

ATLAS COPCO LIQUID RING VACUUM SOLUTIONS FOR THE POWER INDUSTRY



Atlas Copco



ATLAS COPCO: SERVING THE POWER INDUSTRY

Following the acquisition of Edwards Vacuum by Atlas Copco, we are proud to combine the strengths of Atlas Copco's global network of customer support centres with Edwards' breadth of knowledge in challenging vacuum applications. With a comprehensive product range, Atlas Copco is a trusted partner to the power industry. We provide reliable equipment for many challenging applications. Benefits of working with Atlas Copco include:

- World leading player in air/gas compression and purification.
- More than 130 years of experience.
- Presence in more than 160 markets.
- Extensive global service network.
- No compromises on component quality.
- Highly-trained personnel.
- Complete range of solutions and services.

As leader in vacuum technology for over 100 years, Edwards has grown with the power industry – from pioneering work in developing equipment for the early power stations, to the supply of sophisticated vacuum systems for thermal, nuclear and even solar-powered power plants today.

One of Edwards' daughter companies is Hick Hargreaves, which was established in Bolton, UK in 1832. Hick Hargreaves Process Vacuum specializes in the application of vacuum processes, heat transfer and mass transfer technology for end users and main contractors in the industry.





WHY EDWARDS LIQUID RING PUMPS?

Highly effective pumping capability on saturated air loads

Edwards SHR pumps can handle condensable vapours or even slugs of liquid entrained in the incoming gas stream, without damage to the pump. The condensing effect, which occurs as the incoming gas stream contacts the liquid ring, can greatly enhance the upstream capacity of the pump. Edwards liquid ring pumps are ideal for condenser air extraction, where the incoming non-condensable air load is fully saturated with steam.

Well suited to operation across the vacuum range

Edwards SHR liquid ring pumps are suitable for continuous operation across the complete vacuum range from atmospheric pressure down to 30 mbara. The principle of operation produces a relatively constant pumping speed at all inlet pressures. This enables the pump to track the turbine condenser outlet pressure over a much wider range of operating conditions than steam ejector systems. It also provides excellent hogging capability when using duty and standby pumps in parallel.

Capable of handling wet corrosive process streams

A wide selection of materials of construction is available, providing the optimum choice for handling most gases and seal liquids without corrosion. This option is very useful when considering systems using direct seal liquid supply from river or sea water, or on geothermal plants. Common material options include cast iron, SG Iron, 316 stainless steel, aluminium bronze, and duplex stainless steel.

Tolerant of small particulates in the gas stream

As the clearances inside the pump are quite generous, entrained particles can be handled without detrimental effect. The particulate matter is collected by the seal liquid and carried out to the pump discharge.

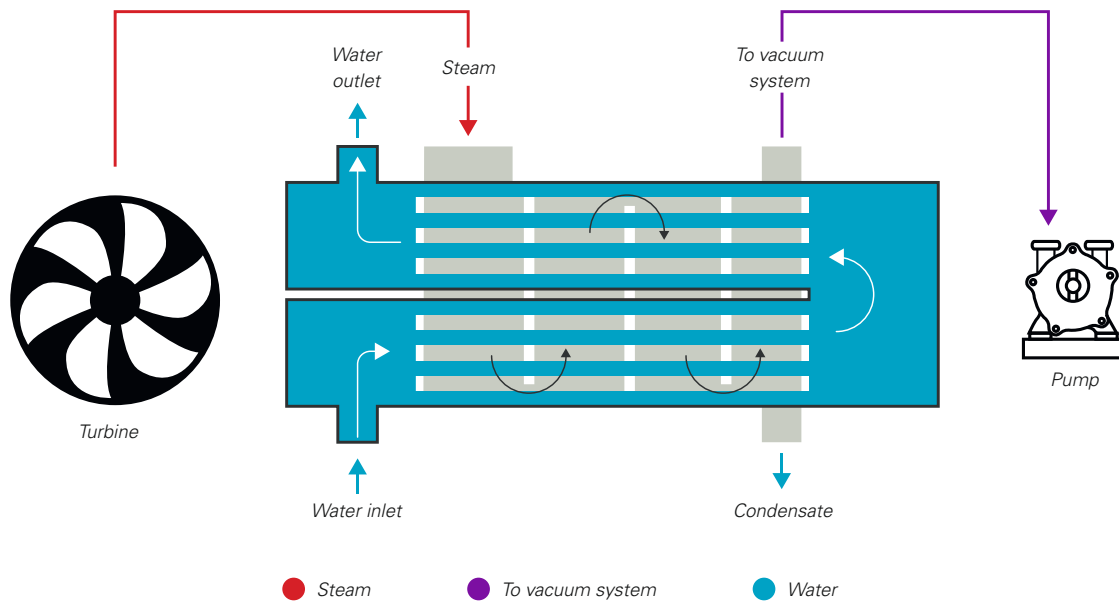
Robust, reliable, low maintenance construction

Edwards SHR pumps have a simple design, with no contact between major pump components. The absence of contacting parts, allied with the low operating temperatures, ensures that these pumps are extremely reliable. Capable of handling process upsets, they require only minimum maintenance and are often considered the workhorse of the vacuum world.

Low noise level

The typical noise level for Edwards liquid ring pumps is below 80 dB(A), if correctly installed. The regular non-pulsating gas flow contributes to low vibration levels in the pump and associated pipework.

CONDENSER AIR EXTRACTION



Improved performance and reliability

To increase the availability, operational performance and reliability of turbine condenser vacuum plants, the dynamic relationship between the vacuum pumping system, condenser performance and turbine back pressure is an important factor in the design requirements and needs careful appraisal when considering overall plant performance. Selection of the vacuum equipment is usually based upon a theoretical condition, with performance requirements taken from HEI (or VGB) recommendations. Client specifications require further analysis of pump performance at actual operating temperatures and pressures, including part load and operation with alternate fuels.

Efficient removal of air leakage

Edwards condenser air extraction packages, based on two-stage liquid ring vacuum pumps, are designed to remove system air leakage across common sizes of turbine generator steam condensers. This is achieved by reducing the pressure in the turbine, enabling more heat from the steam to be converted to mechanical energy, increasing efficiency of the power plant.

Optimal handling of high vapour loads

The air load from the turbine condenser system is saturated with vapour: Edwards SHR pumps are ideal for handling high vapour loads as much of the vapour will be condensed at the pump suction (by the direct condensing action of the inlet water spray or contact with the pump seal water). This condensing reduces the total volume to be handled by the pump, which is a significant advantage when compared to other pumping technologies.



STANDARD SIZE LISTING PER HEI STANDARDS

Edwards standard packages are designed to meet the requirements of HEI standards. Initial Temperature Difference is an important consideration in optimum pump selection. The table below gives pump selection based on varying ITD's at 1" Hg abs (33.86 mbara) at the condenser outlet.

SCFM ITD	10°C	11°C	13°C	15°C	17°C
5	SHR2750	SHR2400	SHR2400	SHR2400	SHR2400
7.5	SHR2950	SHR2750	SHR2750	SHR2400	SHR2400
10	SHR2950	SHR2950	SHR2750	SHR2750	SHR2750
12.5	SHR2950	SHR2950	SHR2950	SHR2750	SHR2750
15	SHR21200	SHR21200	SHR2950	SHR2950	SHR2950
17.5	SHR21850	SHR21200	SHR21200	SHR2950	SHR2950
20	SHR21850	SHR21850	SHR21200	SHR21200	SHR2950
25	SHR22500	SHR21850	SHR21850	SHR21200	SHR21200
30	SHR22500	SHR22500	SHR21850	SHR21850	SHR21850
40	SHR22500	SHR22500	SHR22500	SHR22500	SHR21850

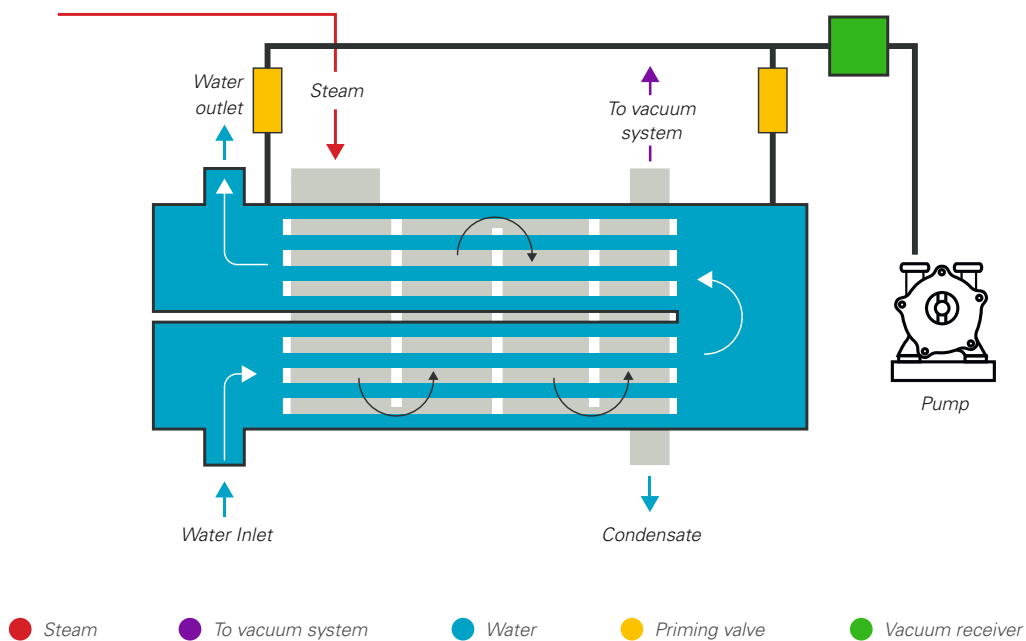
Model	Pump	SCFM	HP	kW	A*	B*	C*
CEP750-2	SHR2400	5 – 7.5	40	22	2350	1000	1500
CEP1000-2	SHR2750	7.5 – 12.5	75	45	3750	1350	2000
CEP1500-2	SHR2950	10 – 20	100	55	3750	1350	2000
CEP2000-2	SHR21200	15 – 25	125	75	4500	1500	2500
CEP3000-2	SHR21850	20 – 30	175	110	4500	1500	2500
CEP6000-2	SHR22500	25 – 40	225	132	5500	1700	3000

*Dimensions in mm



WATERBOX PRIMING

The ability to handle wet gases without detrimental effect makes liquid ring vacuum pumps ideal for this priming application. The pumps are used initially to carry out priming of the main condenser water boxes and CW pump; once this is complete they are used to maintain vacuum in the water box at the required level.



Maximize cooling efficiency

The removal of air from the condenser waterbox prevents accumulation of air in the upper parts of the cooling tube bundle, thereby preventing air locks and maintaining the effective cooling surface of the condenser, ensuring maximum cooling efficiency.

The Edwards priming system is a modular design comprising three component parts: vacuum pumps, vacuum receiver and priming valve and accessories, which are supplied as required to meet customer specifications.

The vacuum pump system comprises a single stage Edwards liquid ring pump complete with a total seal water recirculation system, sized to meet the process duty requirements. If duty and standby pump sets are called for, then two systems are provided, giving true standby capability including the seal water recirculation system.

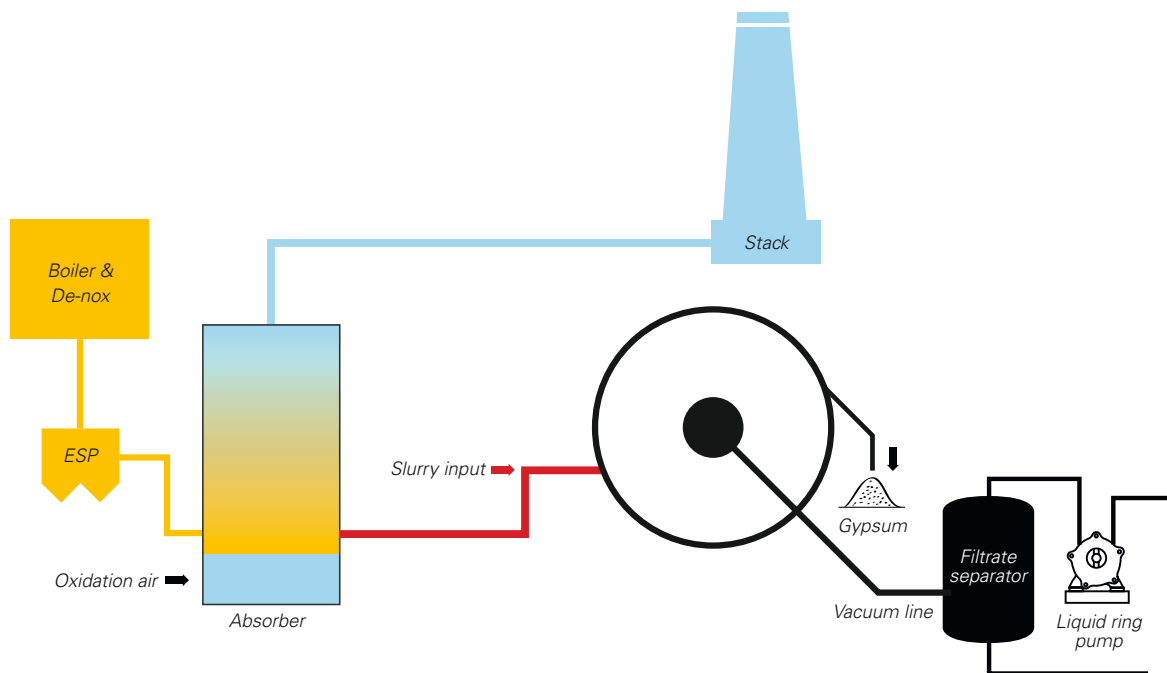
Avoid corrosion

The vacuum receiver vessel is complete with a pressure transmitter to control the pump operation and includes an automatic drain tank arrangement to remove any water carryover from the system, therefore avoiding corrosion. If required, a priming valve and associated accessories can be supplied for each condenser vacuum connection: the priming valve helps to prevent cycling of the vacuum system and minimizes carryover of cooling water. Additional connections can be made to the vacuum receiver to enable main cooling water pumps to be primed before operation.

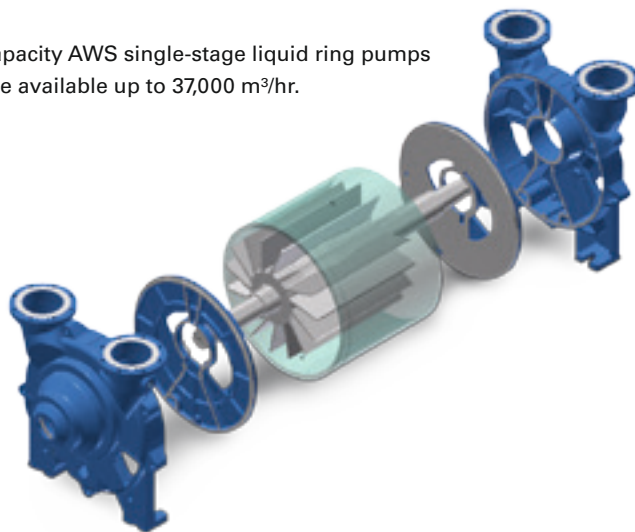


FLUE GAS DESULPHURIZATION

Flue gas desulphurization systems are a common feature on modern coal-fired power plants. A by-product of the process is gypsum which is produced at the outlet of a scrubber. Atlas Copco liquid ring pumps provide reliable vacuum for dewatering the gypsum via belt or rotary drum type filter. The large single stage Atlas Copco AWS liquid ring pumps are designed specifically to handle this type of application & are selected based upon the surface area of the vacuum filter.



The Atlas Copco range of large capacity AWS single-stage liquid ring pumps for this challenging application are available up to 37,000 m³/hr.



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.



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