

# Save energy with oil-free water-cooled compressors

Energy recovery solutions (ER 90-900)

*Atlas Copco*



# Industries & applications

Hot water recovered from the compressed air system can be used for showering, space heating and is particularly suitable for process applications. Using the hot water as boiler pre-feed or directly in processes requiring up to 90°C / 194°F hot water can save costly energy sources such as natural gas and heating oil.

Heat driven chillers are another potential application for the heat recovered from the compressed air system providing industry with more opportunities to save energy.



## Food & Beverage

Hot water and steam are used in many dairy processes. Steam is commonly used for pasteurization, scalding, cleaning and sterilizing cooking vessels, drying products, etc.

In larger dairies, huge amounts of hot water and steam are required in continuous processes. Here, the hot water energy recovery system of the compressor can provide substantial energy savings.

## Pharmaceuticals

Large amounts of steam are used in the pharmaceutical industry and in manufacturing processes.

Fermentation temperature control, drying and sterilization processes are part of the daily routine of the pharmaceutical industry.

The CIP (Clean In Place) cleaning method, SIP (Sterilization In Place), direct contact sterilization in bioreactors and fermenters, and steam barriers against bacteria are commonly employed in these manufacturing units.

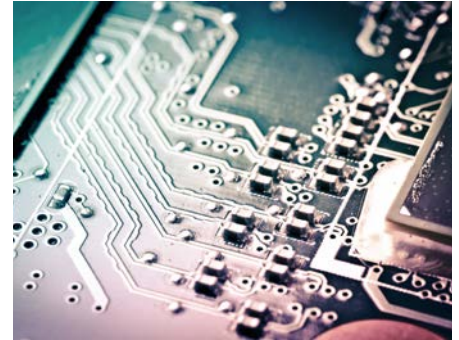
The heat energy recovered from our air compressor contributes to a higher bottom line.

## Automotive

Hot water and steam are used in many automotive processes. Typically it is used for following applications:

- Pre-painting and painting process of shock absorbers, car bodies,... Hot water is used for degreasing and phosphate tanks. Hot water or steam is used for air make-up units and flash ovens in paint booths.
- Heating, ventilation and air-conditioning of production spaces and office buildings.
- Hot water can be used for air handling units and/or space heating.
- Production of powertrain – transmission, engine and engine parts.
- Production of electronic control units.
- Curing process of tires.
- Steam is used for supplying heat and pressure for the chemical crosslinking of the rubber and vulcanizing agents.

Hence, the hot water energy recovery system provides substantial energy savings.



## Chemicals

The chemical industry and refineries are major users of steam. Some applications are:

- Thermal steam crackers require highly superheated steam at typically 40 bar(e) / 580 psi.
- Re-boilers and stripping employ superheated medium pressure steam at typically 10 bar(e) / 145 psi.
- Heat tracing and other applications require superheated low pressure steam at typically 2 bar(e) / 29 psi.

In some processes, a great deal of hot water is recovered after the steam condenses. Hot water from compressors is used as make-up water to supplement the losses.

## Textiles

Coloring of fabric makes use of considerable volumes of hot water at 80°C to 90°C / 176°F to 194°F. Energy Recovery systems of our compressors can directly offer the hot water to the process.

For yarn and fibre treatment steam is used for heat-setting manmade fibers to achieve dimensional stability, increased volume, and wrinkle and temperature resistance.

## Pulp & Paper

Significant volumes of compressed air are used in the wood pulp and paper industry. Vast amounts of steam are also used in the industrial processes. Typical applications are bleaching, digesters, pulp machines and black liquor evaporators.

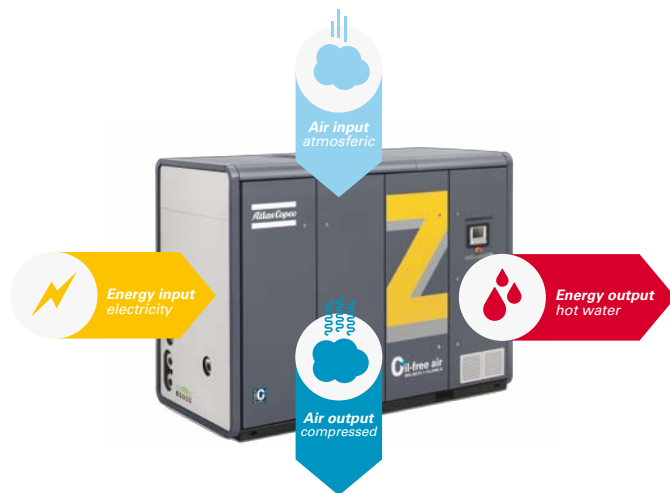
## Electronics

Steam is used for humidification since it is clean and inherently sterile.

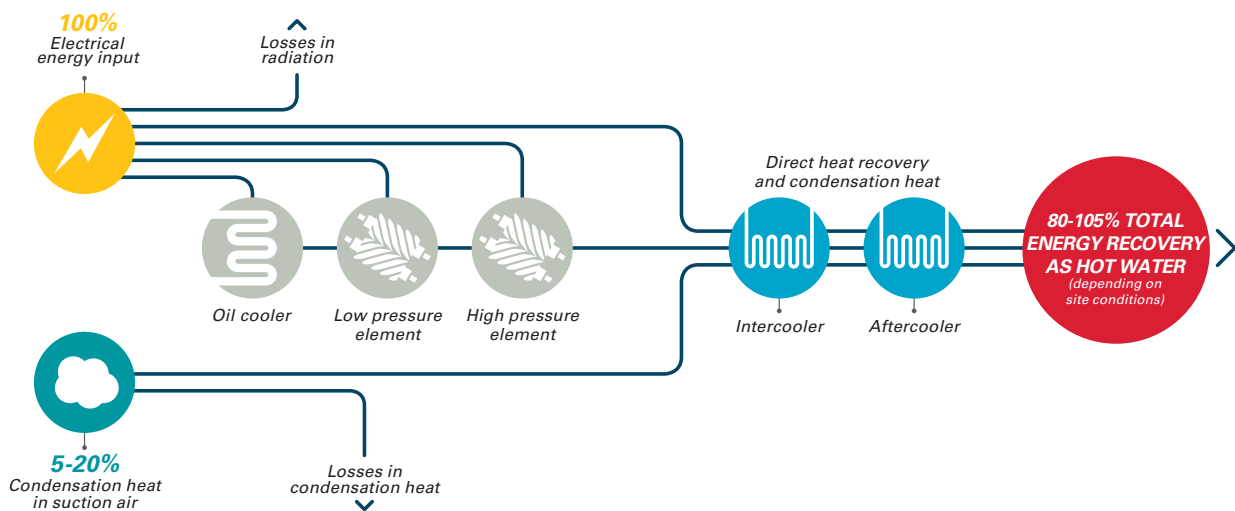
Clean room humidification in electronics assembly, chip manufacture and in pharmaceutical industry is common practice. As this steam is used as a utility, continuous replenishment water is required. Hot water from the air compressor can pre-heat the replenishment water, and consequently, reduce the energy consumption of the steam boiler.

# Switch your compressor into an energy source

According to the laws of thermodynamics, the energy used to compress air is transformed into heat. The major portion of this heat - more than 90% - remains in the compressed air and lubrication oil. A small part is lost to the environment through radiation.



Electrical input is not the only source of energy entering the system. The suction air for the compressor contains water vapour. The heat stored in the vapour is released through condensation in the inter- and aftercooler of the compressor. Typically the condensation heat, contained in the suction air, is equivalent to 5-20% of the electrical input energy.



The water-cooled design of the cooling system of the ZR oil-free screw compressor with energy recovery allows to fully capture all this heat from the compressed air and oil system. As a result, the total energy recovered as hot water amounts up to 80-105% of the electrical input energy, depending on the actual site conditions

and pressure of the compressed air system. In most industrial conditions it will be up to 95%.

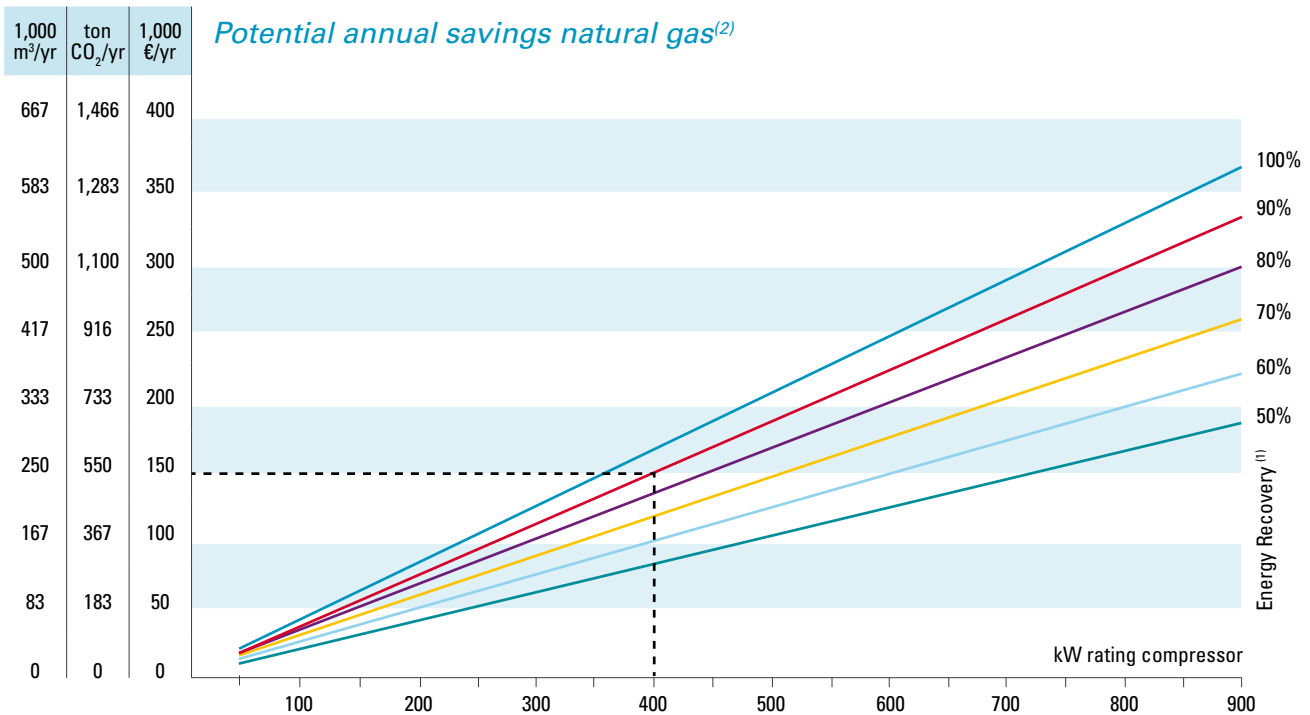
This feature sets the ZR water-cooled oil-free screw compressor with energy recovery apart from any other compressor technology.

# Potential savings with energy recovery

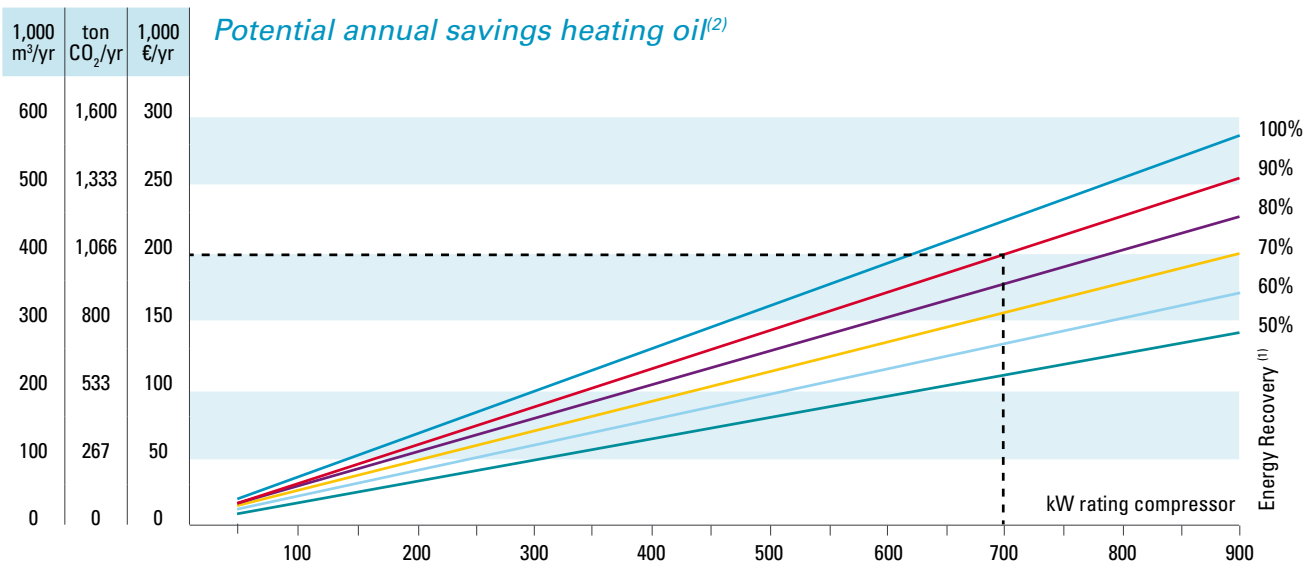
## Reference conditions

Running hours 6,000 / boiler efficiency 80%

	Heating oil <sup>(2)</sup>	Natural gas <sup>(2)</sup>
Calorific value	43,000 kJ/l	39,000 kJ/m <sup>3</sup>
Cost	0.5 €/l	0.6 €/m <sup>3</sup>
CO <sub>2</sub> /MWh	0.279 ton	0.203 ton



A 400 kW compressor with an energy recovery of 90%, can save annually about 250,000 m<sup>3</sup> natural gas, 550 ton CO<sub>2</sub> and € 150,000.

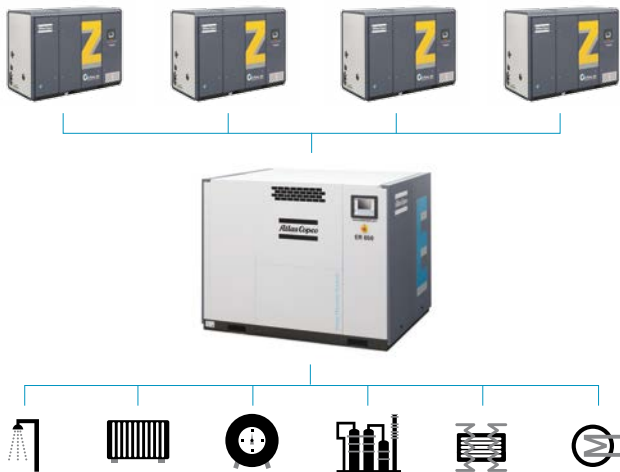


A 700 kW compressor with an energy recovery of 90%, can save annually about 400,000 ltr heating oil, 1,066 ton CO<sub>2</sub> and € 200,000.

<sup>(1)</sup> Energy Recovery as hot water on site condition <sup>(2)</sup> According to reference conditions at full load operation

# The energy recovery control unit

Energy Recovery control units are specifically designed to transfer the energy recovered from any oil-free air water-cooled compressors to the customers' process. The control unit is installed between the compressor and the customers' cooling- and heating circuit. A modular design guarantees perfect integration of the Energy Recovery unit in the application.



## Standard scope of supply

- Variable speed water pump
- Electronic controlled 3 way by-pass valve
- Elektronikon® microprocessor with graphical display for monitoring & control system
- Common baseframe with all pipes and connections included
- Protective canopy
- Single point inlet and outlet connections
- Pre-mounted electrical cubicle
- Single point of electrical connection
- Stainless steel gasketed plate heat exchanger(s)
- Pressure relief valve
- Pressure expansion vessel
- Automatic de-aeration valve
- Pressure approval depend on site requirement

## Advantages

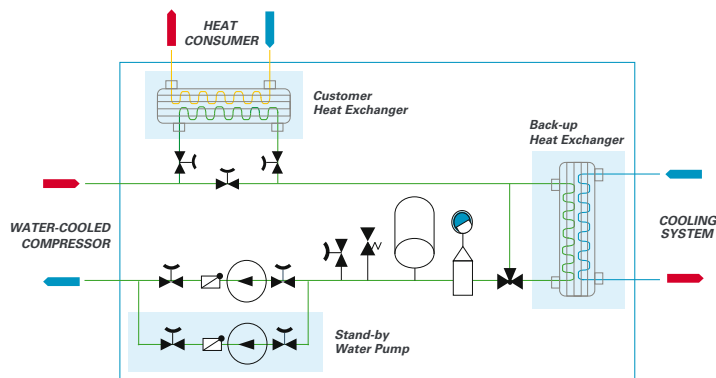
- Regulation of compressor cooling water pressure and temperature to keep the compressed air system working optimally.
- Compressor operates independently from the customers' process.
- Optimal compressor cooling water quality.
- Connectable compressors: Control units are available to handle the heat energy in the cooling water flow of multiple water-cooled compressors, and this up to a maximum of 4 compressors connected to 1 single control unit.

There are 5 sizes of control units available – ER 90, ER 275, ER 425, ER 650 and ER 900 – which can handle the energy recovered from any water-cooled oil-free compressor up to 900 kW. The power consumption of one energy recovery unit is less than 4 kW.

A comprehensive standard execution can be extended with a number of application specific options.



Dimensions	A length	B width	C height
<b>ER 90 - 900</b> Without back-up and customer heat exchanger or with only one heat exchanger (back-up or customer)	1,450 mm 57.1 inch	1,500 mm 59 inch	1,500 mm 59 inch
<b>ER 90 - 900</b> With back-up and customer heat exchanger	1,950 mm 76.8 inch	1,500 mm 59 inch	1,500 mm 59 inch



## Optional equipment

- **Built-in heat exchanger for the customers' process circuit**  
A stainless steel gasketed plate heat exchanger for process water.
- **Built-in back-up heat exchanger**  
Makes sure the requested set point of the cooling water delivered to the compressor is maintained. In case not all the heat energy (hot water delivered by the compressor) is consumed by the customers' process, the fresh cooling water circuit connected to this heat exchanger will further reduce the temperature.
- **Stand-by water pump**  
A redundant variable speed driven water circulation pump will kick in automatically when the duty pump stops. Isolating and check valves are included.
- **Anchor pads**  
Fixation to the foundation of the unit can be guaranteed.

## Monitoring and control: how to get the most from the least



The Elektronikon® unit controller is specially designed to maximize the performance of your compressors and air treatment equipment under a variety of conditions. Our solutions provide you with key benefits such as increased energy efficiency, lower energy consumption, reduced maintenance times and less stress... less stress for both you and your entire air system. Visualization of the actual total achieved recovered energy and its savings.

## Intelligence is part of the package

- High resolution color display gives you an easy to understand readout of the equipment's running conditions.
- Clear icons and intuitive navigation provides you fast access to all of the important settings and data.
- Monitoring of the equipment running conditions and maintenance status; bringing this information to your attention when needed.
- Operation of the equipment to deliver specifically and reliably to your compressed air needs.
- Built-in remote control and notifications functions provided as standard, including simple to use Ethernet based communication.
- Support for 31 different languages, including character based languages.

## Online & mobile monitoring

Monitor your compressors over the Ethernet with the new Elektronikon® controller. Monitoring features include warning indications, compressor shut-down and maintenance scheduling. An App is available for iPhone/Android phones as well as iPad and Android tablets. It allows fingertip monitoring of your compressed air system through your own secured network.

## *Committed to sustainable productivity*

We stand by our responsibilities towards our customers,  
towards the environment and the people around us.  
We make performance stand the test of time.  
This is what we call - Sustainable Productivity.

