

Gene Swetin

Cooling Water Systems

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Mechanical Engineering Group
Accelerator Systems Division



Responsibilities

- ❖ Secondary water systems
- ❖ Water systems for RF
- ❖ Vacuum chamber cooling skids
- ❖ User support
- ❖ Interface with the Facilities Group and PFS as it relates with process water systems and air conditioning of accelerator sensitive areas
- ❖ R & D and miscellaneous tasks
- ❖ Safety, Training, Spare Parts

35 Secondary Water Systems

- ❖ Storage ring systems

 - ❖ Magnets, power supplies, absorbers, front end components

- ❖ RF water systems

 - ❖ Klystrons, cavities, loads, circulators, SCRs, anode tank

- ❖ Booster systems

 - ❖ Magnets, power supplies, cavities

Secondary Water Systems (cont.)

- ❖ Linac/Injection systems

 - ❖ Linac, klystron gallery equipment, PAR, test cages

- ❖ EAA

 - ❖ Test equipment for power supplies, RF, absorbers...

- ❖ LEUTL

Secondary Systems

- ❖ 58 pumps
- ❖ 350-500 GPM
- ❖ 75 and 100 HP pump motors
- ❖ Supply pressure 135-150 psig
- ❖ Supply temperature 78 ± 0.2 deg F
- ❖ Filtration 0.5 micron



Water Systems for RF

- ❖ System monitoring and maintenance
- ❖ Upgrade of interlock systems
 - ❖ Replacement of flowmeters
 - ❖ Installation of new temperature sensors
- ❖ Design of dedicated water system for Test Stand and Klystron
- ❖ Design and installation of miscellaneous test set ups for new equipment testing

*RF loads flow
metering*



*SCR cabinet
flow metering*



Vacuum Chambers Cooling Skids

- ❖ 20 2-pump systems installed around the ring
- ❖ 50 GPM / system
- ❖ Supply temperature 78 ± 0.1 deg F
- ❖ 0.5 micron filtration
- ❖ 12 Mohm - cm resistivity
- ❖ UV lights for bacterial control



User Support

- ❖ Maintenance of user skids (16) and miscellaneous cooling equipment.
- ❖ Design and implementation of connecting users to APS water system.
- ❖ Miscellaneous user support.
 - ❖ Compressed air installation.
 - ❖ Water connections, filter installation, etc.
 - ❖ Ventilation.
 - ❖ User laboratory equipment hook ups.

User Support (cont.)

- ❖ 3 beamlines connected to APS water.
- ❖ 4 more to be connected during April/May shutdown.
- ❖ 5 more inquired about connections in near future.



Piping inside hutches



Piping mains and instrumentation

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Advanced
Photon
Source
ARGONNE NATIONAL LABORATORY



Monitoring and Controls

- ❖ Johnson Controls
- ❖ Allen-Bradley
- ❖ Epics Data Logger
- ❖ Vibration Monitoring
- ❖ Daily Rounds

System	Supply Temperature	Differential Pressure	Supply Pressure	Supply Flow	Return Flow	Mixing Valve Position	Bypass Valve Position
S04-02	77.8625 (°)	115.861 (")	142.226 (")	292.18 (")	299.875 (")	530-HB-mixingValveCMD	0-FW-S04-BypassValve
S04-04	78.1728 (°)	104.438 (")	162.932 (")	295.5 (")	299.28 (")	530-HB-mixingValveCMD	0-FW-S04-BypassValve
S04-06	77.8625 (°)	209.75 (")	142.244 (")	282 (")	291.28 (")	530-HB-mixingValveCMD	0-FW-S06-BypassValve
S04-08	78.0547 (°)	122.569 (")	147.939 (")	270.5 (")	270 (")	530-HB-mixingValveCMD	0-FW-S08-BypassValve
S04-10	77.8846 (°)	111.062 (")	149.821 (")	242.5 (")	242.25 (")	530-HB-mixingValveCMD	0-FW-S10-BypassValve
S04-12	78.0028 (°)	110.225 (")	126.627 (")	281 (")	289.25 (")	530-HB-mixingValveCMD	0-FW-S12-BypassValve
S04-14	78.0074 (°)	111.438 (")	128.925 (")	247 (")	246.5 (")	530-HB-mixingValveCMD	0-FW-S14-BypassValve
S04-16	78.0284 (°)	109.812 (")	126.127 (")	279 (")	281.5 (")	530-HB-mixingValveCMD	0-FW-S16-BypassValve
S04-18	77.8625 (°)	112.062 (")	128.21 (")	279 (")	289 (")	530-HB-mixingValveCMD	0-FW-S18-BypassValve
S04-20	78.005 (°)	208.75 (")	150.692 (")	245.25 (")	248.5 (")	530-HB-mixingValveCMD	0-FW-S20-BypassValve
S04-22	78.0781 (°)	116.812 (")	145.122 (")	305.25 (")	285.5 (")	530-HB-mixingValveCMD	0-FW-S22-BypassValve
S04-24	77.8625 (°)	104.675 (")	127.28 (")	338 (")	325.75 (")	530-HB-mixingValveCMD	0-FW-S24-BypassValve
S04-26	77.9815 (°)	113.062 (")	129.384 (")	270.5 (")	276.75 (")	530-HB-mixingValveCMD	0-FW-S26-BypassValve
S04-28	77.9883 (°)	117.375 (")	144.517 (")	242.75 (")	242.625 (")	530-HB-mixingValveCMD	0-FW-S28-BypassValve
S04-30	78.07 (°)	118.438 (")	145.050 (")	272.5 (")	269 (")	530-HB-mixingValveCMD	0-FW-S30-BypassValve
S04-32	78.0074 (°)	109.562 (")	132.517 (")	291.25 (")	282.5 (")	530-HB-mixingValveCMD	0-FW-S32-BypassValve
S04-34	77.9868 (°)	109.625 (")	200 (")	330 (")	333.75 (")	530-HB-mixingValveCMD	0-FW-S34-BypassValve
S04-36	77.854 (°)	117.438 (")	129.922 (")	271.25 (")	272.25 (")	530-HB-mixingValveCMD	0-FW-S36-BypassValve

Monitoring and Controls (cont.)

- ❖ Supply and return flows
- ❖ Supply/return flow differential
- ❖ Supply temperature
- ❖ System differential pressure
- ❖ Pump status
- ❖ Pump discharge pressure
- ❖ Temperature control valve position
- ❖ Differential pressure control valve position
- ❖ Isolation valve status
- ❖ Supply water resistivity
- ❖ Pump run hours
- ❖ Filter differential pressure

System Maintenance and Upgrade

- ❖ Monitoring of system performance
- ❖ Predictive/preventive maintenance
 - ❖ Rebuilding of pumps and pump motors
 - ❖ Oil changes
 - ❖ Filter replacement
 - ❖ UV lights replacement
 - ❖ Control devices calibration
- ❖ Equipment upgrade
- ❖ Repair/replacement

Safety, Training, Spare Parts

- ❖ Regular safety walk-through of APS.
- ❖ Conduct training sessions with technicians and other groups.
- ❖ Insure availability of spare parts.

Interface With Other Groups

- ❖ RF, Electrical Systems, Controls, MCR Operation, Beamline Support, Experimental Floor Operations, Conventional Facilities...
- ❖ Improvement of temperature stability of air inside the storage ring.
- ❖ Compressed air system monitoring and improvement.
- ❖ Temperature control of primary water system.

R & D and Miscellaneous Tasks

- ❖ Temperature control of water on the order of ± 0.01 deg C.
- ❖ Reduction of flow induced vibration and pulsation dampening.
- ❖ Pump generated noise reduction.
- ❖ System modifications to improve energy efficiency and reduce operating costs.
- ❖ Coordination and review of various Utility Building projects.
- ❖ CNM project support.

Thank you for your attention



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