E.I. Hatch Nuclear Plant
Unit No. 1 / 2

Document Number:

S-53448

Document Title:
RHRSW PUMP TEST CURVES-JOHNSTON PUMP
MODEL 18 DC 7 STG -E11-C001A/B/C/D

SUPERSEDED BY:

S-56429

Superseded by SNC Per ABN-H03080 Ver. 1.0

SNC Ver. 2.0

JOHNSTON PUMP COMPANY

PERFORMANCE TEST SET-UP AND TEST DATA SHEET

TC No.: TC-06784
Job Number: ND-6509
Customer: Georgia Power Company
Model / Stages: 18DC / 7
Imp. Dia.: 13.750
TBF / CL.: .063" / "C"
Imp. Material: Bronze
Bowl Material: St. Stl.
Bowl Coating: Plasite
Suction: Bell
Test D. Head: Lab 16" H.P. Disch. Head
Test Col.: Lab Tapper Column

Test Constants;
Flow: 608.604
Head: 2.31

Pipe Dia. @ Gage: 16.000

Motor Eff. :
100 %:
75 %:
50 %:

Motor H.P. / R.P.M.: 150 / 880
PH / CY / V: 3 / 60 / 480
Motor S / N:
Job OR Lab Motor: Lab
Wattmeter No.: #2
Orifice Diameter: 7.022
Test line Size: 16
Pressure Gage: 300
Impeller Adjustment: Two Turns

DESIGN @ R.P.M.: 1780
G.P.M.: 4000
Head: 955.00
B.H.P.:
Efficiency: 84 % Bowl
Specific Gravity 1: 1.00
Specific Gravity 2: 0.00
Item No.:
Fluid: Water
Application:
End User: Georgia Power Company
Site: Georgia Power Company

Comments: Test the Bowl Assembly only at reduced speed with a Test Lab Disch. Head and Column using a Test Lab Motor.

Reviewed By R. Clark Date 10-19-92
Title Senior Contr. Manager

Test Procedure #: JP-TP-0069 Rev. #4

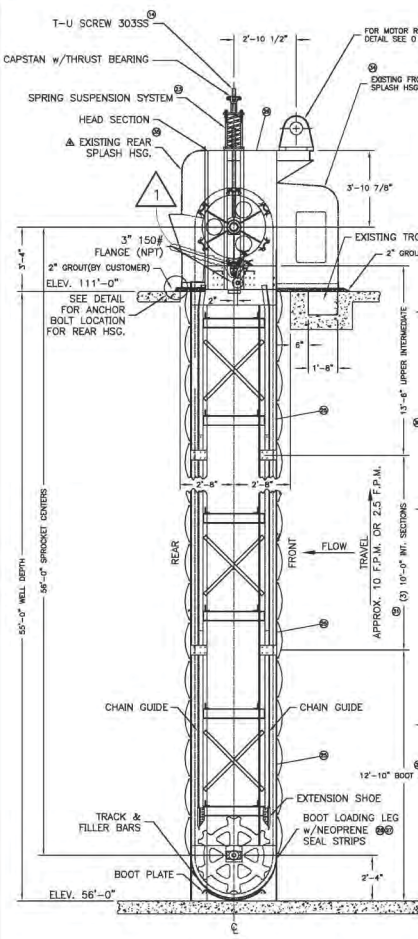
Serial #: NRX - 6533
Job #: ND-6509
POF #: 66224
Chattanooga P.O.#: TE - 10234

Water To Floor: 10 INCHES
Floor To Gauge: 60 INCHES
Take Shut - Off (Yes / No): Yes

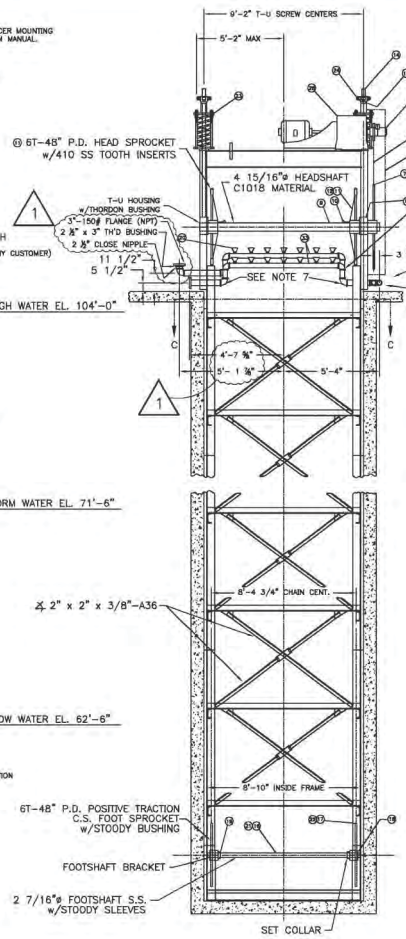
Test Point #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
D	10.80	0.50	1.70	2.70	4.00	5.00	6.10	10.80	13.50	16.90	20.50	24.30	28.50	0.00
Gallons Per Minute	2000	544	794	1000	1217	1361	1503	2000	2236	2502	2756	3000	3249	0
Gage Reading	105.00	144.30	138.10	133.70	129.60	126.00	121.00	105.50	97.30	85.90	74.00	63.60	50.70	152.30
Feet of Head	242.55	333.33	319.01	308.85	299.38	291.06	279.51	243.71	224.76	198.43	170.94	146.92	117.12	351.81
Gage Elev.Corr.	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83
Velocity Head Loss	0.16	0.01	0.02	0.04	0.06	0.07	0.09	0.16	0.20	0.26	0.30	0.36	0.42	0.00
Total Head	248.54	339.18	324.87	314.72	305.27	296.97	285.43	249.70	230.79	204.51	177.07	153.11	123.37	357.65
Watt Reading:	123.90	105.30	106.60	109.60	114.90	118.10	119.50	123.90	124.90	124.00	121.80	118.50	112.40	99.20
Input H.P.	166.09	141.15	142.90	146.92	154.02	158.31	160.19	166.09	167.43	166.22	163.27	158.85	150.67	132.98
Motor Efficiency	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
B.H.P.	149.48	127.04	128.61	132.23	138.62	142.48	144.17	149.48	150.68	149.60	146.94	142.96	135.60	119.68
Test R.P.M.:	887	890	890	889	889	888	888	888	887	887	887	888	889	890
Volts: (Ref.Only)														
Amps (Ref.Only):														
Vibration in Mils:														
Rated R.P.M.:	1780	1780	1780	1780	1780	1780	1780	1780	1780	1780	1780	1780	1780	1780
Gallons Per Minute:	4014	1089	1587	2002	2437	2728	3013	4009	4487	5021	5530	6014	6505	0
Total Head in Feet:	1000.90	1358.71	1299.48	1261.71	1223.82	1193.22	1146.88	1003.29	929.43	823.58	713.09	616.18	494.58	1430.59
B.H.P. @ 1.0 Sp.Gr.:	1207.99	1016.30	1028.85	1061.38	1112.70	1147.56	1161.16	1203.92	1217.74	1208.97	1187.52	1151.44	1088.49	957.43
B.H.P. @ Sp.Gr.1:	1207.99	1016.30	1028.85	1061.38	1112.70	1147.56	1161.16	1203.92	1217.74	1208.97	1187.52	1151.44	1088.49	957.43
B.H.P.@ Sp.Gr.2:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Efficiency:	0.840	0.367	0.506	0.601	0.877	0.716	0.752	0.844	0.885	0.864	0.839	0.811	0.748	0.000

Tested By: Darryl Clark Jr.
Certified By: Ernie Rodriguez
Witnessed By:
Date Of Test: October 16, 1992

S-55894



L.H. SIDE ELEVATION



FRONT ELEVATION

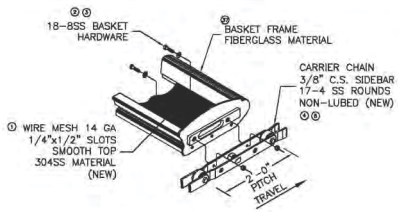
DRIVE COMPONENTS:

REDUCER:	3.0/.75 HP NUTTALL (EXISTING) OUTPUT SPEED 4.8/1.2 R.P.M. INPUT SPEED 1800/450 R.P.M.
MOTOR:	3.0/.75 HP 208V/3 PHASE/60 HZ 1800/450 RPM 2 SPEED/2 WINDING TEFC (EXISTING)
DRIVE SPKT:	10T 9.65" PD (EXISTING) W/ SHEAR PIN HUB DEVICE
DRIVEN SPKT:	55T 53.88" PD (EXISTING)
DRIVE CHAIN:	#1033 3.075" PITCH

#1033 DRIVE CHAIN

DRIVE CHAIN

3/4"=1'-0"



BASKET DETAIL REX F.G.

(62 BASKETS)

THE CHAINS SHOULD BE ASSEMBLED OVER THE SPROCKETS TO TRAVEL IN THE DIRECTION SHOWN. WHEN THE BASKETS ARE ON THE CHAINS, THE BASKETS SHOULD BE BALANCED, OR SOME MEANS PROVIDED FOR SNUBBING THE HEAD SHAFT.

NOTE 1:
ALL C.S. PARTS WILL BE BLASTED PER SSPC-SP10 SPECIFICATIONS, NEAR WHITE BLAST, WITH SURFACE PROFILE OF 2.0 TO 3.0 MILS, AND COATED WITH TWO (2) 4 TO 8 MILS DFT PER COAT OF INTERSEAL 670 HS EPOXY, MANUFACTURED BY INTERNATIONAL.

NOTE 2:
EACH SCREEN IS DESIGNED TO START AT 10 FPM AT A HEADLOSS OF 6.12 FT. AT MAXIMUM WATER LEVEL.

NOTE 3:
HARDWARE: ALL FRAMING HARDWARE IS 18-8 SS.

NOTE 4:
SCREEN WEIGHT APPROX. 31,000 LBS. EACH.

SECTIONAL WEIGHTS:
BASKET WEIGHT (62): 115 LBS. EACH
CARRIER CHAIN WEIGHT (62L/62R): 23.6 LBS. EACH LINK
HEADSHAFT ASSY WEIGHT (1): 2,364 LBS.
FOOTSHAFT ASSY WEIGHT (1): 765 LBS.
HEAD/FRAME ASSY WEIGHT (1): 18,000 LBS.

NOTE 5:
ALL BRASS, BRONZE, AND STAINLESS STEEL PARTS WILL NOT BE PAINTED.

NOTE 6: SEE O & M MANUAL FOR PARTS LIST.

NOTE 7:
DRILL ⅜" DIA. HOLE ON THE BOTTOM OF EACH OF THE (4) 90° ELBOWS ON THE TWO NEW SPRAY HEADERS. (FOR FREEZE PROTECTION).

SPRAY WASH REQUIREMENTS

(BASED ON 7 NOZZLES EACH HAVING A 5/16"ø ORIFICE)

G.P.M.	P.S.I.
306	100
292	80
264	60
234	70

DIFFERENTIAL WATER LEVEL

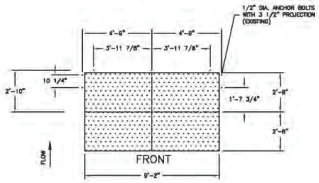
% OF CLEANLINESS	HEADLOSS IN FT. (AT 71.3 ELEV. @ 50,000 gpm)	
100	0.09	1.81 FPS VELOCITY
75	0.15	2.42 FPS
50	0.44	3.53 FPS
25	1.84	7.25 FPS

DIFFERENTIAL WATER LEVEL

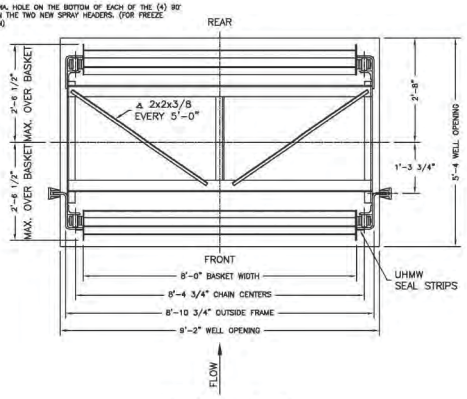
% OF CLEANLINESS	HEADLOSS IN FT. (AT 62.5 ELEV. @ 100,000 gpm)	
100	1.05	8.64 FPS VELOCITY
75	3.82	11.32 FPS
50	8.35	17.28 FPS
25	30.24	34.56 FPS

DIFFERENTIAL WATER LEVEL

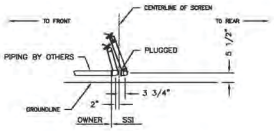
% OF CLEANLINESS	HEADLOSS IN FT. (AT 81.7 ELEV. @ 100,000 gpm)	
100	2.41	9.65 FPS VELOCITY
75	5.44	13.14 FPS
50	12.10	18.74 FPS
25	51.03	38.43 FPS



REAR SPLASH HSG. ANCHOR BOLT DETAIL



SECTION C-C



VIEW D-D

Southern Nuclear Operating Company, Inc.
Edwin I Hatch Nuclear Plant
Unit 1 & 2
MPL # 1W33-E003A/B
Bailey, Georgia
SSI Quote #R00-856 R1
REX & ROYCE T.W.S.

THIS PRINT IS THE PROPERTY OF SSI SCREENING SYSTEMS INTERNATIONAL, INC. IT IS CONFIDENTIAL AND CONTAINS TRADE SECRETS. IT IS NOT TO BE COPIED OR SUBMITTED TO OTHERS FOR USE OR EXAMINATION.

Screening Systems International, INC.
CONTROL DRAWING#: R-E 1-8-4 P11.5

MATERIAL: AS NOTED	REV	DESCRIPTION	DATE	BY
NOTES:	A	REVISED SPRAY PIPES	10-10-00	AJF
	B	ADDED MORE INFORMATION	10-5-00	AJF
	C	ADDED NOTES & CHANGED SEAL	10-2-00	AJF
	D	DWG CLARIFICATION	9-29-2000	RLB

DRAWN BY SLB | SSI | DATE 3-12-2000 | SCALE N.T.S. | APPROVED BY | PAGE SIZE D | DWG NUMBER A00B-0036

SHEET 1 OF 2

1

CAD AutoCAD | S55894 | 1W33-E003A&B

Southern Company Services, Inc.
FOR
PLANT: HATCH
UNIT: 1 & 2
TITLE: UNIT 1 AND 2 TRAVELING WATER SCREENS - GENERAL ARRANGEMENT DRAWING

VENDOR:	P.O.#:
S.S.I.	6046417

S-55894

THIS DWG. PART OF VENDOR MANUAL N/A
TAB/SECT. N/A
PAGE N/A
FIGURE N/A

REVISION	1	DATE	3-11-03

REVISED PER ABN 00-0022-015.

SEE MICROFILM FOR PREVIOUS REV. SIGNATURES.

BY	CHK'D	APPR.1	APPR.2	APPR.3	APPR.4	APPR.5
Vep	CFC	DEW				

Revised by SNC per ABN H03080 Version 1.0 (Drawing Correction)	Document No.: Document Ver.:	**S-56429** **5.0**
Vendor: JOHNSTON PUMP CO.	Purchase Order:	6057240
By: DAB Checked: JCP Approved: JTL	Date:	09/15/15

DOCUMENT INSERTION SHEET

E. I. Hatch Nuclear Plant – Unit No. 1 / 2

RHR SERVICE WATER PUMP
PERFORMANCE CURVES

Description	Remove	Insert
1. This insertion sheet	Existing Sheet(s)	Front of Manual
2. Pump curve TC-14323 for 2E11C001D (pdf pgs 27 & 28)	N/A	SNC Ver. 5.0

SULZER

Sulzer Pumps (US) Inc.
Sulzer Nuclear Service Center
Art Washburn P.E.
Engineering Manager
4126 Caine Lane
Chattanooga. TN 37421

Tel. (423) 296-1922
Fax (423) 892-8217
Email art.washburn@sulzer.com
Web www.sulzeroumps.com

Kevin Glandon
Southern Company
Hatch Nuclear Generating Station

w 205.992.7342
email klglando@southernco.com

May 26, 2012
No. Pages – 1

Subject: Hatch Nuclear Power Plants (Unit 1 & 2) – RHRSW, PSW & SBSW Pumps Minimum Submergence Requirements
RHRSW Pumps: 18DC 7 Stage Vertical Pump (Unit 1 - s/n GC-2755/58, Unit 2 - s/n NE-3561/64)
PSW Pumps: 24EC 3 Stage Vertical Pump (Unit 1 - s/n GC-2751/54, Unit 2 - sin NE-3565/68)
SBSW Pump: 12EMC 3 Stage Vertical Pump (s/n GC-2273)
Sulzer FEAR E-068-02699

The objective of this memorandum is to document minimum submergence requirements for the current pump configurations associated with Residual Heat Removal Service Water (RHRSW) Pumps, Plant Service Water (PSW) Pumps and Standby Service Water (SBSW) Pumps at Southern Company Hatch Nuclear Power Plants (Units 1 & 2) as requested by Southern Company engineering personnel. Minimum submergence requirements were determined by Johnston Pump criteria (Dicmas method), which is a Sulzer accepted methodology.

Submergence requirements are related to fluid velocities around the suction bell (flare). The velocity around the RHRSW, PSW and SBSW pumps is specific to each pump design and relatively low. Minimum submergence required is the depth of immersion of the suction flare below the water level to prevent vortexes and air borne vortexes upstream of the flare inlet for a standard pump cell design. Submergence can be further reduced by applying special features (e.g., vortex plate, suction umbrella or suction splitter to name a few) to lower fluid velocities around the suction flare.

RHRSW Pumps:
The RHRSW pumps are currently configured with a 20" suction bell flare diameter and without a vortex plate.
Submergence limits are as follows: 4,000 GPM (31" submergence) and 4,400 GPM (34" submergence).
The addition of a 26" diameter vortex plate (attached to the bottom of the suction bell flare) can reduce submergence limits as follows: 4,000 GPM (18" submergence) and 4,400 GPM (20" submergence).

PSW Pumps:
The PSW pumps are currently configured with a 27" suction bell flare diameter and without a suction umbrella.
Submergence limits are as follows: 4,500 GPM (25" submergence), 7,000 GPM (39" submergence) and 8,500 GPM (48" submergence).
The addition of a 36" diameter suction umbrella (attached to the bottom of the suction bell flare) can reduce submergence limits as follows: 7,000 GPM (22" submergence) and 8,500 GPM (27" submergence).

SBSW Pumps:
The SBSW pumps are configured with a 12" suction bell flare diameter and without a vortex plate.
Submergence limits are as follows: 700 GPM and 850 GPM (12" submergence).

If there are further questions, please contact myself.

a

Art Washburn P.E.
Engineering Manager

xc: Robert Davis
Julie Duryee
Jeff Leeper
David Linn
George Onimus
Don Spencer

RHR SERVICE WATER PUMP PERFORMANCE CURVES WITH 1ST STAGE CUTTER MODIFICATION

LOCATION	UNIT	DESCRIPTION	WORK ORDER	WO DATE	PURCHASE ORDER	VENDOR	APPLICABLE TEST CURVE
1E11C001A	1	Unit 1A RHR Service Water Pump	1029001304	6/11/2009	6074371	Johnston/ Sulzer	TC-14312, 14322
1E11C001B	1	Unit 1B RHR Service Water Pump	1042371101	5/27/2005	6057240	Johnston/ Sulzer	TC-11840, 11807
1E11C001C	1	Unit 1C RHR Service Water Pump	1041447301	9/3/2004	6054234	Johnston/ Sulzer	TC-11597,11599
1E11C001D	1	Unit 1D RHR Service Water Pump	1029001305	10/15/2007	6068710	Johnston/ Sulzer	TC-12906
2E11C001A	2	Unit 2A RHR Service Water Pump	2029001802	5/14/2008	6065029	Johnston/ Sulzer	TC-13229, 13163
2E11C001B	2	Unit 2B RHR Service Water Pump	C009000709	2/5/2000	6043773	Johnston/ Sulzer	TC-09328
2E11C001C	2	Unit 2C RHR Service Water Pump	C009000705	12/6/2002	6050379	Johnston/ Sulzer	TC-07495
2E11C001D	2	Unit 2D RHR Service Water Pump	2029001803	7/10/2009	6074371	Johnston/ Sulzer	TC-14349/14323

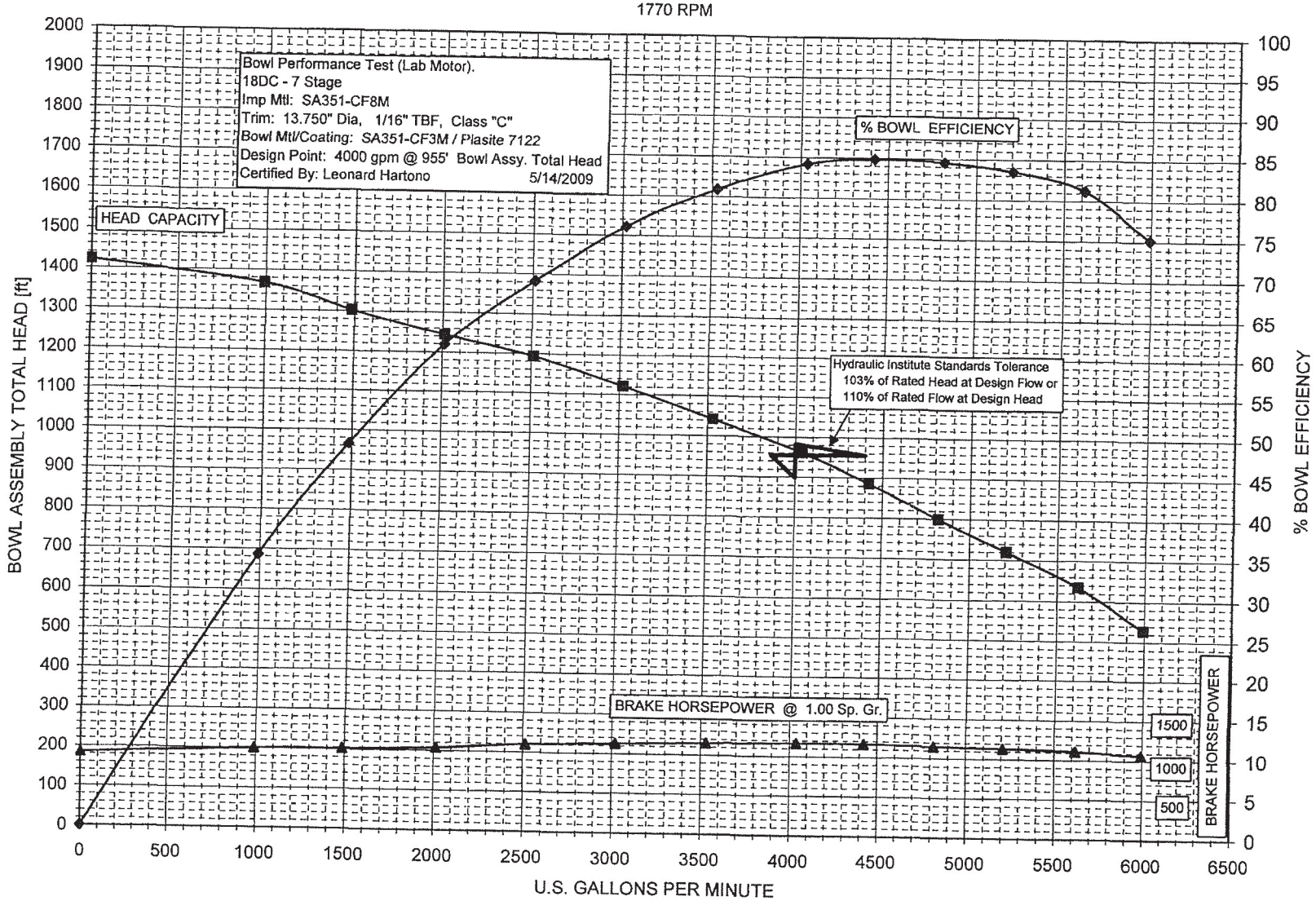
S/N NRW-6525

1E11C001A

Reviewed By EH Date 5/19/09
Title PROJECT ENGINEER

Sulzer Pumps Houston Inc.
Brookshire, Texas
Customer: Chattanooga Svc. Center
Job#: 100024586, TC-14322, Rev #: 0
PO #: 4500079419, Fluid: Water
1770 RPM

SULZER



18DC-7_24586_TC-14322.xls

Georgia Power Company - Hatch Electric Generating Plant
Purchase Order 6074371 Item 003
Performance Test Results
Page 3 of 4

Sulzer Pumps Houston Inc.

Performance Test: Set up and Test Data Sheet

Test Curve No.: 14322

Job Number: 100024586
Unit: A
Customer: Chattanooga Svc. Center
Pump Category: Turbine

	Primary	Inducer
Model:	18DC	
Stages:	7	
Test Imp. Dia [in]:	13.750	
Calc'd Imp. Dia [in]:		
TBF / CL.:	1/16" / "C"	
Imp. Material:	SA351-CF8M	
Bowl Material:	SA351-CF8M	
Bowl ID Coating:	Plasite 7122	

Specific Speed: Ns
Suction Type: Bell
Discharge Head: Lab
Column Pipe: Lab

Pipe ID @ Gauge: 18.000 Inches
Water To Floor: 4 Inches
Floor To Gauge: 60 Inches
Press Tap Location: Bowl

Pump Driver: Lab
Motor H.P. / R.P.M.: 150 / 880
PH / CY / V: 3 / 60 / 480
Motor S / N: 1118661

Water Temp: 83.4 °F

Head Constant: 2.319

Impeller Adjustment: 1/4"
Acceptance Criteria by: see app. check
Rated RPM: 1770
Flow: 4000.0 GPM
Head: 955.0 FT
Power: 1175.0 BHP
Efficiency: 82.000 %
Test Lab Water Sg: 0.996 As Tested
Job Specific Gravity: 1.00 Job

Fluid: Water
Application:
Marking: PO: 4500079419

DAQ Test
Flow Meter: 16" Mag 0-20,000 GPM- Id# 357
Power Meter: 200/400 HP- Id# 300

Tachometer: 3600RPM Id# 293
Temp Meter: 50-140F Id# 292
Test Line: 16" Mag

Manual Test
Press Gauge: 0-200 PSI

Comments: Non-Witnessed performance test on the bowl assembly only at reduced speed using a lab motor. Use lab 16" disch. head & lab 16" tapered column (18.50" reg & 21" B.C.).

Test as per Procedure # EPP T04.3 Rev # 1.

Revision: 0
Rev Date:
Comment:

@ Test - Floor to bottom of baseplate: 19.00 in.
Total Pump Length (TPL): 179.50 in.
@ Test - Submergence over Suction Bell: 13.04 FL

Test Point Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Target Flow (gpm)	2005.0	501.0	752.0	1002.0	1253.0	1503.0	1754.0	2005.0	2205.0	2405.0	2606.0	2806.0	3007.0	0.0
Actual Flow Rate (gpm)	2002.5	497.53	744.4	1008.3	1257.2	1510.2	1765.1	2019.5	2211.4	2409.1	2603.8	2809.8	3004.2	0.0
Bowl Discharge Pressure (psi)	102.0	146.2	138.7	132.4	126.3	118.5	110.0	101.3	93.0	83.7	75.2	66.0	54.7	152.0
Head [ft]	236.5	339.0	321.8	307.0	292.9	274.8	255.1	234.9	215.6	194.1	174.4	153.0	126.8	352.4
Gage Elev.Corr. [ft]	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33
Velocity Head Loss [ft]	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.0
Total Head [ft]	242.0	344.3	327.0	312.4	298.3	290.2	260.5	240.4	221.2	199.6	180.0	158.7	132.5	357.8
Watt Reading [kW]	120.94	104.14	105.00	107.71	113.12	115.94	118.70	120.44	120.38	118.74	117.15	114.49	110.41	96.24
Input H.P.	162.1	139.6	140.7	144.4	151.6	155.4	159.1	161.5	161.4	159.2	157.0	153.5	148.0	129.0
Volt (Ref)	481.9	480.9	481.1	480.2	480.3	479.9	479.3	479.4	479.1	478.2	478.0	477.5	478.3	479.7
Amps(Ref)	194.1	172.1	173.6	178.8	183.8	187.4	191.2	194.5	193.4	191.4	189.0	185.4	180.7	163.4
Job Motor Efficiency														
Lab Motor Efficiency	0.899	0.901	0.901	0.901	0.900	0.900	0.899	0.899	0.899	0.899	0.899	0.900	0.901	0.900
B.H.P.	145.7	125.8	126.8	130.1	136.5	139.8	143.1	145.1	145.0	143.1	141.3	138.1	133.3	116.2
Actual Test Speed (rpm):	885	888	887	887	885	885	885	885	885	885	885	885	887	888
Rated Speed (rpm):	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770
Rated Flow Rate (gpm)	4005	992	1485	2014	2514	3020	3530	4039	4423	4818	5206	5620	5995	0
Rated Total Disch Hd (Ft):	966.02	1368.09	1301.97	1243.88	1193.01	1120.78	1042.08	961.53	884.68	798.57	719.88	634.73	527.71	1421.48
Rated B.H.P.@ Lab Sg:	1185.48	996.00	1007.54	1033.42	1091.97	1118.62	1144.55	1160.82	1160.25	1144.92	1130.01	1104.96	1059.05	919.94
Rated B.H.P.@ Job Sg:	1189.90	999.77	1011.36	1037.33	1096.10	1122.85	1148.89	1185.22	1164.64	1149.26	1134.29	1109.15	1063.06	923.42
Rated Bowl Efficiency:	83.7%	34.3%	48.3%	61.0%	69.1%	76.1%	80.9%	84.2%	84.6%	84.5%	83.5%	81.2%	75.1%	0.0%

Tested By: Jesus Cruz
Witnessed By: ——
Certified By: Leonard Hertono
Date of Test: 5/14/2009

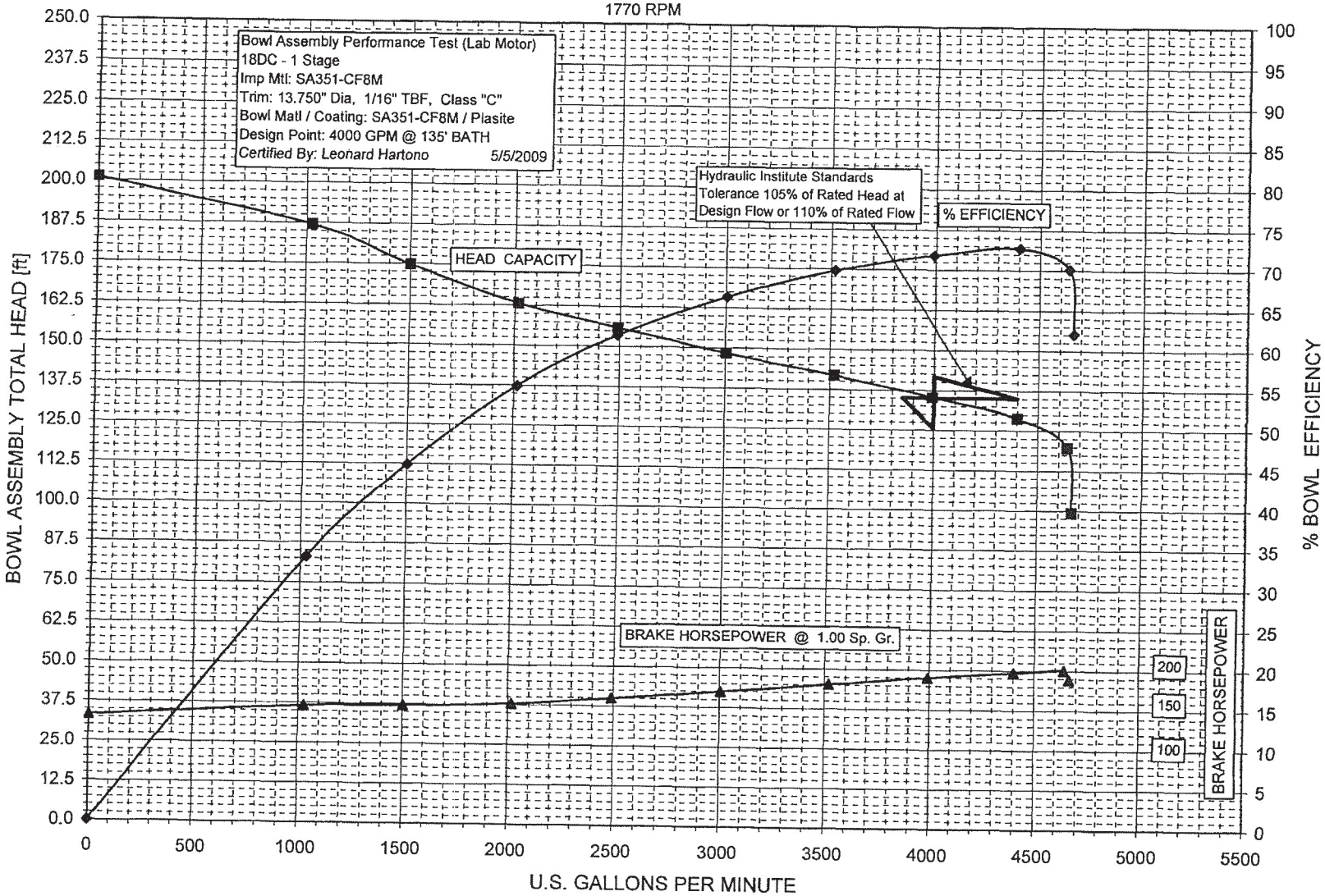
18DC-7_24586_TC-14322.xls

S/N NRW-6525
6074371
1E11C001A

Reviewed By: SH Date: 5/4/09
Title: Project Eng

Sulzer Pumps Houston Inc.
Brookshire, Texas
Customer: Chattanooga Svc. Center
Job# 100024018, TC-14312, Rev # 01
PO: 08410829, Fluid: Water
1770 RPM

SULZER



18DC-1_24018_TC-14312_Rev#1 (2).xls

Georgia Power Company - Hatch Electric Generating Plant
Purchase Order 6074371 Item 003
Performance Test Results
Page 1 of 4

Sulzer Pumps Houston Inc.

SULZER

Performance Test: Set up and Test Data Sheet

Test Curve No.: 14312

Job Number: 100024018
Unit: A
Customer: Chattanooga Svc. Center
Pump Category: Turbine

	Primary	Inducer
Model:	18DC	
Stages:	1	
Test Imp. Dia [in]:	13.750	
Calc'd Imp. Dia [in]:		
TBF / CL.:	1/16" / "C"	

Imp. Material:	SA351-CF8M	
Bowl Material:	SA351-CF3M	
Bowl ID Coating:	Plasite 7122	

Specific Speed: Ns
Suction Type: Bell
Discharge Head: Lab
Column Pipe: Lab

Pipe ID @ Gauge: 16.000 Inches
Water To Floor: 15 Inches
Floor To Gauge: 60 Inches
Press Tap Location: Bowl

Pump Driver: Lab
Motor H.P. / R.P.M.: 500 / 1770
PH / CY / V: 3 / 60 / 2300
Motor S / N: MMJ122024

Water Temp: °F

Head Constant: 2.310

Impeller Adjustment: 1/4"
Acceptance Criteria by: see app. check
Rated RPM: 1770
Flow: 4000.0 GPM
Head: 135.0 FT
Power: 188.0 BHP
Efficiency: 82.000 %
Test Lab Water Sg: 1.000 As Tested
Job Specific Gravity: 1.00 Job

Fluid: Water
Application:
Marking: PO. 08410829

DAQ Test
Flow Meter: 16" Mag 0-20,000 GPM- id# 357
Power Meter: 1250 HP- id# 196
Press Meter: 0-500 PSig- id# 294
Tachometer: 3600RPM id# 293
Temp Meter: 50-140F id# 292
Test Line: 16" Mag

Manual Test
Press Gauge: 0-200 PSI

Comments: Non-Witnessed performance test on the 1st stage of bowl assembly only at full speed using a lab motor. Use lab 16" disch. head & lab 16" tapered column (18.50" reg & 21" B.C.)

Submergence to be 4'-8" (+0,-2") over lip of suction bell. Run-out as far as possible to check NPSHr.

Test as per Procedure # EPP T04.3 Rev#1

Project Manager:

@ Test - Floor to bottom of baseplate: 17.50 in.
Total Pump Length (TPL): 88.50 in.
@ Test - Submergence over Suction Bell: 4.67 Ft.

Revision: 01
Rev Date: 5/5/2009
Comment: Corrected PO#, Bowl Mat'l, and Procedure

Test Point Number	1	2	3	4	5	6	7	8	9	10	11	14
Target Flow (gpm)	4034.0	1008.0	1513.0	2017.0	2521.0	3025.0	3530.0	4034.0	4437.0	4841.0	5244.0	0.0
Actual Flow Rate (gpm)	4024.5	1037.92	1517.4	2037.9	2515.9	3035.8	3554.5	4029.5	4441.8	4683.3	4708.3	0.0
Bowl Discharge Pressure (psi)	56.9	80.2	74.6	69.6	66.4	63.0	60.0	57.0	54.1	50.0	41.0	86.5
Head [ft]	131.4	185.3	172.8	160.8	153.4	145.5	138.6	131.7	125.0	115.5	94.7	199.8
Gage Elev.Corr. [ft]	5.42	5.42	5.42	5.42	5.42	5.42	5.42	5.42	5.42	5.42	5.42	5.42
Velocity Head Loss [ft]	0.6	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.8	0.9	0.9	0.0
Total Head [ft]	137.5	190.7	178.3	166.4	159.1	151.3	144.5	137.7	131.2	121.8	101.0	205.2
Watt Reading [kW]	155.71	121.24	122.58	125.39	132.09	140.03	148.49	155.64	161.07	163.54	154.37	110.73
Input H.P.	208.7	162.5	164.3	168.1	177.1	187.7	199.1	208.6	215.9	219.2	206.9	148.4
Volt (Ref)	2362.5	2367.4	2368.3	2368.6	2366.6	2367.5	2367.8	2366.2	2365.4	2365.5	2365.1	2367.1
Amps(Ref)	45.1	37.7	38.0	38.5	39.9	41.6	43.4	44.8	46.1	46.8	44.7	35.4
Job Motor Efficiency												
Lab Motor Efficiency	0.936	0.926	0.927	0.928	0.930	0.932	0.934	0.936	0.937	0.938	0.936	0.923
B.H.P.	195.4	150.6	152.3	155.9	164.6	174.9	185.9	195.3	202.3	205.6	193.6	137.0
Actual Test Speed (rpm):	1785	1788	1788	1788	1788	1788	1787	1786	1786	1786	1786	1788
Rated Speed (rpm):	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770
Rated Flow Rate (gpm)	3991	1027	1502	2017	2481	3005	3521	3993	4402	4641	4666	0
Rated Total Disch Hd (Ft):	135.19	186.90	174.72	163.02	155.86	148.28	141.78	135.27	128.83	119.81	99.20	201.12
Rated B.H.P.@ Lab Sg:	190.47	146.06	147.74	151.27	159.68	169.69	180.68	190.06	196.95	200.10	188.44	132.94
Rated B.H.P.@ Job Sg:	190.47	146.06	147.74	151.27	159.68	169.69	180.68	190.06	196.95	200.10	188.44	132.94
Rated Bowl Efficiency:	71.5%	33.2%	44.9%	54.9%	61.4%	66.3%	69.8%	71.8%	72.7%	70.1%	62.0%	0.0%

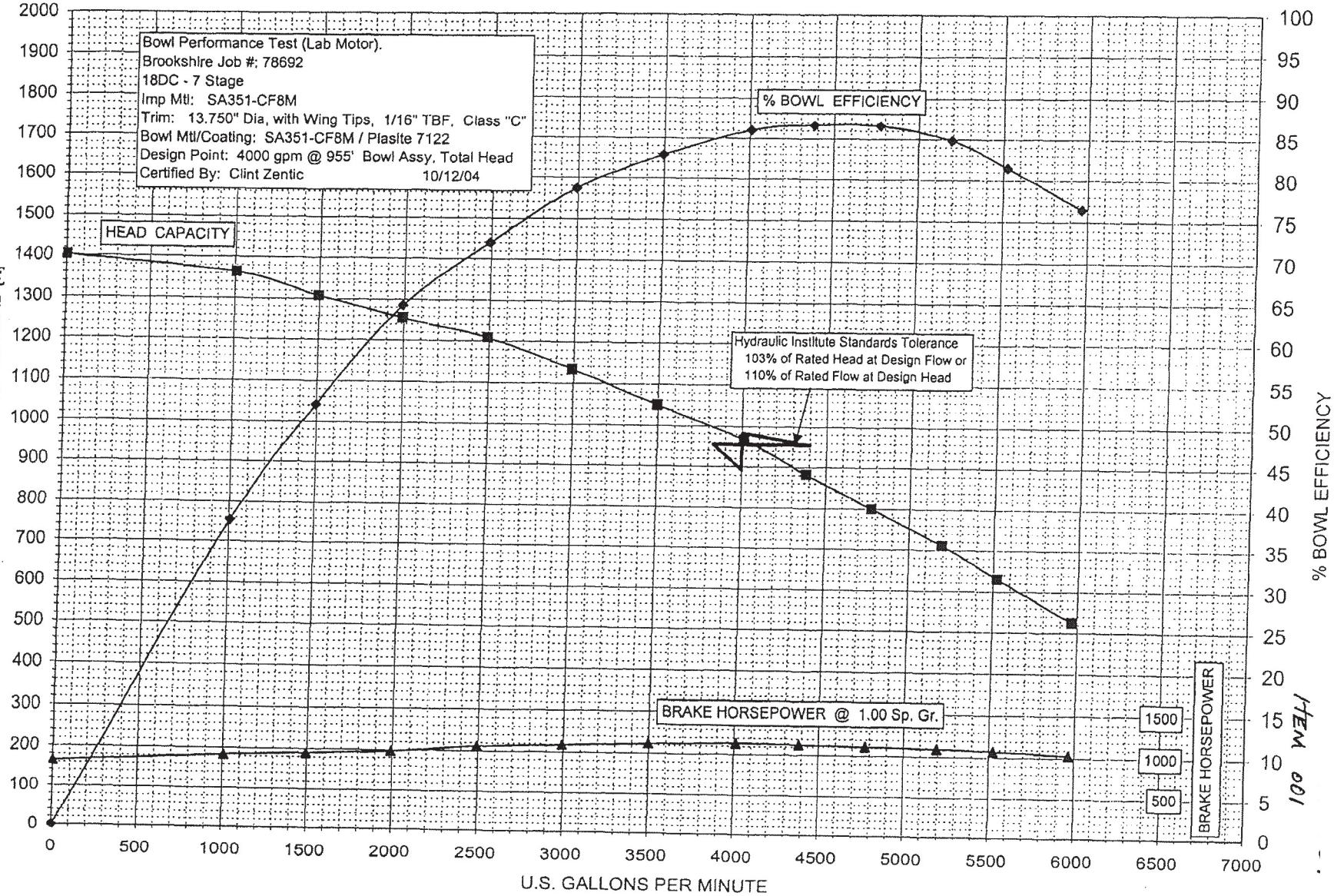
Tested By: Jesus Cruz
Witnessed By: ——
Certified By: Leonard Hartono
Date of Test 5/4/2009

18DC-1_24018_TC-14312_Rev#1 (2).xls

S/N NRX-6531
1E11C001B

Johnston Pump Company

Brookshire, Texas
Customer: Georgia Power
Chattanooga Job#: 03JC1513=77603, POF#: SJC-66940, PO#: TE-78692
TC-11840, Rev #: 0, Fluid: Water
1770 RPM



ITEM 001

18DC-7_03JC1513_TC-11840

ATTACHMENT "B" PAGE 1 OF 2

Johnston Pump Company

Performance Test: Set up and Test Data Sheet

Test Curve No.: 11840

Job Number: 03JC1513=77603
Unit: A
Customer: Georgia Power
Pump Category: Turbine

	Primary	Inducer
Model:	18DC	
Stages:	7	
Test Imp. Dia [in]:	13.75 w/ Wing Tips	
Calc'd Imp. Dia [in]:		
TBF / CL.:	1/16" / "C"	

Imp. Material:	6A351-CF8M	
Bowl Material:	6A351-CF8M	
Bowl ID Coating:	Plasite 7122	

Specific Speed: Ns
Suction Type: Bell
Discharge Head: Lab
Column Pipe: Lab

Pipe ID @ Gauge: 15.250 Inches
Water To Floor: 10 Inches
Floor To Gauge: 60 Inches
Press Tap Location: Bowl

Pump Driver: Lab
Motor H.P. / R.P.M.: 150 / 880
PH / CY / V: 3 / 60 / 480
Motor S / N: 1118661

Water Temp: 84.4 °F
Head Constant: 2.31

Impeller Adjustment: 1/4"
Acceptance Criteria by: CZ 3/18/04 see app. check
Rated RPM: 1770
Flow: 4000.0 GPM
Head: 855.0 FT
Power: 1176.0 BHP
Efficiency: 82.000 %
Test Lab Water Sg: 1.00 As Tested
Job Specific Gravity: 1.00 Job

Fluid: Water
Application:
Marking: Serial #: 78692
Job #: 03JC1513=77603
POF #: SJC-66940
Chattanooga P.O. #: TE-78692

DAQ Test
Flow Meter: 16" Mag 0-20,000 GPM- Id# 357
Power Meter: 200/400 HP. Id# 300

Tachometer: 3600RPM Id# 293
Temp Meter: 50-140F Id# 292
Test Line: 16"

Manual Test
Press Gauge: 0-200 PSI

Comments: Non-Witnessed performance test on the bowl assembly only at reduced speed using a lab motor. Use lab 16" disch. head & lab 16" tapered column (19.50" reg & 21" D.C.)

Test as per Procedure # JP-TP-0069 Rev. 08.

Project Manager: Earl Huffaker

Revision:
Rev Date:
Comment:

@ Test - Floor to bottom of baseplate: 16.00 In.
Total Pump Length (TPL): 150.00 In.
@ Test - Submergence over Suction Bell: 10.33 Ft.

Test Point Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Target Flow (gpm)	2005.0	501.0	752.0	1002.0	1253.0	1503.0	1754.0	2005.0	2205.0	2405.0	2606.0	2808.0	3007.0	0.0
Actual Flow Rate (gpm)	2004.8	505.88	750.5	999.4	1251.6	1500.8	1752.6	2009.8	2196.3	2392.7	2603.2	2772.2	2993.7	0.0
Bowl Discharge Pressure (psi)	102.5	148.4	140.0	134.2	129.4	121.0	111.5	102.5	93.3	84.4	74.6	66.0	54.5	151.0
Head [ft]	236.0	336.2	323.4	310.0	298.9	279.5	257.6	236.8	215.5	195.0	172.3	152.5	126.9	348.8
Gage Elev.Corr. [ft]	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83
Velocity Head Loss [ft]	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.0
Total Head [ft]	242.8	344.0	329.3	315.9	304.8	285.5	263.5	242.8	221.6	201.1	178.5	156.7	132.2	354.6
Watt Reading [kW]	118.84	98.51	99.25	102.78	110.86	113.96	116.72	118.86	117.63	116.27	114.61	112.93	108.22	86.85
Input H.P.	159.0	129.4	133.0	137.7	148.6	152.8	156.5	159.3	157.7	155.9	153.6	151.4	145.1	116.4
Volt (Ref)	479.3	478.2	478.2	478.1	479.3	479.5	479.0	479.6	479.7	479.4	479.0	479.4	479.7	478.6
Amps(Ref)	192.0	164.0	187.7	172.0	181.7	186.6	189.5	191.8	190.5	188.9	186.7	184.9	178.7	152.6
Job Motor Efficiency														
Lab Motor Efficiency	0.899	0.900	0.901	0.901	0.900	0.900	0.900	0.899	0.899	0.900	0.900	0.900	0.901	0.899
B.H.P.	143.0	116.5	119.8	124.1	133.8	137.6	140.7	143.3	141.8	140.2	138.3	136.3	130.7	104.6
Actual Test Speed (rpm):	887	889	888	888	888	888	887	887	887	887	887	888	888	890
Rated Speed (rpm):	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770
Rated Flow Rate [gpm]	4000	1007	1496	1992	2492	2991	3497	4011	4383	4775	5195	5526	5957	0
Rated Total Disch Hd (Ft):	966.83	1363.76	1308.16	1255.01	1206.34	1134.10	1049.43	966.83	882.36	800.86	710.72	630.36	525.08	1402.68
Rated B.H.P.@ 1.0 Sg:	1136.29	919.47	949.07	982.78	1056.15	1088.67	1118.33	1138.30	1126.86	1114.15	1098.60	1079.21	1034.78	822.87
Rated B.H.P.@ Sg 1:	1136.29	919.47	949.07	982.78	1056.15	1088.67	1118.33	1138.30	1126.86	1114.15	1098.60	1079.21	1034.78	822.87
Rated Bowl Efficiency:	86.0%	37.7%	52.1%	64.2%	72.0%	78.7%	82.9%	86.0%	86.7%	86.6%	84.9%	81.5%	76.5%	0.0%
Trimmed Flow Rate (GPM)														
Trimmed Total Disch Hd (FT):														
Trimmed B.H.P.@ 1.0 Sg:														
Trimmed B.H.P.@ Sg A:														
Trimmed Bowl Efficiency:														

Tested By: Darryl Clark
Witnessed By:
Certified By: Clint Zantic 10/12/04
Date of Test: 10/12/2004

18DC-7_03JC1513_TC-11840

ITEM 001

Johnston Pump Company

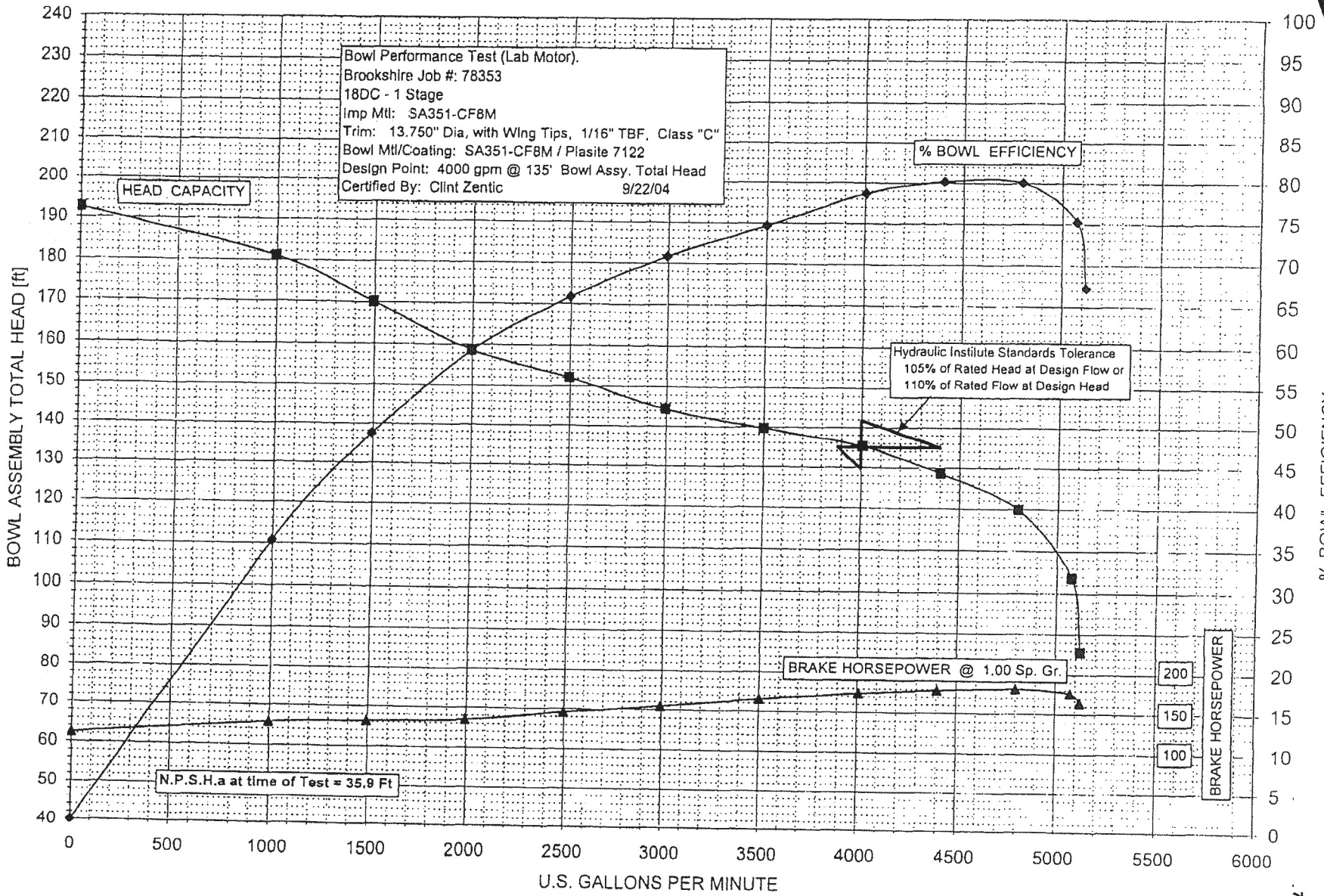
Brookshire, Texas

Customer: Georgia Power

Chattanooga Job#: 03JC1513 = 77603, POF#: SJC-66931, PO#: TE-78353

TC-11807, Rev #: 0, Fluid: Water

1770 RPM



18DC-1_03JC1513_TC-11807

ATTACHMENT "A" PAGE 1 OF 2

TEM 001

Johnston Pump Company

Performance Test: Set up and Test Data Sheet

Test Curve No.: 11807

Job Number: 03JC1513 = 77803
Unit: A
Customer: Georgia Power
Pump Category: Turbine

	Primary	Inducer
Model:	18DC	
Stages:	1	
Test Imp. Dia (in):	13.750	
Calc'd Imp. Dia (in):		
TBF / CL.:	1/16" / "C"	

Imp. Material:	SA351-CF8M
Bowl Material:	SA351-CF8M
Bowl ID Coating:	Plasite 7122

Specific Speed: Ns
Suction Type: Bell
Discharge Head: Lab
Column Pipe: Lab

Pipe ID @ Gauge: 15.250 Inches
Water To Floor: 10.5 Inches
Floor To Gauge: 60 Inches
Press Tap Location: Bowl

Pump Driver: Lab
Motor H.P. / R.P.M.: 200 / 1770
PH / CY / V: 3 / 50 / 480
Motor S / N: 110608

Water Temp: 93.0 °F
Head Constant: 2.31

Impeller Adjustment: 1/4"
Acceptance Criteria by: CZ 3/18/04 see app. check
Rated RPM: 1770
Flow: 4000.0 GPM
Head: 135.0 FT
Power: 175.0 BHP
Efficiency: 80.000 %
Test Lab Water Sg: 1.00 As Tested
Job Specific Gravity: 1.00 Job

Fluid: Water
Application:
Marking: Serial #: 78353
Job #: 03JC1513=77803
PDF #: SJC-66831
Chattanooga P.O. #: TE-78353

DAQ Test

Flow Meter:	12" Mag D-11,000 GPM- Id# 355
Power Meter:	200/400 HP- Id# 300
Press Meter:	0-500 PSig- Id# 284
Tachometer:	3600RPM Id# 293
Temp Meter:	50-140F Id# 282
Test Line / Orifice:	12"

Comments: Non-Witnessed performance test on the 1st stage of bowl assembly only at full speed using a lab motor. Use lab 16" disch. head & lab 16" tapered column (18.50" reg & 21" B C)

Submergence to be 4'-8" (+2,-2") over lip of suction bell. Run-out as far as possible to check NPSHr

Test as per Procedure # JP-TP-0069 Rev 08.

Project Manager: Earl Huffaker

@ Test - Floor to bottom of baseplate: 10.50 in
Total Pump Length (TPL): 76.50 in
@ Test - Submergence over Suction Bell: 4.63 Ft

Revision:
Rev Date:
Comment:

Test Point Number	1	2	3	4	5	6	7	8	9	10	11	12		14
Target Flow (gpm)	4034.0	1008.0	1513.0	2017.0	2521.0	3025.0	3530.0	4034.0	4437.0	4841.0	5244.0	5647.0		0.0
Actual Flow Rate (gpm)	4025.2	1008.09	1510.9	2015.6	2519.0	3024.6	3528.3	4038.0	4437.8	4835.7	5114.9	5154.4		0.0
Bowl Discharge Pressure (psi)	56.8	77.5	72.6	67.4	64.3	61.0	58.5	56.5	53.8	49.6	42.5	34.5		82.6
Head (ft)	130.7	179.0	187.7	155.7	148.5	140.9	135.4	130.5	123.8	114.8	98.2	79.7		190.8
Gage Elev.Corr. (ft)	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88		5.88
Velocity Head Loss (ft)	0.8	0.0	0.1	0.2	0.3	0.4	0.6	0.8	0.9	1.1	1.3	1.3		0.0
Total Head (ft)	137.4	184.9	172.7	161.8	154.7	147.2	141.8	137.2	130.6	121.6	105.3	86.8		196.1
Watt Reading (kW)	142.90	107.16	109.84	111.65	120.01	127.40	135.83	142.68	146.59	148.81	144.95	135.09		93.57
Input H.P.	191.6	143.6	146.7	149.7	160.9	170.8	182.1	191.3	196.5	199.6	194.3	181.1		125.4
Volt (Ref)	486.4	487.5	487.7	486.8	486.9	487.0	486.5	486.2	486.2	486.2	486.0	485.4		485.9
Amps(Ref)	219.5	174.3	176.7	179.9	190.2	199.5	209.9	218.4	223.6	226.7	221.9	209.1		158.4
Job Motor Efficiency														
Lab Motor Efficiency	0.930	0.928	0.928	0.928	0.929	0.930	0.930	0.930	0.930	0.930	0.930	0.930		0.923
B.H.P.	178.1	133.2	136.2	139.0	149.5	158.8	168.3	177.9	182.7	185.5	180.7	168.4		115.8
Actual Test Speed (rpm):	1784	1789	1789	1787	1785	1787	1784	1783	1784	1783	1784	1784		1789
Rated Speed (rpm):	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770		1770
Rated Flow Rate (gpm)	3994	997	1495	1996	2499	2996	3501	4009	4403	4800	5075	5124		0
Rated Total Disch Hd (Ft):	135.25	181.04	170.02	158.70	152.12	144.44	139.52	135.18	128.59	119.80	103.86	85.49		192.53
Rated B.H.P.@ 1.0 Sg:	173.98	129.03	131.86	135.03	145.79	154.33	165.39	174.00	178.45	181.44	176.47	164.49		112.11
Rated B.H.P.@ Sg 1:	173.98	129.03	131.86	135.03	145.79	154.33	165.39	174.00	178.45	181.44	176.47	164.49		112.11
Rated Bowl Efficiency:	76.4%	35.3%	48.7%	59.2%	65.8%	70.8%	74.8%	78.6%	80.1%	80.0%	75.3%	67.2%		0.0%
Trimmed Flow Rate (GPM)														
Trimmed Total Disch Hd (FT):														
Trimmed B.H.P.@ 1.0 Sg:														
Trimmed B.H.P.@ Sg A:														
Trimmed Bowl Efficiency:														

Tested By: Darryl Clark
Witnessed By:
Certified By: Clint Zarnic 9/22/04
Date of Test: 9/22/2004

18DC-1_03JC1513_TC-11807

ATTACHMENT "A"

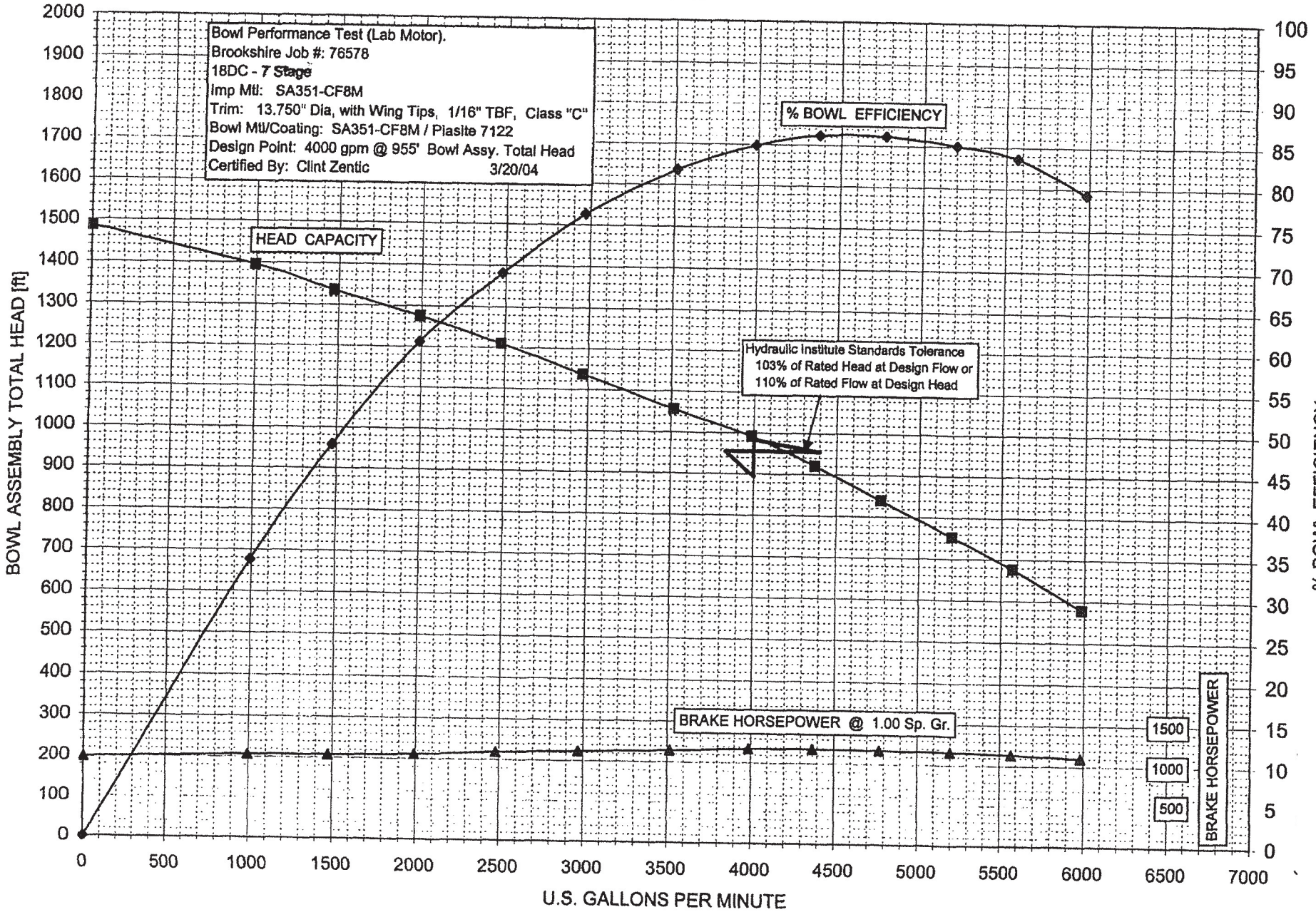
PAGE 2 OF 2

ITEM 001

NRX-6532
1E11C001C

Reviewed By BA Date 3-22-04
Title Repair Tech.

Johnston Pump Company
Brookshire, Texas
Customer: Georgia Power
Chattanooga Job#: 03JC1501=73154, POF#: SJC-66916, PO#: TE-76578
TC-11597, Rev #: 0, Fluid: Water
1770 RPM



Johnston Pump Company

Performance Test: Set up and Test Data Sheet

Test Curve No.: 11597

Job Number: 03JC1501=73154
Unit: A
Customer: Georgia Power
Pump Category: Turbine

	Primary	Inducer
Model:	18DC	
Stages:	7	
Test Imp. Dia [in]:	13.75 w/ Wing Tips	
Calc'd Imp. Dia [in]:		
TBF / CL.:	1/16" / "C"	

Imp. Material:	SA351-CF8M	
Bowl Material:	SA351-CF8M	
Bowl ID Coating:	Plaska 7122	

Specific Speed: Ns
Suction Type: Bell
Discherge Head: Lab
Column Pipe: Lab

Pipe ID @ Gauge: 16.250 Inches
Water To Floor: 7 Inches
Floor To Gauge: 60 Inches
Press Tap Location: bowl

Pump Driver: Lab
Motor H.P. / R.P.M.: 150 / 880
PH / CY / V: 3 / 60 / 460
Motor S / N: 1118661

Water Temp: 84.5 °F
Head Constant: 2.31

Impeller Adjustment: 1/4"
Acceptance Criteria by: CZ 3/18/04 *see app. check*
Rated RPM: 1770
Flow: 4000.0 GPM
Head: 955.0 FT
Power: 1175.0 BHP
Efficiency: 82.000 %
Test Lab Water Sg: 1.00 As Tested
Job Specific Gravity: 1.00 Job

Fluid: Water
Application:
Marking: Serial #: 78578
Job #: 03JC1501=73154
POF #: SJC-68916
Chattanooga P.O. #: TE-78578

DAQ Test
Flow Meter: 16" Mag 0-20,000 GPM- Id# 357
Power Meter: 200/400 HP- Id# 300

Tachometer: 3600RPM Id# 293
Temp Meter: 50-140F Id# 292
Test Line: 16"

Manual Test
Press Gauge: 0-200 PSI

Comments: Non-Witnessed performance test on the bowl assembly only at reduced speed using a lab motor. Use lab 16" disch. head & lab 16" tapered column (18.50" reg & 21" B.C.).

Test as per Procedure # JP-TP-0069 Rev. 08.

Project Manager: Earl Hutfaker

Revision:
Rev Date:
Comment:

@ Test - Floor to bottom of baseplate: 20.50 in.
Total Pump Length (TPL): 179.50 in.
@ Test - Submergence over Suction Bell: 12.67 Ft.

Test Point Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Target Flow (gpm)	2005.0	501.0	762.0	1002.0	1253.0	1503.0	1754.0	2005.0	2205.0	2405.0	2606.0	2806.0	3007.0	0.0
Actual Flow Rate (gpm)	2006.2	500.93	742.7	1003.2	1247.4	1494.6	1771.1	2006.4	2200.0	2401.6	2617.2	2803.6	3015.1	0.0
Bowl Discharge Pressure (psi)	106.3	151.0	144.4	137.8	130.3	122.3	113.6	106.3	98.5	89.6	80.0	71.6	61.0	181.0
Head (ft)	246.6	348.6	333.6	318.3	301.0	282.5	262.4	246.4	227.5	206.7	184.6	165.4	140.9	371.9
Gage Elev.Corr. [ft]	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56
Velocity Head Loss [ft]	0.2	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.0
Total Head [ft]	251.3	354.4	339.2	323.9	306.7	288.2	268.1	251.2	233.4	212.6	190.7	171.4	146.9	377.5
Watt Reading [kW]	125.01	109.75	110.00	112.16	115.99	118.29	121.73	124.84	125.06	124.43	123.02	120.48	118.93	105.10
Input H.P.	167.6	147.1	147.5	150.4	155.5	158.6	163.2	167.1	167.8	166.8	164.9	161.5	159.7	140.9
Volt (Ref)	480.7	480.9	480.5	480.7	480.0	479.9	480.3	480.3	480.4	480.9	480.6	480.2	480.9	481.2
Amps(Ref)	196.6	179.2	179.7	182.6	187.5	190.1	194.5	196.1	196.9	197.6	196.3	192.9	188.2	173.4
Job Motor Efficiency														
Lab Motor Efficiency	0.897	0.901	0.901	0.900	0.900	0.899	0.898	0.898	0.897	0.898	0.898	0.899	0.900	0.901
B.H.P.	150.4	132.5	132.6	135.4	139.9	142.6	146.8	150.0	150.4	149.7	148.1	145.1	141.0	126.9
Actual Test Speed (rpm):	891	892	892	892	891	891	892	891	891	891	891	891	892	892
Rated Speed (rpm):	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770	1770
Rated Flow Rate (gpm)	3985	994	1474	1991	2475	2969	3514	3985	4370	4771	5199	5569	5983	0
Rated Total Disch Hd (Ft):	991.82	1395.48	1335.49	1276.54	1210.14	1137.34	1055.63	991.37	920.87	839.00	752.61	676.22	578.53	1488.37
Rated B.H.P.@ 1.0 Sg:	1179.06	1035.18	1037.54	1057.63	1096.64	1117.81	1145.38	1175.70	1179.44	1173.79	1160.97	1137.65	1101.58	991.63
Rated B.H.P.@ Sg 1:	1179.06	1035.18	1037.54	1057.63	1096.64	1117.81	1145.38	1175.70	1179.44	1173.79	1160.97	1137.65	1101.58	991.63
Rated Bowl Efficiency:	84.7%	33.8%	47.9%	60.8%	69.1%	76.3%	81.8%	84.9%	86.2%	86.1%	85.1%	83.8%	79.3%	0.0%
Trimmed Flow Rate (GPM)														
Trimmed Total Disch Hd (FT):														
Trimmed B.H.P.@ 1.0 Sg:														
Trimmed B.H.P.@ Sg A:														
Trimmed Bowl Efficiency:														

NRX-6532

1E11C001C

Johnston Pump Company

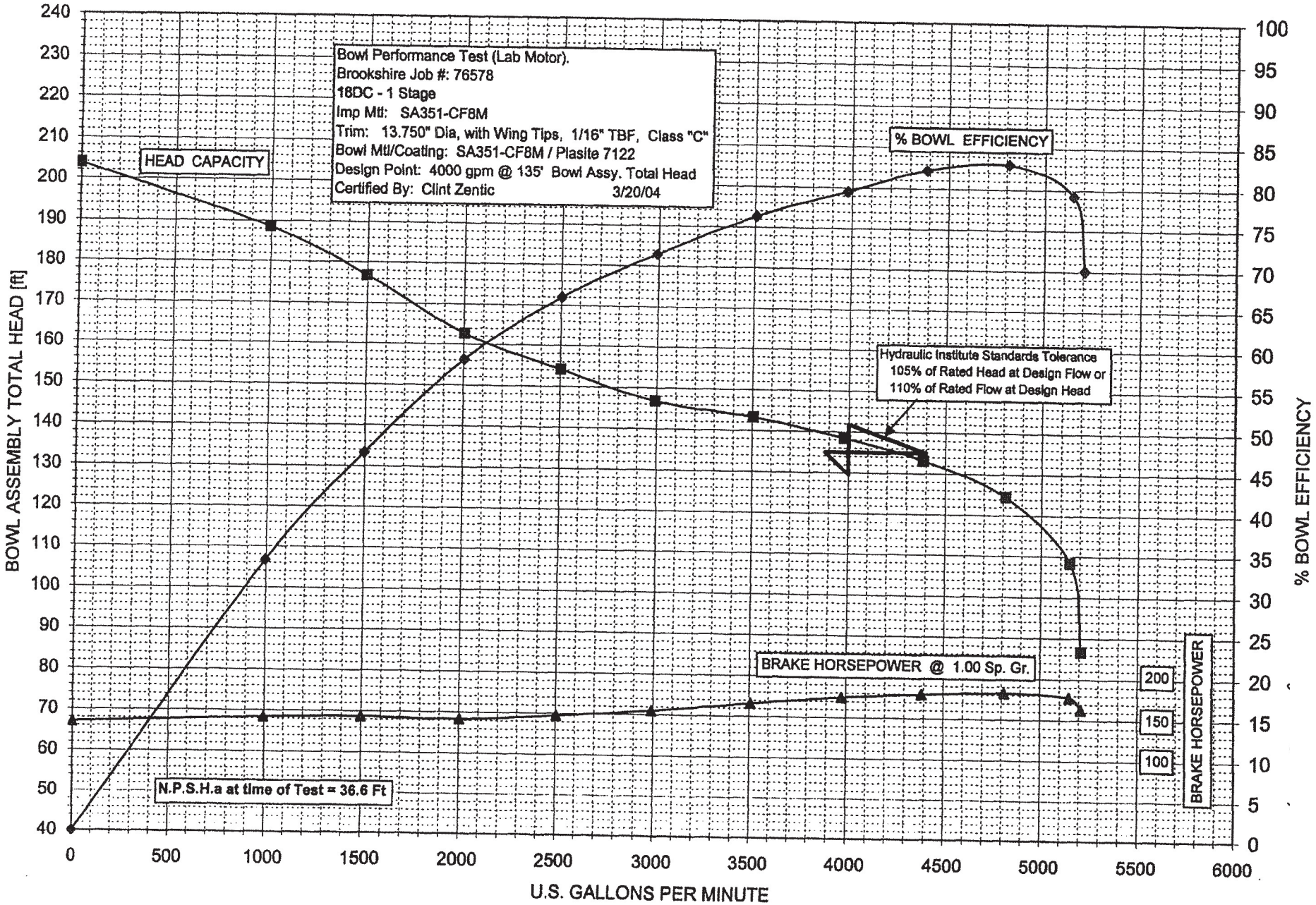
Brookshire, Texas

Customer: Georgia Power

Chattanooga Job#: 03JC1501=73154, POF#: SJC-66916, PO#: TE-76578

TC-11599, Rev #: 0, Fluid: Water

1770 RPM

Reviewed By EA Date 3-22-04

Title Repair Tech.