108050000-TD0012-R00

Spallation Neutron Source

CHL DI Water Controls

Functional System Design (FSD)

July, 2002

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SNS Project Engineer

SNS

Operating Philosophy

Purpose:

The purpose of DI water system operation is to:

a) Maintain the DI water at an appropriate temperature setpoint.
b) Provide alarms if the resistivity in the circulating loop or polishing loop are abnormal

Assumptions: None

Operator Controls and Operating Modes

1) OFF: Pump is de-energized. Tower water return line control valve at 50% open.
2) ON: Pump is energized. Tower water return line control valve is modulated to control DI water supply temperature at setpoint selected by the operator.

OPERATOR INTERFACE DEFINITIONS

Local Hardware Displays/Operator Controls
1) Post heat exchanger DI water pressure *(PI 5200A)*
2) Pre heat exchanger DI water pressure *(PI 5200B)*
3) Post heat exchanger DI water temperature *(TI 5200A)*
4) Pre heat exchanger DI water temperature *(TI 5200B)*
5) Tower water supply pressure *(PI 5200C)*
6) Tower water return pressure *(PI 5200D)*
7) Tower water supply temperature *(TI 5200C)*
8) Tower water return temperature *(TI 5200D)*
9) HOA switch for Pump A *(HS 5200A)*
10) Pressure differential across pump *(PDIS 5200A)*
11) DI water pump isolation valves *(HV 5200W, HV 5200X)*
12) DI water pressure gauge isolation valves *(HV 5200A,B)*
13) Tower water pressure gauge isolation valves *(HV 5200C,D)*
14) Tower water return flow indicator *(FI 5200A)*
15) Pre heat exchanger DI water flow *(FI 5200B)*
16) Polish to re-circulate DI valve *(HV 5200I)*
17) Polish return DI valve *(HV 5200H)*
18) FAULT indicator light on MCC
19) READY indicator light on MCC
20) RUN indicator light on MCC

Software HMI/EPICS Digital Operator Controls
1) Pump Mode
   a. OFF
   b. ON

Software HMI/EPICS Digital Displays
1) Pump Mode switch status
   a. OFF
   b. ON
2) Pump energized or de-energized. *(PDIS 5200A)*

Software HMI/EPICS Analog Operator Controls
1) DI water temperature

Software HMI/EPICS Analog Displays
1) DI water supply temperature *(TT 5200A)*
2) Tower water return line controller output *(IP 5200A/TCV 5200A)*
3) Resistivity of circulating loop *(AIT 5200A)*
4) Resistivity of polishing loop *(AIT 5200B)*

Alarms
1) Glycol supply temperature high and low
2) Low Flow due to Pump failure or massive leak (pump energized and differential pressure is low)
3) Flow path blocked (Pump energized and high differential pressure)
4) Circulating loop resistivity low
5) Polishing loop resistivity low

Control Logic Description
In the OFF mode, the pump is de-energized and the Tower Water Return Line Control Valve is set to 50 % open.

In the ON mode, the pump is energized and the Tower Water Return Line Control Valve is modulated by a PID algorithm to maintain the DI Water Temperature Setpoint. After a delay period the differential pressure for the pump will be periodically checked for high or low flow. If either condition exists, the pump will be de-energized and the appropriate alarm returned to the operator.

Limit values for the Circulating Loop Resistivity and Polishing Loop Resistivity will be set in the EPICS system to generate alarms.