Case Study -CPU

INDION® 2250 H & INDION® GS 3000 OH for Condensate Polishing Unit (CPU) at 660 MW, SUPER CRITICAL THERMAL POWER PLANT.

Introduction:

Ion Exchange (India) Ltd. Received the order for CPU resin for one of the four Ultra Mega Thermal Power Plant Project awarded by the ministry of power, government of India which is based in Madhya Pradesh for the application of Condensate Polishing Unit (CPU) which is used in power generation for purification of condensate water.
The CPU resin removes 'crud' – corrosion products consisting mostly of oxide of iron, copper or nickel, dissolved solids – mostly consisting of sodium, chloride, silica and carbon dioxide. Condensate polishing units are typically installed for super thermal power stations with the main objective of improving the boiler water quality. The benefit of condensate polishing is quicker start-up, and as a result, full load conditions are reached early, giving economic benefits. The orderly shutdown is possible in the case of condenser tube leak conditions. This is a very critical application wherein impurities from high pressured condensate is treated and would be again taken for steam generation by burning any kind of conventional source of energy (fossil fuels).

Process Description:

The condensate polishers are located in the turbine hall and the exhausted resins are hydro pneumatically transferred to the water treatment plant areas where they are regenerated and transferred back to the polisher.
It is normal to operate the polisher initially in the hydrogen cycle, in which the cation resin is in hydrogen form and the anion resin is in the hydroxide form. The process typically takes around 7 – 8 days, after which the cation resin gets converted into ammonium form, and the polisher is then operated in the ammonia cycle. In some cases, it can also go up to 30 days in hydrogen cycle, experience has shown that the hydrogen cycle operation is almost always problem free and produces condensate of the required quality. Boiler drum sodium, chloride, and silica increases within 2 – 3 days of operation of the polisher in the ammonia cycle. To avoid this risk of ionic leakage of Cl, SiO_2, and Na, the ammonia cycle is not operated in the CPU at a power plant in India.

The CPU MB Resin - separation of ion exchange resin in a mixed bed is done by backwashing the unit with water. In this process the cation resin settles at the bottom and the lighter anion resin remains at the top. However, it is observed that a small percentage of cation resins in the anion portion and vice versa, (a phenomenon called cross contamination) is always present at the interphase of Cation and Anion resin. This cross contaminated interphase is always retained in the separation unit while transfer of Anion to ART and

transfer of Cation to CRT.
In this CPU application the inlet pressure of the condensate water in CPU ranges from 20 to 40 bars and temperature of condensate water can go up to 50 ºC. Here, outlet parameters are very stringent, so a specialized resin is required to cater the water quality. The detailed characteristics of the resin that Ion Exchange (India) Ltd. offer for this application is mentioned below.

Advantages:

- Improvement in the quality of condensate and "cycle" clean up.
- Reduced blow down and make up requirements.
- Improvement in boiler water quality for drum type boilers.
- Quick start up and as a result, full load conditions are reached early giving economics benefits.
- Orderly shutdown possible in case of condenser tube leak conditions.
- Improvement in quality of steam which results in enhanced turbine life.

Results:

After passing high pressurized condensate through ion exchange columns containing INDION® 2250 H and INDION® GS 3000 OH, the treated condensate exactly meets the customer's requirement with respect to the reduction in dissolved ions, Silica and Cruds. Outlet parameters of treated water at CPU are as follows:

Parameter	Inlet	Outlet
Conductivity (µS/cm)	< 2.0	< 0.1
pH	8.8 – 9.2	6 – 7
Sodium (ppb as Na)	< 5.0	< 2.0
Silica (ppb as SiO_2)	< 10	≤ 5
ΔP Kg/cm^2	-	< 2.5