ATTACHMENT 2-C

Test Report 10530R01
Test Report for Testing of a CA Pump and WDF Pump with a Void Fraction Inlet Fluid Condition
~~(Proprietary)~~

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TEST REPORT

REPORT NO. 10530R01, Revision 0
WYLE JOB NO. 10530
CUSTOMER P.O. NO. 500281122
PAGE 1 OF 137 PAGE REPORT
DATE 01/18/05
SPECIFICATION(S) WLTP 10530TP, Revision 0

TEST REPORT FOR TESTING OF A CA PUMP AND A WDF PUMP WITH A VOID FRACTION INLET FLUID CONDITION

Arizona Public Service (APS)

STATE OF ALABAMA
COUNTY OF MADISON } SS.
Alabama Professional Eng Reg. No. 25471
Ralph D. Yeardley being duly sworn, deposes and says: The information contained in the report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

SUBSCRIBED and sworn to before me this 21 day of Jan, 2005

Ardella Stebbins SEAL
Notary Public in and for the State of Alabama at large
My Commission expires March 3, 2007

Wyle shall have no liability for damages of any kind to person or property, including special or consequential damages, resulting from Wyle's providing the services covered by this report.

PREPARED BY S. Smyth 1/21/05 Date
APPROVED BY 1/21/05 Date
WYLE Q. A. 2/5/05 Date

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TABLE OF CONTENTS

Attachments

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1.0	CUSTOMER	Arizona Public Service Co.
	ADDRESS	Palo Verde Nuclear Generating Station Tonpah, AR 85354.
2.0	TEST SPECIMEN	The equipment to be tested consists of two ESF (Emergency Safety Feature) pump / motor assemblies; the CA pump and motor and the WDF pump and motor.
3.0	MANUFACTURER	The pumps were manufactured by Ingersoll-Rand. The motors were manufactured by Westinghouse.

4.0 SUMMARY

This document has been prepared by Wyle Laboratories to document the results of a test program on the CA and WDF pumps and motors to determine the performance with a void fraction inlet fluid condition.

This testing was performed in accordance with Wyle Laboratories Test Procedure 10530TP, "Test Procedure for Testing of a CA pump and a WDF pump with a Void Fraction Inlet Fluid Condition". The testing meets the requirements of the APS Purchase Order 500281122.

5.0 EQUIPMENT DESCRIPTION

The equipment to be tested consists of two pump / motor assemblies; the CA pump and motor, and the WDF pump and motor.

Description: The equipment description is as follows:

CA

Motor (CA):
Westinghouse Electric Frame 5810H
Class 1E
Rated at 1000 HP, 3-Phase, 60 Hz, 4000 Volts
Speed: 3553 rpm
Weight: 4,800 lbs
Motor Identification Number: 17535LN01

Pump (CA):
4x11CA-8
Nameplate Head = 2850 ft
Horizontal shaft
Nameplate Rated flow = 900 gpm
Weight: 4,400 lbs
Suction diameter: 10" sch 40
Discharge diameter 4" sch 80

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Attachment A1

Receiving Inspection

RESULTS

Receiving inspections were performed on November 22, 2004 for both the CA and WDF motor and pump assemblies upon receipt at Wyle Laboratories in accordance with section 3.1 of Wyle Laboratories Test Procedure No. 10530, Revision 0.

The CA pump and motor arrived as two individual pieces. The coupling and miscellaneous spare parts were supplied with the pump.

The WDF pump and motor arrived as three pieces; the inlet piping and pump casing assembly, the motor assembly and a box of miscellaneous parts including the seal piping and impeller.

The nameplate data and results of the inspection were recorded on the attached Receiving Inspection Data Sheet.

The specimen pump and motor assemblies were as described in paragraph 5.0 of this report.

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RECEIVING INSPECTION DATA SHEET

PUMP DATA

TAG NO.:	087634	SERIAL NO:	087634
MANUFACTURER:	Ingersoll-Rand	RATED FLOW:	[ ]
NOMINAL SIZE:	8 x 20 WDF	SHUT OFF HEAD:	[ ]
END CONNECTION:	[ ] [ ] [ ]		

MOTOR DATA

MANUFACTURER:	Westinghouse	FRAME:	55010-P39
MODEL #: (ID)	VSWF	SERIAL #:	1S-78
INS. CLASS:	B	VOLTAGE:	4000
CURRENT @RATED VOLTAGE	62	SPEED:	1776
FREQUENCY:	60 Hz		

DESCRIBE CONDITION OF RECEIVED ITEM:

Motor received on metal pallet marked #2B. Pump casing on pallet #1B. Received box containing diffuser, pump seal piping, struts, electric box and hardware.

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RECEIVING INSPECTION DATA SHEET

PUMP DATA

TAG NO.:	N/A	SERIAL NO:	117814/547
MANUFACTURER:	Ingersoll-Rand	RATED FLOW:	[ ]
NOMINAL SIZE:	4 x 11 CA x 8	SHUT OFF HEAD:	[ ]
END CONNECTION:	[ ]		
	[ ]		
	[ ]		

MOTOR DATA

MANUFACTURER:	Westinghouse	FRAME:	5810H
MODEL #: (ID)	HSW2	SERIAL #:	17535LN01
INS. CLASS:	F	VOLTAGE:	4000
CURRENT @RATED VOLTAGE	123	SPEED:	3553
FREQUENCY:	60 Hz		

DESCRIBE CONDITION OF RECEIVED ITEM:

Pipe on bottom of pump appears to be bent. Miscellaneous parts with pump include plates and all thread. Seals, gaskets, and spare bearings included. SS shaft is s/n 557. Coupler sleeve and coupler both have tags with 62013784. Motor received on pallet.

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Attachment A2

Test Facility Description, Equipment Setup for testing and Instrumentation

RESULTS

Test Facility Description

[

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The overall test facility is illustrated in Figure 1 in Attachment A6. [

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CA Pump/Motor Equipment Setup for Testing

The CA pump and motor were setup in accordance with section 3.2 of Wyle Laboratories Test Procedure No. 10530TP, Revision 0.

From December 01 to 09, the following activities were completed:

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Instrumentation

Following the CA test specimen pump and motor installation and alignment, the instrumentation was installed.

The following table summarizes the instrumentation used for the test program and the identification numbers (TAG) used by Wyle Laboratories:

CA Pump Loop Instrumentation:

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All Wyle Laboratories' test equipment is calibrated on a periodic basis with the calibration interval displayed on a decal. This decal is affixed to the equipment indicating the last calibration date, the next calibration due date, accuracy, and by whom calibrated. The instrumentation equipment sheet for all the instrumentation is presented in this attachment.

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Instrumentation

Following the WDF test specimen pump and motor installation, the instrumentation was installed.

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Key of Attachments:

Instrumentation Sheet for Test Program. (3 pages)

Calibration Data for the Turbine Flow Meters. (2 pages)

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Attachment A3

Checkout Testing

RESULTS

Prior to the actual testing, a test facility and test specimen check out was performed to verify facility capabilities, test specimen operation and instrumentation functionality for the two test loops.

During this checkout test program, the data channels were acquired at [ ] sample frequency. A Test Log datasheet was used to record test run descriptions, as well as test data and time information and the [ ] conditions. The test log datasheets obtained during the check out testing are presented in this attachment.

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In all cases, the data files have been supplied to APS separately.

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An instrumentation equipment sheet for the testing is presented in attachment A2.

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Key of Attachments:

Test Log Sheets for the Check Out Testing (4 pages)

Start up Check list (CA pump test) (2 pages)

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Test Procedure No. 10530TP
Page 21

TEST LOG SHEET

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TEST LOG SHEET

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TEST LOG SHEET

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TEST LOG SHEET

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Attachment A4

Performance Testing

RESULTS

The intent of the testing was to determine if temporary performance degradation occurs during the ingestion of a void fraction, and to identify any permanent degradation of performance after un-voided inventory returns to the pump.

A summarized test matrix for both pumps is presented in this Attachment.

During the test program, the data channels described in Attachment A3 were acquired [ ] by the Wyle Laboratories data acquisition system. A Test Log datasheet was used to record test run descriptions, as well as test data and time information and the ambient temperature, pressure and flow conditions. The log is presented in Attachment A3.

[ ]

The instrumentation equipment sheet for this testing is presented in Attachment A2.

[ ]

Actual Test Matrix

Throughout the test program, the required data described in Attachment A2 was recorded. This data covers the complete test program. Note that the test matrix presented here represents the target data for testing. [ ]

The actual test data files consisting of [ ]

CA and WDF Pump Test Matrix

CA Pump Test Matrix

[redacted]

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WDF Pump Test Matrix

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A summary of the actual test data plots is presented here for the following test cases; 1D rerun, 2E, 3C and 4B.

DataSet for Test 1D rerun

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DataSet for Test 2E

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DataSet for Test 3C

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Dataset for Test 4B – the WDF pump

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Attachment A5

Equipment Inspection and Shipment

RESULTS

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Attachment A6

Photographs

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Attachment A7

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DATA FILE FORMAT

The recorded data is as follows:

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OVERALL g RMS DATA FOR VIBRATION DATA FILES LISTED

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