COMPRESSED AIR SYSTEM
REFURBISHMENT AND
MODERNIZATION

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BACKGROUND

- The compressed air system is used for a variety of safety and control functions within NCNR, and as such, its reliability is critical to the safe continued operation of the National Bureau of Standards Reactor (NBSR).

- Critical reactor control and support systems include components of ventilation, confinement doors, storage pool, fuel transfer system, and other integral systems.
PROJECT APPROACH

1. Research historical documentation on the compressed air system
2. Analyze potential area of improvements
3. Submit an Engineering Change Request (ECR)
4. Design experiments and test the system during Major Scram
5. Recommend improvements and contact manufacturer for proper replacements
6. Cost analysis of labor and replacement parts
7. Modify drawing E-60-017 (if needed)
PURPOSE

- To test the reliability of the compressed air system given the aging equipment and plant modifications.
- A compressed air system study is required to determine how the system is functioning and what modifications, if needed, are required to return the system to design specifications.
- Identification of changes that are required for the system to be up to industry standard.
- System Documentation.
June 12th - The confinement back door was found deflated.

**Possible causes:**
- Regulator
- Solenoid valve
- Clogged airline

**Concluded:**
The door will inflate but very slowly. Not allowed to use the door unless there is an emergency.
PRESSURE DROP

- Allow measurement of the change in pressure in undesirable locations, identify leaks, and observe any changes that affect the system.
- Is the change in pressure significant?

**Experiment setup**
- Prior to Major Scram isolate PAV12, CAV 21 and install transducers, close valve CAV 103 and 104 then relieve the pressure in the air dryer, install the transducers in place on the air dryer relief then isolate CAV 93 and install the transducer in CAV 93A. Apply snoop to check for air leaks when installing and resetting the equipment.
- Program monitors.
MATERIALS

- Pressure gauge: Identify the pressure in the regulator.
- Wire: To carry the electrical signal converted from the transducer to the recorders.
- Yokogawa monitors: Used to record the signal, time of the operation, and chart the data received from the transducers.
- 8v-30v Power Source: Supply power to the transducers.
- Snoop: Leak detector for connections.
- Pressure transducers: Seven transducers will be used to change difference in pressure across the system into an electrical signal.
EXPECTED RESULTS

- Expected to see some loss but not significant amount to affect the system due to leakage or pressure drop in undesirable location.

- Possible reasons for pressure drop:
  a) Incorrectly connected pressure transducer
  b) Clogged filters and pipes
  c) Not enough pressure in the receivers
  d) Regulator malfunction
  e) Leaks in pipes
RESULTS

PAV 12

CAV 21
ENGINEERING CHANGE REQUEST (ECR)

The purpose is to remove and replace old, discontinued, obsolete, broken, and faulty valves and replace them with modern components.

- Estimated cost of replacement solenoid valves: $37,575.00
- Engineering Effort: 440 hours
- Operating Effort: 600 hours
CONCLUSIONS

- Reproducible Test
- No air leakage
- Negligible amount of pressure drop
- Achieved confinement in 12s
- Valve activation in 1.5s
- Replace critical components for preventative maintenance
FUTURE TESTS

1. **Pressure relief with compressor** - To observe the speed and efficiency of the compressor by recording the time used to fill the receivers with the compressor.

2. **Pressure relief with receivers** - Observe valves response to the difference in air for pressure drop and observe the amount of air used by the valve and how long until an issue arises.

3. **Speed requirement test** - Since there is no specified time requirement for the solenoid valve closure (generally assumed to close in 5 seconds) *(optional)*.

4. **Minimum air required for use in single cycle** - Enabling us to see how well/ how long the system works and the status of the confinement with just half the pressure in the receivers.

5. **Pressure drop test** - Allowing measurement of the change in pressure in undesirable locations, identify leaks, and observe any changes that effect the system.
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