Flow Control Division
Anchor/Darling Valves
BW/IP Valves
Edward Valves
Valtek Control Products
Worcester Valves

May 17, 2007

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington DC, 20555-0001

Subject: 10 CFR Part 21 report concerning 3" and 4" Borg Warner Check Valves

Reference: NRC Part 21 Report 2001-27-0

Dear Sir or Madam:

This letter is intended to amend information previously supplied in the Part 21 report referenced above. The report advised of a potential problem with 3" and 4" Borg Warner swing check valves and disc assemblies supplied in 1977 or earlier.

Flowserve has identified one instance in which valves with this design configuration were supplied after 1978. The details concerning this situation are provided in the attached letters.

Please advise if there are any questions concerning this issue.

Flowserve Corporation
Flow Control Division

Robert D. Barry
Quality Assurance Manager

Attachments

IE19

Flowserve U S Inc
Flow Control Division

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Raleigh, NC 27603

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May 17, 2007

Arizona Public Service Company
PO Box 52034
Mail Station 7990
Phoenix, AZ 85072-2034

Attention: Procurement Engineering Section Leader

Subject: 10 CFR Part 21 report concerning Borg Warner 3" & 4" Swing Check Valves

Dear Sir or Madam:

On August 23, 2001, Flowserve – Williamsport, PA issued the enclosed 10CFR Part 21 report regarding Borg Warner 3" and 4" swing check designs. Some disc assemblies were shipped with an excessive stud-to-disc weld that could keep the disc washer too far from the back of the disc and consequently permit excessive angular movement of the disc. This could result in the top of the disc catching on the seat ring bore and prevent the valve from closing.

The report recommended inspection of 3" and 4" swing check valves or disc assemblies purchased in 1977 or earlier. At the time, it was believed that by 1977 all such designs were modified to provide a weld configuration flush with the back face of the disc as shown in the attached Figure 1. Design calculations determined that this modification limited the disc angular movement and prevented the problem described above.

On March 7, 2007, Arizona Public Service Co. advised Flowserve of an incident involving a 3"-300 Borg Warner swing check valve in which the disc assembly stud failed in service. The valve was supplied by Borg Warner Corporation - Van Nuys, California sometime between 5-31-79 and 11-30-81. The APS investigation concluded that the apparent cause of the failure was due to cyclic fatigue brought on by the repeated impacting of the valve disc to the seat caused by a lack of DP across the valve.

The APS investigation concluded that the failure of the stud was not reportable but that Flowserve would be notified of the incident. Flowserve investigated the incident and also concluded that the stud failure was not reportable. Swing check component failure due to unstable flow and cyclic fatigue is a situation well documented throughout the industry.

However, the APS investigation report noted that the disc-to-stud weld surface was raised and non-uniform. APS understood that the surface of the weld should be flat and flush with the back face of the disc.

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The purpose of this letter is to notify the industry that some 3" and 4" Borg Warner swing check disc assemblies provided after 1977 have the same problem as that reported in 2001 for assemblies supplied in 1977 or earlier.

The extent of this condition is not known and difficult to determine. The design data from Borg Warner – Van Nuys has transferred through 3 facilities since 1986 and is incomplete. A review of the data remaining today could not be 100 percent conclusive in determining whether any other disc assembly drawings were overlooked when the design modification was implemented by Borg Warner – Van Nuys in 1977.

The only known design with this condition is disc assembly drawing number 76333, which is identified as the disc and stud assembly part number on the Borg Warner valve assembly drawing. Flowserve has no reason to believe that the number of disc assemblies with raised welds produced after 1977 is extensive. However, knowing that there was one with this condition, Flowserve decided it would be prudent to re-notify all utilities originally notified in 2001.

Flowserve recommends that 3" and 4" Borg Warner swing check valves and spare part disc assemblies provided after 1977 be inspected for this condition at the earliest convenience.

A review of the assembly drawings for 3"-300 Borg Warner check valves currently in-service may be conducted to identify any with disc and stud assembly part number 76333. Those provided in 1990 or earlier may not have the modified design.

As indicated above, this report is not limited to the 76333 design. It is currently the only one known to have a raised weld after 1977. Though it is not possible for Flowserve to identify all of the designs currently in service, Flowserve can confirm the modification date for any disc and stud assembly part number identified by the utility.

Flowserve is not aware of exactly how all of these valves are being used by the utilities and therefore has not been able to determine the safety significance of the problem. Please contact one of the team leaders listed below, if Flowserve can assist you in any way.

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May 17, 2007

Constellation Energy
1503 Lake Road
Ontario, NY 14519

Attention: Manager, Quality Assurance

Subject: 10 CFR Part 21 report concerning Borg Warner 3" & 4" Swing Check Valves

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May 17, 2007

Duke Energy Carolinas LLC
PO Box 1006
Charlotte, NC 28201-1006

Attention: OEA Manager, Nuclear Assessment Division
Mail Code EC05P

Subject: 10 CFR Part 21 report concerning Borg Warner 3" & 4" Swing Check Valves

Dear Sir or Madam:

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May 17, 2007

Edison Material - Songs
PO Box 128
Clemente, CA 92674-0128

Attention: Manager, Nuclear Oversight Division

Subject: 10 CFR Part 21 report concerning Borg Warner 3" & 4" Swing Check Valves

Dear Sir or Madam:

On August 23, 2001, Flowserve – Williamsport, PA issued the enclosed 10CFR Part 21 report regarding Borg Warner 3" and 4" swing check designs. Some disc assemblies were shipped with an excessive stud-to-disc weld that could keep the disc washer too far from the back of the disc and consequently permit excessive angular movement of the disc. This could result in the top of the disc catching on the seat ring bore and prevent the valve from closing.

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May 17, 2007

Entergy Operations, Inc.
PO Box 31995
Jackson, MS 39286-1995

Attention: Manager, Operating Experience

Subject: 10 CFR Part 21 report concerning Borg Warner 3" & 4" Swing Check Valves

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May 17, 2007

Florida Power & Light
700 Universe BLVD
PO Box 14000
Juno Beach, FL 33408

Attention: R.A. Symes, Supervisor of Performance Assessment

Subject: 10 CFR Part 21 report concerning Borg Warner 3" & 4" Swing Check Valves

Dear Mr. Symes:

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May 17, 2007

Knolls Atomic Power Laboratory
Kesselring Site Operation
350 Atomic Project Road
Ballston Spa, NY 12020-2817

Attention: Mr. David Couse

Subject: 10 CFR Part 21 report concerning Borg Warner 3" & 4" Swing Check Valves

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A review of the assembly drawings for 3"-300 Borg Warner check valves currently in-service may be conducted to identify any with disc and stud assembly part number 76333. Those provided in 1990 or earlier may not have the modified design.

As indicated above, this report is not limited to the 76333 design. It is currently the only one known to have a raised weld after 1977. Though it is not possible for Flowserve to identify all of the designs currently in service, Flowserve can confirm the modification date for any disc and stud assembly part number identified by the utility.

Flowserve is not aware of exactly how all of these valves are being used by the utilities and therefore has not been able to determine the safety significance of the problem. Please contact one of the team leaders listed below, if Flowserve can assist you in any way.

Flowserve Corporation
Flow Control Division

Robert D. Barry

Robert D. Barry
Quality Assurance Manager

Attachments:

Cc: Dan Hall, North Team Leader (919-831-3245)
Gary Shaw, South Team Leader (919-831-3331)
Dave Osborne, West Team Leader (919-831-3277)

Flow Control Division
Anchor/Darling Valves
BW/IP Valves
Edward Valves
Valtek Control Products
Worcester Valves

May 17, 2007

Nuklearna Elektrarna Krsko
8270 Krsko, Vrbina 12
Slovenia

Attention: Zvonimir Zec, Superintendent Engineering Support

Subject: 10 CFR Part 21 report concerning Borg Warner 3" & 4" Swing Check Valves

Dear Mr. Zec:

On August 23, 2001, Flowserve – Williamsport, PA issued the enclosed 10CFR Part 21 report regarding Borg Warner 3" and 4" swing check designs. Some disc assemblies were shipped with an excessive stud-to-disc weld that could keep the disc washer too far from the back of the disc and consequently permit excessive angular movement of the disc. This could result in the top of the disc catching on the seat ring bore and prevent the valve from closing.

The report recommended inspection of 3" and 4" swing check valves or disc assemblies purchased in 1977 or earlier. At the time, it was believed that by 1977 all such designs were modified to provide a weld configuration flush with the back face of the disc as shown in the attached Figure 1. Design calculations determined that this modification limited the disc angular movement and prevented the problem described above.

On March 7, 2007, Arizona Public Service Co. advised Flowserve of an incident involving a 3"-300 Borg Warner swing check valve in which the disc assembly stud failed in service. The valve was supplied by Borg Warner Corporation - Van Nuys, California sometime between 5-31-79 and 11-30-81. The APS investigation concluded that the apparent cause of the failure was due to cyclic fatigue brought on by the repeated impacting of the valve disc to the seat caused by a lack of DP across the valve.

The APS investigation concluded that the failure of the stud was not reportable but that Flowserve would be notified of the incident. Flowserve investigated the incident and also concluded that the stud failure was not reportable. Swing check component failure due to unstable flow and cyclic fatigue is a situation well documented throughout the industry.

However, the APS investigation report noted that the disc-to-stud weld surface was raised and non-uniform. APS understood that the surface of the weld should be flat and flush with the back face of the disc.

Flowserve U S Inc
Flow Control Division

Raleigh Operations
PO Box 1961
1900 South Saunders Street
Raleigh, NC 27603

Toll Free: 1-800-225-6989
Phone: 1-919-832-0525
Facsimile: 1-919-831-3369
www.flowserve.com

During the Part 21 investigation regarding the stud failure, Flowserve reviewed the history of the disc assembly drawing and discovered that the weld configuration was not modified to provide a surface flat and flush with the back face of the disc until 1990. This finding is inconsistent with the information provided in the 10CFR Part 21 report issued by Flowserve – Williamsport in August of 2001.

The purpose of this letter is to notify the industry that some 3" and 4" Borg Warner swing check disc assemblies provided after 1977 have the same problem as that reported in 2001 for assemblies supplied in 1977 or earlier.

The extent of this condition is not known and difficult to determine. The design data from Borg Warner – Van Nuys has transferred through 3 facilities since 1986 and is incomplete. A review of the data remaining today could not be 100 percent conclusive in determining whether any other disc assembly drawings were overlooked when the design modification was implemented by Borg Warner – Van Nuys in 1977.

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Mark Alsip, International Team Leader (919-831-3279)

Flow Control Division
Anchor/Darling Valves
BW/IP Valves
Edward Valves
Valtek Control Products
Worcester Valves

May 17, 2007

Tennessee Valley Authority
Nuclear Assurance and Licensing
Chattanooga, TN 37402-2801

Attention: Manager, Operating Experience

Subject: 10 CFR Part 21 report concerning Borg Warner 3" & 4" Swing Check Valves

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Worcester Valves

May 17, 2007

TXU Electric Company - CPSES
PO Box 1002
Glen Rose, TX 76043

Attention: Group Vice President - Nuclear

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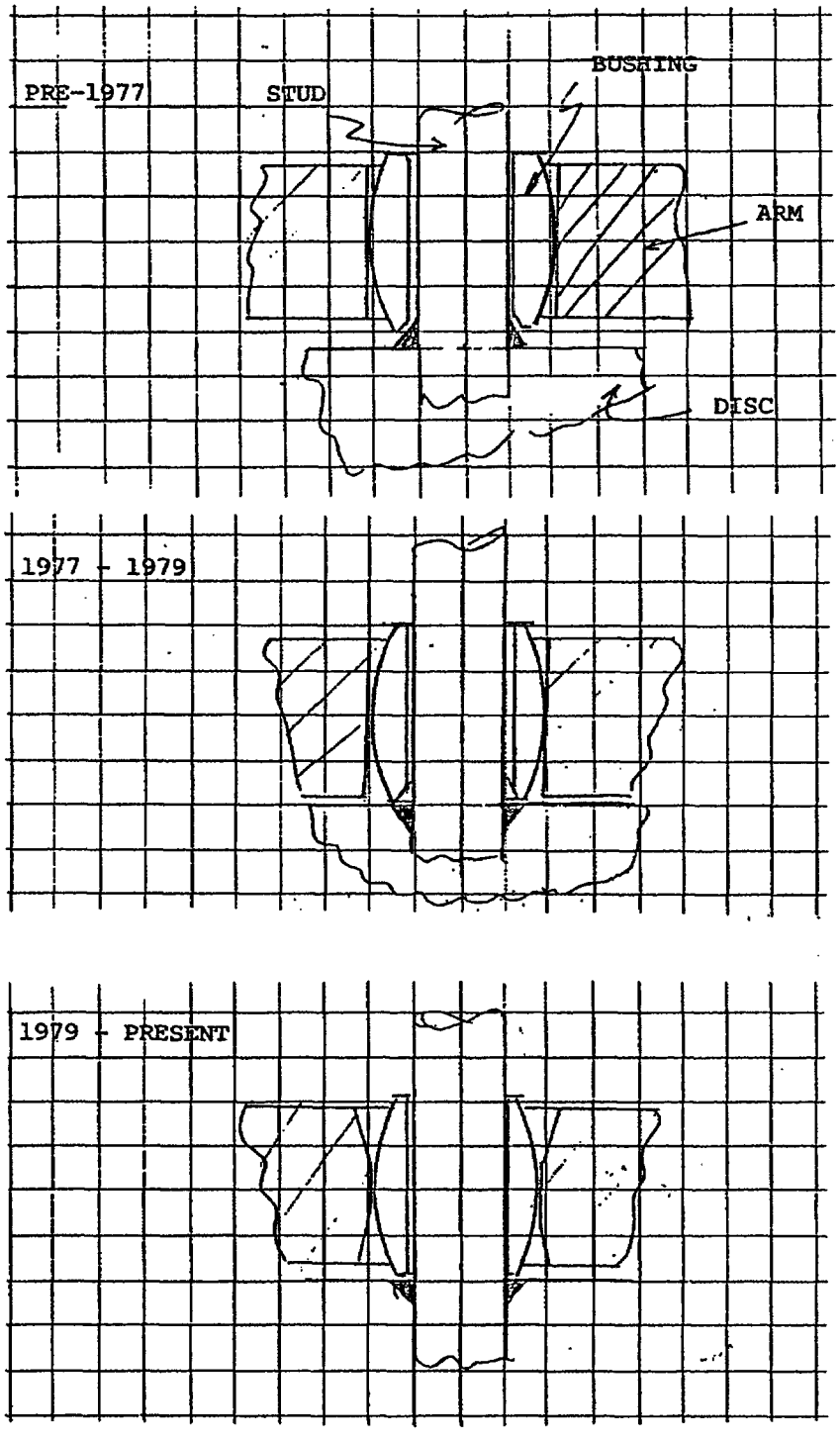


Figure 1 - Design History

FLOWSERVE

Flow Control Division

August 23, 2001

U.S. Nuclear Regulatory Commission
Attn: Linda Joy Smith
611 Ryan Plaza Drive
Arlington, TX 76011

Subject: Borg-Warner 3" and 4" Swing Check Valves

Dear Linda:

As we discussed over the last few weeks, Arizona Public Service advised Flowserve that a 4"-1500# Swing Check Valve didn't perform properly for the same reason that was earlier reported as a 10CFR21 on a 4"-150# Swing Check Valve. A copy of the original report is attached.

Also attached is a copy of the letters sent to all customers who received either 3" or 4" Swing Check Valves of any pressure class during the time when the problem may have occurred. These are submitted per your request.

Please advise if there are any additional questions.

FLOWSERVE CORPORATION
Flow Control Division

G.W. Knieser
Technical Manager

Attachments

cc: USNRC, Document Control Desk, Washington, DC

GWK/dc

Flowserve FCD Corporation
A Unit of Flowserve Corporation
Flow Control Division

Williamsport Operations
P.O. Box 3428 701 First Street
Williamsport, PA 17701-0428

Phone 570 327 4800
Facsimile 570 327 4805
www.flowserve.com

IE19

BW/IP International, Inc.

Byron Jackson® Pumps
United Centrifugal™ Pumps
Pump Division

P.O. Box 2017 Terminal Annex

Los Angeles California 90051

Telephone 213 587 6171
Telex 677233
Fax 213 589 2080

12 February 1993

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

This letter transmits a notification of defects and nonconformances required by 10CFR - Part 21. The attached notification, CFRN-9301, reports a condition which occurred at Texas Utilities, Comanche Peak Steam Electric Station.

Very truly yours,

D. A. Gibson
Manager Nuclear Products Operations

DAG/ah

Attach.

cc: Mr. K. B. Lemmon, Manager, Field Service Operations
Mr. R. D. Ham, Manager of Quality
Mr. F. Costanzo, Manager of Engineering
Mr. K. A. Huber, Technical Liaison
Mr. W. A. Klemmer, Product Manager

10 CFR PART 21 NOTIFICATION

(Reference No. CFRN-9301)

NAME AND ADDRESS OF THE INDIVIDUAL OR INDIVIDUALS INFORMING THE COMMISSION:

Mr. D. A. Gibson
BW/IP International, Inc.
Pump Division
Los Angeles Operation
2300 E. Vernon Avenue
Vernon, CA 90058
(213) 587-6171

For Technical Information Contact: Dr. Kent Huber

IDENTIFICATION OF THE FACILITY, THE ACTIVITY, OR THE BASIC COMPONENT SUPPLIED FOR SUCH FACILITY OR SUCH ACTIVITY WITHIN THE UNITED STATES WHICH FAILS TO COMPLY OR CONTAINS A DEFECT:

Texas Utilities, Comanche Peak Steam Electric Station.
Basic Component: 4-inch 150# Bolted Bonnet Swing Check Valve
BW/IP Part No. 75580
TU Tag Nos. 2CC-0697 & 2CC-0693

IDENTIFICATION OF THE FIRM CONSTRUCTING THE FACILITY OR SUPPLYING THE BASIC COMPONENT WHICH FAILS TO COMPLY OR CONTAINS A DEFECT:

BW/IP International, Inc.
Successor to:

Borg-Warner Nuclear Valve Division
7500 Tyrone Avenue
Van Nuys, CA 91409

10 CFR, Part 21, Notification
(Ref. No. CFRN-9301)

NATURE OF THE DEFECT OR FAILURE TO COMPLY AND THE SAFETY HAZARD WHICH IS CREATED OR COULD BE CREATED BY SUCH DEFECT OR FAILURE TO COMPLY:

Valve 2CC-0697 did not fully close during pre-operational testing. Radiographs taken at the time of failure show the disk positioned at approximately 21° from the full closed position. The valve was disassembled. The top of the disk was found to be lodged under the seat lip preventing full closure. Valve 2CC-0693 subsequently failed testing in a similar manner. Both valves are located in the Component Cooling Water return lines from the Reactor Coolant Pump Motor Coolers and do not serve an active safety function. However the failure mechanism could apply to other valves that do provide a safety function.

Evaluation of the basic component by BW/IP indicates the root cause of the failure to close is due to the configuration of the attachment weld between the disk to the stud. Prior to 1977, this weld was placed on the back surface of the stud and extended into the bushing bore. In disks manufactured after 1977, the weld was recessed into the back surface of the disk and a final machine cut made to assure a flush surface.

THE DATE ON WHICH THE INFORMATION OF SUCH DEFECT OR FAILURE TO COMPLY WAS OBTAINED:

The incident was initially reported to BW/IP on 18 December 1992. Additional information has subsequently been supplied by Texas Utilities.

IN THE CASE OF A BASIC COMPONENT WHICH CONTAINS A DEFECT OR FAILS TO COMPLY, THE NUMBER AND LOCATION OF ALL SUCH COMPONENTS IN USE AT, SUPPLIED FOR, OR BEING SUPPLIED FOR ONE OR MORE FACILITIES OR ACTIVITIES SUBJECT TO THE REGULATIONS IN THIS PART:

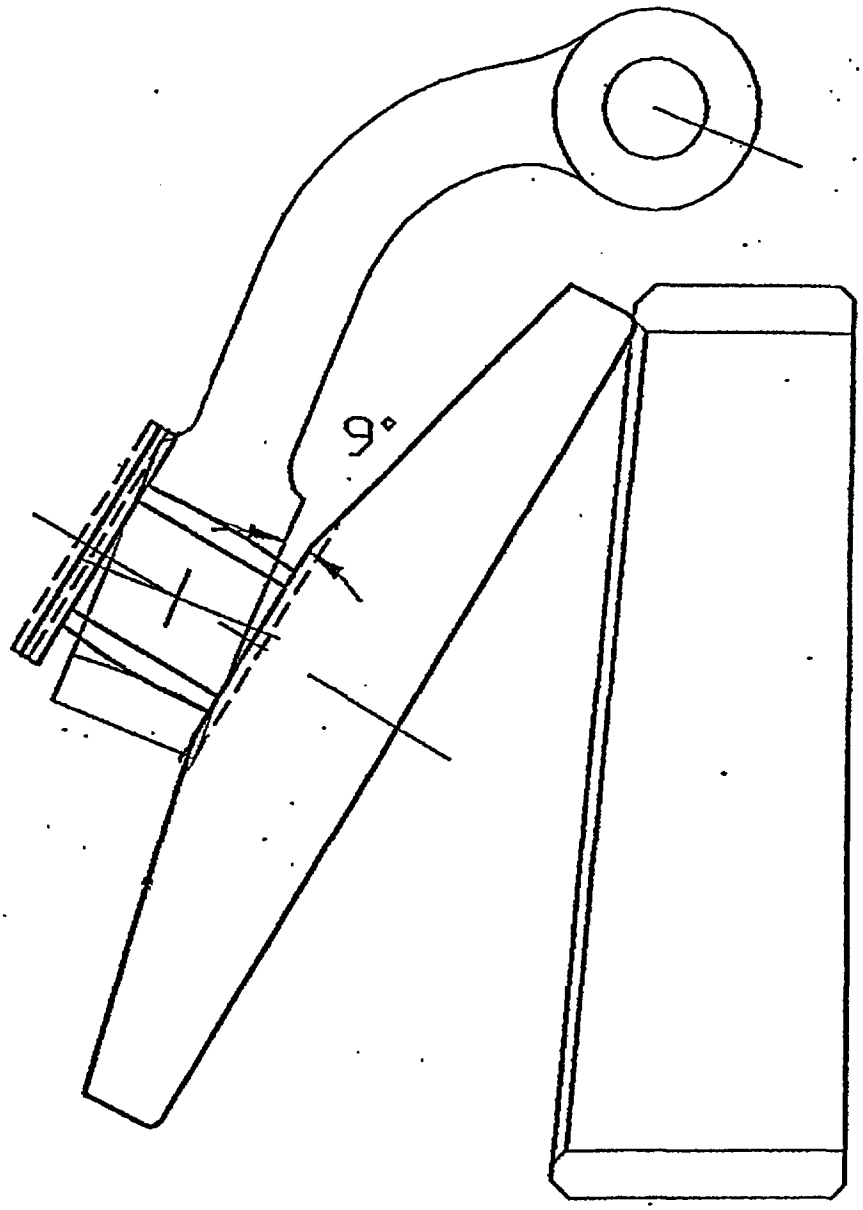
This notice applies to all BW/IP 4-inch, 150#, bolted bonnet swing check valves which have a raised disk-stud retention weld on the back surface of the disk.

THE CORRECTIVE ACTION WHICH HAS BEEN, IS BEING, OR WILL BE TAKEN; THE NAME OF THE INDIVIDUAL OR ORGANIZATION RESPONSIBLE FOR THE ACTION; AND THE LENGTH OF TIME THAT HAS BEEN OR WILL BE TAKEN TO COMPLETE THE ACTION:

Corrective action is complete with the disk design modification identified above.

ANY ADVICE RELATED TO THE DEFECT OR FAILURE TO COMPLY ABOUT THE FACILITY, ACTIVITY, OR BASIC COMPONENT THAT HAS BEEN, IS BEING, OR WILL BE GIVEN TO PURCHASERS:

Licensees with valve installations effected by this notice should install a new disk component or refurbish the existing disk.



Required Angle of Disc Rotation and Axial Gap for Interference

FLOWSERVE

Flow Control Division

August 14, 2001

Edison Material - Songs
P.O. Box 128
Clemente, CA 92674-0128

Attn: Manager, Nuclear Oversight Division

Subject: Borg-Warner 3" & 4" Swing Check Valves

Dear Sirs:

On February 12, 1993, BW/IP, Los Angeles, California issued the enclosed 10CFRPart 21 report to the NRC describing a nonconforming condition with Borg-Warner 4"-150# bolted bonnet swing check valves. Some disc assemblies were shipped with an excessive stud-to-disc weld that could keep the disc washer too far from the back of the disc and consequently permit excessive angular movement of the disc. This could result in the top of the disc catching in the seat ring bore and preventing the valve from closing. The design was revised in 1977 so the only affected valves and spare part disc assemblies were those furnished in 1977 or earlier.

Subsequent to the report, BW/IP determined the problems was not limited to that single design but potentially extended to all Borg-Warner 3" and 4" swing check designs. It is not clear that all utilities were advised of this.

On May 31, 2001, Arizona Public Service Co. advised Flowserve that they recently encountered the same problem on a 4"-1500# pressure seal swing check valve. Because of this, Flowserve decided it would be prudent to notify or re-notify all customers who purchased 3" or 4" swing check valves or disc assemblies in 1977 or earlier of the potential problem. We recommend the valves be inspected at the earliest convenient time and if evidence of interference is found, replace the disc assembly. The enclosed sketch depicts the potential problem if there is excessive disc angular movement.

Flowserve is not aware of exactly how all of these valves are being used by the utilities and therefore has not been able to determine the safety significance of the problem. Please contact either Dan Hall (570-327-4866) or George Knieser (570-327-4811) if Flowserve can assist you in any way.

FLOWSERVE CORPORATION
Flow Control Division

Charlene E. Fitzgerald

Charlene E. Fitzgerald
Contract Administrator

CEF/dc

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Facsimile 570 327 4805
www.flowserve.com

FLOWSERVE

Flow Control Division

August 14, 2001

Arizona Public Service Company
P.O. Box 52034
Mail Station 7990
Phoenix, AZ 85072-2034

Attn: Procurement Engineering Section Leader

Subject: Borg-Warner 3" & 4" Swing Check Valves

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FLOWSERVE

Flow Control Division

August 14, 2001

TXU Electric Company - CPSES
P.O. Box 1002
Glen Rose, TX 76043

Attn: Lance Terry, Group Vice President - Nuclear

Subject: Borg-Warner 3" & 4" Swing Check Valves

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FLOWSERVE

Flow Control Division

August 14, 2001

Florida Power & Light
P.O. Box 14000
Juno Beach, FL 33408

Attn: R.A. Symes, Supervisor of Performance Assessment

Subject: Borg-Warner 3" & 4" Swing Check Valves

Dear Mr. Symes:

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FLOWSERVE

Flow Control Division

August 14, 2001

Duke Energy Corporation
P.O. Box 1006
Charlotte, NC 28201-1006

Attn: Manager, Operating Experience
Assessment Group, M/S EC05P

Subject: Borg-Warner 3" & 4" Swing Check Valves

Dear Sirs:

On February 12, 1993, BW/IP, Los Angeles, California issued the enclosed 10CFRPart 21 report to the NRC describing a nonconforming condition with Borg-Warner 4"-150# bolted bonnet swing check valves. Some disc assemblies were shipped with an excessive stud-to-disc weld that could keep the disc washer too far from the back of the disc and consequently permit excessive angular movement of the disc. This could result in the top of the disc catching in the seat ring bore and preventing the valve from closing. The design was revised in 1977 so the only affected valves and spare part disc assemblies were those furnished in 1977 or earlier.

Subsequent to the report, BW/IP determined the problems was not limited to that single design but potentially extended to all Borg-Warner 3" and 4" swing check designs. It is not clear that all utilities were advised of this.

On May 31, 2001, Arizona Public Service Co. advised Flowserve that they recently encountered the same problem on a 4"-1500# pressure seal swing check valve. Because of this, Flowserve decided it would be prudent to notify or re-notify all customers who purchased 3" or 4" swing check valves or disc assemblies in 1977 or earlier of the potential problem. We recommend the valves be inspected at the earliest convenient time and if evidence of interference is found, replace the disc assembly. The enclosed sketch depicts the potential problem if there is excessive disc angular movement.

Flowserve is not aware of exactly how all of these valves are being used by the utilities and therefore has not been able to determine the safety significance of the problem. Please contact either Dan Hall (570-327-4866) or George Knieser (570-327-4811) if Flowserve can assist you in any way.

FLOWSERVE CORPORATION
Flow Control Division

HLPatterson

H.L. Patterson
Sr. Contract Administrator

HLP/dc

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Williamsport Operations
P.O. Box 3428 701 First Street
Williamsport, PA 17701-0428

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FLOWSERVE

Flow Control Division

August 14, 2001

Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72801

Attn: Mr. Lloyd Magness

Subject: Borg-Warner 3" & 4" Swing Check Valves

Dear Mr. Magness:

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August 14, 2001

Knolls Atomic Power Laboratory
Kesselring Site Operation
350 Atomic Project Road
Ballston Spa, NY 12020-2817

Attn: Mr. David Couse

Subject: Borg-Warner 3" & 4" Swing Check Valves

Dear Mr. Couse:

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August 14, 2001

Nuklearna Elektrarna Krsko
8270 Krsko, Vrbina 12
Slovenia

Attn: M. Novsak, Engineering Director

Subject: Borg-Warner 3" & 4" Swing Check Valves

Dear Mr. Novsak:

On February 12, 1993, BW/IP, Los Angeles, California issued the enclosed 10CFRPart 21 report to the NRC describing a nonconforming condition with Borg-Warner 4"-150# bolted bonnet swing check valves. Some disc assemblies were shipped with an excessive stud-to-disc weld that could keep the disc washer too far from the back of the disc and consequently permit excessive angular movement of the disc. This could result in the top of the disc catching in the seat ring bore and preventing the valve from closing. The design was revised in 1977 so the only affected valves and spare part disc assemblies were those furnished in 1977 or earlier.

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August 14, 2001

Rochester Gas & Electric
Ginna Station
1503 Lake Road
Ontario, NY 14519

Attn: Mr. Mike Burchell

Subject: Borg-Warner 3" & 4" Swing Check Valves

Dear Mr. Burchell:

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August 14, 2001

Tennessee Valley Authority
Nuclear Assurance and Licensing
1101 Market Street
Chattanooga, TN 37402-2801

Attn: Manager, Operating Experience

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