Two Cell Conductivity Analyzer as Applied to Reverse Osmosis

Application Note

Industry: Water Treatment

Background

When a semipermeable membrane separates solutions of different concentrations, the natural flow of the more dilute water to the more concentrated side of the membrane is called “osmosis”.

In water purification by reverse osmosis (RO), sufficient pressure is applied to the concentrated side to force the water to flow through the membrane in the other direction. The water is purified since dissolved solids cannot easily pass through the membrane.

Reverse osmosis can remove 85 % to 98 % of dissolved salts in one pass, and multiple passes can further improve purity. The purified water is called “permeate” or “product”. A continuous flow of the concentrated water is discharged to prevent an excessive buildup; this discharge is called “concentrate” or “reject”.

Solution

Efficiency of reverse osmosis operations is usually monitored by comparing inlet and outlet conductivity (sometimes reported in terms of ppm TDS (total dissolved solids).

Calculations of percent passage or percent rejection used for this comparison can be provided and displayed directly by a two-cell 9782 analyzer.

Individual cell temperature compensation for salts, with either conductivity or TDS, and percent passage or rejection readouts provide a flexible RO monitoring system. Temperature readout is also available for normalized performance comparisons.

With direct conductivity or TDS, low percent passage or high percent rejection indicates good system efficiency. Alarms can be set accordingly. From operating experience and flow rate data, abnormal readings can be interpreted as membrane fouling, incorrect flow rate, membrane failure, etc.

Resistivity ratios can also be used to calculate the percentages. As shown in Figure 1, Cell 1 and Cell 2 are interchanged for the calculation, since resistivity is the reciprocal of conductivity.

A special note: Many membrane materials and water compositions also require a pH adjustment of the feedwater to prevent membrane deterioration or fouling.

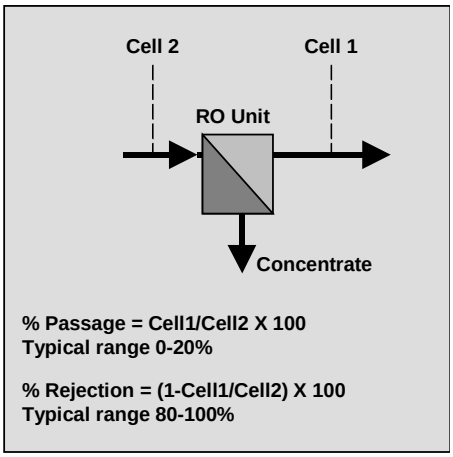

Figure 1 – Percentage Calculation

Benefit Summary

The Honeywell 9782 two-cell Conductivity Analyzer provides the following benefits when measuring Reverse Osmosis:

- Temperature compensation specific to high-purity water applications for improved accuracy
- Two independent cell inputs on one analyzer lowers product costs
- Rugged materials of construction, reducing cell replacement costs
- Flexible mounting assemblies, reduce installation costs
- Automatic math computations for improved process analysis

Benefit Summary, continued

Figure 2 – 9782 Two-Cell Conductivity Analyzer

The 9782 two-cell Conductivity Analyzer (Figure 2) has these features:

- High-purity temperature compensation for neutral salts
- Computed, calculated variables (% passage, % rejection, ratio and difference)
- Large digital display showing conductivity, resistivity, or total dissolved solids and temperature
- Up to two independent cell inputs
- Up to four relays available
- Ruggedly constructed cells with stand pressures up to 250 psig and temperatures up to 285 °F (140 °C)

Implementation

Using industry-accepted algorithms, the 9782 analyzer (Figure 2) accurately compensates for conductivity changes with temperature, making it ideal for a broad range of water treatment applications.

The superior electronic design ensures reliable signals from the cells over the full display range, allowing separation of cell and analyzer by as much as 1,500 feet without reduction of accuracy.

A wide variety of conductivity cells with cell constants specified for individual processes allows reliable, continuous measurements.

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Two Cell Conductivity Analyzer applied *Application Note*

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