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TEST RESULT REPORT

Emergency Cooldown Check Valve Acceptance

Test for the Cold Flow Development Test System

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ABSTRACT

This report presents the results of the acceptance testing of the Emergency Ccoldown Check Valve for use with the Cold Flow Development Test System (CFDTS). The valve satisfactorily completed each test.

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I INTRODUCTION

The Emergency Cooldown Check Valve (ECCV) is used in the pump discharge line to prevent backflow to the turbopump when the emergency cooldown system is employed. This report presents the results of an acceptance test of the ECCV to be used in the cold flow development test system.

II SUMMARY AND CONCLUSIONS

The valve, P/N 285994, S/N 0000005, was subjected to an ambient temperature proof test of 1500 psig. After being conditioned to LH₂ temperature, the valve was subjected to an external leak test and a cracking and reseal pressure test. The valve satisfactorily completed the three phases of testing and is acceptable for CFDTs usage.

III DISCUSSION

A. Test Objective

The objective of the testing was to demonstrate the suitability of the valve for use in engine system tests. Criteria used for establishing the ECCV suitability for CFDTs use was as follows:

1. The unit is to withstand ambient temperature proof test of 1500 psi for 2 minutes with no sign of distortion or permanent set.
2. The unit is to withstand external leak test at LH₂ temperature and 1000 psig with a maximum external leakage of less than 6×10^{-2} scc/sec.
3. The unit is to require an unseating pressure at LH₂ temperature of 1.7 psi or less.

Testing was accomplished in accordance with NERVA Test Plan 1.2.2-64-R-001 dated 1 September 1964.

B. Test Component

The test component was a 5" swing check valve manufactured by H. W. Loud Company in accordance with AGC Specification Control Drawing 285994. The unit tested was S/N 0000005. The manufacturers part number was 1584L000.

C. Test Procedure

1. Ambient Proof Test

The valve was subjected to 1500 psig internal pressure at ambient temperature for two (2) minutes. No sign of distortion or permanent set was observed.

2. The valve was installed in the test system shown in Figure (1) and while the valve was at cryogenic temperature, tests were conducted as follows:

a. External Leak Check

The external joint on the valve was encapsulated with silicone rubber and fiberglass tape as a leakage collection manifold. A 1/4 inch diameter tube from this manifold to an inverted 1000 cc water filled beaker, as shown in Figure (1), completed the leakage monitoring system.

Liquid hydrogen was flowed through the valve setup until the copper-constantan thermocouple on the exterior of the valve outlet tooling stabilized at -346°F indicating that thermal equilibrium was established in the valve.

The LH_2 flow was terminated and 970 psig GHe leak test pressure was applied to the valve. No bubbles were observed in the bubble displacement leak measuring device during the 2 minutes at this pressure, indicating a leakage rate less than the maximum allowable 6×10^{-2} scc/sec. The pressure was reduced to 0 psig following the leakage test.

b. Cryogenic Unseat and Reseat Pressure Test

Helium pressure was applied to the valve inlet port with the outlet port vented. The pressure at the inlet port and ΔP across the valve flapper were recorded. The helium pressure at the inlet port was increased until a sudden change in the pressure rise rate occurred, indicating that the valve flapper had unseated. The pressure was then reduced until a sudden change in the rate of pressure reduction occurred, indicating the valve flapper had re-seated. The results of five (5) such tests are shown in Table I. No reseat pressure was noted on runs number 1 and 2 as the pressure decrease was so rapid that the reseat pressure could not be identified. The data obtained shows that the valve "cracking" pressure is less than the maximum allowable 1.7 psid.

TABLE I

Cryogenic Crack and Reseat Pressure Test Data

<u>Test Run</u>	<u>Cracking Pressure</u>	<u>Reseat Pressure</u>
1	1.65 psi	-
2	1.63 psi	-
3	1.77 psi	1.55 psi
4	1.55 psi	1.38 psi
5	1.65 psi	1.55 psi

Average cracking pressure: 1.67 psi

Average reseat pressure: 1.49 psi

FIGURE (1)

NOTE: ALL BRACKETING & PLUMBING PER
TEST AREA SAFETY PROCEDURE #39