

- CONESep® is an externally regenerated technology that fully isolates the resin regeneration process and chemicals from the condensate lines
- Fully automatic operation
- Fully flexible in resin ratio employed
- One CONESep® system can service a number of service polishers
- Allows for a spare charge of resin to be transferred back into the service vessel as soon as the exhausted resin is removed, to minimise polishing down time
- High resin separation efficiency: anion resin in cation resin < 0.4 % cation resin in anion resin < 0.1 %
- CONESep® does not require inert resins or 3-bed systems to achieve high resin separation levels. Only 2 vessels are needed
- Resin separation process can be monitored locally
- The system can be factory-assembled with break down and re-build kept to a minimum
- CONESep® can achieve optimum resin separation that is independent of the ratio of anion and cation resins used, enabling different resin types to be used
- Simple procedure for the removal of resin fines
- Resin interface isolated from the transfer of resins back into service

The company

Our pedigree in the UK can be traced back to 1902, with the development of some of the first industrial softening systems in order to overcome problems with boiler water chemistry. Since that time Christ-Kennicott Water Technology has been developing and supplying innovative solutions to meet the increasingly stringent demands of industry for cost effective water purification and treatment. We are part of the Christ Water Technology Group of companies within the BWT Group, that is renowned worldwide as leaders in water technology. With offices throughout Europe and the Rest of the World, our group can service your needs for the construction of cost effective solutions to water related requirements.



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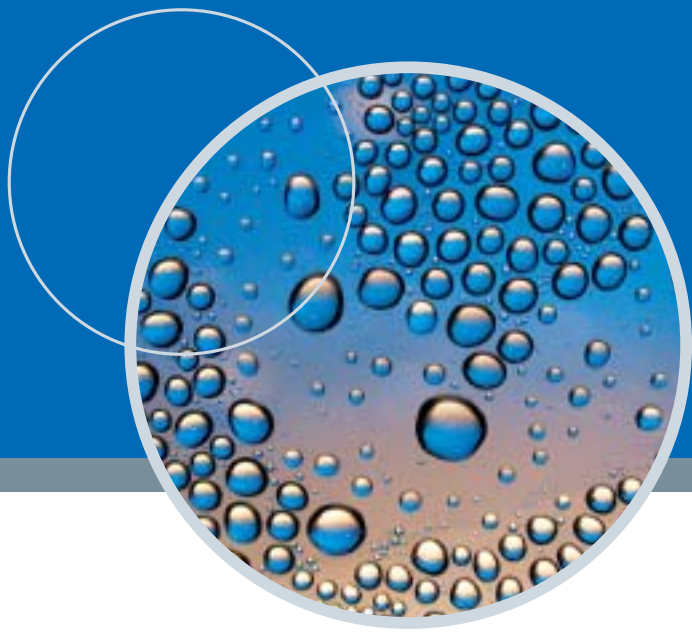
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CHRIST KENNICOTT®

Christ Water Technology Group

CONESSEP®

Externally regenerated condensate polishing technology

The modern power station operating with condensing type turbines normally has a make-up rate, which is less than 3 % of the total boiler evaporation. In fact, during normal operation the make-up can often be less than 1 %.

When a generating set is started up, either during commissioning, or after any subsequent shut-down, particularly in stations which are multi-shifting, then contamination of the condensate returns is experienced due to the production of corrosion products. These contaminants can be both in suspended and soluble form. Contamination of condensate can also occur if the condenser is subject to any leakage, allowing relatively high TDS cooling water ingress.

Deionisation techniques are applied to polish a portion of, or the total, boiler-feed flow, removing any solids, which are present from either of the sources of contamination listed above.

Because of the general low order of solids to be removed and the extremely large volumes of water to be treated, these deionisation plants are designed to operate at very high flow rates.

External regeneration: CONESSEP®

Deionisation at high flow rates can present challenges with respect to the design of a suitable internal distribution system, particularly when one considers the very large ratio that would exist between the normal high operating flow and the necessary resin regeneration flow. CONESSEP® has been developed allowing for transfer of

the ion exchange resins from the service polishing unit into completely separate vessels, where regeneration of the resin is carried out. When the resin is fully regenerated the process is reversed and the resin transferred back into the service unit.

This arrangement of plant ensures there is no chance of any regenerant accidentally entering the boiler-feed system and allows optimal design of the service and regeneration vessels.



CONESSEP® installations

CONESSEP® "S" – World leading resin separation technology

Resin separation is the key to condensate polishing system performance. For 20 years, Christ-Kennicott Water Technology have supplied their patented CONESSEP® system as part of the Condensate Polishing Plants (CPP) to power stations around the world.

Years of operating experience in over 80 installations have demonstrated that the unique design of CONESSEP® outperforms all other systems in the elimination of resin cross-contamination. This allows for consistent operation in the ammonia cycle, and in a fully oxygenated regime, where control of sulphate and chloride ions to the lowest practicable levels is paramount to the integrity of the complete steam cycle.

Standard packages are designed for turbine sets up to 900 MW.

CONESSEP® packages consist of:

- Resin separation/anion regeneration vessel
- Cation regeneration/mix and hold vessel
- Resin interface isolator
- Instrumentation including conductivity and optical interface detection probes
- All pipework and valves between resin inlet and outlet connections
- Local control panel including resin interface detection unit
- Service vessels designed to enable a 99.9 % resin removal in to the external regeneration system

CONESSEP® installations

The CONESSEP® design has been widely accepted and since the first plant was commissioned at Aghada Generating Station in Ireland in 1980, Christ-Kennicott Water Technology has also granted licenses to other overseas water

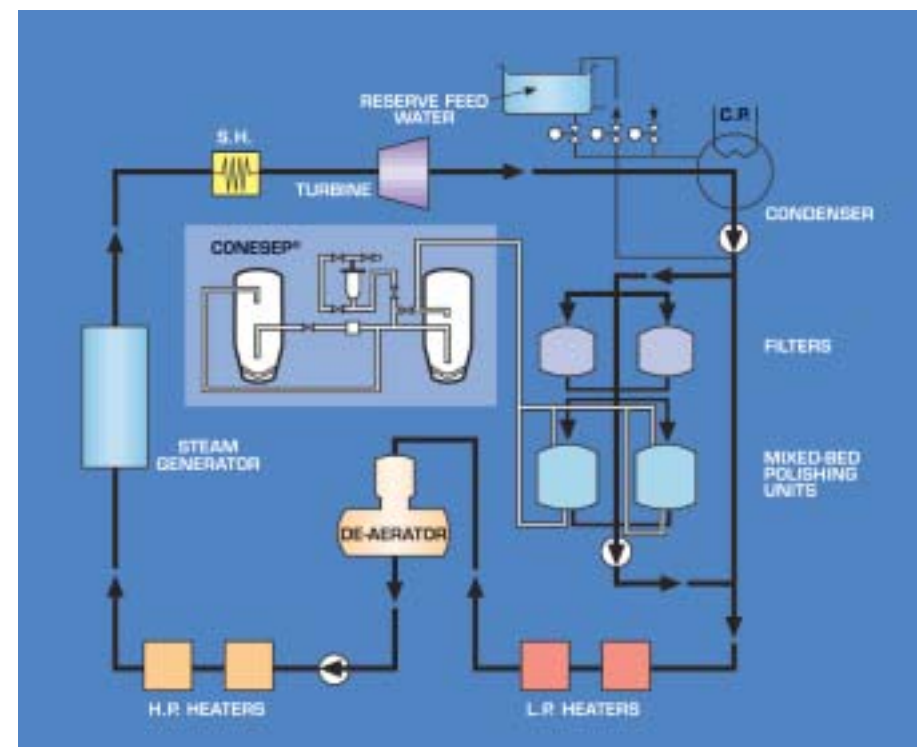
treatment specialists, in specific geographies. Over 90 power plants, thermal and nuclear, use CONESSEP® technology on all continents. CONESSEP® has been installed in many different environments, including sub and super critical fossil fuel plants PWR and AGR nuclear plants.

CONESSEP® "R" – Retrofit option

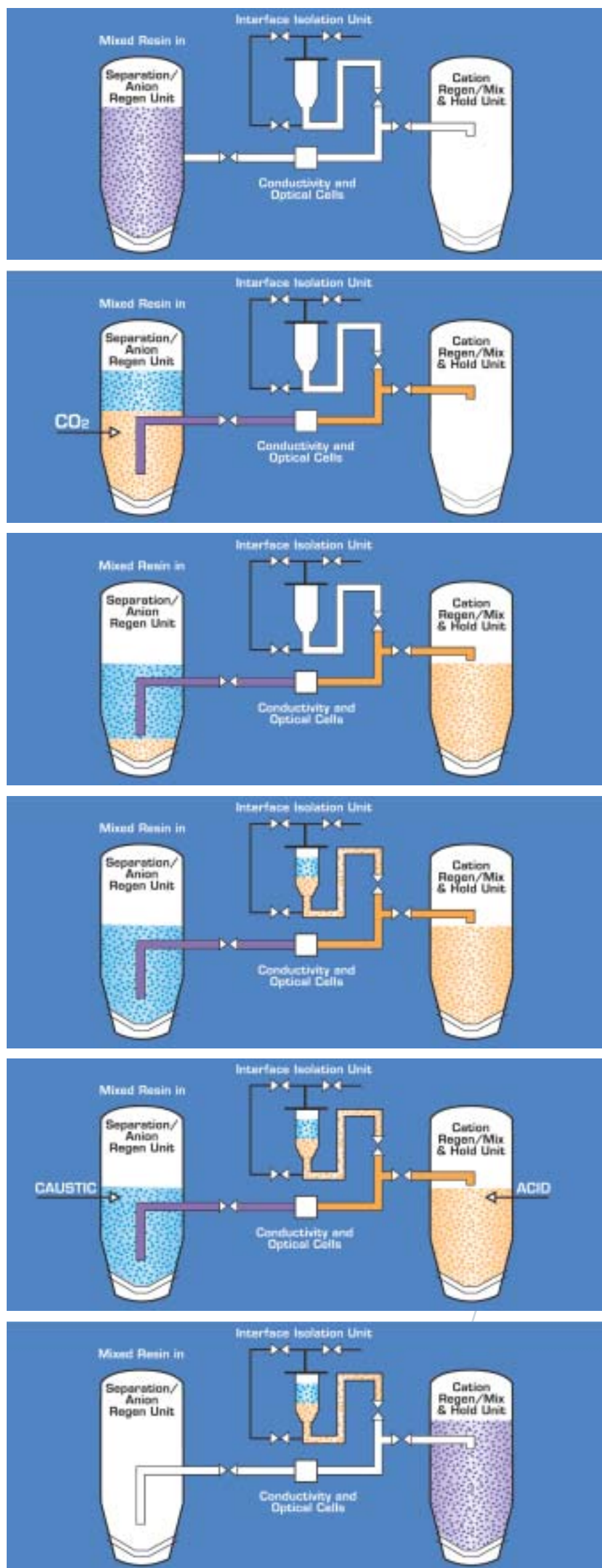
By retrofitting CONESSEP® "R", Christ-Kennicott Water Technology can provide their superior external regeneration of any existing condensate polishing system, improving its performance, giving greater flexibility of system operation.

CONESSEP® "R" includes:

- Resin separation/anion regeneration vessel
- Resin interface isolator
- Instrumentation including conductivity and optical interface detection probes
- Local control panel including resin interface detection unit
- On-skid pipework and valves



▲ Typical configuration of a high pressure boiler and associated condensate polishing plant, and CONESSEP® external regeneration



Exhausted, mixed resin is transferred to the resin separation/anion regeneration vessel. A small amount of mixed resin isolated during the previous regeneration is added from the resin isolation pot. The resins are backwashed and air scoured to remove particulates.

The resin is backwashed again without air scour and the denser cation resin sinks to the bottom of the vessel. The interface is visible through a sight glass in the vessel.

Carbon dioxide is carefully injected into the vessel and the resin transfer line is opened. The cation resin flows into the second vessel. The unique cone design of the vessel bottom gradually reduces the diameter of the resin interface and directs it into the outlet branch.

As the resin interface moves into the transfer line, the difference in conductivity between the resins is detected. The transfer line is closed and the small amount of resin in the line is diverted to the interface isolation pot. A back-up optical cell detects the interface by colour difference in the unlikely event of the conductivity cell failing.

The cation and anion resins are regenerated simultaneously and rinsed to drain. Any cation resin still in the anion is now very dense and settles at the bottom of the vessel. This resin is then transferred to the interface isolation pot to achieve the quoted cross-contamination levels.

The regenerated anion resin is transferred to the cation regeneration/mix and hold vessel, the two resins are rinsed to final quality, and then transferred back to the next available polisher service vessel.