Examples of 5 Years Autopsy Experience - Potentials and Limits

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Background and Methods

Reverse osmosis is a process with many influencing parameters. In the case of plant failures, all stakeholders (e.g. consultants, plant manufacturers, plant operators, membrane and chemical suppliers) have a great interest in identifying and resolving the causes of failure. Membrane autopsy is a tool to investigate and quantify local performance decline resulting in reduction of salt rejection or product water flow. Performance decrease can be caused by different fouling mechanism taking place on the membrane surface. In many cases, more than one mechanism is working with complex fouling structures in result.

Since 2012 more than 100 autopsies have been carried out by IUTA, the most of them in the context of process water production for beverage and pharmaceutical industries or drinking water supplies. In these applications installed elements are not exposed to high salt contents, but partially to high silicon, calcium or iron contents.

Usually the autopsy in IUTA labs comprises a visual inspection, dismantling, internal inspection and probing, fouling analysis and SEM/EDAX-investigations of the clogged membrane surface. If necessary, additional fouling and surface analysis for special questions are performed.

Results

Summaries, correlations and conclusions from the evaluation of the autopsies performed are presented. For example, correlations between the element weight and the occupancy can be made. An anonymous case study shows how the evaluation of the individual results can give an overall image of the fouling characteristics.

A second case study reveals contrary results of the single investigations, the resulting questions and problems. Finally opportunities for required further examinations along the process chain are presented.

Summary

The membrane autopsy is a valuable tool for investigating the cause of membrane damages. However, it can only deliver a partial result and must be supplemented by appropriate further investigations and systematic damage assessments.