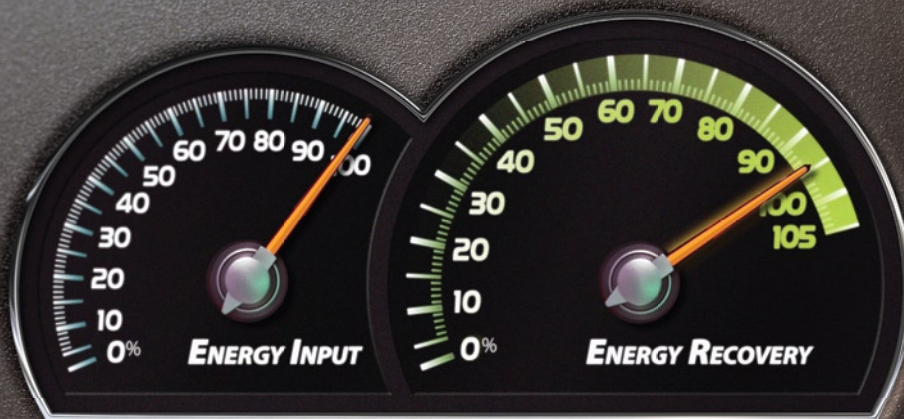


**Use your energy twice**



**Switch your compressor  
into an energy source**

*Sustainable Productivity*

**Atlas Copco**



# Combining forces to save our planet

## Why is energy important?

Compressed air is one of the most important utilities for industry. It is also one of the largest consumers of energy. Therefore, any savings made in compressed air systems have a significant impact on costs and on the environment.

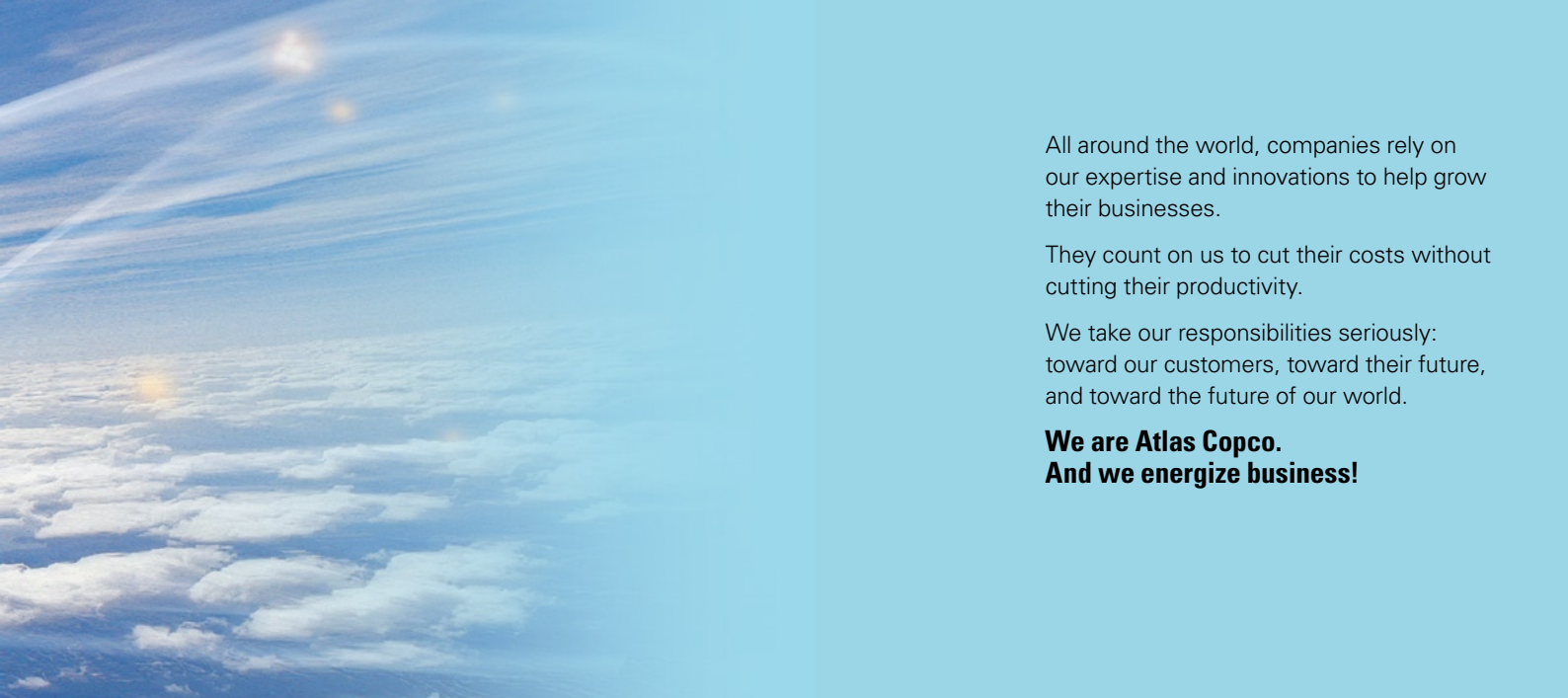
While compressed air systems in general account for about 10% of total industrial electricity consumption, this can amount to as much as 40% of the electricity bill for certain plants. In view of this, Atlas Copco has been innovating in energy-efficient compressed air solutions for many years.

### Yearly energy consumption by compressed air systems\*

Country	Compressed Air Systems consumption TWh	% of industrial electricity consumption
France	12	11
Germany	14	7
Italy	12	11
United Kingdom	10	10
Rest of the EU	32	11

\* Blaustein, Edgar; Radgen, Peter (Ed.): Compressed Air Systems in the European Union. Energy, Emissions, Savings Potential and Policy Actions. Stuttgart 2001





All around the world, companies rely on our expertise and innovations to help grow their businesses.

They count on us to cut their costs without cutting their productivity.

We take our responsibilities seriously: toward our customers, toward their future, and toward the future of our world.

**We are Atlas Copco.  
And we energize business!**

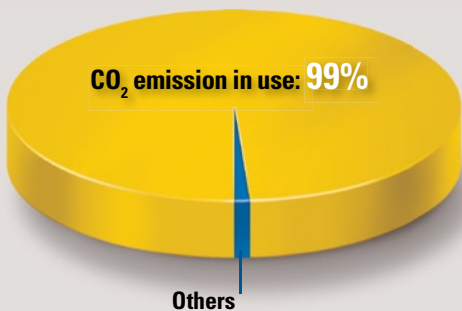
Climate change is one of the most serious environmental threats facing our planet. The **Kyoto Protocol** sets the standard around the world, which means that countries and industries today face stringent targets to reduce carbon dioxide emissions. Commercial and legislative pressures to preserve the environment are driving industry to strive for energy efficiency.

By achieving these targets, companies not only enhance their own **green credentials**, but they also improve their bottom line by **reducing energy costs**.

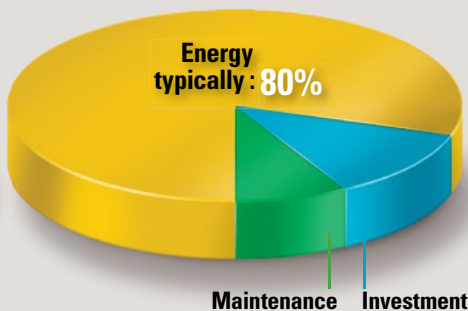
## Energy savings on compressed air benefit your bottom line and the planet

Atlas Copco seeks to reduce the CO<sub>2</sub> footprint at every stage of a compressor's life time from 'cradle to grave'. From the design phase right through to the equipment's manufacture, distribution, consumer use, disposal and recycling. Though when looking at the typical carbon footprint of an air compressor, the energy consumed in its use accounts for 99% of CO<sub>2</sub> emissions. As energy consumption also typically represents over 80% of a compressor's lifecycle cost, energy savings in compressed air systems will have a significant impact towards preserving not only the environment but also your bottom line.

Typical CO<sub>2</sub> footprint of air compressors



Total cost of ownership

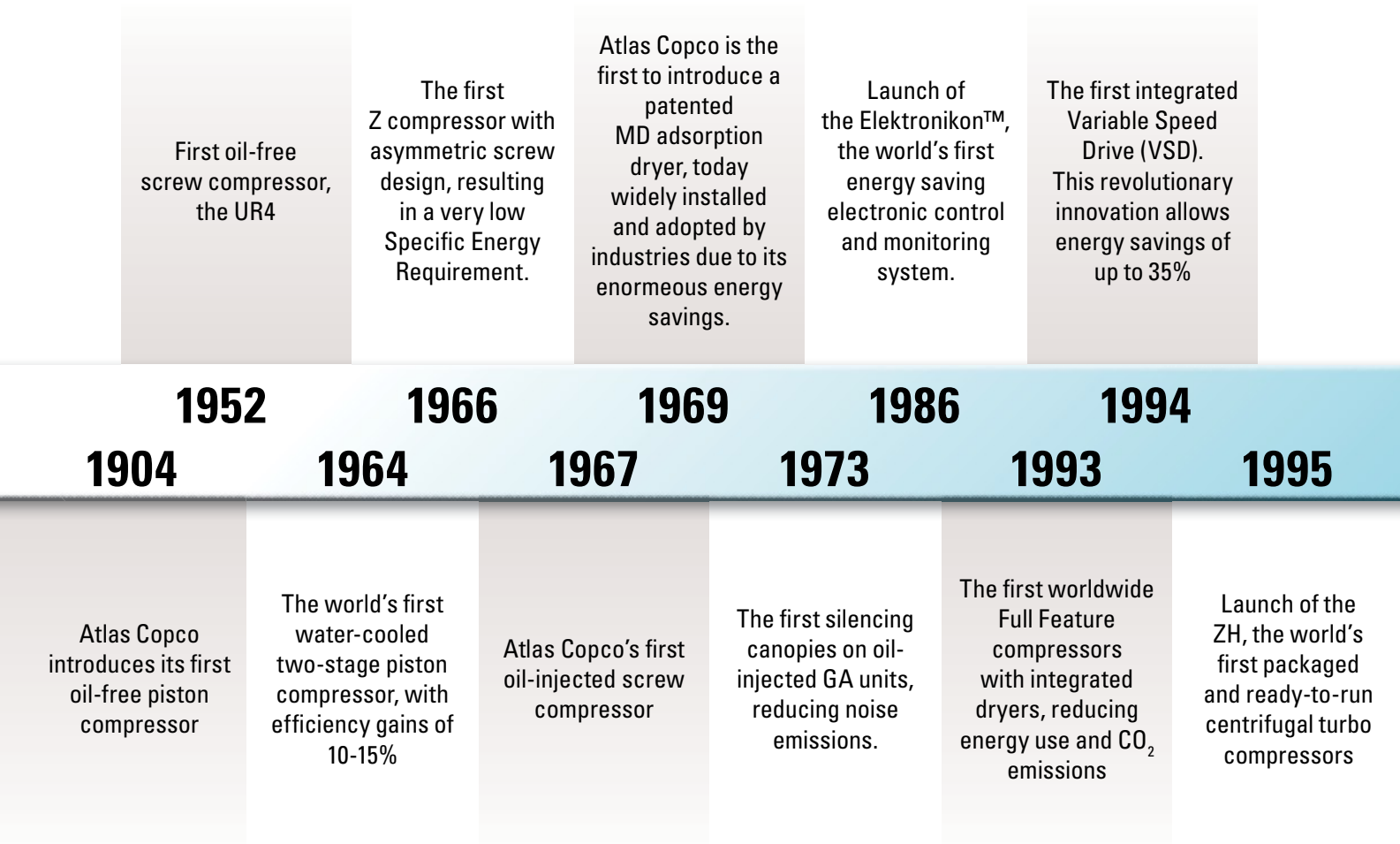




# Innovation is key to achieve sustainable

Innovation is one of Atlas Copco's key values. Throughout the years, the company has been at the forefront of compressor technology with important innovations.

Hundreds of patents related to both compressors and air treatment equipment have contributed to Atlas Copco's becoming and remaining First in Mind-First in Choice® with its customers.



# productivity

Additional energy savings are achieved by improving inter- and aftercooling on the ZR coolers.

Launch of the ES system/controller, which optimizes the operation of multiple compressor installations.

Highly energy efficient XD heat of compression adsorption dryer range developed.

Atlas Copco is the first manufacturer to receive TÜV certification for its ZR oil-free screw compressors range with energy recovery

1995

2002

2005

2009

2002

2003

2006

**2011**

Introduction of the Z Full Feature compressors with integrated MD dryer, saving energy up to 20%.

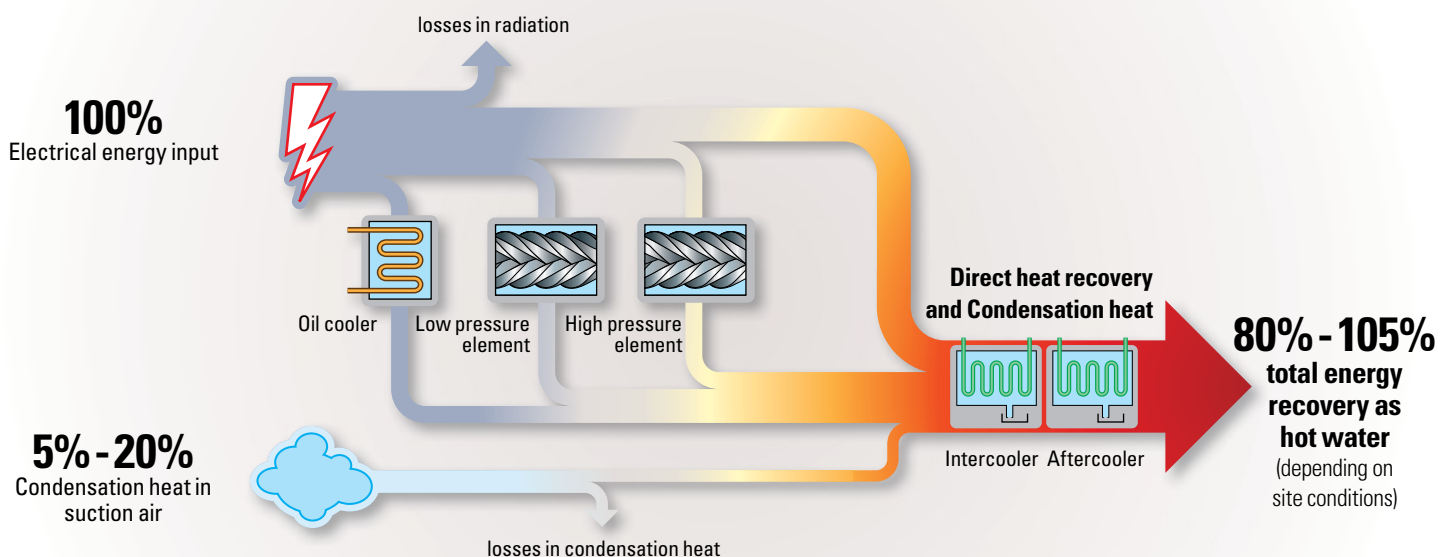
Airscan™ allows customers to assess their compressed air needs and tailor their installations to save more energy.

The Z compressors are the first to be awarded ISO 8573-1 Class 0 (no oil traces in the air stream as measured by the TÜV)

**a new and challenging opportunity to use your energy twice**



# Switch your compressor



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.

However, 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 unique 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.

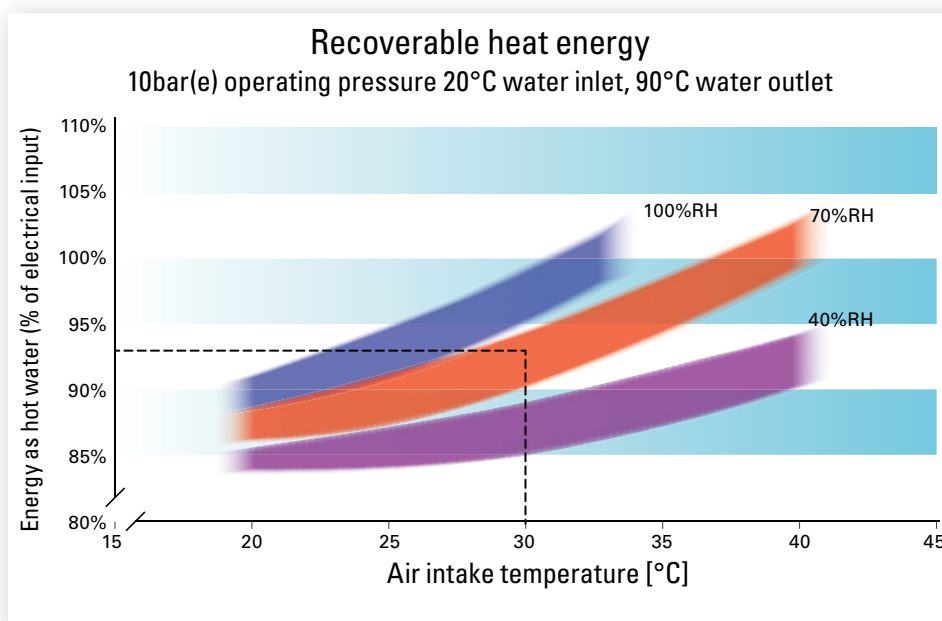
As a result, the total energy recovered as hot water amounts up to 80-105% of the electrical input energy, depending on the site conditions. In most industrial conditions it will be 90 to 95%.

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





## into an energy source



The recoverable heat energy depends on the actual site conditions and pressure of the compressed air system.

At a pressure of 10 bar(e) in the compressed airnet, 30°C air intake and 70% relative humidity (RH), the recoverable energy amounts up to 90 to 95%.

Consult Atlas Copco for specific design conditions.

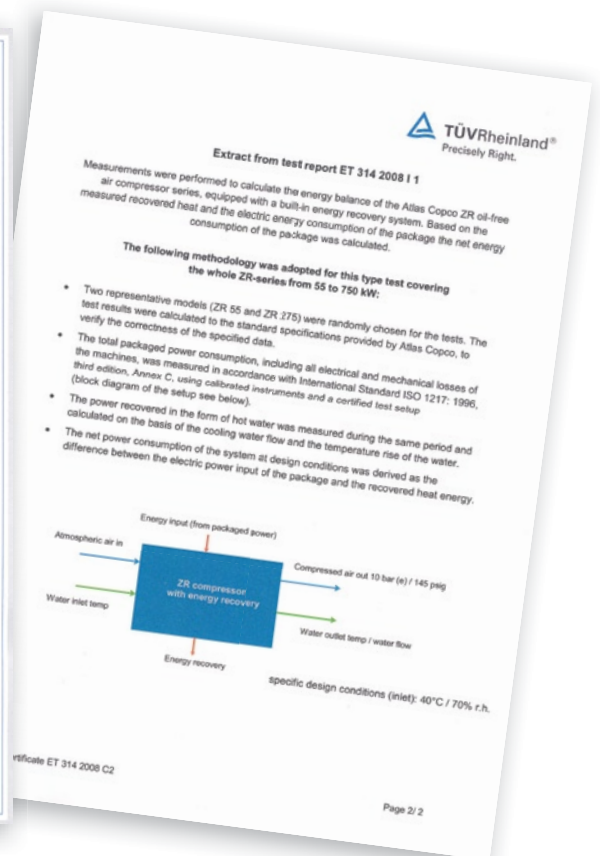
# Push the limits of energy

## TÜV certification

The TÜV supervised the type-testing and certified Atlas Copco's ZR 55-750 range of water-cooled oil-free screw compressors with built-in energy recovery systems.

The testing process involved the real-time measurement of the electrical input power and the output power as hot water.

It was proven that with a pressure of 10 bar(e) / 145 psig under the specific design conditions of 40°C ambient temperature, 70% relative humidity, 20°C cooling water temperature, 100% of the electrical input power could be recovered in the form of hot water.



## What is the TÜV?

The TÜV, Germany's Technischer ÜberwachungsVerein or Technical Inspection Association, is an independent, international organization that specializes in evaluating the safety and quality of technology. The TÜV is recognized worldwide for its independence, neutrality, professional expertise and strict standards.



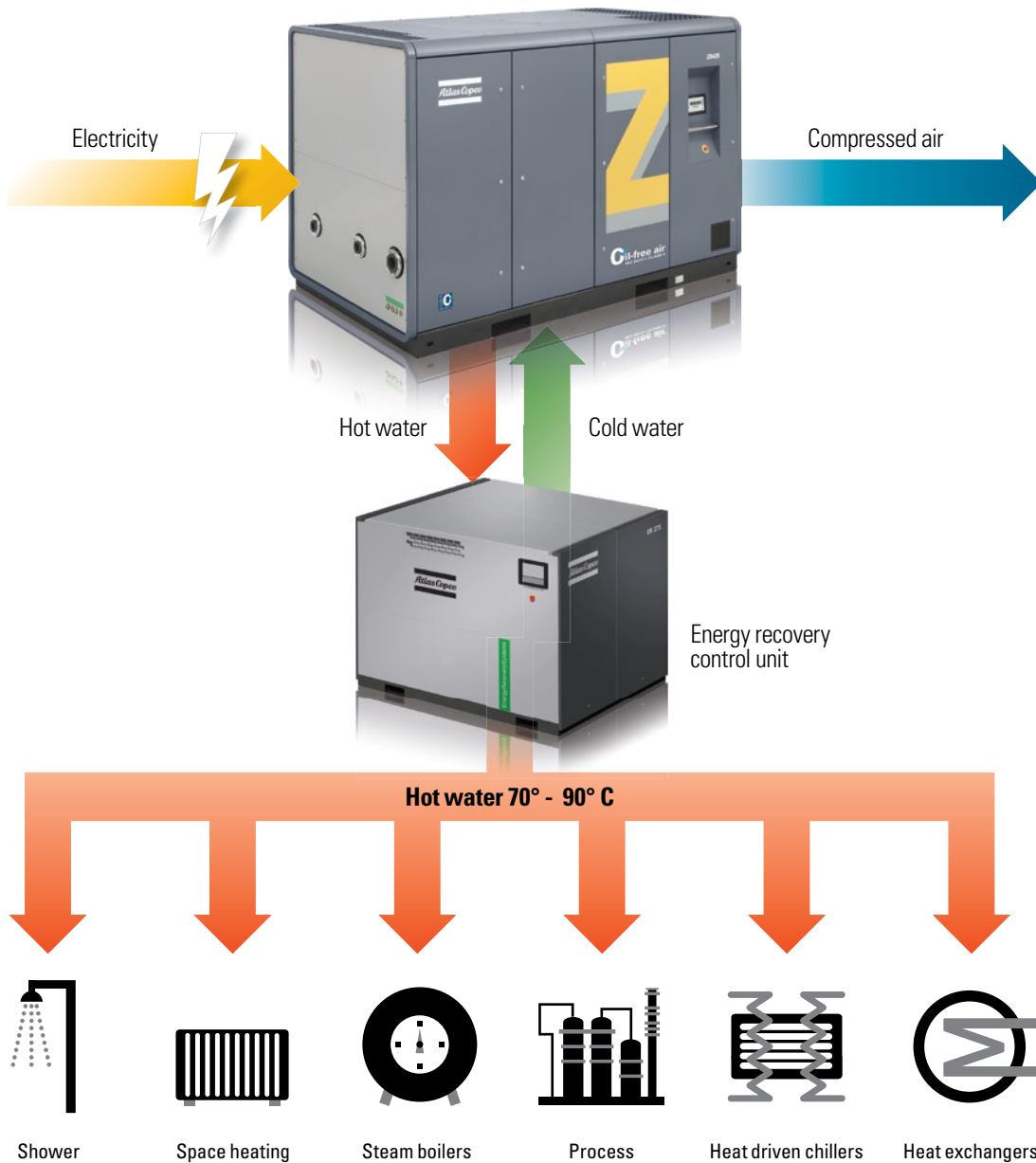
# recovery

## The applications to recover energy

Hot water recovered from the compressed air system can be used for sanitary purposes, space heating and is particularly suitable for process applications. Using the hot water as boiler pre-feed or directly in processes requiring 70-90°C 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

Consult Atlas Copco to receive expert guidance in creating the most efficient compressed air solution.



# Process heating applications: some examples

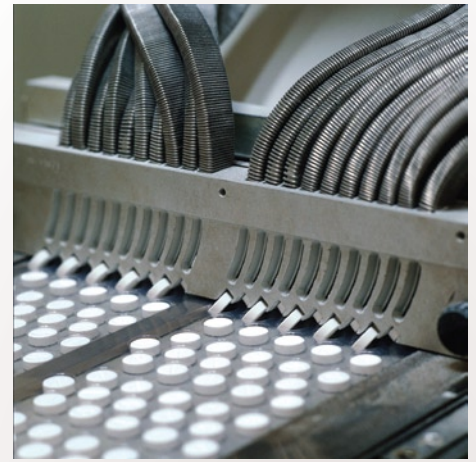
Steam is a preferred medium due to its high heat carrying capacity. It is also intrinsically safe (non-flammable). High-level applications require large amounts of hot water, as process hot water or boiler feed. The use of hot water from the compressor can dramatically reduce or even eliminate heating fuel consumption in this regard.



## 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.



## 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.
- Re-boilers and stripping employ superheated medium pressure steam at typically 10 bar.
- Heat tracing and other applications require superheated low pressure steam at typically 2 bar.

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.



## 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 the Atlas Copco air compressor contributes to a higher bottom line.



## Textiles

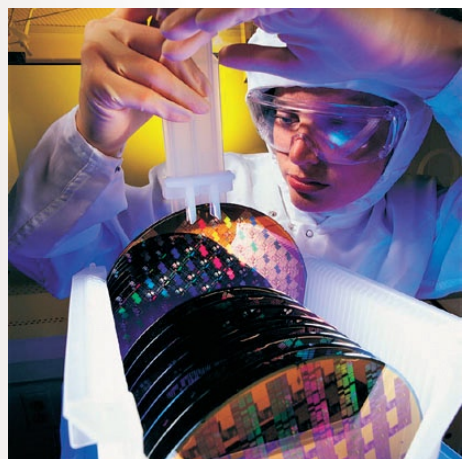
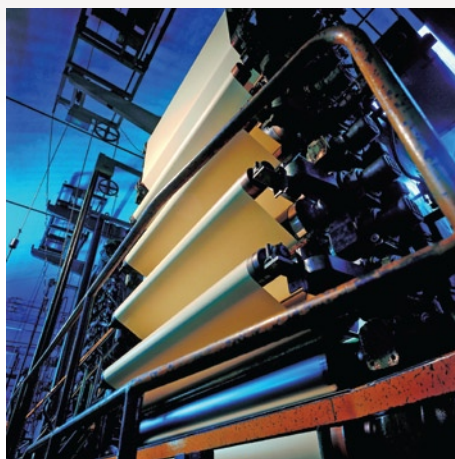
Coloring of fabric makes use of considerable volumes of hot water at 80° to 90°C. Energy Recovery systems of Atlas Copco's compressors can directly offer the hot water to the process.

For yarn and fibre treatment steam is used for heat-setting man-made 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.



## Humidity control

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.



## Steam turbines

Highly superheated steam (typically 40 bar) is used for motive applications such as steam turbines.

Turbines are used as prime movers for captive power generation and for several machines.

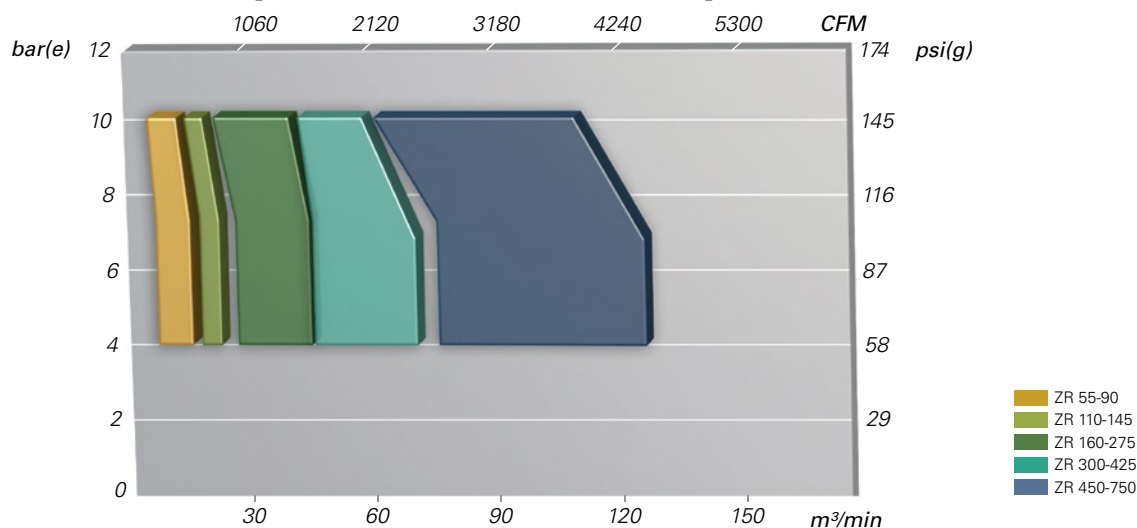
Preheated boiler feed water reduces fuel consumption in boilers resulting in significant savings.



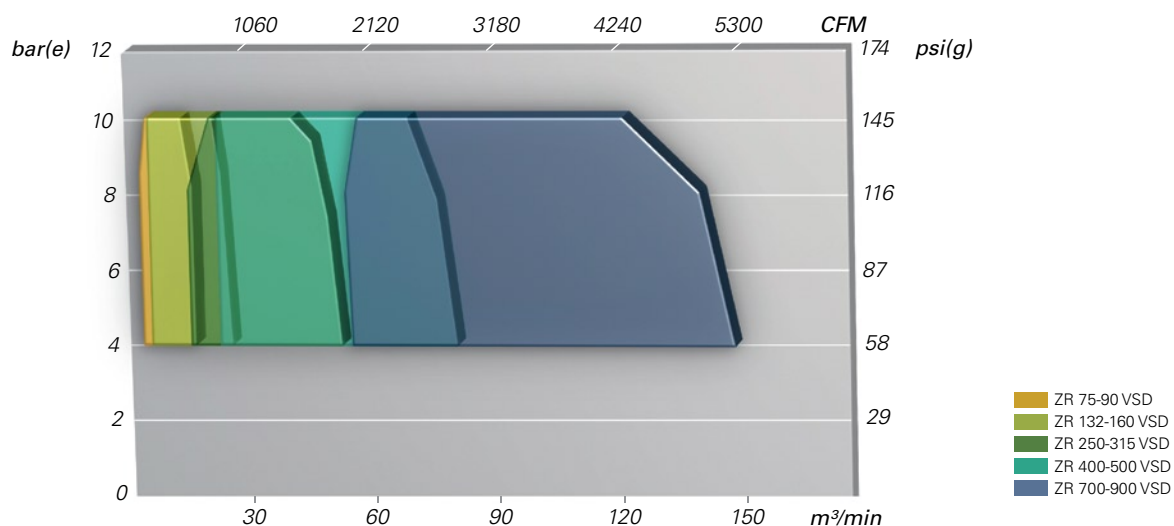
# The ZR compressor range with energy



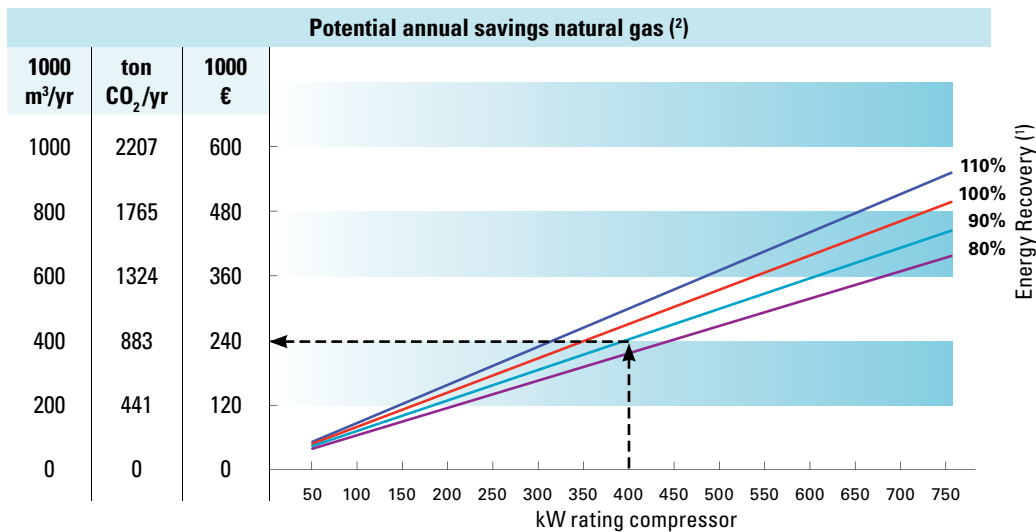
## Fixed speed oil-free screw compressor range



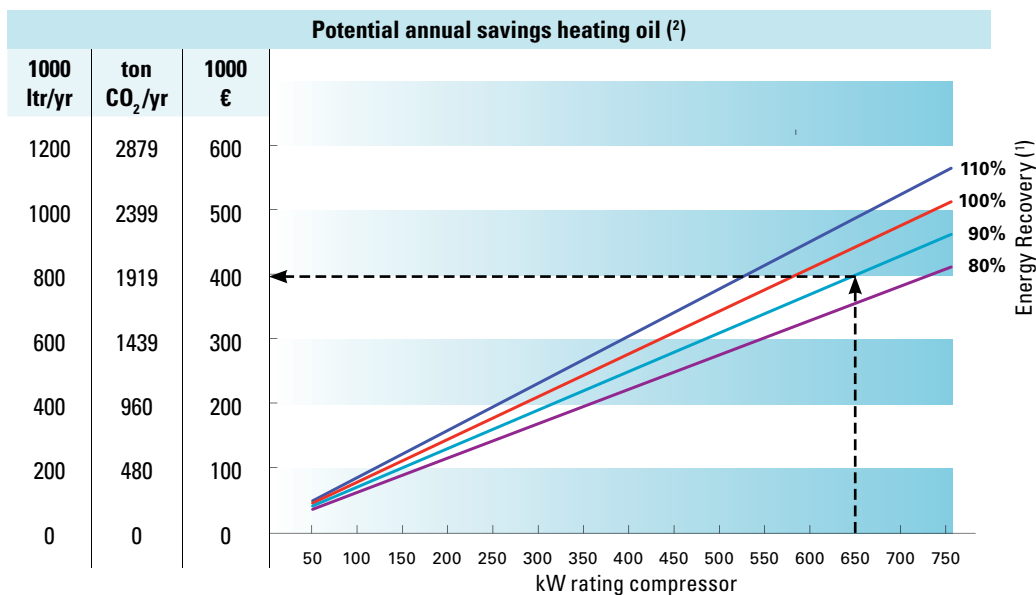
## Variable speed oil-free screw compressor range



# recovery



A 400 kW compressor with an energy recovery of 90%, can save annually about 400 000 m<sup>3</sup> natural gas, 883 ton CO<sub>2</sub> and €240 000.



A 650 kW compressor with an energy recovery of 90%, can save annually about 800 000 ltr heating oil, 1919 ton CO<sub>2</sub> and €400 000.

<sup>(1)</sup> Energy Recovery as hot water depending on site conditions.

<sup>(2)</sup> According to reference conditions at full load operation

Yearly running hours: 8500 - Boiler efficiency: 70%

	Heating Oil	Natural gas
Calorific value	43000 kJ/kg	39000 kJ/m <sup>3</sup>
Cost	0,5 €/ltr	0,6 €/m <sup>3</sup>
CO <sub>2</sub> /MWh	0,279 ton	0,203 ton

SOURCE: <http://www.defra.gov.uk/environment/business/reporting/pdf/20090928-guidelines-ghgconversion-factors.pdf>

# The Energy Recovery control unit



Energy Recovery control units are specifically designed to transfer the energy recovered from oil-free air 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 in the application.

## Main functionalities:

- 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
- Single interface between compressed air system - up to 4 units - and the customers' process.

There are 4 sizes of control units available, which can handle the energy recovered from the oil-free compressors up to 900 kW.

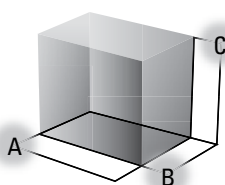
A comprehensive standard execution can be extended with a number of application specific options.

## Standard scope of supply:

- Variable speed water pump
- Electronic controlled 3 way by-pass valve
- Elektronikon® microprocessor with graphical display for monitoring & control system
- Pre-mounted electrical cubicle
- Single point of electrical connection (380-500V 50/60Hz)
- Stainless steel gasketed plate heat exchanger(s)
- Pressure relief valve
- Pressure expansion vessel
- Automatic de-aeration valve
- CE or ASME Approval depend on site requirement
- Single point inlet and outlet connections (DIN or ANSI flanges)
- Common baseframe with all pipes and connections included
- Protective canopy

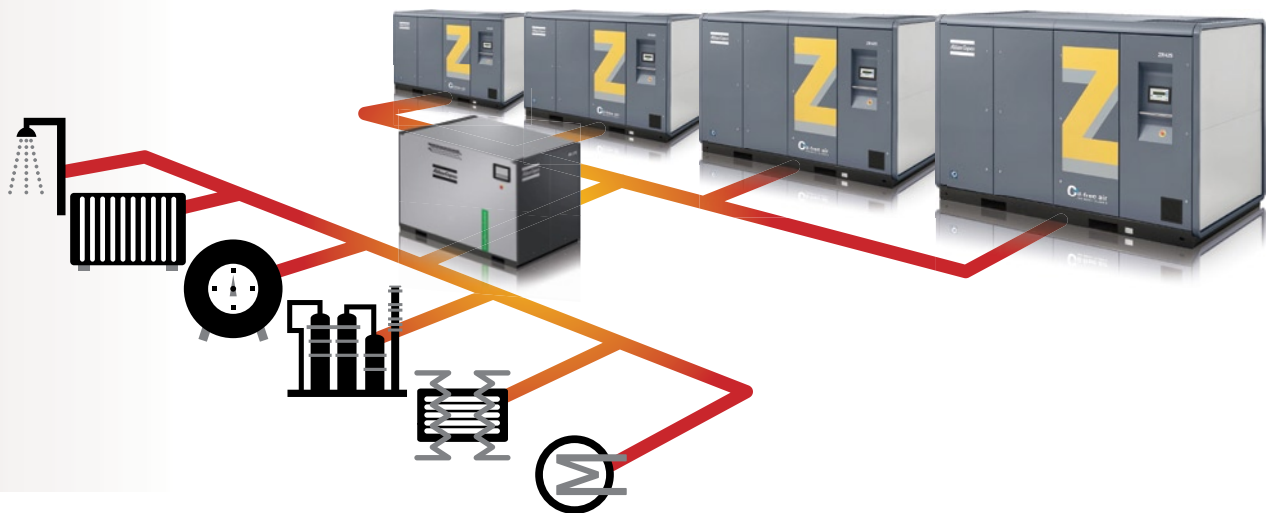
Options table	Models			
	ER 90	ER 275	ER 425	ER 900
❶ Stainless steel back-up heat exchanger	●	●	●	●
❷ Stainless steel heat exchanger for customer's process circuit (*)	●	●	●	●
❸ Cooling water connections for (I)MD dryer type (*)	●	●	●	●
❹ Stand-by water pump	●	●	●	●
❺ Anchor pads	●	●	●	●
❻ Maximum # connectable compressors:	1	4	4	4

(\*) If this option is selected, the built in back-up heat exchanger is automatically selected



Dimensions	A (mm)	B (mm)	C (mm)
<b>ER 90 - 900</b> Without optional heat exchanger for customer's process	1450	1500	1500
<b>ER 90 - 900</b> With optional heat exchanger for customer's process	1950	1500	1500





## Optional equipment:

- ❶ **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.
- ❷ **Built-in heat exchanger for the customers' process circuit:** A stainless steel gasketed plate heat exchanger for process water
- ❸ **Secondary fresh cooling water connection :** Available to supply cooling water to the (I)MD dryer
- ❹ **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
- ❺ **Anchor pads:** Fixation to the foundation of the unit can be guaranteed
- ❻ **Connectable compressors:** Control units are available to handle the heat energy in the cooling water flow of multiple compressors, and this up to a maximum of 4 compressors connected to 1 single control unit.

## Control & monitoring

The latest generation Elektronikon® controller offers a great variety of control and monitoring features that allow you to increase the machine's efficiency and reliability:

- Improved user-friendliness with 6-inch high-definition colour display with clear pictographs and extra LED indicators
- Multilingual user interface and durable keyboard
- Built-in web server for visualisation of all the parameters
- Remote control and connectivity functions via digital contacts and field bus interfaces



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