

ENEL Power, Italy – Sulcis Project – ZLD Plant for FGD Wastewater Treatment

The Facility

The Sulcis Power Plant is equipped with 1 x 345 MW fluidized bed boiler and 1 x 240 MW conventional boiler. This coal-fired power plant is located in Sardinia Island and has a total of 585 Mwe capacity. The units normally fire imported coal with < 1% Sulphur. The flue gases are treated sequentially by SCR-DeNOx with ammonia as the reagent. This is followed by a high efficiency ESP to remove fly ash and wet limestone gypsum forced oxidation DeSOx. Each unit is equipped with a 1 x 100% DeSOx line with a prescrubber for final dedusting and gas saturation and an absorber. The blow down from both the prescrubber and absorber along with other wastewaters are sent to an existing wastewater treatment plant where heavy metals and suspended solids only are removed. In the first stage lime and sodium sulfide are added to remove metals; in the second stage ferric chloride is added to remove suspended solids and in third stage hydrogen peroxide is added to remove oxidizing agents. The Unit 3 prescrubber is fed with seawater and at the WWTP the brine was treated and discharged into the Adreatic Sea.



The Problem

Wastewaters from FGD treatment plant can no longer be discharged into the sea due to tough Italian and EU environmental regulations. In order to overcome this major environmental problem, ENEL decided to feed the prescrubber with fresh and recirculated waters and install the Zero Liquid Discharge (ZLD) plant so that no industrial wastewater discharges are allowed by the entire power plant.

The Solution

To overcome the problem, ENEL selected the Softening – Evaporation – Crystallization (SEC) process to treat the wastewaters and reuse/conserves fresh waters. Aquatech supplied, installed, commissioned the ZLD plant as an EPC contractor with local associates.

The SEC plant comprises of 1 x 100% Softener Clarifier (calcium reduction by soda ash dosing), 1 x 100% Falling Film type Brine Concentrators (equipped with two Vapor Compressors operating in series), 1 x 100% Crystallizer (equipped with Thermocompressors) and 2 x 50% Belt Filter Presses. The plant also includes several chemical dosing systems, storage tanks, pumping systems, electrical works (MCC, cable trays, cabling etc), controls & instrumentation.

The ZLD plant is a fully integrated automated system. The Brine Concentrator operates in seeded slurry mode. The Brine Concentrator is equipped with external mist eliminator for ease in maintenance. The Crystallizer operates in forced circulation method.

The industrial grade soft water and high purity distillate produced in the system will be used in the main power plant.

PROJECT PROFILE SERIES # 54

DESIGN FGD WASTEWATER ANALYSIS

Design Flow.....45 m₃/hr (PT Plant)

Calcium.....1200 ppm

Magnesium.....1200 ppm

Sodium + Potassium.....Balance

TSS.....80 ppm

pH.....9.0

Bicarbonate.....80 ppm

Phosphates.....25 ppm

Chlorides.....22800 ppm

Nitrates.....300 ppm

Sulfate.....1700 ppm

SiO₂10 ppm

PROCESS FLOW DIAGRAM

