BOILER FEEDWATER TREATMENT

Accurate analytical measurement and Control of the Water Treatment Process in Industrial and Utility Boiler applications can ensure optimum Boiler Feedwater Quality resulting in savings on Chemical reagent Costs and greatly reduced costly boiler pipework corrosion.

PROCESS OVERVIEW:

Makeup Water Treatment

Utility and Industrial power plants that burn fossil fuels or produce nuclear reactions for the generation of electricity or process steam require billions of gallons of water per day for steam production and cooling purposes. In order to keep these plants as efficient as possible, the quality of the water is vital.

Ultra-high-purity water is required for makeup in high pressure steam generating systems. However, relatively high concentrations of impurities can be tolerated in makeup water for open recirculating cooling systems. These plants require a constant intake of water to replace water lost through sampling systems, steam losses, evaporation from cooling, and blowdown.

- Since there is a constant loss of cycle water for one reason or another, it is always necessary to have a continual source of incoming water.
- Treating this water is the beginning of the power plant's cycle chemistry.
- Makeup treatment almost always consists of demineralization to remove dissolved impurities.
- Other pretreatment equipment consists of softeners, clarifiers, and filters.
- On an increasing basis, membrane technology is being used along with ion exchangers for effective demineralization treatment.
- The overall goal of the demineralization treatment is to yield high purity water for use in the overall feedwater/condensate cycle.

Make Up Water Treatment Plant

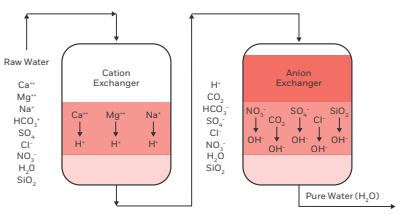


Figure 1 Ion Exchange Units used in the removal of Anions and Cations which will effectively remove minerals and salts from the make up water.

PROBLEM: TREATMENT PLANT EFFICIENCY

Sources of water can vary from the local water authority to a local river to a nearby ocean. Each water source has unique characteristics, including organic growth, dissolved minerals, and chemical contaminants. Each of these inherent characteristics/contaminants can cause difficulties in a power plant.

The water must be treated to minimize potential problems, since these problems often result in either reduction of plant efficiency or large capital costs due to the characteristics and contaminants, the difficulties that they can cause, and the means of treatment for each type. The process of preparing water for use by a plant is known as “makeup water treatment.”

Analytical measurements such as Conductivity, ORP, Sodium Ion, and pH play an important part in ensuring that the various components necessary for water purification are operating at maximum efficiency at all times.

Typically the following measurements are carried out in the Make Up Water treatment and Pre-treatment stages:

- **Electrolytic Conductivity**
  - Cation and Anion Neutralization
  - Reverse Osmosis Plant Efficiency
  - Total Dissolved Solids (TDS)
- **pH**
  - Neutralization of Excessive Acidity or Alkalinity
- **Redox / ORP**
  - Control of Water Treatment Chlorine / Bromines

Reverse Osmosis Membrane Stack in Power Utility

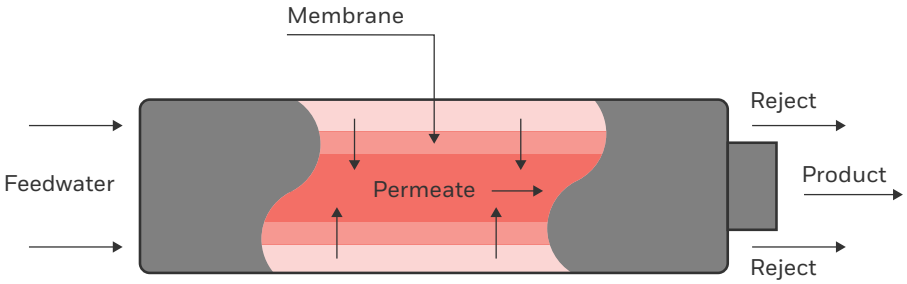


Figure 1

Typical Makeup Water Treatment plant showing Ion Exchange Beds along with make up water inlet and outlet manifolds

RISKS:

The major risks to process operational performance are:

- Corrosion and Scaling of boiler pipework and associated components leading to costly unscheduled outage.
- Excessive and costly use of chemical dosing reagents due to poor water treatment control.
- Inefficient Operation of ion exchange and RO filtration systems resulting in poor feed water quality and costly exchanger re-generation.

DESCRIPTION OF THE SOLUTION:

Liquid Analysis Instrumentation is located in Ion Exchange, Reverse Osmosis, Acid and Base water treatment systems.

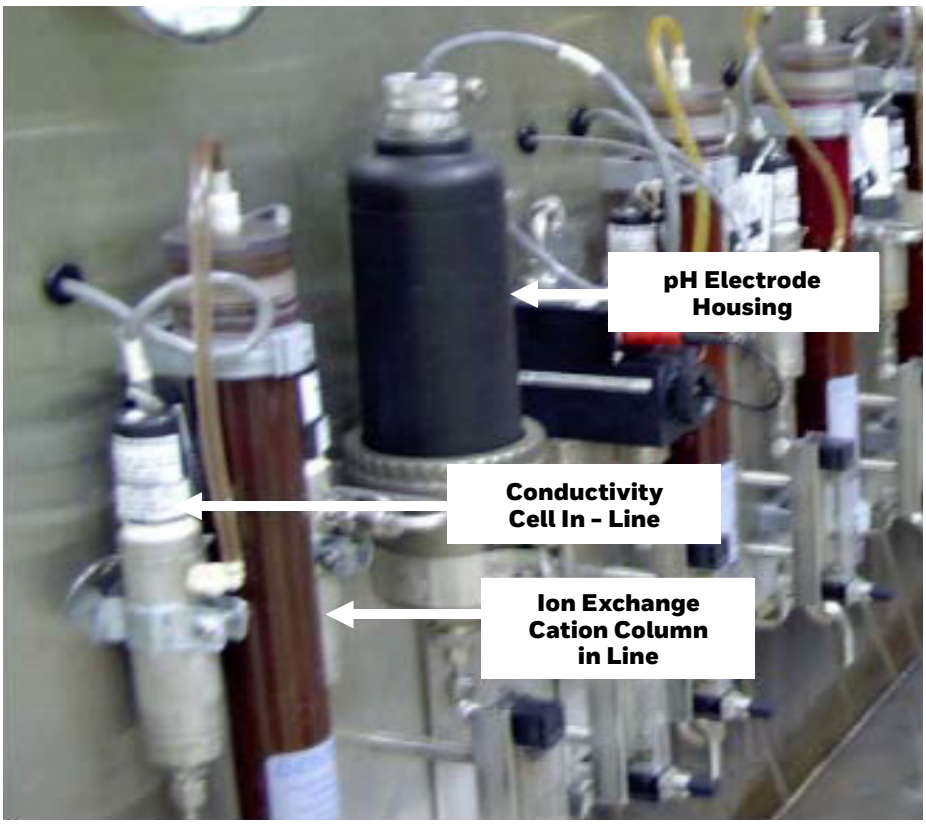
Conductivity is always monitored continuously as well as pH, ORP and Sodium Ion depending upon the components in the make up water. Cation conductivity is measured in the makeup water storage tank to ensure water integrity. Typically this water is at a minimum of 1 Megohm-cm of resistivity (1 microsiemen/cm conductivity); with usual limits being 5 to 10 Megohms-cm resistivity.

ORP may be monitored if some form of chlorination/de-chlorination exists, whether as a monitor of incoming water or as a controlled parameter to protect some types of reverse osmosis or deionization resins.

Specific and Cation conductivity is typically measured in various places to determine efficiency of ion exchangers, softeners, and reverse osmosis systems.

pH or conductivity may be measured as part of the ion exchange regeneration cycle.

Honeywell's UDA analyzer will accept combinations of measuring electrode inputs, and complimented by field proven Conductivity cells provides the optimal solution to Feedwater measurement needs.



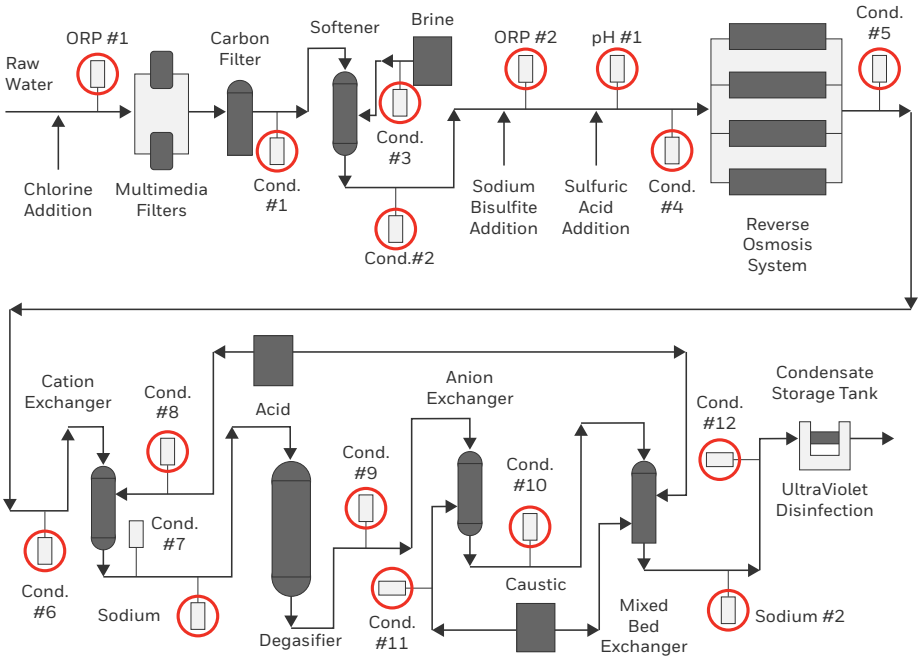
On - Line Liquid Analysis Steam and Water Sampling. pH and Conductivity.

Effects of Corrosion

BENEFITS:

Honeywell Smart Sensor Analytical technology:
Ensures accurate, repeatable pH, Redox/ORP, Conductivity measurements resulting in:

- Cost savings through accurate control of chemicals used in water conditioning.
- Timely regeneration of Ion exchange beds and RO filtration resulting in savings on chemical costs and good quality Feedwater stock.
- Less risk of boiler feed pipework and mechanical parts becoming subject to corrosion damage leading to high replacement costs and lost power generation.
- Reduced analytical inventory with UDA analyzer – no requirement to hold different analyzers "in House"



Typical Water Treatment Schematic Showing Analytical measurement Points ◯

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