

Part 21 (PAR)

Event # 48998

<b>Rep Org:</b> CURTISS WRIGHT FLOW CONTROL CO.	<b>Notification Date / Time:</b> 05/03/2013 10:50 (EDT)
<b>Supplier:</b> WOLLASTON ALLOYS, INC.	<b>Event Date / Time:</b> 05/03/2013 (EDT)
	<b>Last Modification:</b> 05/03/2013
<b>Region:</b> 1	<b>Docket #:</b>
<b>City:</b> CHESWICK	<b>Agreement State:</b> Yes
<b>County:</b>	<b>License #:</b>
<b>State:</b> PA	
<b>NRC Notified by:</b> JAMES DRAKE	<b>Notifications:</b> GORDON HUNEGS R1DO
<b>HQ Ops Officer:</b> PETE SNYDER	KATHLEEN O'DONOHUE R2DO
<b>Emergency Class:</b>	ERIC DUNCAN R3DO
<b>10 CFR Section:</b>	MARK HAIRE R4DO
21.21(d)(3)(i) DEFECTS AND NONCOMPLIANCE	PART 21 REACTORS EMAIL

## PART 21 REPORT - INSUFFICIENT PROCESS CONTROL ON PUMP IMPELLER

The following is a summary of information received via fax:

"In January 2013, Curtiss-Wright Electro Mechanical Corporation completed final testing on AP1000 Reactor Coolant Pump (RCP) Serial Number 9, part number 6D70795G05, Revision 8, which contained a sand cast impeller (S/N 3021) cast by Wollaston Alloys of Braintree, MA. When it was disassembled for inspection it was discovered that a piece of an impeller blade approximately 3 inches by 2 1/2 inches had separated from the main impeller casting. The separated piece was the leading edge of one blade, and it was subsequently recovered intact from the pump test loop.

"This incident was investigated as a significant condition adverse to quality with the potential to create a substantial safety hazard; but, was deemed not a reportable incident since all cast impellers were either:

- 1) in CW-EMD control, or
- 2) exported to customers in the Peoples Republic of China.

"Our customers (Westinghouse Electric Company and the Chinese customers and regulatory authorities) were kept informed as the investigation progressed and root cause was identified.

"The physical cause of the failure is most likely due to a flaw present in both the cast material and weld overlay applied to the impeller blade. The original failure was most likely a consequence of tensile overload failure due to cooling stresses introduced by the welding process. Subsequent weld repairs were insufficient in remediating the original flaw, which went undetected by NDT methods. Ultimately, AP1000 RCP Serial Number 3021 failed by high cycle fatigue followed by ductile failure.

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"As a result of the above investigation, CW-EMD is concerned that the identified lack of process control at Wollaston Alloys, Inc., could result in other significant conditions adverse to quality with the potential to create a substantial safety hazard.

"Because of the nature of the issue, CW-EMD is unable to complete a full extent of condition investigation, and is reporting this issue to the Commission to ensure full awareness within the industry.

"Name and address of the individual or individuals informing the Commission

James A. Drake, General Manager  
Curtiss-Wright Electro-Mechanical Corporation  
1000 Wright Way  
Cheswick, Pa 15024"

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EMD  
1000 Wright Way  
Cheswick, PA 15024  
Phone: 724.275.5000  
<http://emd.cwfc.com>

<b>To:</b>	NRC Operations Center	<b>From:</b>	Curtiss-Wright EMD (Jay Gardiner)
<b>Fax:</b>	301-816-5151	<b>Pages:</b>	4 (including cover)
<b>Phone:</b>	301-816-5100	<b>Date:</b>	5.3.2013
<b>Re:</b>	Report 10CFR21 2013-002	<b>CC:</b>	

Dir Sir or Madam:

Following this cover page, please find attached our report 2013-002, for a 10CFR21 report notification regarding process control deficiencies identified for sand cast items provided by our supplier, Wollaston Alloys, Inc.

A copy of this report will be mailed to the NRC Document Control Desk. Additionally, a copy of this report will be provided to Wollaston Alloys, Inc. and Westinghouse Electric Company.

Should there be any questions, please feel free to contact me.

A handwritten signature in black ink, appearing to read 'Jay Gardiner'. The signature is fluid and cursive, with a large loop at the end.

Jay Gardiner, Manager  
Quality Programs and Code

5.3.2013



EMD  
1000 Wright Way  
Cheswick, PA 15024  
Phone: 724.275.5680  
<http://emd.cwfc.com>

EMD-GM-13-20

May 3, 2013

Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Attn: Document Control Desk

Subject: Report of Potential Substantial Safety Hazard in accordance with Title 10 Code of Federal Regulations, Part 21

Background:

In January 2013, Curtiss-Wright Electro-Mechanical Corporation (CW-EMD) completed the final testing on AP1000 Reactor Coolant Pump (RCP) Serial Number 9, part number 6D70795G05, Revision 8, which contained a sand cast impeller (S/N 3021) cast by Wollaston Alloys of Braintree, Ma. When disassembled for post test inspection, it was discovered (January 13, 2013) that a piece of an impeller blade, approximately 3 inches by 2½ inches had separated from the main impeller casting. The separated piece was from the leading edge of one blade, and was subsequently recovered, intact, from the pump test loop.

This incident was investigated as a significant condition adverse to quality with the potential to create a substantial safety hazard; but, was deemed not a reportable incident since all cast impellers were either:

- 1) in CW-EMD control, or
- 2) exported to customers in the Peoples Republic of China.

Our customers (Westinghouse Electric Company and the Chinese customers and regulatory authorities) were kept informed as the investigation progressed and root cause was identified.

The physical cause of the failure is most likely due to a flaw present in both the cast material and weld overlay applied to the impeller blade. The original flaw was most likely a consequence of tensile overload failure due to cooling stresses introduced by the welding process. Subsequent weld repairs were insufficient in remediating the original flaw, which went undetected by NDT methods. Ultimately, AP1000 RCP Serial Number 3021 failed by high cycle fatigue followed by ductile failure.

As a result of the above investigation, CW-EMD is concerned that the identified lack of process control at Wollaston Alloys, Inc., could result in other significant conditions adverse to quality with the potential to create a substantial safety hazard.

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Because of the nature of the issue, CW-EMD is unable to complete a full extent of condition investigation, and is reporting this issue to the Commission to ensure full awareness within the industry.

(i) Name and address of the individual or individuals informing the Commission

James A. Drake, General Manager  
Curtiss-Wright Electro-Mechanical Corporation  
1000 Wright Way  
Cheswick, Pa 15024

(ii) 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.

Sand casting process control deficiencies at Wollaston Alloys, Inc. Wollaston Alloys produces sand cast parts for use in various pumps, valves, etc., sold to various suppliers which may use the parts to manufacture basic components for sale to U.S. facilities and activities.

(iii) Identification of the firm constructing the facility or supplying the basic component which fails to comply or contains a defect.

Wollaston Alloys, Inc,  
205 Wood Road,  
Braintree, Ma 02184.

(iv) 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.

The investigation described in the background, above, identified the following deficiencies at Wollaston Alloys, Inc.

- a) Insufficient filler metal control as evidenced by mismatched filler material identified in weld overlays on the separated impeller piece.
- b) Insufficient weld process control as evidenced by indications of use of an unapproved welding process identified by the investigation
- c) Insufficient pass down of contract requirements to shop floor operations as evidenced by more than one post weld heat treatment cycle used on S/N 3021 impeller when only one post weld heat treatment cycle was authorized by contract documents.
- d) Penetrant examination performed by Wollaston Alloys, Inc. did not identify surface flaws in the casting for impeller Serial Number 3021. However, using the Wollaston Alloys, Inc. procedure, EMD was able to identify flaws that were dispositioned as unacceptable.
- e) Insufficient control of records as evidenced by:
  - 1) Updated records submitted using identical record number with no indication of correction annotated on the record.
  - 2) Incomplete records packages submitted to EMD with product and no apparent mechanism for assuring all records are included or delivered.

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- (v) The date on which the information of such defect or failure to comply was obtained.

March 13, 2013

- (vi) In the case of a basic component which contains a defect or fails to comply, the number and location of these components in use at, supplied for, being supplied for, or may be supplied for, manufactured, or being manufactured for one or more facilities or activities subject to the regulations in this part.

Unknown. This information is outside the purview and control of CW-EMD.

- (vii) 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.

CW-EMD issued a supplier corrective action request to Wollaston Alloys, Inc. with respect to the initial incident (see background) and Wollaston Alloys, Inc. agreed to conduct a Root Cause Analysis.

Additionally, CW-EMD notified Wollaston Alloys, Inc. of our additional concerns on April 16, 2013, and our intent to submit this report in accordance with the requirements of this regulation.

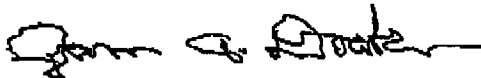
- (viii) Any advice related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.

CW-EMD recommended to Wollaston Alloys, Inc., on April 22, 2013, to inform their customers of the details of this issue and encourage them to review their products manufactured, sold and delivered to nuclear facilities for further review and investigation of possible substantial safety hazards.

Further, CW-EMD recommends the Commission also notify U.S. facilities and activities.

- (ix) In the case of an early site permit, the entities to whom an early site permit was transferred.

Not applicable.



James A. Drake, General Manager  
Curtiss-Wright Electro-Mechanical Corporation

Copy to: Westinghouse Electric Company  
Wollaston Alloys, Inc.