

Heat recovery from air compressors

Air compressors are widely used in industrial applications to compress air from ambient conditions; that can be humid and at 1 bar absolute, to most popularly 6 bar and dried from entrapped moisture. Compression is either by piston type or screw-type compressors, whereby the air molecules are squeezed, consequently increasing the compressed air temperature up to 60°C. The friction also increases the lubrication oil temperature as high as 80°C, which must be cooled down for efficiency.

A well-known fact is that a massive **72% to 90% of the electrical energy used by air compressors is released as waste heat**. This heat, if not recovered, is thrown out to the atmosphere and wasted, where at the same time, there can be a boiler burning fossil fuels to heat water or generate the steam needed for different processes in the plant. Sadly, the waste heat from the compressor is released to the atmosphere by an open/closed cooling tower or where not available can be an air cooler.

Typically, there are two in built heat exchangers to exchange the heat which can either be shell and tubes, brazed plate heat exchangers for their compactness or gasketed plate heat exchangers (GPHE) for their ease of cleaning and compactness. The choice will depend on the manufacturer of the compressor.

Benefits of heat recovery

Recovering waste heat from air compressors not only has environmental benefits in sustainability, reducing carbon emissions and monetary savings, helping plant profitability but also improves the dryness quality of the air that has just been compressed. For the dryer located after the air cooler, needs to further cool the air down to 3°C to remove the moisture that is inherent in the humid air intake. Heat recovery savings are also in the extended life of power tools and other air-operated equipment, as *moist compressed air* is a significant problem at points of usage

The diagram below shows a typical compressor working. For previously installed and operating air compressors heat recovery is still possible not having to remove or replace the existing coolers. If the compressor is cooled with an open cooling tower, all the above alternatives in heat recovery will provide extra savings as below:

- Free up cooling tower capacity
- Savings in water with less water evaporation
- Reduction in tower water treatment costs
- Reduced electricity costs with tower fan operation
- Less make up water usage, hence less CaCO₃ in the system avoiding build-up.

