Condensate Demineralizer Ionic Loading Program (CDIL)

Introduction

A **single-source management and tracking** program in Microsoft Excel format for deep bed condensate demineralizers, the program compiles the data and results required by **Chemistry, System Engineering and Operations** to effectively manage the Condensate Polishers. The plant is provided with a defensible and documented method of conservatively estimating the remaining ion exchange capacity of each bed, addressing the intent of Nuclear Regulatory Guide 1.56 without the need for frequent resin sampling and laboratory residual capacity determinations. The program is periodically upgraded based on industry needs or requests by users.

Current BWR Users

- Oyster Creek
- James A. FitzPatrick
- LaSalle Units 1 & 2
- Limerick 1 & 2
- Pilgrim
- Clinton
- Hope Creek
- Perry
- Nine Mile Point Unit 2
- Grand Gulf
- River Bend

Configuration

Configuration for a specific plant is based on representative analyses of the main condenser circulating cooling water, Condensate Polisher bed volumes and bed/vessel designations.

Sample Summary Report

Power (%)	100.0
System dP (psid)	35
Condensate Temp (^{o}F)	102

	Vessel 1-1	Vessel 1-2	Vessel 1-3	Vessel 1-4	Vessel 1-5	Vessel 1-6	Vessel 1-7
CURRENT STATUS	I/S	I/S	JOBW	I/S	I/S	I/S	I/S
FLOW RATE (gpm)	2450	2550	0	2500	2440	2390	2420
CATION RESIN	Dow XUS43582(550C)	Dow XUS43582(550C)	Dow XUS43582(550C)	DOW HGR-W-2	Dow C-500-ES	Dow C-500-ES	DOW HGR-W-2
ANION RESIN	Dow SBR-C-OH	Dow SBR-C-OH	Dow SBR-C-OH	Dow SBR-C-OH	Dow SBR-C-OH	Dow SBR-C-OH	Dow SBR-C-OH
DAYS I/S SINCE JOBW	7	4	0	21	1	15	15
% ANION RESIN LOADING	0.93	8.41	8.20	0.43	2.70	8.24	1.46
% ANION RESIN LOADING (Corrected for Anion Thermal Decomp.)	0.93	8.68	8.48	0.43	2.73	8.51	1.47
% CO_2 LOADING	0.00	30.88	1.91	0.00	4.36	0.97	4.42
% TOTAL ANION LOADING (IncludesCO_2)	0.93	39.56	10.40	0.43	7.09	9.48	5.88
% ANION REMAINING CAPACITY (excludes CO_2 & Anion Thermal Decomp.)	99.07	91.59	91.80	99.57	97.30	91.76	98.54
% TOTAL CATION LOADING	0.96	8.90	8.78	0.42	2.62	7.83	1.41
% CATION REMAINING CAPACITY	99.04	91.10	91.22	99.58	97.38	92.17	98.59
Fe LOADING (lb.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CALC. LAST "NEW DATE"	11/28/2000			01/11/2001	09/19/2000		11/15/2000
LAST NEW DATE	11/28/2000	04/20/2001	12/22/1999	01/11/2001	09/19/2000	02/20/2000	11/15/2000
SERVICE DAYS SINCE NEW	53	297	290	21	96	254	73

Ionic Loading and Resin Cleaning Status Date: **02/01/2001**

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Features

- All operating and chemistry data are input on a single template. Daily values are input for power, CDI conductivity, condensate temperature, CW conductivity, condensate flow, CDI iron crud, flow through each bed and operating status (In Service, Out of Service, etc.), CDE iron crud, dP (system, bed, post strainer and lateral) and remarks. The program defaults to the previous value if a new value is not input on a given day.

- Templates are included to input the resin analysis for each lot of resin received, both cation and anion, creating a convenient reference to the analyzed physical and chemical properties of each resin lot received.

- The actual new resin capacity data for each bed of resin installed is also input, so differences between resin lots will be accounted for in the ionic loading calculations.

- From a single entry of the capacity of each new bed, the ionic loading calculations are automatically updated for days after the replacement date.

- A typical summary table and a summary bar chart, which may be generated for a specified date, present the following parameters:
  - Power level
  - Condensate Temperature
  - System dP (if applicable)
  - Flow through each bed
  - Bed dp (if applicable)
  - Post strainer dP (if applicable)
  - Lateral dP (if applicable)
  - Cation/anion resin identification in each bed
  - Calculated anion ionic loading for each bed
  - Anion ionic loading corrected for anion resin thermal decomposition
  - Carbon dioxide loading during shutdown and early startup periods
  - Calculated cation ionic loading for each bed
  - Crud loading
  - Number of service days since the resin was replaced
  - Number of days since the resin was cleaned (if applicable)
  - The date the resin was last replaced
  - Circulating water leak rate

- A template for adding resins to an existing bed is included, which automatically adjusts the remaining capacity after the addition date.

- CDI Conductivity, temperature and power charts.

- Circulating water leak and circulating water conductivity charts

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- Auto generation of anion loading summary chart.
- Auto generation of cation loading summary chart.
- Auto generation of dP trend charts.
- On-board instructions are included in the program file.
- The program is self-documenting. The bases and algorithms used are documented in the program along with sample calculations and references, facilitating configuration control requirements.
- The history of any revisions and updates is documented in the program.
- Program control is maintained through Finetech's controlled software system.
- The majority of the calculations are now performed in Visual Basic, reducing the number of embedded formulas and the size of the program file.

Requirements

Microsoft Excel
Windows
Memory Required: Approximately 16 MB RAM, 10MB Hard Disk Space (with one fuel cycle of data)

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