

Title: Improved CEDI Module Cleaning Procedure

Date: February 22, 2007 (Revised February 25, 2015)

Scope: This bulletin applies to the following Ionpure CEDI models:

LX (all models), MX (all models), VNX (all except E, EX, and CDIT that require alternate concentrate flow rates)

This bulletin does NOT apply to legacy CEDI models such as: H-series, Compact CDI or P-series.

Purpose: The purpose of this service bulletin is to inform the field service organization of changes in recommended practices for chemical cleaning of CEDI modules, specifically for removal of organic foulants and biofilm.

Introduction

Chemical cleaning of CEDI modules results in exhaustion of the ion exchange resins and the subsequent electrochemical regeneration of the resin can take many hours. Therefore it is common practice to perform multiple cleanings at once, especially if the cause of the performance decline is unknown. In the past, it was recommended that low pH cleaning be performed before high pH cleaning. The main reason was to remove contaminants (such as hardness ions) that could precipitate in high pH cleaning solutions.

One of the leading manufacturers of RO membranes now advocates performing high pH (caustic) cleaning before low pH (acidic) cleaning. They claim to have found that the low pH cleaner can "harden" organic and biological foulants and make them more difficult to remove from RO membranes. It seems logical that this would also apply to organic & biological fouling of the ion exchange resins and ion exchange membranes in CEDI modules.

The presence of the ion exchange resin in a CEDI module complicates matters somewhat, as it is still desirable to first remove hardness ions from the resin before recirculating a high pH cleaning solution. This can be addressed by performing an initial flush with a neutral (pH 7) salt solution such as sodium chloride.

Note: It may be desirable to take samples of the cleaning solution(s) for analysis of the contaminants removed during cleaning (for example, hardness and TOC). Sampling of the cleaning solution before and after cleaning allows subtraction of background contamination in the cleaning solutions. Dilution is normally required before analysis, depending on the method employed.

Procedure

The following procedure will apply to the majority of circumstances, and addresses the removal of both organics and mineral scale. The procedure below does not attempt to provide specific details or safety precautions. These are given in the CEDI module instruction manual.

- [1] Make up a 5% (by weight) salt solution and flush the CEDI module(s) once-through to drain, for about 5 minutes, at a product flow rate of *half the nominal product flow*, and a reject flow rate of half the product flow rate. A typical cleaning tank size would allow about 5 minutes of “once-through” flow.

NOTE: VNX E, EX, and CDIT modules have different reject flow rates than standard VNX modules. Please consult the manual for these modules or contact Ionpure technical support for the correct flow rates.

- [2] Flush the CEDI module(s) once-through to drain with RO or DI water, for about 5 minutes, at the flow rates used in the previous step.
- [3] Make up a mixture of 5% sodium chloride (NaCl) and 1% sodium hydroxide (NaOH) - both by weight - and recirculate this through the CEDI modules (both product and reject returned to the cleaning tanks) at *nominal product flow* and a reject flow rate of half the nominal product flow rate. This recirculation should continue for a minimum of 60 minutes. Warming the solution (to a maximum of 45°C) is allowed.
- [4] It has been observed in some cases that significantly better results (especially in terms of lowering the electrical resistance) were obtained if the CEDI module(s) were allowed to soak overnight in the alkaline brine solution (with the cleaning pump off). While not always practical, this is recommended in cases of high module electrical resistance (an increase of 2X the initial baseline resistance).

CAUTION: while the construction materials in Ionpure LX, VNX and MX modules are compatible with the overnight high pH soak, this is not true for all CEDI devices. This should not be attempted with legacy (Compact, H and P series) CDI modules.

- [5] After soaking in the brine/caustic solution overnight, the solution should be recirculated for 10-20 minutes and then the tank drained.

- [6] Repeat steps [1] and [2] to displace the caustic from the module and prepare the system for low pH cleaning.
- [7] Make a 2-4% (by weight) hydrochloric acid (HCl) solution and recirculate through the CEDI module(s). 4% HCl is recommended for a more aggressive clean. Add acid as required to keep the solution pH below 1.0. Continue recirculation for 60 minutes. Do not heat the acid solution.
- CAUTION:** Do not go above 4% (by weight) of HCl as this may cause damage to the stainless steel cathode within the module as well as any stainless steel in the system.
- [8] If desired allow 2-4% HCl solution to soak overnight. This is recommended in cases of high electrical resistance or a decrease in concentrate flow.
- [9] Repeat step [1] to displace the acid from the module.
- [10] Flush the CEDI modules once-through to drain for about 10 minutes with DC power off.
- [11] Apply normal operating DC power and perform service flush.

Summary

It appears that the effectiveness of brine/caustic and acid cleaning of CEDI modules can be improved significantly by allowing an extended soak time and by performing the high pH cleaning before the low pH cleaning.