March 24, 2017

U.S. Nuclear Regulatory Commission
Document Control Room
11555 Rockville Pike
Rockville, MD 20852

Subject: Reply to NRC Inspection Report No. 99901468/2016-201 Notice of Nonconformance

References: NRC Notice of Nonconformance Docket Number 9901468/2016-201-01

Dresser Inc. Jacksonville Operation (Dresser) hereby responds to the Notice of Nonconformance, dated June 15, 2016 The Nonconformance was identified during the Nuclear Regulatory Commission's (NRC) inspection of the Dresser Pineville, Louisiana facility conducted May 2-6, 2016, by Inspectors Laura Micewski, Raju Patel, Ashley Thomas, and Paul Carman.

As of this date, the Dresser Pineville facility has been closed and the 10 CFR Part 21 responsibilities have been transferred to the Dresser Jacksonville facility located at 12970 Normandy Blvd. Jacksonville, Florida 32221.

Attached please find Dresser's reply to Notice of Nonconformance 9901468/2016-201-01.

Dresser appreciates the opportunity that NRC Inspection provides us to Continuously improve our Quality Process and Products we supply to the Nuclear Industry and to ensure we comply with NRC regulations.

Please contact me at 508/941-5430 if you have any questions or need to discuss this matter in greater detail.

Sincerely,

John A. Kerr
Nuclear Quality Leader
Dresser Jacksonville

Attachments

1) Redacted version of Finding Response with proprietary information removed, and is for public disclosure.
2) Copy of Affidavit

Cc: John Burke, NRC Branch Chief

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NRO

The Notice of Nonconformance:
The Notice of Nonconformance provides the following description of Nonconformance -01

QSM 1000N 21.0, "Commercial Grade Dedication," Revision F, dated August 25,2016, Subsection 21.2.1, states in part, Commercial grade items are identified by the Requisition Engineer in design documents that have been prepared and approved according to the requirements of Sections 3.0 and 6.0 of this manual. Commercial grade items may be applied, provided the Requisition Engineering department provides verification the commercial grade items will perform the intended function and will meet the design requirements.

Contrary to the above, as of May 6, 2016, Dresser Pineville failed to identify the method of determining acceptance criteria used to accept non-steel materials where mechanical properties were defined as a critical characteristic.
Specifically:
1. Dresser did not provide the correct technical justification for establishing the acceptance criteria for non-steel material.
2. Dresser Procedure EG 504 did not clearly describe all of the methods used for obtaining acceptable hardness values for different types of materials.

Corrective Steps Taken and Results Achieved:

Procedure EG 504 Revision 4, was revised to Revision 5 clarifying the methods used. Dresser completed a review of previously dedicated components against the revision 5 requirements and verified that the methods used were correct.

Corrective Steps That Will Be Taken:

As noted above, all outstanding actions have been completed and fully implemented.

Date Full Compliance Achieved:

The steps to address the issues and improve the process have been implemented
And Dresser respectfully asserts that it is in full compliance as of the date of this response.

Dresser Inc., Jacksonville Operation

AFFIDAVIT

I, John Kerr, state as follows:

(1) I am Nuclear Quality Manager and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Attachment 1 of NRC Inspection Report No. 99901468/2016-201 Notice of Nonconformance to Document Control Desk (US NRC). The proprietary information in Attachment 1, entitled NRC Inspection Report No. 99901468/2016-201 Notice of Nonconformance.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, Dresser Jacksonville relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975 F2d 871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F2d 1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by Dresser, Inc Jacksonville's competitors without license from Dresser Inc. Jacksonville constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4) a. and (4) b. above.

(5) To address 10 CFR 2.390 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by Dresser Inc. Jacksonville, and is in fact so held. The information sought to be withheld has, to the

best of my knowledge and belief, consistently been held in confidence by Dresser Inc., Jacksonville, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraph (6) following.

(6) Initial approval of proprietary treatment of a document is made by the Quality manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge.

(7) The information identified in paragraph (2) is classified as proprietary because it contains details of Dresser's Commercial Grade Dedication methodology. The development of this methodology, along with the testing, development and approval was achieved at a significant cost to Dresser Inc., Jacksonville.

Dresser's competitive advantage will be lost if its competitors can use the results of the Dresser experience to normalize or verify their own process or if they can claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to Dresser Inc. would be lost if the information were disclosed to the public. Making such information available to competitors without having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive Dresser Inc. Jacksonville of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 24th^{h} day of March 2017.

John A. Kerr
Nuclear Quality Leader
GE Oil & Gas
Jacksonville Operation

Attachment # 2

NRC Finding Response

As a follow up to our previous communication, this part explains the technical justification for using hardness as the critical mechanical property characteristic. A walk through of the commercial grade dedication process of one of the spindles is also included to provide more clarification. This document can be appended to our previous communications to complete our explanation on the finding.

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Part Description: Spindle

Valve Type (Assembly where used): 19000 (various sizes/pressure classes)

Material Description: SB-637 Type B Inconel X-750, UNS N07750

Section I - Technical justification – Commercial Grade Dedication of Spindle

Application

The 19000 series pressure relief valve provides over pressure protection by providing a spring biased load acting against a disc that positively retains process fluid till the valve set pressure (opening pressure) is reached. When the inlet pressure reaches the opening pressure, the pressure acting against the disc overcomes the spring load to relieve the system pressure till the inlet pressure reaches the reclosing pressure of the valve. The general arrangement drawing is shown in Figure 1. [[

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Safety function of the spindle

The safety function of the spindle is to transfer the spring load through the spring washer to the disc. The load transmission is explained in Figure 2. The spindle is subject to compressive loads during the performance of its safety function. [[

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Failure modes for the spindle

1. Compressive failure

   Compressive stress is the primary membrane stress acting on this part. At the maximum pressure/temperature combination (6000 psi at 100 °F), the maximum membrane stress (Compressive Force corresponding to 6000 psi/ Nose cross sectional area) for this part is 17300 psi with a Factor of safety for yield at 6.65. A Finite Element Analysis was also performed to verify the hand calculations. Figure 3 shows the equivalent stress across the cross section of the "nose" of the spindle.

   Tensile strength is typically measured with the standard tensile test where a prepared specimen is loaded in tension. The failure mode is initiated as a tensile yield typically noticed as a necking at the minimum cross section followed by tensile fracture typically noticed with the fractured portion showing a cup-cone feature after failure. While, the standard tensile stress test results in the flow of metal in the secondary direction to cause necking, compressive failure happens due to the flow of metal in the secondary direction typically noticed by barreling. (Reference: Mechanical Metallurgy, Dieter G.E, 2nd Edition)

   Since this part is not under tension and the compressive failure mode is different from tensile failure, the tensile strength does not provide reasonable assurance for the safety function of the part.

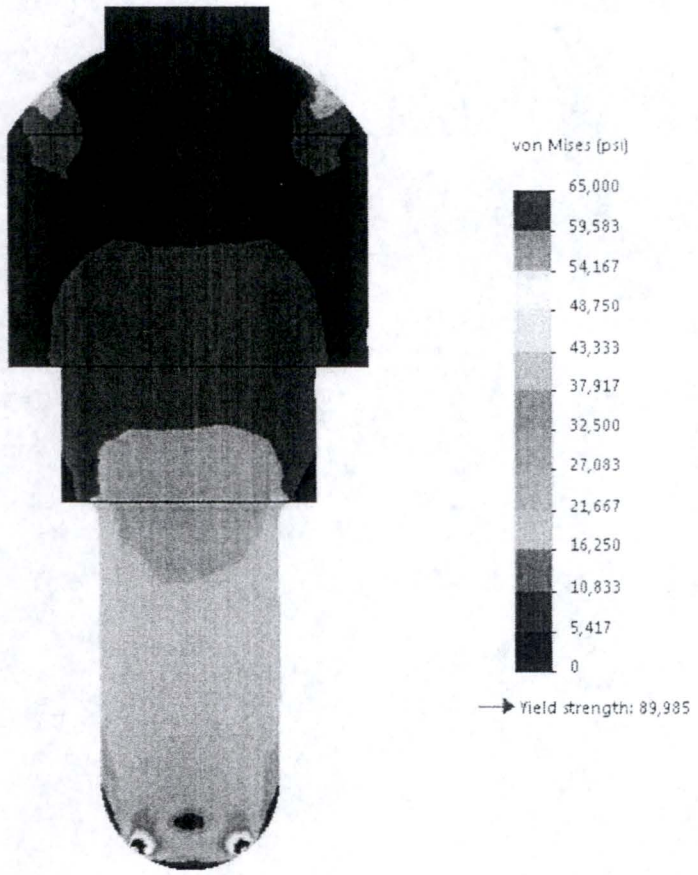

Figure 3 – von Mises stress plot

2. Coining or Brinelling failure

   Coining or Brinelling failure (permanent deformation at the surface) is caused by peak stresses acting on the surface of the part. The maximum contact stresses are present at the point of load transfer from the spindle to the disc. The part failure is noticed as cracks, pits or flaking of the surface material. The Hertzian contact stress (peak stress) for the spindle at the bearing point is 58,800 psi (3.4 x Membrane Stress). Figure 3 also provides FEA verification of the calculated contact stress values.

   Hardness is the resistance of metal to plastic deformation due to indentation. Measurement of hardness provides assurance of the performance of the spindle (Reference: Introduction to Physical Metallurgy, Avner S.H, 2nd Edition).

3. Buckling failure

   Buckling failure happens on long slender columns or columns with eccentric loading subject to compressive loads. Typically, buckling failure is not considered when the slenderness ratio is less than 30 (Reference: Design of Machine Elements, Bhandari VB, 3rd Edition). Since the spindle loaded area slenderness ratio (r/l ratio) is lower than 30, buckling failure mode is not applicable.

4. Bending failure

   The spindle is loaded axially under compression as shown in Figure 2. Bending failure mode is not applicable for this component.

5. Stress corrosion cracking

   Stress corrosion cracking failure happens in hydrogen rich environments. SCC is also exacerbated at low operating temperatures and by the selection of materials. The spindle is not exposed to the process fluids as it is in the secondary side. The risk of failure due to stress corrosion cracking is minimal.

Critical Characteristic for CGD of the Spindle

Table 1 – Weak Link Failure Mode - Spindle

	Hertzian Contact	Axial Compressive
Stress (psi)	58,800	17,300
Factor of Safety	1.99	6.65

The weak link failure mode for the spindle is failure due to coining or brinelling at the bearing point of the spindle where the load gets transferred. Since the weak link failure mode is due to contact stresses, the hardness of the spindle was the primary mechanical property characteristic chosen for commercial grade dedication of the spindle as it provides the best assurance against the brinelling failure mode.

Furthermore, the high factor of safety (6.65) at commercial design pressure/temperature limits of the part and successful field performance for more than 20 years of this product provides confidence of the performance of the safety function of the spindle. The maximum set pressure for the nuclear installed base of this product line was 1800 psig meaning the minimum safety factor for the nuclear installed base is at least 22:1.

The heat treatment, precipitation hardening, (Reference: CMTR) and the material form, bar with grain flow in the axial direction, (Reference: CMTR) ensures optimal performance of the spindle design.

Section II. Walk through of the commercial grade dedication process for the 19000 series spindle, ASTM SB-637 Type 2 Inconel (X-750), UNS N07750

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1. Selection of materials for commercial grade dedication
    a. [[]]
    b. Inspection and Test Plan
       [[]]

2. Commercial Grade Dedication Plan

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3. Commercial Grade Dedication
    a. Checking heat number, serial number traceability for commercial parts
        i. [[
        ii.]]
    b. Commercial grade dedication dimensional check
        i. [[]]
    c. Commercial grade dedication chemical properties check
        i. [[]]
    d. Commercial grade dedication mechanical properties check
        i. [[]]

[[Notes:

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References

1. Mechanical Engineering Design, Shigley & Mischke, 5th Edition
2. Mechanical Metallurgy, Dieter G.E, 2nd Edition
3. Design of Machine Elements, Bhandari V.B., 3rd Edition
4. Introduction to Physical Metallurgy, Avner S.H, 2nd Edition

[[]]

Action Tracking System

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Finding ID: 364
Finding Date: 04-May-2016

Responsible Person:	Md Nayem Jahingir Click to email this finding!	*Audit Name/Number:*	NRC Inspection
Finding Dept/COE:	Engineering	*Audit/Action Type:*	Process - Self *(Audit Type)*
Finding Cause/Issue:		*Finding Type:*	Requires Correction
Finding Failure Mode:	Controls in Place but not Followed	*Finding Sub-Category:*	
Finding Category:	Design Inputs	*Assessor/Auditor:*	Anne E Sullivan
Noncompliance Items:	1	*Multiple Email CC:*	david1.harvey@ge.com; tuan.doan@ge.com; george.D.walker@ge.com; rajesh.krithivasan@ge.com
Repeat Finding?:	No	*Closure Category:*	60 day
Status:	✓ Closed *03-Jul-2016* *Md Nayem Jahingir*		

Finding Description:

10CFR Part 21 could apply to this issue: The Technical Report # TR-0643, "Technical Evaluation of Pressure Relief Valves and Parts for Commercial Grade Dedication Applications" includes among other information the list of critical characteristics to be evaluated in the process of CGD. These characteristics include tensile strength and hardness. The hardness test is used within a standard Engineering formula to calculate the tensile strength range. This does not constitute 2 independent characteristics. Also, the formula seems to be derived to cover various stainless steels; but is used in this report to also calculate values for inconel and monel. There is no basis included to justify the usage of this formula for nonsteel materials. This report should be revised to include analytical basis for usage of this formula or alternate methods to obtain values for critical characteristics for nonsteel materials. It has also been determined that 10 components of these materials have been shipped from site bases on these analyses.

Finding Requirement: QSM 1000N Rev. C Section 21 Commercial Grade Dedication clause 21.2.3 CGD Procedure

Correction & Containment Action(s): A 10CFR Part 21 review has been initiated to evaluate this concern.

Closure Comment

Dresser, Inc. has completed an extensive Part21 evaluation (2016-01) to investigate the safety consequences of this identified condition. During a recent NRC inspection of Dresser, Inc. Alexandria Operations, it was perceived that Dresser, Inc. may have incorrectly used a steel correlation to other non-steel materials in their commercial grade dedication process as documented in the Dresser Engineering Guideline EG504.

The investigation determined that the procedure (EG504 revision 4) did not clearly describe all of the methods used for obtaining acceptable hardness values for different types of materials. In revision 4, the only method described for calculating acceptable hardness values utilized the correlated formula for steel, yet acceptance values for non-steel materials were in this document. During the investigation it was determined that this formula had in fact not been used for the non-steel materials and the value was determined from an alternative method. The procedure has been updated to clearly describe the multiple methods used by Dresser, Inc. for obtaining acceptable hardness values for dedication of various materials. Revision 5 of EG504 will include the corrected language describing the alternate methods.

The procedural revisions were further evaluated to identify potential safety consequences. There were a

total of 29 items identified that were investigated. It is concluded that the identified condition does not constitute a reportable safety condition under 10 CFR Part 21.

File attachments: Add attachments

View History