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Reverse Osmosis Filter Monitoring

Industry: Water and Wastewater
Product: Pressure Transmitter, DPharp EJA and EJX Series

Introduction

The reverse osmosis (RO) process is used in many industries. This process uses membrane separation which has been proven to be one of the most economical means to remove suspended solids from feed water, which is used in:

❑ Pretreatment for deionizers for ultra pure water, typically used in the semiconductor industry

❑ Production of zero hardness water used for boiler feed water

❑ Treatment of sanitary waste

❑ Water purification

Filter arrays   Storage tank

Application

In this process, a cellulose acetate membrane is used to remove dissolved solids from the filtered raw water. The removal is accomplished by applying high pressure to the side of the filter which contains the raw water. This creates a differential pressure across the filter which causes pure water to flow from the high pressure side to the low pressure side, removing the waste. As the waste builds up, the differential pressure increases across the filter.

As the differential builds, it becomes a burden for the system, and the process takes longer. The filters need to be cleaned or replaced on a regular basis. The differential measurement can be used to determine at which point the filters need to be cleaned or replaced. Typically, a pressure switch is used in these applications; however, problems can arise from vibration and pressure surges in the system.
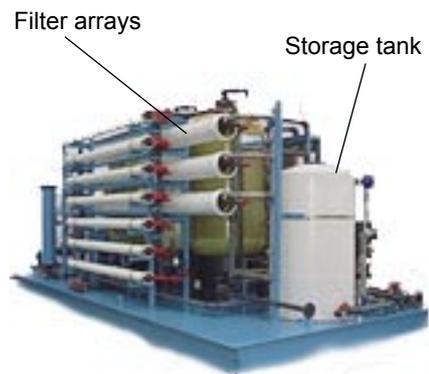
Solution

One semiconductor facility which produces their own deionized water changed from switches to a competitor's transmitter. Pressure surged from the pumps caused the zero to shift constantly, and became a maintenance headache. One of the units was replaced with an EJA110A. With its superior overpressure protection ($\leq \pm 0.1\%$ @ 16MPa, 2300 psi), and vibration tolerance, the EJA110A operated for over 6 months without a zero shift. The competitors units were being re-zeroed every week. The EJA produced consistently accurate output, resulting in better process efficiency and less maintenance downtime.

Notes

1. It is important to note that this is not a flow measurement. The process is a diffusion of molecules through the filter, therefore the DP is not proportional to flow.

2. The setup range for the transmitter will vary depending on the size of the RO system and its daily output. In this instance, a medium range unit was used and had a span of 0 to 30 kPa (0 to 120 inH$_2$O).

3. These filters are setup in arrays. In this application there were two banks of arrays and the flow is directed dependent on requirements. The two arrays were 8 x 4 and 4 x 2, having associated banks of 32 and 8 transmitters. Each filter has its own transmitter.

Main Features of DPharp

EJA110A Digital Solution

❑ Best-in-class performance

❑ ±0.03% Overpressure calibration protection

❑ ±0.1% per 5 years long term stability

❑ 100:1 turndown

❑ ±0.065% accuracy

EJX110A Premium Value

❑ ±0.1% per 10 years long term stability

❑ 200:1 turndown

❑ Best-in-class high accuracy, 0.04%

❑ Multi-sensing output

❑ Multi-variable transmitter as EJX family line-up

❑ Safety as standard (IEC 61508)