Part 21 (PAR) Event # 47015

Rep Org: AUTOMATIC VALVE CORPORATION		**Notification Date / Time:** 07/01/2011 15:56 (EDT)	
Supplier: AUTOMATIC VALVE CORPORATION		**Event Date / Time:** 06/28/2011 07:00 (EDT)	
		Last Modification: 07/01/2011	
Region: 3		**Docket #:**	
City: NOVI		**Agreement State:** No	
County:		**License #:**	
State: MI			
NRC Notified by: KEVIN ARMSTRONG		**Notifications:** CHRISTINE LIPA	R3DO
HQ Ops Officer: JOE O'HARA		MARK FRANKE	R2DO
Emergency Class: NON EMERGENCY		PART 21 GRP EMAIL	
10 CFR Section:			
21.21 UNSPECIFIED PARAGRAPH			

SEAL FAILURE AND LEAKAGE ASSOCIATED WITH MODEL B5497-301 VALVES

The following was received via fax:

Automatic Valve Corporation made this report based upon its investigation and engineering evaluation of valve serial number 57056 which was leaking following an outage test stroke at McGuire Station. Automatic Valve Corporation determined that the cause of the leakage was seal failure as a result of the seal being displaced from its retaining groove. The displaced seal became trapped between the poppet face and valve seat inside the valve body. Automatic Valve Corporation reported that seal replacement combined with inspection; and testing would prevent additional failures.

Shearon Harris and McGuire utilize these types of valves. Automatic Valve Corporation has no reported failures of these valves at Shearon Harris.

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IE19

NRR

NRC Operations Center 301-816-5151 (FAX)

10 CFR PART 21 Notification:

Automatic Valve Corporation
41144 Vincenti Court, Novi MI 48375
Contact: Kevin Armstrong, President, 248-474-6700 ext. 170

Basic Component Model Numbers:

B5497-301

Nature of the Defect:

Extrusion of internal seals creates seal displacement and leakage.

Number and Location of Components:

Valve Model	Quantity	Customer
B5497-301	20	RA Hiller

Corrective Action to Be Taken:

Please see attached report.

Advice to Purchasers:

Please see attached report. Automatic Valve will rebuild units as necessary.

Date the Evaluation of the Defect was Complete: 06/28/2011

REQUIREMENTS:

NUMBER: 543

Type of Problem: Part B5497-301 Procedure _____ Date: 06-09-2011

Who found Problem: _____ Supplier _____ Distributor X Customer

Company: Duke - McGuire Station **Contact Name:** Ryan Printy

Address: 12700 Hager's Ferry Road Huntersville, NC 28078-9340

1. **Team Working on Problem:** Leader: Kevin Armstrong Members:
Brian Bielat, Tom Troy, Todd Hutchins

2. **Describe Problem (Initial Concern and Symptoms):.**

Valve, serial number 57056, was noted to be leaking after an outage test stroke.

Contain Symptom (Action):

All elastomeric components require replacement. Valve to be returned to customer in as originally shipped condition.

Approved by: _____ Title: _____ Date: 7.1.11

4. **Root Cause/s of Problem:** **10 CFR Part 21 Report Required: Yes**

A 10 CFR 21Is report required based on the statement made by plant staff on June 28th:

"when the 4-way for 2CF-26AB failed we drained the tank in a relatively short period of time and we actually started to drain the main nitrogen header the leak was so large. If this happens again during a feedwater isolation we would violate one of our requirements to maintain a minimum of 50 psig in the tank for a 24 hour period."

The root cause of the valve leakage is seal failure.

The seal on item 3, A5497-314, is displaced from its retaining groove. (See attached print Sheets 1and 3; photograph 1) This created a condition where the displaced seal was trapped between the poppet face and the valve seat inside the valve body. This creates a gap through which nitrogen passes directly between the inlet port and exhaust port. The exact size of this leak is dependent on several factors including volume and pressure of nitrogen available to force the piston (item 6, attached print sheet 1)) into its fully stroked position. This piston, in turn, drives the unseated seal back into the poppet grove, and creates an (imperfect) seal on the rolled edge or the face of the poppet. At normal operating pressure, above 265 psi, testing shows the displaced seal is forced back (imperfectly) into its retaining groove. The valve leaks but still functions. At lower pressures, the displaced seal will create a larger leak path.

The seal failed due to compression set. It extruded and rolled over the wall of the poppet face (Photograph 2).Note that the extrusion only occurs on the end of poppet which is exposed to ambient pressure (344 psig) around the entire area of an unconstrained seal. The seal on the poppet face which mated to the valve body seat during in-service operation does not extrude. (Photograph 3).

As the extrusion continues the seal begins to cut. The cut either creates a leak path, which is formed where the high pressure nitrogen can pass under the seal causing it to lift or the cut causes the seal to loose squeeze and high pressure differentials during shift create the lift. Automatic Valve has not been able to duplicate the displacement of an extruded seal.

Other issues of note not directly related to the failure:

FME was noted at disassembly of the vale (photograph 4). If the FME is taken into the valve through vent ports it would be expected to degrade lubrication. Degraded lubrication can be expected to both increase minimum operating pressures and slow movement of internal components. This will tend to increase the impact of the displaced seal.

Plant staff indicate a low pressure requirement of 50 psig. The valve prints do not specify this pressure. No testing was done by Automatic Valve below 90 psig. Please see print sheet 2 of 3, Notes 5 and 10.

The only other installation of these valves is at Shearon Harris. Automatic Valve has had no reports of failures from that plant. Three replacement units were purchased by Shearon Harris in October of 2008, after an original installation in 1999.

Approved by: _____ Title: _____ Date: 7.1.11

5. Corrective Action:

Time required for compression set and extrusion to occur is unknown. The valve has, however, functioned without failure since 1999. Replacement of seals combined with additional inspection; testing and replacement protocols would prevent an in-service unit from developing the same failure mode.

Additional work is required to modify the seal such that compression set will not impact performance.

Approved by: [signature] Title: [illegible] Date: 7.1.11

6. Implementation:

Approved by: Title: Date:

7. Corrective Action to System to Prevent Recurrence:

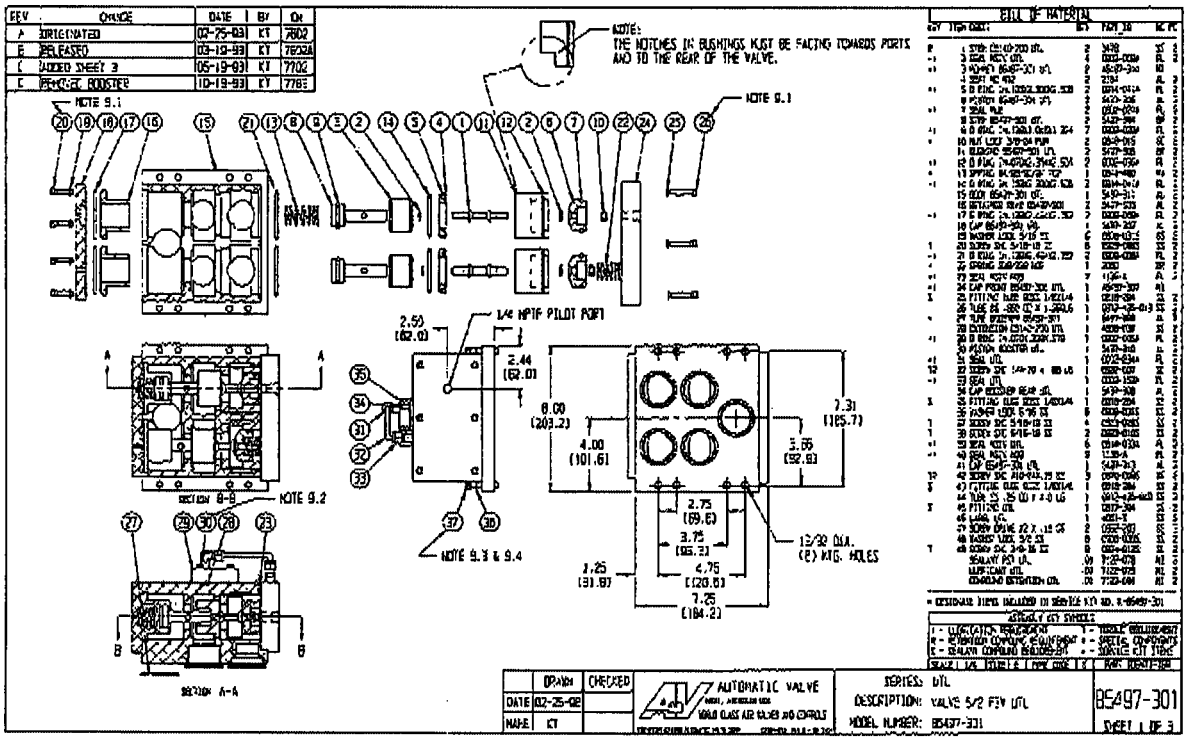
Approved by: Title: Date:

8. Verification (Describe):

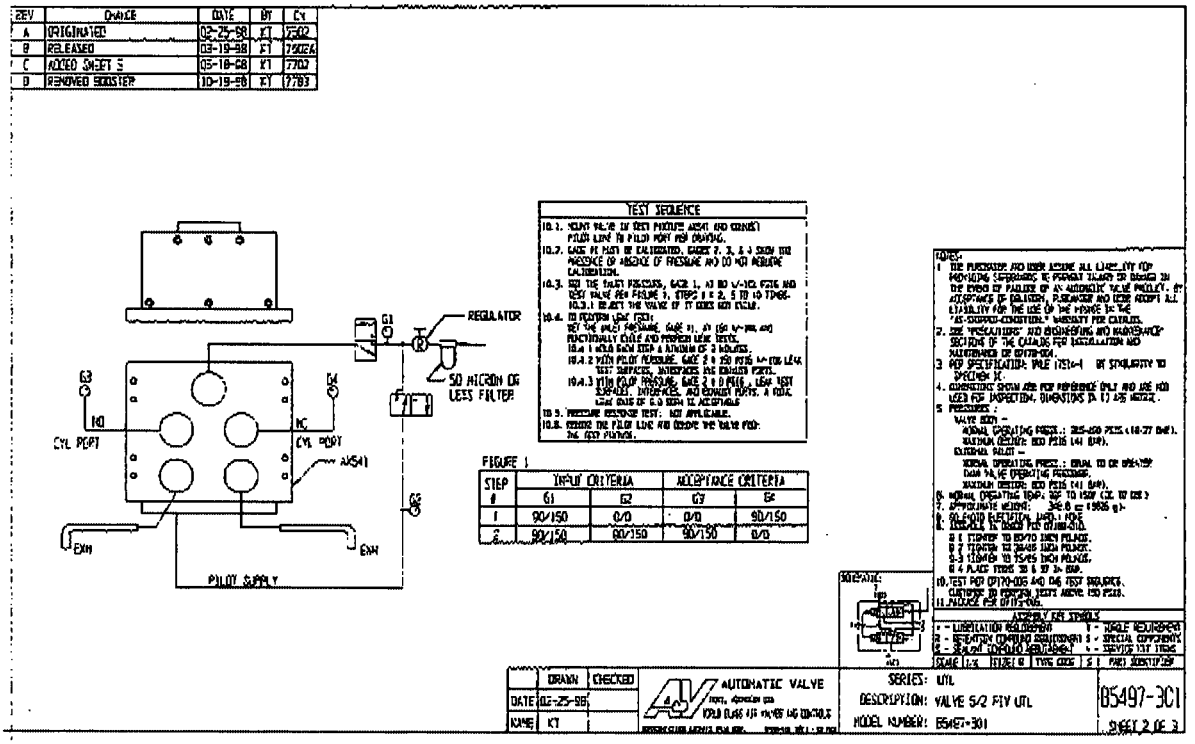
Approved by: Title: PRS Date:

AUTOMATIC VALVE	NUMBER: D7174-003	Page 3 of 8
TITLE: CORRECTIVE ACTION	LOCN: I:\WORD\DOCUMENT\D7174003.DOC	DATE: 10-21-1999
SUBJ: CORRECTIVE ACTION	TYPE: FORM DEPT RESP: DQA	REV: F-CN8020

B5497-301 Revision D, Print Sheet 1

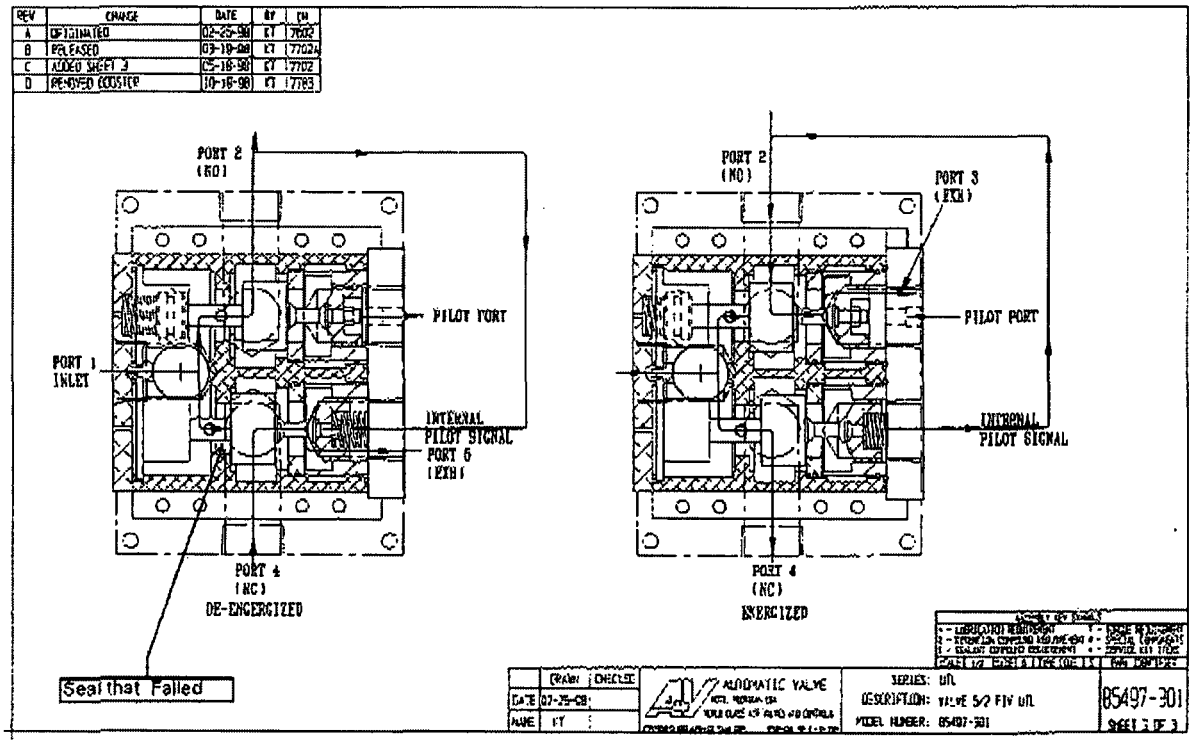


B5491-307 Revision D, Print Sheet 2



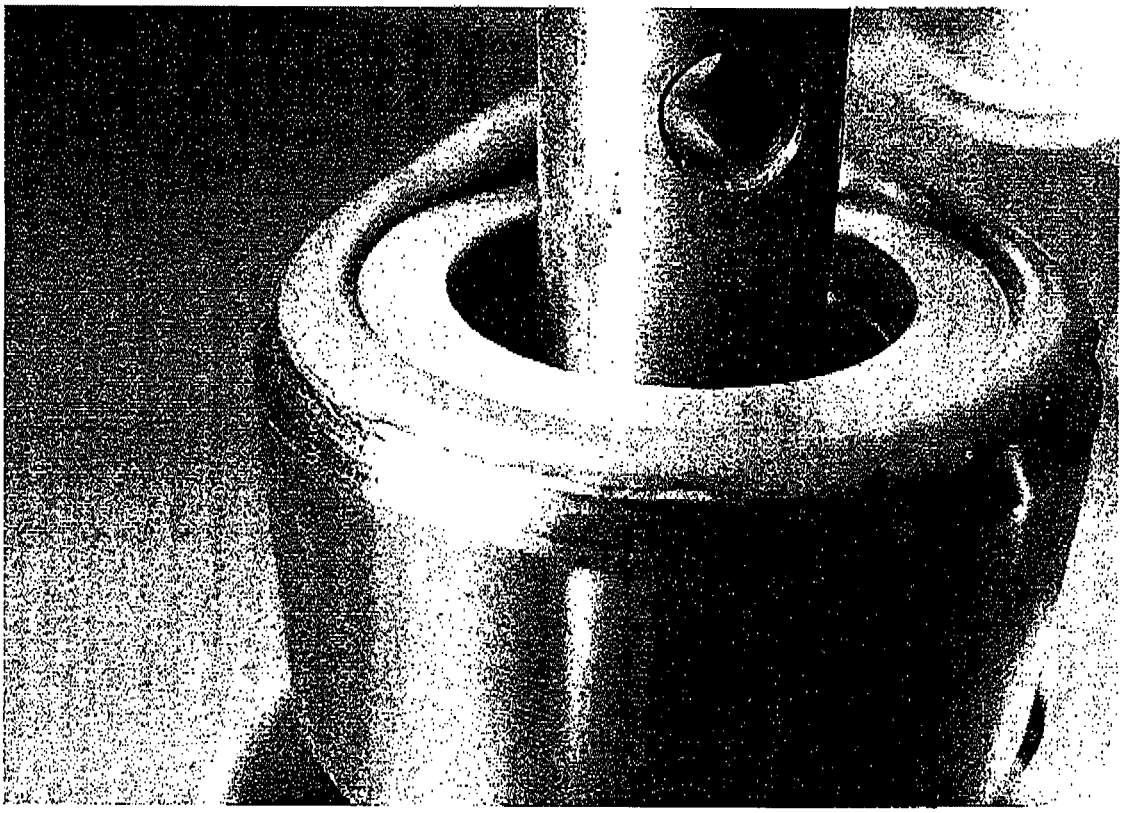
AUTOMATIC VALVE	NUMBER: D7174-003	Page 5 of 8
TITLE: CORRECTIVE ACTION	LOCN: I:\WORD\DOCUMENT\D7174003.DOC	DATE: 10-21-1999
SUBJ: CORRECTIVE ACTION	TYPE: FORM DEPT RESP: DQA	REV: F-CN8020

B5491-307 Revision D, Print Sheet 3

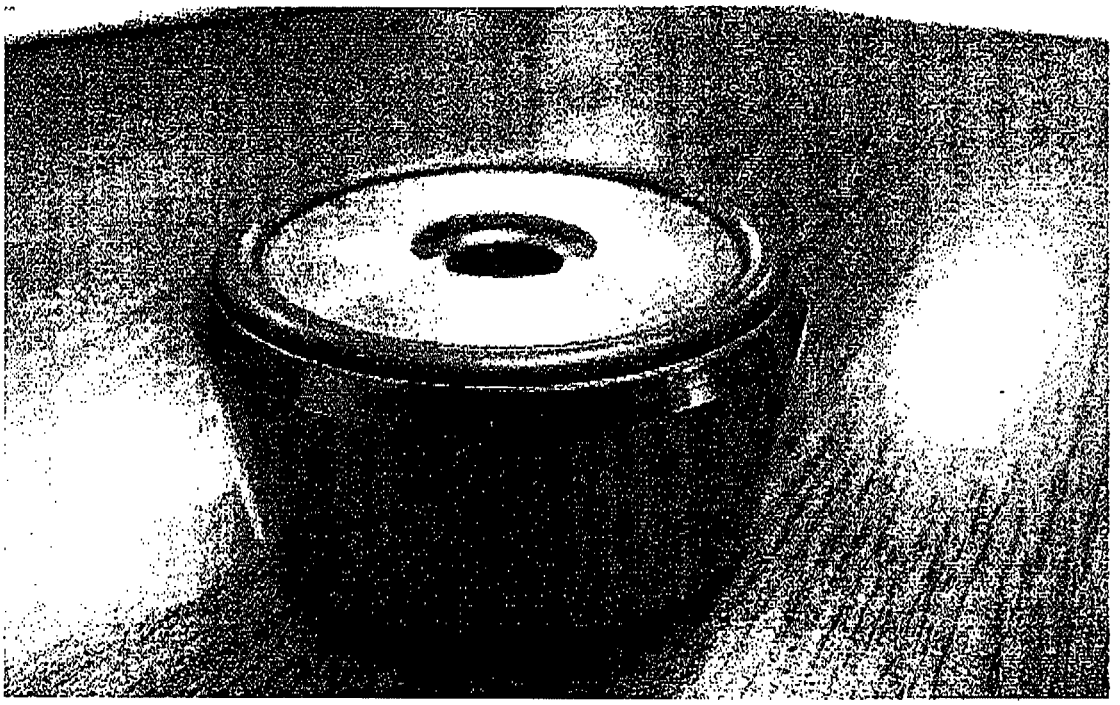


Photograph 1: Displaced, as found, Seal

Photograph 2: Seal Extrusion



Photograph 3: Seal Face -Without Extrusion - Compressed Against Face In Service



Photograph 4: FME As Found Normally Closed Side, Inlet Face