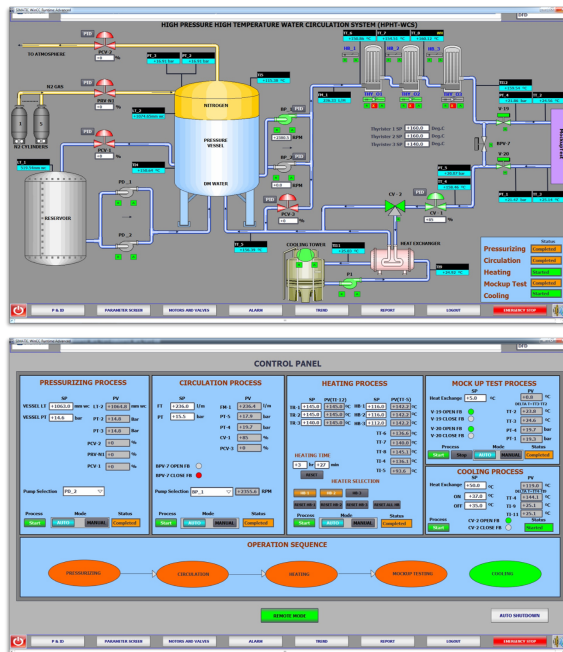


## DATA ACQUISITION & CONTROL SYSTEM

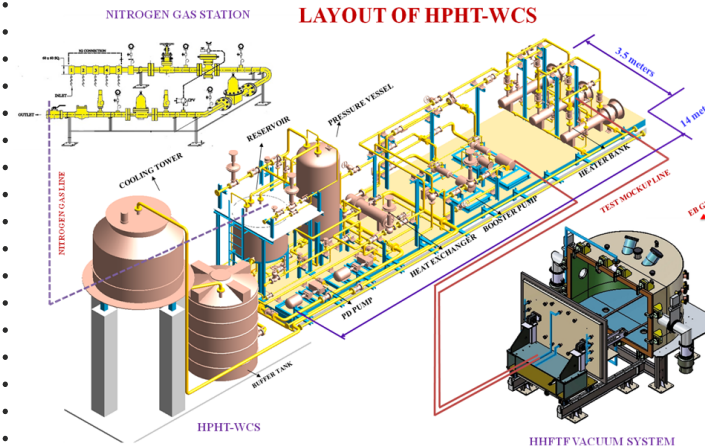
- ▶ **FEATURES:** Operated in Local / Remote and Auto / manual mode
- ▶ **PLC:** Siemens S7-300 series PLC based operation
- ▶ **PROGRAMMABLE:** Sequential and operational interlocks
- ▶ **INTERFACE:** Ethernet, PROFIBUS, OPC
- ▶ **SOFTWARE:** WINCC V7.0 SP3, RT 128
- ▶ **INTERLOCKS:** Hardwired, 10 -20 ms
- ▶ **CHANNELS:** AI (20)/ AO (14) & DI (48) /DO (32)
- ▶ **DATA SERVER:** Storage, Analysis
- ▶ **TRENDS:** Online and Offline analysis of various signals



GUI of DACS

## PRESENT STATUS

- The HPHT -WCS was successfully commissioned and integrated with HHFTF.
- The HPHT -WCS was validated performance wise as per design specifications.
- The control logic implemented was successfully tested at various operating parameters.
- Presently the system has been integrated with target handling facility of HHFTF and testing of plasma facing components is ongoing



# HIGH PRESSURE HIGH TEMPERATURE WATER CIRCULATION SYSTEM



High Temperature Technologies Division

## CONTACT

Website: [www.ipr.res.in/httd/index.html](http://www.ipr.res.in/httd/index.html)  
 Ph-No: +91-79-2328 1023  
 Fax.No: +91-79-2396 2277  
 E-mail id: [technology@ipr.res.in](mailto:technology@ipr.res.in)

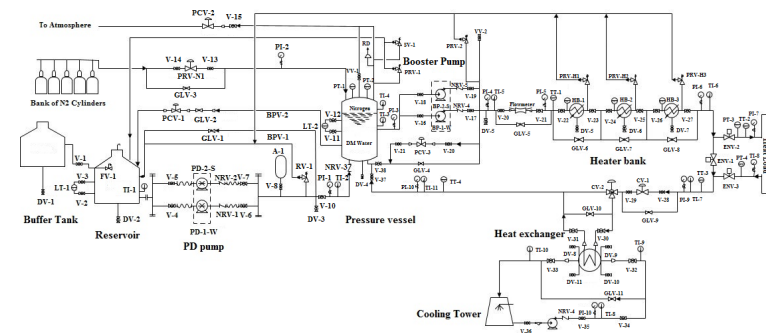


Institute for Plasma Research  
 Bhat, Gandhinagar, Gujarat,  
 India-382428  
[www.ipr.res.in](http://www.ipr.res.in)

## OBJECTIVE

- To test water cooled test mock-ups / components at ITER parameters
- To operate at various process parameters
- To achieve and maintain the pressure and temperature anticipated during testing of divertor components at various heat fluxes
- To validate the various cooling configurations like - smooth tube, swirl tube, hypervaportron - used for the divertor components
- To investigate the consequences of Critical Heat Flux (CHF) at various operating conditions

## PROCESS & INSTRUMENTATION DIAGRAM



### PARAMETERS

Temperature at test mock-up, °C  
Coolant pressure (Water), MPa  
Coolant flow rate (Water), LPM

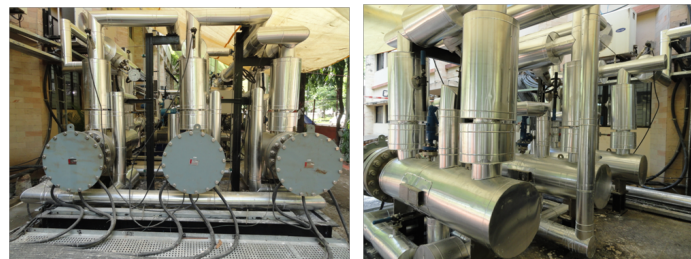
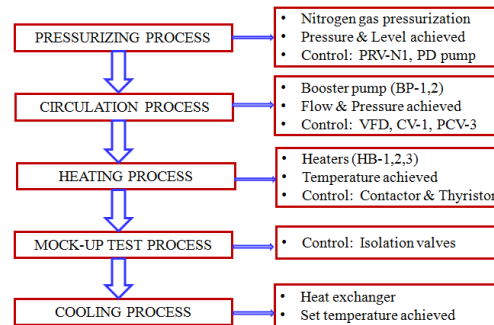
### OPERATING

30 to 160  
0.5 to 6  
50 to 300

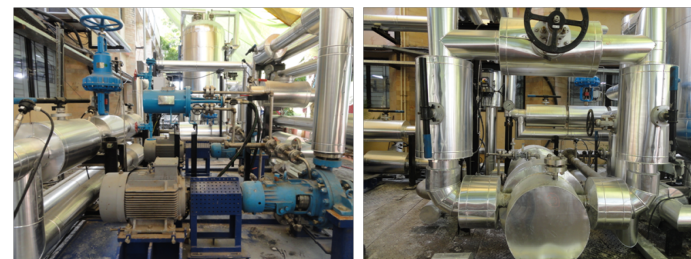
### DESIGN

200  
7  
300

## OPERATING PROCEDURE



Heating System



Pumping System & Heat Exchanger



Pressurizing System & Target Handling System

## TECHNICAL SPECIFICATIONS

S.No	COMPONENT	SPECIFICATIONS
1	Reservoir	Capacity: 2 m <sup>3</sup> , MOC: SS 316
2	PD pump	Type: Reciprocating piston pump, Flow: 55 LPM, Working pressure: 70 bar
3	Pressure vessel	Capacity: 2.3 m <sup>3</sup> , MOC: SS 316, Design pressure: 70 bar, Design temperature: 200°C
4	Nitrogen gas reducing station	No. of cylinders: 5 Nos., Flow: 25 Nm <sup>3</sup> /hr, cylinder max pressure of 140 bar, operating pressure: 60 bar
5	Booster pump	Type: End suction single stage centrifugal pump, suction pressure: 70 bar max., discharge pressure: 80 bar max, flow rate: 157 LPM (min) and 300 LPM (max), Temperature: 200°C, motor 18.5 kW, 2900 RPM, MOC: SS 316 & Duplex steel, Make: Sulzer
6	Heater bank	Capacity: 200 kW, Manual ON/OFF controlled and PID controlled, Heating element: INCOLOY, MOC: SS 316, Make: Watlow
7	Heat exchanger	Type: shell and tube, Heat load 210 kW, operating pressure at tube side 70 bar max., shell side of 5 bar max., operating temperature at tube side 160°C max, MOC: SS 316
8	Cooling tower	Induced draft round type, Capacity: 125 TR, Delta T-I/L & O/L - 5°C, (38°C/33°C), motor: 2.2 kW with 1440 RPM
9	Cooling tower pump	End suction back pullout type, Flow rate: 1000 LPM, head: 52.9 meters
10	Valves	Type: Manual (Ball & Globe), Control (electro pneumatic), Safety (Relief)
11	Pipe	MOC: SS 316 L, Line size: 2 inch, SCH:80S
12	Instrumentation	Level, pressure, temperature and flow transmitters, Make: Forbes Marshall
13	Insulation	Material: Perlite (Pipe sections and components), LRB Rockwell (Valves and Flanges), thickness: 50 mm



HPHT-WCS ASSEMBLY