

The illustration above shows a simple demineralisation plant where anions are exchanged with hydroxyl ions and cations are exchanged with hydrogen ions

(by the use of ion exchange resins) to produce pure, mineral-free water. ABB sodium monitors are used for continuous monitoring of sodium in the process water.

## Why use Sodium Monitoring in Water Treatment Processes?

### The customer needs:

- ▶ To detect sodium breakthrough and to ensure the process water is pure.
- ▶ To ensure the plant operates at the maximum efficiency.
- ▶ To allow the plant to be maintained to specified standards.

## Why use a Sodium Monitor?

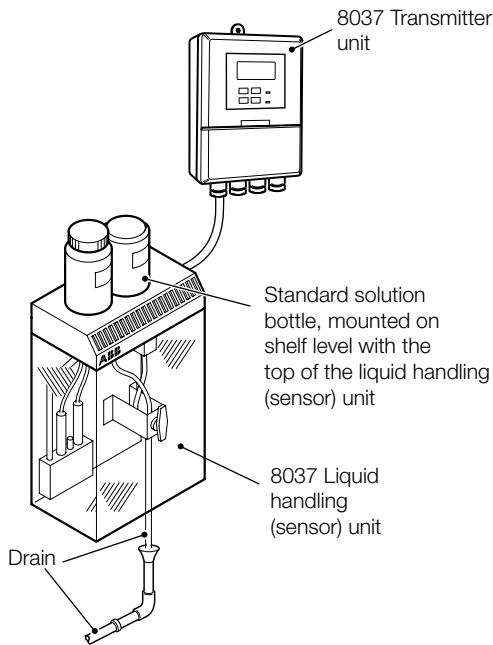
- ▶ Wide sample and ambient temperature tolerances as standard minimise the need for additional conditioning equipment.
- ▶ The 8037 is a pumpless system which requires minimum maintenance.
- ▶ Detachable cables ensure rapid electrode replacement.
- ▶ Our system can use non-carcinogenic, non-pressurised ammonia reagent.
- ▶ Sample driven 'entrainment' reagent addition removes:
  - the need for pumps or diffusion tubing,
  - the need for additional maintenance normally required by such systems.
- ▶ We supply full details of reagents to ensure the most cost-effective procurement options.
- ▶ Our integral constant head design eliminates the effects of sample pressure and flow rate variations and minimises sample transport time.
- ▶ Our patented calibration solution technique ensures thermal equilibrium.
- ▶ In addition, ABB offer greater security at a lower cost by having:
  - A worldwide network of companies and agents to ensure backup in most countries.
  - Proven reliability – over 100 years of process instrumentation experience.
  - Full installation, commissioning and routine servicing facilities available.

## Associated Instrumentation Products from ABB

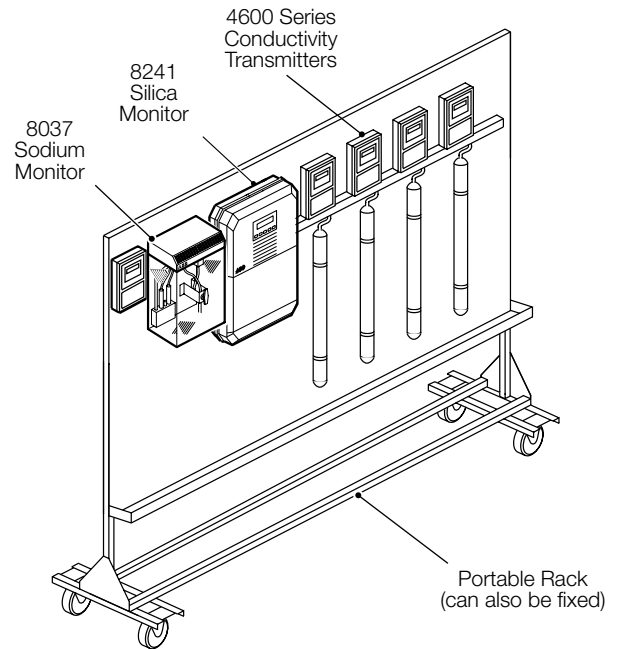
- ▶ **Analytical applications**
  - pH monitors and associated electrode systems.
  - Conductivity monitors and associated measuring cells.
  - Silica monitors.
- ▶ **Industrial applications**
  - Recorders and recorder/controllers.
- ▶ **Flow applications**
  - MagMaster flowmeters.
  - Differential pressure transmitters.

## Installation

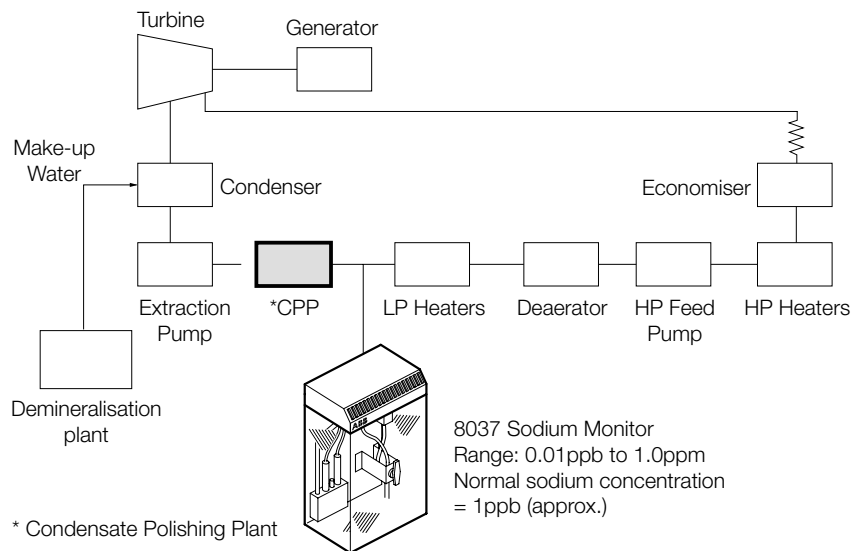
- ▶ ABB Sodium monitors are normally located inside the Water Treatment Plant on a rack – preferably in an air-conditioned room.
- ▶ Samples are normally at ambient temperatures so sample cooling should not be necessary (even the polishing plant will be below 55°C).
- ▶ Fit a needle valve upstream to control the sample flow within required limits.
- ▶ Conveniently site the standard solution bottles on the top of the liquid handling section of the monitor.



Model 8037 Sodium monitor – wall-mounted



Sodium monitor in typical rack-mounted arrangement



Simplified schematic of 'once-through' boiler system showing location on CPP

## Process Description

### Basic Measurement/ Analysis Theory

All on-line sodium monitors are based on the use of a sodium ion selective electrode and a reference electrode. The measurement is very similar to that of pH, with the electrode pair also responding to hydrogen ions and changes in sample temperature.

The hydrogen ion interference is controlled by raising the pH of the sample (reducing the hydrogen ion concentration). This is achieved by adding an alkali – usually ammonia gas or a volatile amine. Temperature effects are reduced by monitoring temperature and carrying out automatic temperature compensation. The monitor is calibrated by use of solutions of known sodium ion concentration, with the electrode pair producing a millivolt output proportional to the sodium ion concentration.

### Cation Exchange Bed

Cations are exchanged for hydrogen ions in this bed until all the hydrogen ions in the bed have been removed. At this stage (known as resin bed exhaustion) the levels of dissolved solids in the water will increase and the resin will need to be regenerated by passing acid (usually sulphuric or hydrochloric) to reinstate the hydrogen ions in the resin.

### Mixed Bed

The mixed bed contains a mixture of both cation and anion exchange resins to further reduce the dissolved solids content, and thus produce the quality of make-up water required.

### Condensate Polishing Plant (CPP)

This type of plant is used mainly on once-through type boilers. It takes the condensate from the steam turbine/condenser and purifies or polishes it to reduce the concentrations of any impurities such as sodium chloride, sulphate etc., which may have entered the system via condenser tube leaks. Condensate polishing plants (CPP's – see figure on previous page) only normally remove small levels of contaminants, therefore only have a mixed bed stage.

## Measuring Points

### Cation Bed Outlet

Monovalent cations such as sodium ( $\text{Na}^+$ ) are the first ions to breakthrough when cation resin exhaustion occurs. The ability of the sodium monitor to detect very low levels of sodium makes it a much more sensitive method of detecting resin exhaustion than conductivity.

### Mixed Bed Outlet

Here again, sodium monitors are used to check the quality of the final water and detect exhaustion of the cation exchange resin within the mixed bed. It is essential that the sodium concentration in the final water is kept as low as possible to minimize thermal losses due to blowdown.

### Condensate Polishing Plant (CPP) Outlet

As with the complete demineralisation plant, the CPP has a sodium monitor on the outlet from the mixed bed unit to detect exhaustion of the cation resin. This is particularly important on once-through boilers as any sodium in the feed water after the CPP is deposited in the boiler, causing corrosion and potentially, the premature shutdown of the system.

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**ABB Limited**  
Oldends Lane, Stonehouse  
Gloucestershire  
GL10 3TA  
UK  
Tel: +44 (0)1453 826661  
Fax: +44 (0)1453 827856

**ABB Inc.**  
125 E. County Line Road  
Warminster  
PA 18974  
USA  
Tel: +1 215 674 6000  
Fax: +1 215 674 7183