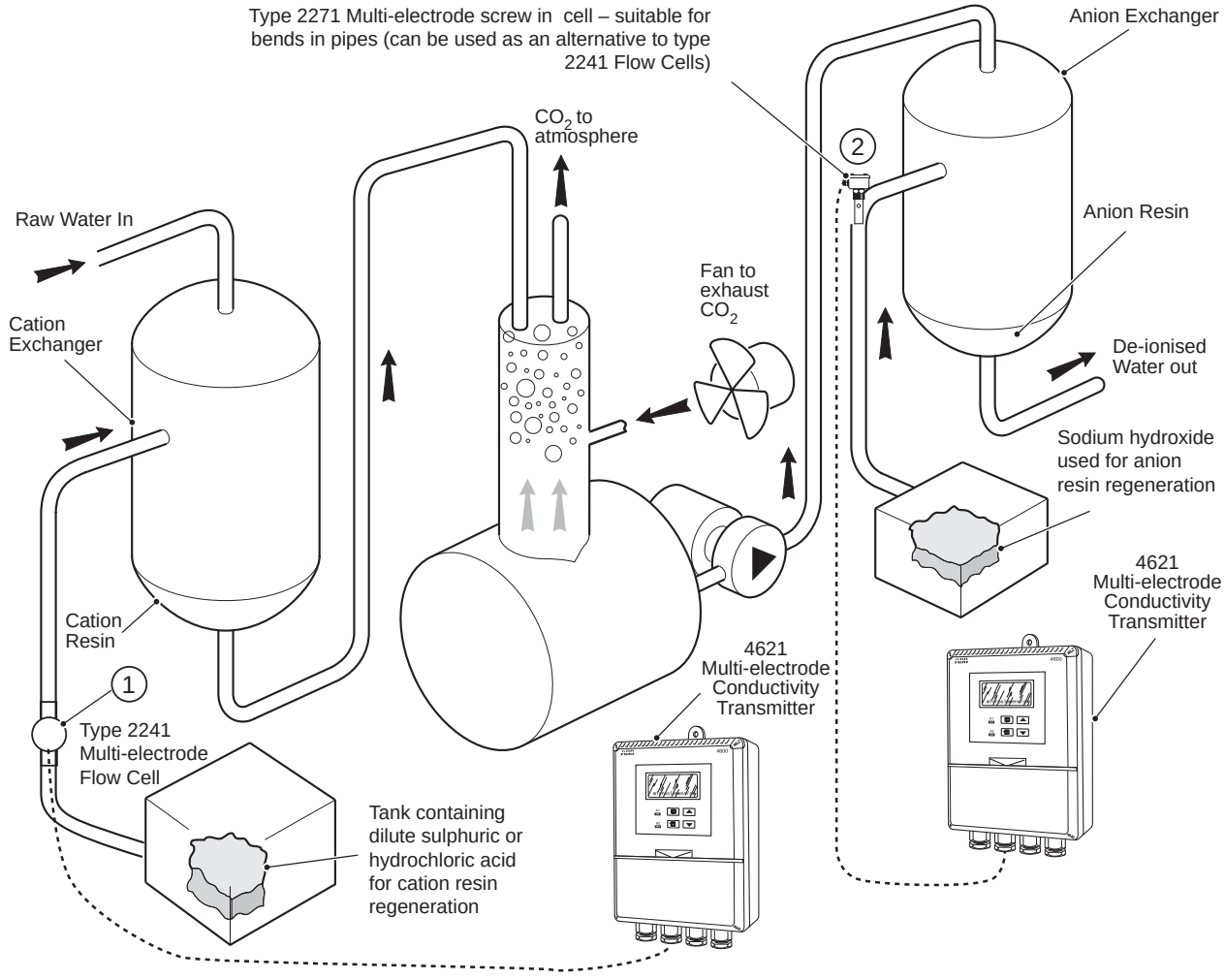
Application Guide

Resin Bed Regeneration in Water Treatment Processes



The illustration above shows how ABB multi-electrode conductivity systems are used to control/ monitor the concentration of chemicals used to regenerate exhausted cation and anion resins. For optimum regeneration it is necessary to monitor the concentration of the regeneration chemicals.

Cation bed measuring points – Acid concentration is monitored at the point 1 between the acid dilution stage and the inlet to the cation resin bed.

Anion bed measuring points – Sodium Hydroxide concentration is monitored at the point 2 between the alkali dilution stage and the inlet to the anion resin bed.

Mixed Bed Resin Regeneration – Monitoring points will differ between WTP manufacturers, but both acid and alkali concentrations should be monitored during the regeneration process (not detailed in this guide).

Condensate Polishing Plant – As mixed bed resin regeneration.

ABB Instrumentation

Why monitor conductivity in the regeneration process ?

The customer needs:

- To control the strength of regeneration chemicals and regenerate exhausted resin using the most efficient and economical method.
- To control and monitor the regeneration process to ensure the resin is suitable for use.
- To ensure that the plant operates at the maximum efficiency.
- To allow the plant to be maintained to specific standards.

Why use ABB Instrumentation ?

- ABB offer greater security at a lower cost by having:
  - a worldwide network of companies and agents to ensure backup in most areas,
  - proven reliability – over 100 years of process instrumentation experience,
  - over 40 years experience in on-line conductivity measurement,
  - full installation, commissioning and routine servicing facilities available (in the UK and some other countries this is covered by the ***Assist*** ™ Customer Support Programme).
- Comprehensive range of field-proven conductivity cells.
- Both transmitters and cells are designed and manufactured by the same company.
- Transmitters are easily converted for use in low level conductivity applications and also pH and dissolved oxygen applications.

What ABB products are suitable for:

Anion regeneration,

Cation regeneration,

Mixed bed resin regeneration,

Condensate Polishing Plant Resin Regeneration ?

- **Model 4621/26 Series Multi-electrode Conductivity Transmitters and Type 2241/2271 Conductivity Cells:**
  - 4621/26 multi-electrode transmitters have a direct readout in:
    - sulphuric acid or hydrochloric acid

    and
    - sodium hydroxide,
  - 4621/26 multi-electrode systems are equipped with a fouling alarm,
  - 4621/26 systems offer true multi-range flexibility without recalibration,
  - continuous on-line monitoring with comprehensive alarm/diagnostic facilities as standard,
  - multi-electrode based conductivity systems include a fouling alarm as standard,
  - well proven electronics, easy to read, backlit LCD 4-language display (English, German, French, Spanish) can be customised with user friendly software,
  - NEMA4X IP66 (wall-mounted) enclosure suitable for installation in the most demanding environments.
  - unique, highly accurate/repeatable cell constants (±1%) means that cells are interchangeable without recalibration,
  - sophisticated electronics package enables 100m separation between cell and transmitter.

Other ABB monitoring capabilities suitable for Water Treatment processes ?

Analytical Applications:

- Low level conductivity monitoring of the process water (using type 4620/25 transmitters) and associated conductivity cells.
- pH monitoring (using type 4630/35 transmitters) and associated electrode systems.
- Sodium monitoring (using type 8036 Sodium Monitors).
- Silica monitoring (using type 8241 Silica Monitors).

Industrial Applications:

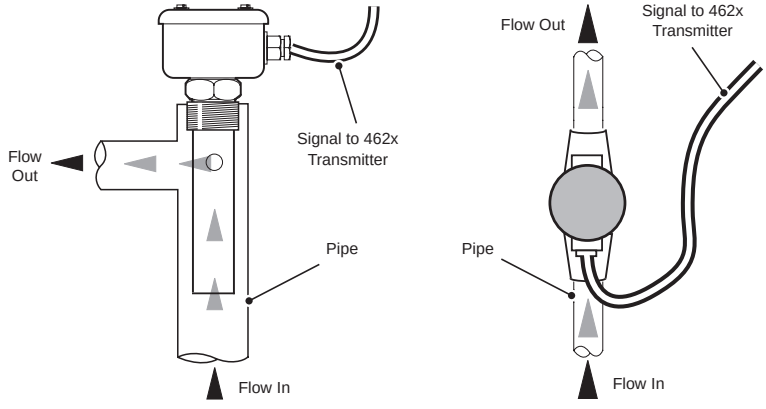
- Recorders and recorder/controllers (PR100, C1900, C100, C150, C200, C300).

Flow Applications:

- MagMaster flowmeters,
- Type 600T Smart pressure transmitters.

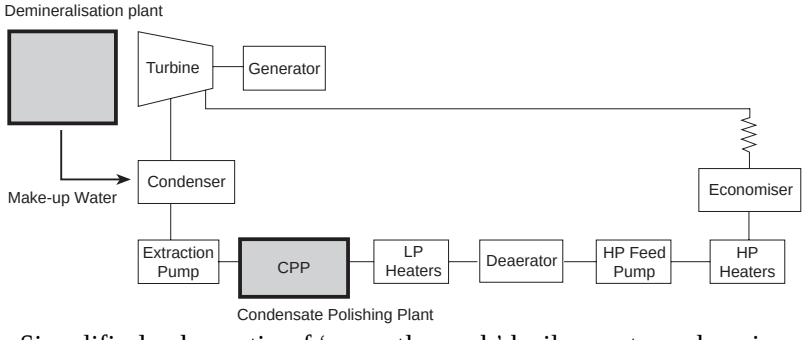
Installation

- ABB conductivity cells and transmitters are usually mounted near the sampling point (wall mounted version).
- Flow line cells are usually mounted vertically with the sample flow entering at the bottom – this minimises problems with air bubbles.
- It may be necessary to fit a needle valve upstream of the cell to ensure the sample flow remains within the required limits.



Type 2271 Screw-in Cell Type 2241 Flow Cell

Typical Installation of Screw-in and Flow Type Cells



Simplified schematic of 'once-through' boiler system showing location of Demineralisation plant and Condensate Polishing Plant (CPP)

Process Description

Cation Bed Regeneration

During the production of ultra pure water, cation resin, usually in the hydrogen form, is used to remove cations such as Sodium (Na+), Calcium (Ca++), Magnesium (Mn++) etc. from the process water and replace them with hydrogen ions.

The process continues until the cation resin is exhausted and ceases to function.

At this stage Hydrochloric or Sulphuric acid is passed through the exhausted resin to recharge it with hydrogen ions and remove the cations which have been extracted from the sample water. The regenerated resin is then put back into service.

Anion Bed Regeneration

Anion resin (in the form of hydroxyl) is used to remove anions such as Chloride (Cl^-), Sulphate (SO_4^{--}), Silica (SiO_2) etc. from the process water and replace them with hydroxyl ions.

As with the cation resin, this process continues until the resin is exhausted and ceases to function.

At this stage, the Chloride, Sulphate, Bisilicate and other anions are exchanged for hydroxyl ions by regenerating the exhausted resin with Sodium Hydroxide. The regenerated resin is put back into service.

Resin Regeneration

Efficient monitoring and controlling of the concentration of regeneration chemicals helps optimise plant performance by reducing the frequency of regeneration, therefore reducing downtime and saving on the cost of regeneration chemicals.

RBRW_1GG.PDF

AG/RBRWT Issue 1

ABB Kent-Taylor Ltd.
St. Neots
Cambs.
England, PE19 3EU
Tel: +44 (0) 1480 475321
Fax: +44 (0) 1480 217948

ABB Kent-Taylor Ltd.
Analytical & Flow Group
Stonehouse, Glos.
England, GL10 3TA
Tel: +44 (0) 1453 826661
Fax: +44 (0) 1453 826358

ABB Instrumentation Inc.
PO Box 20550, Rochester
New York 14602-0550
USA
Tel: +1 716 292 6050
Fax: +1 716 273 6207

ABB Kent-Taylor SpA
22016 Lenno
Como
Italy
Tel: +39 (0) 344 58111
Fax: +39 (0) 344 56278