

If the compressor cooling system is not adequate the effect will be noticed in the downstream air treatment plant, particularly in the dryer. Many dryers are still designed strictly according to ISO 7183 option A, which gives an ambient temperature of 25°C and a compressed air inlet temperature of 35°C. Summer conditions however, can easily see the ambient rising to 35°C and the compressed air inlet temperature to 40°C, in which case such dryers are quite inadequate. The resulting failure leaves residual humidity in the compressed air to eventually precipitate out as condensate and bring inevitable malfunctions and downtime.

In other words, if your, and the thermometer starts to



Water-cooled machines must also be properly ventilated to dissipate radiated heat.



creep to summer highs, then you may need to wipe your brow and wonder if you made savings in the right place.

The purchaser of a compressed air station should make certain that the operational safety of the compressor is guaranteed up to an ambient temperature of 40°C, that the cooler size is sufficient, the package housing is equipped with cooling air filter mats and that the ventilation system is correctly dimensioned and laid out. He should choose a dryer

designed to operate in ambient temperatures up to 35°C and with inlet air up to 40°C. He should also ensure that his cooling water recirculating system is adequate for these conditions, i.e. an inlet temperature to the compressors of not more than 30°C.

Next summer will surely come!

Author: Erwin Ruppelt, Dipl.-Ing. (FH),
Kaeser Kompressoren GmbH,
D-8630 Coburg; in der Schweiz:
Kaeser Kompressoren AG, 8153 Rümlang

The cooler must be cleaned from time to time to maintain full efficiency and this is easily done with the swing-out type.