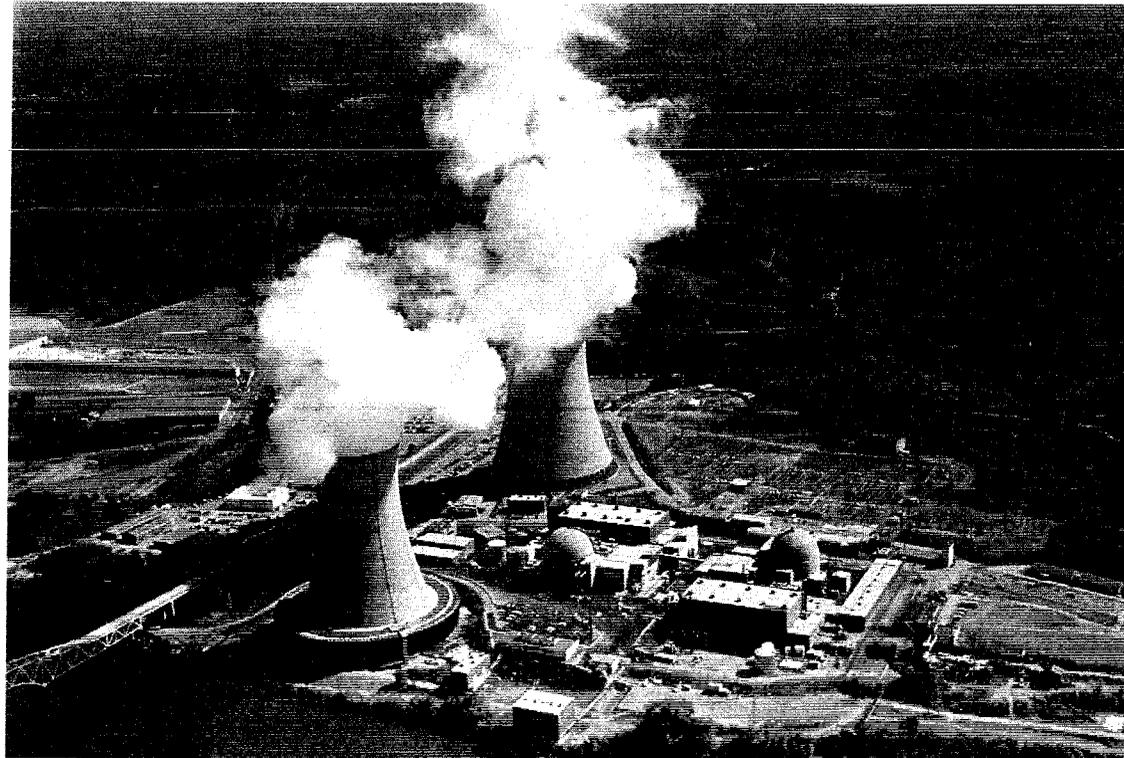


# Predecisional Enforcement Conference

RW Pump Binding & Strainer Fouling - April 13, 2000



**BVPS**  
Beaver Valley Power Station

**FENOC**

*FirstEnergy Nuclear Operating Company*

# Desired Outcomes - Lew Myers

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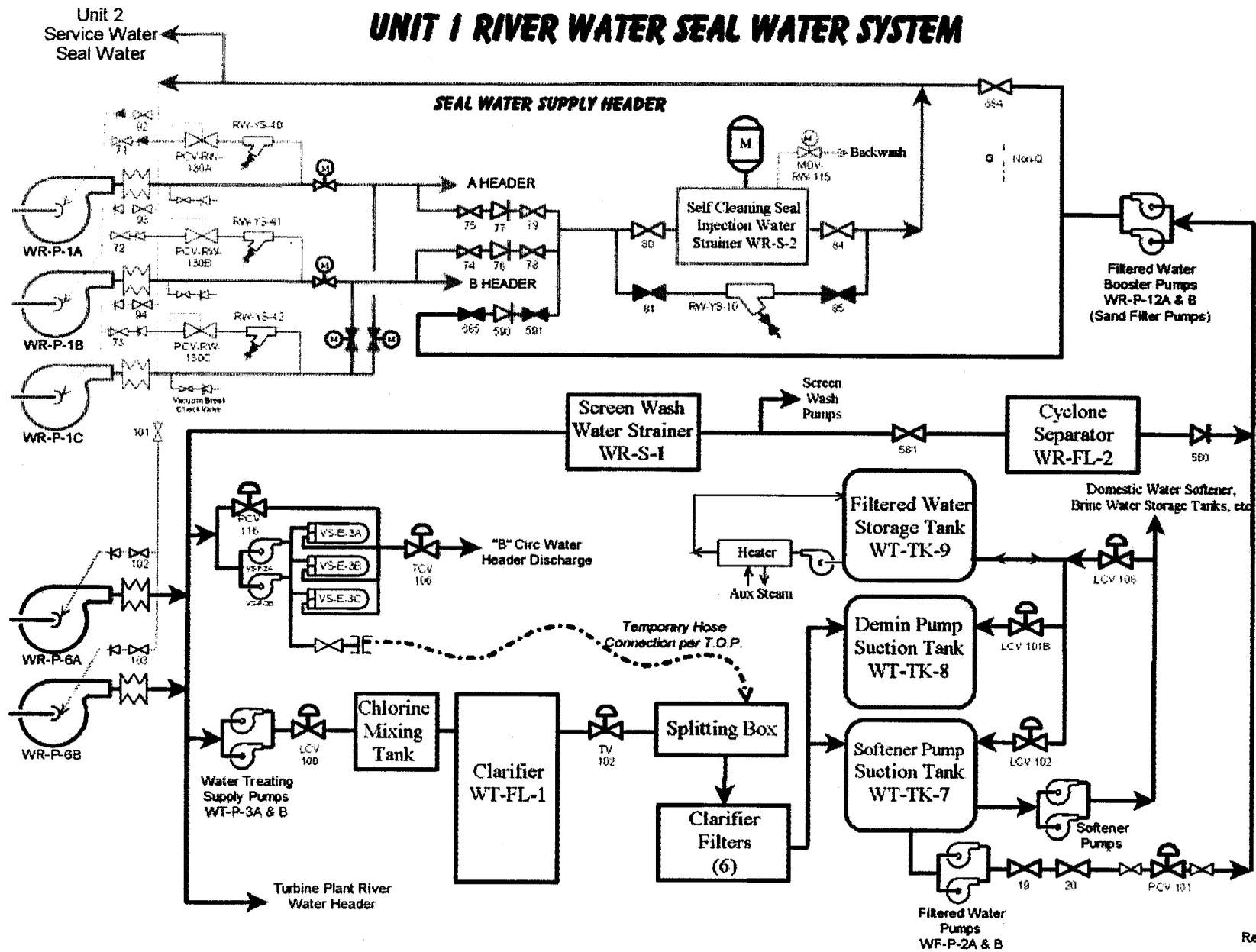
- Obtain a common understanding of the facts, corrective actions and safety significance
  - Original construction deficiency
  - Temporary Operating Procedure review adequate for Water Treatment risk
  - Filtered Water System masked design concerns, however, a good questioning attitude could have resulted in a more timely identification
  - Corrective actions were comprehensive and timely
  - Low to medium safety significance

# Agenda - Lew Myers

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- Event Review - Bill Pearce
- Immediate Actions - Bill Pearce
- Temporary Operating Procedure (TOP) Review - Bill Pearce
- Event Review Summary - Bill Pearce
- Cause Analysis - Larry Freeland
- Corrective Actions - Larry Freeland
- Safety Significance - Ray Hruby
- Summary - Lew Myers

# UNIT 1 RIVER WATER SEAL WATER SYSTEM



# Event Review - Bill Pearce

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- 2/8/00 - 'B' and 'C' RPRW pumps trip during start attempts
  - Caused by seal water to river water temperature differential
- 2/19/00 - Partial fouling of 'B' RPRW pump self supplied strainer
- 3/3/00 - 'C' RPRW pump started, seal water pressure drops after pump start

# Immediate Actions - Bill Pearce

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- 'A' RW train protected
  - Access limited to 'A' pump
  - Stationed operator
- Auxiliary RW pumps verified to freely rotate
- 'B' & 'C' pumps quarantined
- Operators reviewed procedures for loss of RW system

# Temporary Operating Procedure Review - Bill Pearce

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- Temporary Operating Procedure technical review was reasonable for water treatment system
  - 70°F is within normal river temperature range
  - Heated water could always be provided from filtered water storage tank
  - No acceptance criteria for RPRW pump seal water temperature existed
- Design requirements were not specified

# Event Review Team Summary

Bill Pearce

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- Pump shaft expansion event was self revealing
- No technical information previously available
- No industry experience previously available
- Seal water design problems self identified
- Use of filtered water masked original design deficiency

# Direct Cause - Pump Binding

## Larry Freeland

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- Pump trips caused by seal water induced thermal expansion
  - Due to differential temperature between river and seal water temperature

# Cause Analysis - Pump Binding

## Larry Freeland

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- Design analysis deficiency
  - Original use of filtered water as seal water supply without knowledge of temperature effects on pump shaft length
- Site documents lacked critical characteristic information regarding temperature effects on pump shaft length

# Cause Analysis - Seal Water Strainer Fouling - Larry Freeland

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- Self-supplied seal water strainers size (3/4") did not reliably filter river water when:
  - high silt levels in river water exist
  - starting of an idle pump when river silt has accumulated near pump intake
- Use of filter water seal supply masked safety related supply reliability problems
- Pre-operational testing focused on pump performance and used self cleaning strainer

# Corrective Actions - Larry Freeland

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- Controls implemented to preclude use of filtered water
- New cyclone separators and 2” strainers were installed
  - Cyclone separator prototype testing
  - Post modification testing
- Assess long term effectiveness of new cyclone strainers
- Revised vendor technical information

# Cyclone Separator Prototype Testing

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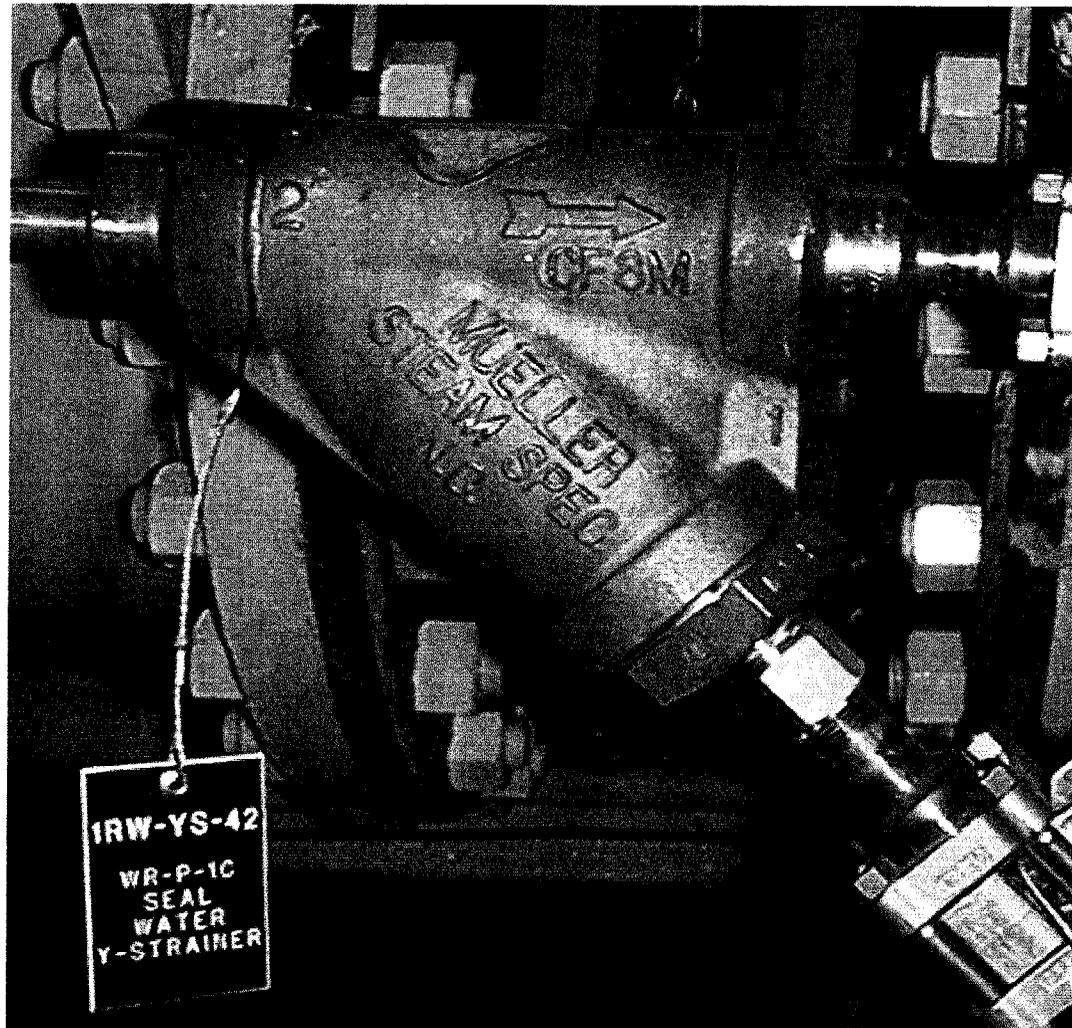
# Corrective Actions - Larry Freeland

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- Controls implemented to preclude use of filtered water
- New cyclone separators and 2" strainers were installed
  - Cyclone separator prototype testing
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- Assess long term effectiveness of new cyclone strainers
- Revised vendor technical information

# New 2" Strainer Installed

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# Corrective Actions - Larry Freeland

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- Controls implemented to preclude use of filtered water
- New cyclone separators and 2" strainers were installed
  - Cyclone separator prototype testing
  - Post modification testing
- Assess long term effectiveness of new cyclone strainers
- Revised vendor technical information

# Corrective Actions - continued

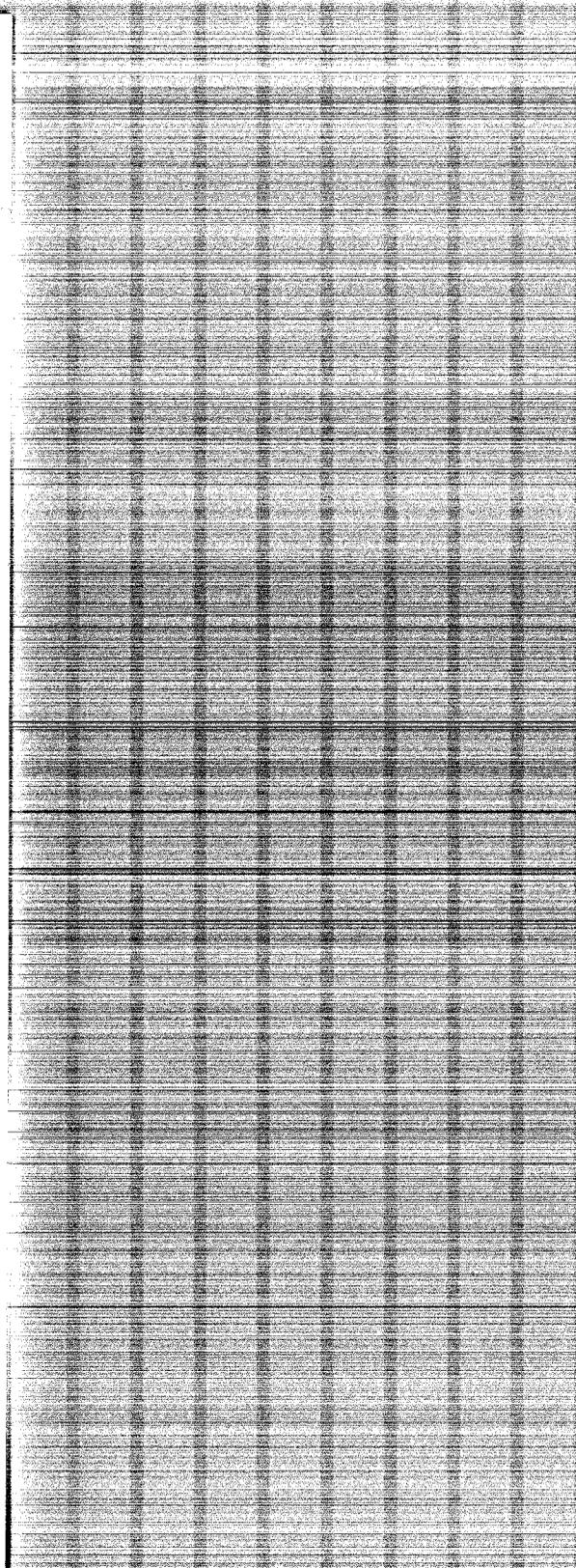
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- Revised procedures to:
  - periodically test safety related seal supply during pump start
  - measure bays silt levels following high river water conditions and clean if needed
- Extent of condition review continuing
- River Water/Service Water System performance review
- Event reported to industry as INPO OE and LER, including Part 21

# Safety Significance - Ray Hruby

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- The delta CDF associated with the unavailability of two RW pumps due to the shaft thermal expansion event was categorized as low to medium risk
  - Delta CDF - **HIGH WHITE**
- The delta CDF associated with the RPRW pump seal water issues was categorized as low to medium risk
  - Annual Delta CDF - **WHITE**



# 1R13 Accomplishments

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- Shortest Unit 1 Refueling Outage
- No loss time or OSHA reportable accidents
- No nuclear safety challenges
- Personnel manrem dose well below goal (208 vs. 270 projected)
- Installed permanent reactor cavity seal
- Unit start-up was operator error free

# 1R13 Accomplishments - continued

- 379 steam generator tubes recovered by sleeving
- Repaired reactor coolant pump flange leaks
- Cleaned containment sump
- Replaced MOV-RH-758
- Refurbished steam dump valves
- Reduced main unit generator hydrogen leakage

# 1R13 Accomplishments - continued

- Temporary modifications reduced from 20 to 4
- BCO's reduced from 17 to 9
- Maintenance rule A(1) systems reduced from 9 to 5
- Implemented 11 design changes
- Sealed condenser tube sheets
- Turbine generator worked

# Closing Remarks - Bob Saunders

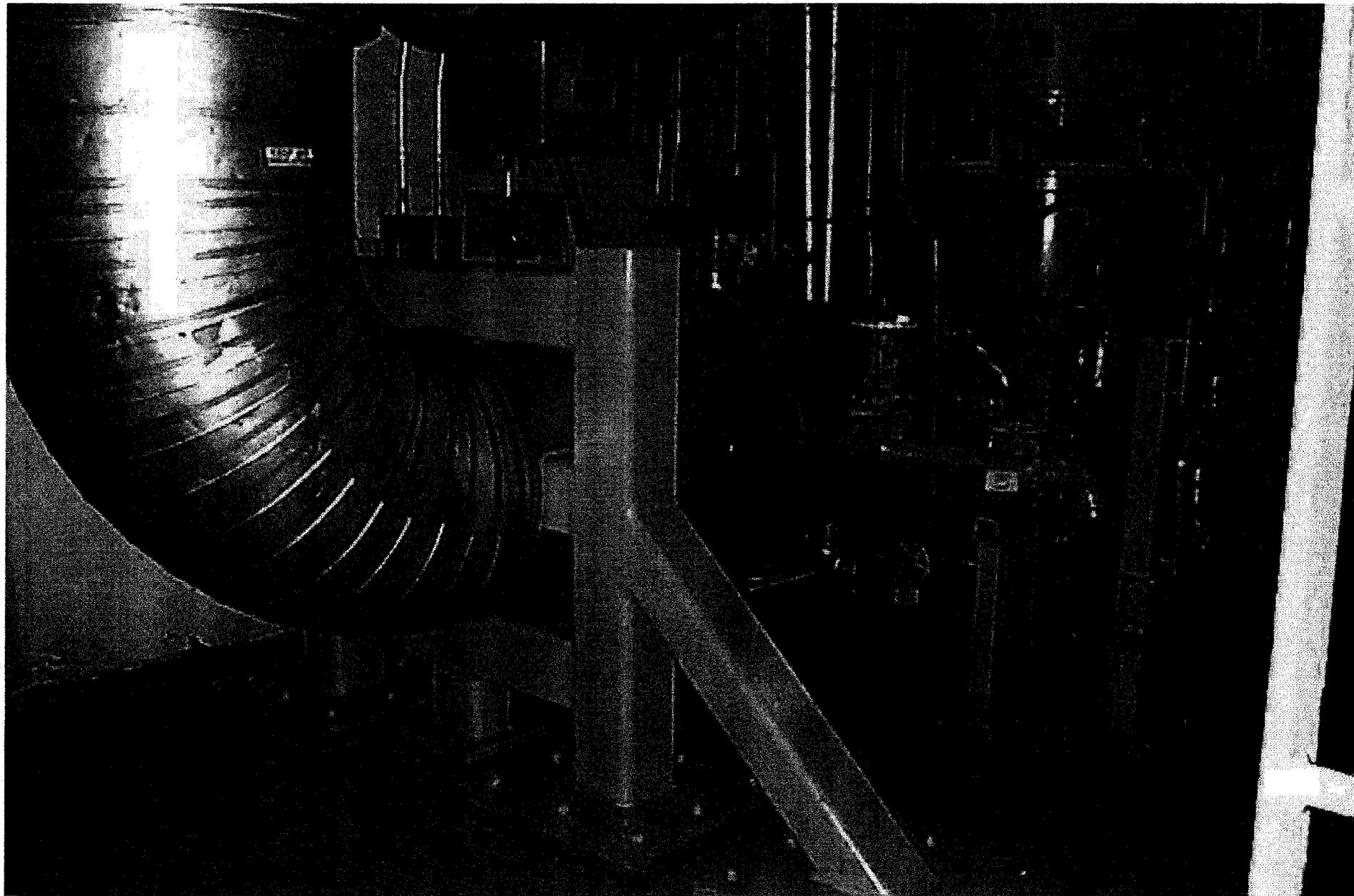
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- Expectations of FENOC
- Overall perception
- Committed to safe plant operation
- Identify problems and take prompt corrective actions
- Recent improvements

# Summary - Lew Myers

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- RPRW pump event was self revealing
- Seal water fouling problems self identified. Use of filtered water masked original design deficiency
- Comprehensive corrective actions
- RPRW pump event low to medium safety significance
- Seal water fouling problems low to medium safety significance



# New Cyclone Separator & Strainer Installed

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