

From: Patrick Loudon *PL*
To: Harold Chernoff *HC*
Date: Tue, Jun 29, 2004 9:13 AM
Subject: Fwd: PB AFW Recirc AOV CAP

release

A-36

From: "PGK1@NRC.GOV" <pgk1@nrc.gov>
To: "PLL@NRC.GOV" <pll@nrc.gov>, "jlc@nrc.gov" <jlc@nrc.gov>
Date: Mon, Jun 28, 2004 4:32 PM
Subject: PB AFW Recirc AOV CAP

CC: "MAK3@NRC.GOV" <mak3@nrc.gov>

State Change History

Initiate
by CHAPMAN, ROB AR Pre-Screen
6/28/2004 14:23:24 Owner (None)

Section 1

Activity Request Id: CAP057635
Activity Type: CAP Submit Date: 6/28/2004 14:23:24

One Line Description: AFW Recirculation AOVs not set up in conformance with Calculations

Detailed Description: 6/28/2004 14:23:24 - CHAPMAN, ROB:
During preparation of Revision 1 to Calculation 2002-0002 for the nitrogen backup system for the Motor-Driven AFW pump AOVs, it was discovered that the AFW recirculation AOVs are not set up in conformance with the calculation. This also applies to the AOVs for the Turbine-Driven AFW pump (and calculation 2001-0056). Both calculations require the AOVs to be set up such that there is a 1/4" gap between the actuator frame and the diaphragm housing when in the shut position. This serves to minimize the dead volume of the actuator. This dead volume is an input to the calculations, and the value used for this actuator (Copes Vulcan D-100-160) dead volume plus stroke volume of 291 cubic inches is contingent on the valve being set up in this manner.

A walkdown confirmed the following dimensions:

- 1AF-4002 1.7/8"
- AF-4007 1 1/8"
- AF-4014 7/8"
- 2AF-4002 1 1/4"

The calculations contain a large amount of margin in that very conservative leakage is assumed, as well as conservatively large number of valve strokes. A review of the effects on the calculations (current revisions on record) using the worst case stroke volume (dead volume plus stroke volume) of 600 cubic inches follows:

Calculation 2001-0056 Rev 2 (TDAFP): If the worst case value of 600 cubic inches is used, it results in a required tank volume of approximately 211 gallons (the 1/2T-212 tanks are actually 150 gallons). If a realistic value of leakage is used (from recent performance of IT 8C), the required tank volume is 154 gallons. The net result of this condition is that less than 2 hours of backup air may be available, if the recirculation valves are stroked 10 times per hour.

Calculation 2002-0002 Rev 0 (MDAFP): If the worst case value of 600 cubic inches is used, it results in a bottle changeout pressure of approximately 1927 psig to ensure a minimum of 90 minutes of operation. Note that this review has also considered CAP057630 was issued earlier that has resulted in a required increase in the changeout pressure to 1950 psig.

Initiator: CHAPMAN, ROB Initiator Department: EXD Engineering Safety & Design Review PB

Date/Time of Discovery: 6/28/2004 14:19:00 Date/Time of Occurrence: 6/28/2004 14:19:00

Identified By: Site-Identified System: AF PB

Equipment # (1st): (None) Equipment Name (1st): (None)

Equipment # (2nd): (None) Equipment Name (2nd): (None)

Equipment # (3rd): (None) Equipment Name (3rd): (None)

Site/Unit: Point Beach - Common

Why did this occur?: 6/28/2004 14:23:24 - CHAPMAN, ROB:
Requirements from calculations were not transferred to the field for setup of the AOVs.

Immediate Action Taken: 6/28/2004 14:23:24 - CHAPMAN, ROB:
Reviewed calculations for the effects of this condition.

Recommendations: 6/28/2004 14:23:24 - CHAPMAN, ROB:

The recirculation AOVs should be set up such that the gap between the actuator frame and the diaphragm housing is less than 1/4". This will bring the actuators into conformance with the calculations.

SRO Review Required?: Y

Section 2

Operability Status: (None) Compensatory Actions: N

Basis for Operability:

Unplanned TSAC Entry: N External Notification: N

Section 3

Screened?: N Significance Level: (None)

INPO OE Req'd?: N Potential MRFF?: N

QA/Nuclear Oversight?: N Licensing Review?: N

Good Catch/Well Doc'd?: NA

Section 4

Inappropriate Action:

Process: (None) Activity: (None)

Human Error Type: (None) Human Perf Fail Mode: (None)

Equip Failure Mode: (None) Process Fail Mode: (None)

Org/Mgt Failure Mode: (None) Group Causing Prob: (None)

Hot Buttons: (None)

Using the difference in SCFA volumes in the tank as equal to the total required demand:

$$V_{STI} - V_{STJ} = V_{SCFA} = 35.4 \text{ SCFA} \quad (6.1.9)$$

Inserting Eq 6.1.9 into Eq 6.1.7 and 6.1.8 and solving yields:

$$V_{TANK} = 0.142(35.4 + V_{STJ}) = 0.195V_{STJ}$$

$$V_{STJ} = \frac{0.142(35.4)}{(0.195 - 0.142)} = 94.8 \text{ SCFA}$$

$$V_{STI} = 35.4 + 94.8 = 130.2 \text{ SCFA}$$

$$V_{TANK} = 0.195(94.8) = 18.5 \text{ ft}^3 * (7.48 \text{ gal/ft}^3) = \underline{138 \text{ gal}}$$

6.2 Calculation of Modification PMT Acceptance Criteria

$$V_v = 291 \text{ in}^3$$

$$d_i = 0.245 \text{ in}$$

$$L_i = 1000 \text{ in}$$

$$t = 5 \text{ minutes}$$

Swept volume of diaphragm including dead band (Input 5.2)
Tubing diameter (Input 5.9, Section 6.1)
Maximum length of tubing pressurized (Input 5.9)
Test duration (Input 5.10)

- Calculation of filled volume of tubing and valve:

$$V_i = \frac{\pi}{4} d_i^2 L_i = \frac{\pi}{4} (.245[\text{in}])^2 (1000[\text{in}]) = 47.1[\text{in}^3] \quad (6.2.1)$$

$$V_{TEST} = V_i + V_v = 47.1 + 291 = 338 \text{ in}^3$$

$$V_{TEST} = 338 \text{ in}^3 * (1 \text{ ft}^3 / 1728 \text{ in}^3) = 0.196 \text{ ft}^3$$

- Pressure drop in system during testing:

The pressure drop can be calculated for standard conditions assuming any value of leakage in SCFM. The equation for the change in standard volume of air is:

$$V_{leak} = \frac{(V_i - V_f)}{t} \quad (6.2.2)$$

where V_i and V_f are the initial and final volumes of air in the pressurized section of tubing in SCFA. Using Equations 6.1.5 and 6.1.6, the pressures and volume have the following relationship: