AEOD TECHNICAL REVIEW REPORT

TR Report No. AEOD/T309
DATE: April 25, 1983
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UNIT: Brunswick 2
DOCKET NO.: 50-324
LICENSEE: Carolina Power & Light Co.
NSSS/AE: General Electric Company/UE&C

SUBJECT: AIR IN RWCU SYSTEM INSTRUMENT SENSING LINES AT BRUNSWICK - 2

EVENT DATE: December 16, 1982

SUMMARY

On December 16, 1982, operations personnel at the Brunswick 2 plant noticed that a reactor water cleanup (RWCU) system differential flow indicator (2-G31-R615) was reading on the downscale meter stop for the past 3 days. This malfunction was caused by the three flow transmitters (2-G31-FT N012, N036 and N041) supplying erroneous signals to the summer circuit (2-G31-K604). An investigation of the transmitters by the licensee discovered that air in the sensing lines caused the transmitter output errors. The lines were drained by the licensee, and all instruments were calibrated and returned to service.

As a result of this malfunction, a search was initiated to obtain previous instrument and equipment failures caused by air in the liquid sensing lines. The search indicated there were numerous instrument and equipment malfunctions at various BWR and PWR plants caused by air in liquid sensing lines. From this limited technical review it is recommended that an engineering evaluation be initiated to investigate the causes, consequences and corrective measures associated with other similar incidents which have occurred at other LWRs.

DISCUSSION

On December 13, 1982, operations personnel noticed that RWCU differential flow indicator 2-G31-R615 was reading on the downscale meter stop. Following this discovery the licensee issued a Work Request and Authorization (2-E-82-5051) to investigate the downscale reading.

At approximately 3:00 A.M. on December 16, 1982, operations personnel who had witnessed the problem on December 13, 1982, but had been off-shift since, noticed that the R615 was still downscale and that the Work Request and Authorization (5051) had not been worked. I & C was immediately requested to begin an investigation of the R615 failure. At approximately 7:00 A.M. on December 16, 1982, the Shift Foreman was notified that the output from each of the three flow transmitters was incorrect and the indication on R615 did not reflect the true system condition. The licensee immediately established an LCO on the RWCU differential flow isolation instrumentation and the RWCU system was isolated.

Due to the arrangement of the RWCU system, differential flow measurement provides an accurate leakage detection method. The flow from the reactor vessel is compared with the flow from the filter-demineralizer and the regenerative heat exchanger. An alarm in the Control Room and isolation signal is initiated when higher flow upstream from the filter-demineralizers indicates that a leak equal to established leak rate limit may exist.

The R615 indicator is a direct reading type and connects off one of the two parallel signals from a flow summer. Three flow transmitters, one on the RWCU suction line and one each on the two discharge lines, feed a summing circuit. This is shown in the attached figure. The summer circuit takes the suction flow and compares it with the combined discharge flow to produce a differential flow signal to the isolation circuits. The design of the instrumentation is such that prior to reaching the isolation setpoint for a differential flow, a "Differential Flow High" alarm followed by a "Differential Flow High-High" alarm is received.

The licensee investigated this incident and determined that the sensing lines to each of the three transmitters contained air, and caused an output signal error in the nonconservative direction. Analysis of the as found condition by the licensee indicated that the system would probably have isolated at approximately 65 gpm instead of the technical specification value of $\leq$ 53 gpm. However, the licensee isolated the RWCU system before the isolation signal setpoint was reached. Following isolation the licensee removed the air from each of the sensing lines and the entire circuitry was recalibrated and returned to service.

As a result of this event, a search was performed to collect and review previous LERs and other operating experience documents to determine the extent to which other similar instrument and equipment problems have occurred due to air in the liquid sensing lines. So far, approximately 35 cases have been traced involving both PWRs and BWRs after January 1976. Twelve of these were BWRs with the balance involving PWRs.

Due to a relatively large number of instrument and equipment problems caused by air in liquid sensing lines, a more detailed analysis and evaluation of this problem should be made.

FINDINGS

In this particular incident, analysis of the as found condition by the licensee indicated that the system would probably have isolated at approximately 65 gpm instead of the technical specification value of $\leq$ 53 gpm.

CONCLUSIONS

For the incident described in this technical review, if the system had reached the effective isolation setpoint, the corresponding leakage rate would have been higher than the allowable leakage rate. However, in view of the relatively small nonconservatism involved and the availability of other diverse instrumentation (e.g., area temperature monitors) this event by itself does not represent a significant safety problem.

Be that as it may because of the relatively large numbers of other similar instrument and equipment failures caused by air in liquid sensing lines which have been found, it is recommended that an engineering evaluation of this general problem be performed.

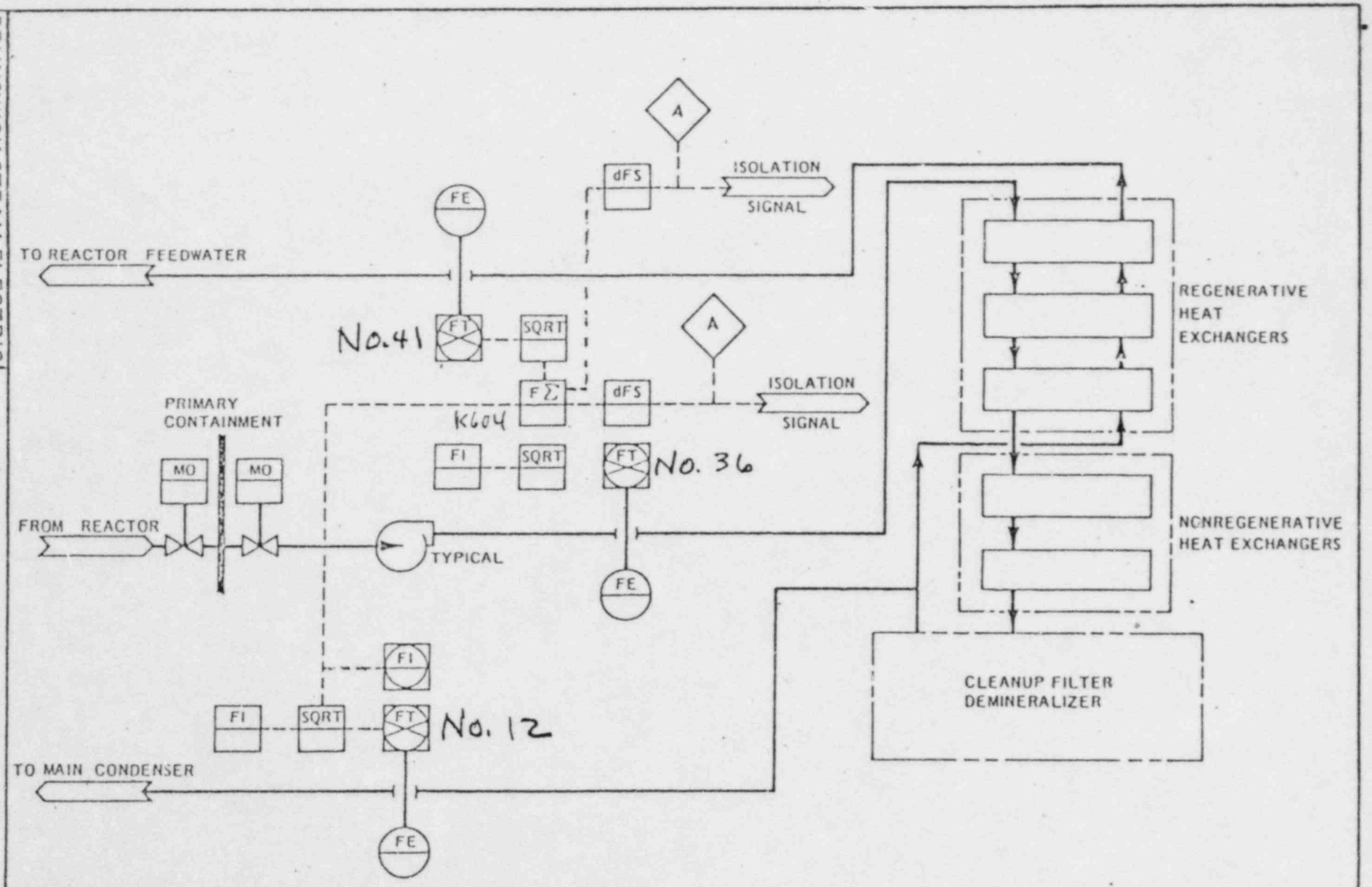
References

1. LER 82-139
2. Brunswick Steam Electric Plant Units 1 & 2 Updated FSAR Volume 4

BRUNSWICK STEAM ELECTRIC PLANT UNITS 1 & 2

Carolina Power & Light Company

UPDATED FINAL SAFETY ANALYSIS REPORT



REACTOR WATER CLEANUP BREAK DETECTION BY DIFFERENTIAL FLOW MEASUREMENT

FIGURE 1

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