Haw & Inglis Civil Engineering (Pty)

TNPA/879 UPGRADE OF ROBINSON DRY DOCK

OEM APPROVAL:

Main Pumps – APE WVP-130-30(P30)

ROBINSON DRY DOCK UPGRADE			
Document No.:	IA331- DS - 003		
Revision No.:	03		
Date:	11 March 2022		
CONTRACTOR			
Name:	Faizel Isaacs	**Designation:**	PM
Signature:		**Date:**	11/03/22
Name:	Johan Bester Pr Eng 980128	**Designation:**	Design Lead
Signature:		**Date:**	11/03/22
EMPLOYER			
Name:	Morena Lengane	**Designation:**	Project Engineer (NEC Supervisor)
Signature:		**Date:**	2022/03/14

Contents:

1. **Demonstration of compliance with design intent**
2. **Technical Data Sheets**
3. **Lead Times**
4. **Warrantees/Guarantees**
5. **Aftermarket Support Services, Spares Availability, Maintenance and Repairs**
6. **Additional Corrosion Protection Measures**
7. **Life expectancy in marine conditions**
8. **Technical Review Clarifications**

1. Demonstration of compliance with design intent

Due to the very high specification required on this project, there are not many pumps on the market that could comply to the specification. At tender stage, we were only able to obtain 1 pump that could comply, and since then we have found another. There are then only two pumps available in the market that complies.

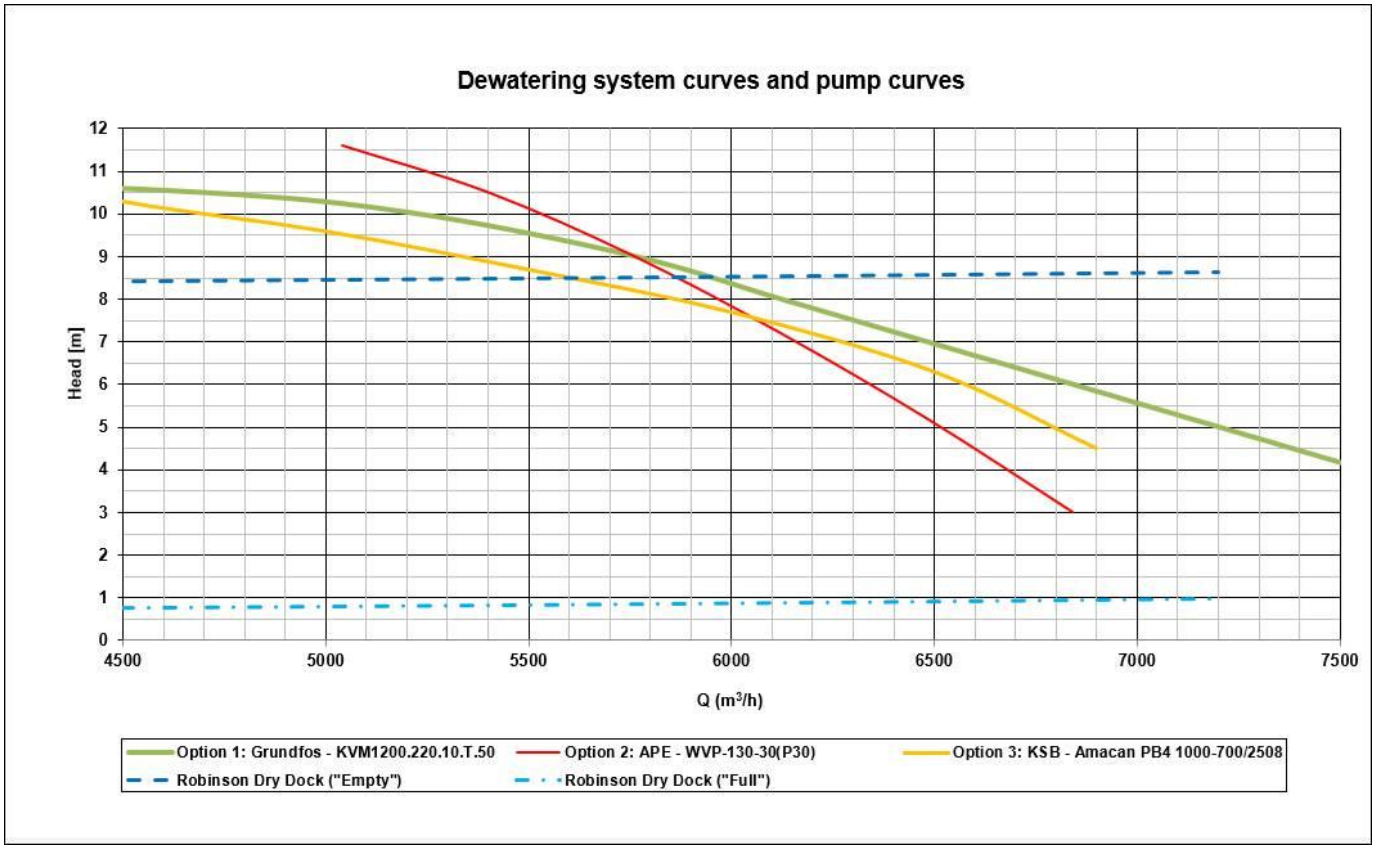
In our hydraulic review, we also included a third pump, the KSB Amacan PB4 in our review. While it did not comply to the material of construction specification, hydraulically it showed the required performance, and we therefore included it in the review.

These 3 pumps have been reviewed in terms of hydraulic capacities, as well as project specifications. Hydraulic capacities are specifically covered by this section. Other project specifications i.e materials, motor ratings, etc are provided in the data sheets.

Three pumps were reviewed:
Option 1: Grundfos - KVM1200.220.10.T.50
Option 2: APE - WVP-130-30(P30)
Option 3: KSB – Amacon PB4 (not compliant)

These pumps' system curves are provided in the table below:

Figure 1:



The requirement was that 24000m3 be dewatered in approximately 4 hours, hence, 6000m3/hr.

Note the "boundary condition" system curves in the figure 1 above. The upper limit pump curves for the various options are also shown.

From this figure 1 above we can derive:

- that the three options have sufficient flow capacity for average dock levels; even at the critical depth of an "empty" dock that ranges from 5650m3/hr to 5950m3/hr
- that should pump be started in the "full" dock status, and with no throttling or no VSD control, then the pump will run "freely" to the right side of the pump curve – caution!

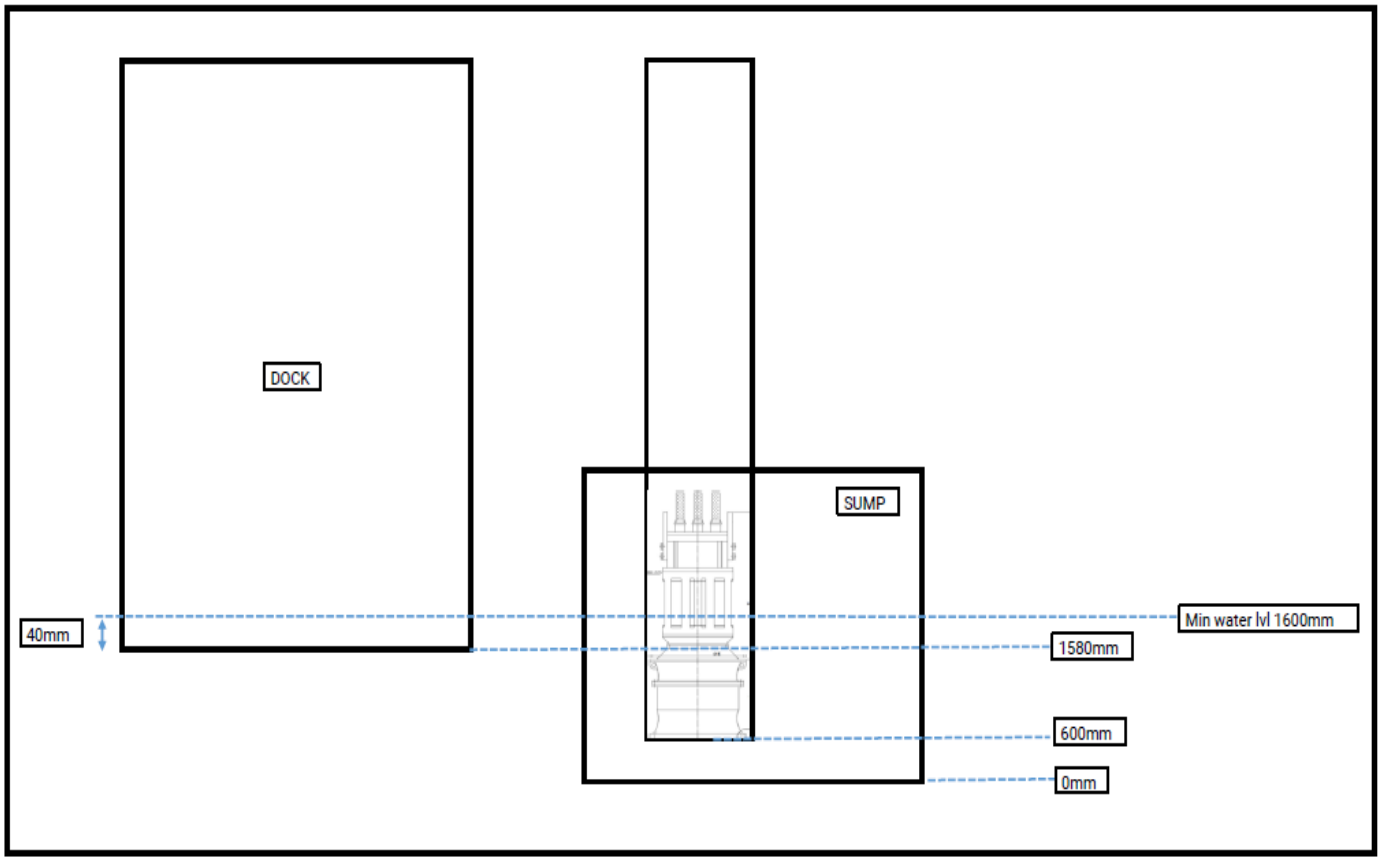
The HAZOP prompted that we consider the “safe” submerged level of the pump, and the resulting/calculated “safe” water depth left in the dock.

This is calculated from the dewatering sump levels; installation levels of the pump and the technical data sheets (see summary table below).

Table 1:

Pump make and model considered	**Design duty as mentioned on technical data sheet**	**Required "safe" depth left in Dock**
Option 1: Grundfos - KVM1200.220.10.T.50	5880m3/hr (1633 l/s)@9.2m	0.04m
Option 2: APE - WVP-130-30(P30)	6120m3/hr @6.5m	0.02m

Figure 2: (for APE Pump only)



While the data sheets included shows a minim water submergence of 2300mm, after close engagement with the OEM and their engineers, they have confirmed that this can safely be reduced to 1000mm. See official correspondence included with the datasheets.

The dock can therefore be emptied within the 4hr requirement.

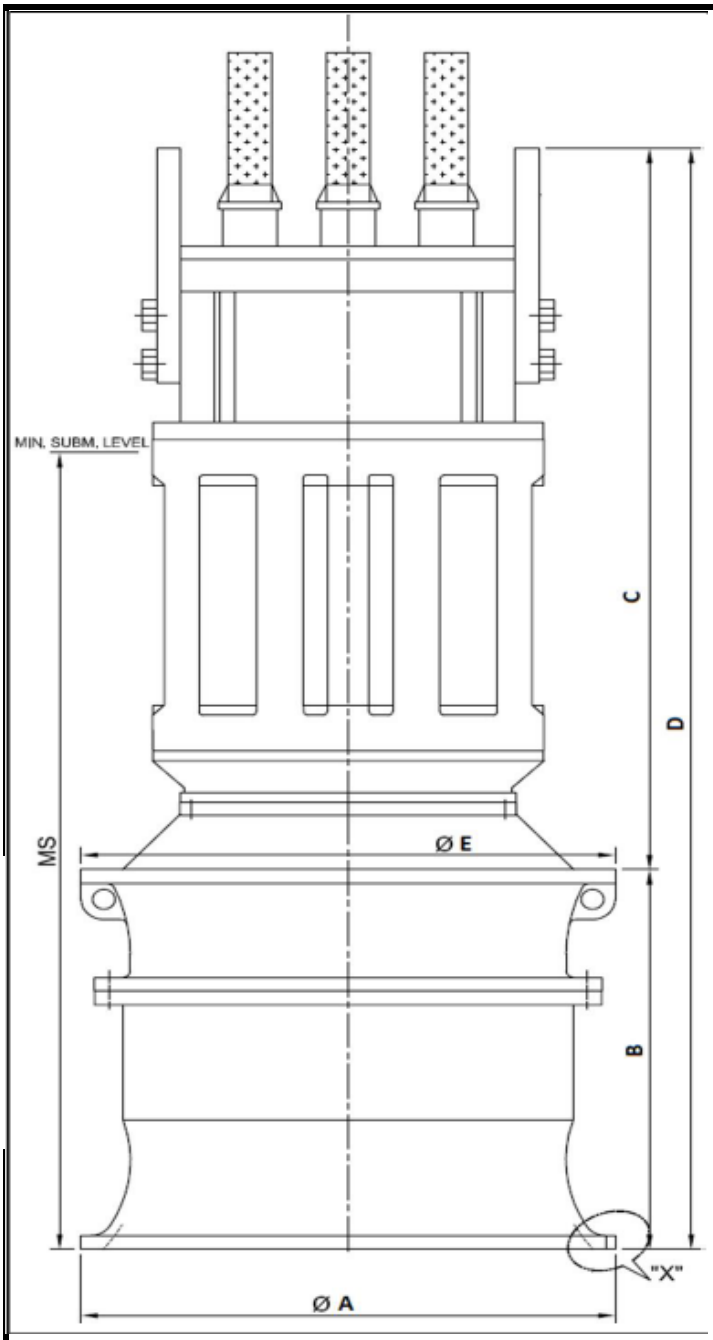
Through our submission, we seek the Employer’s approval of the APE WVP-130-30(P30) pump for the Main Dewatering Pumps.

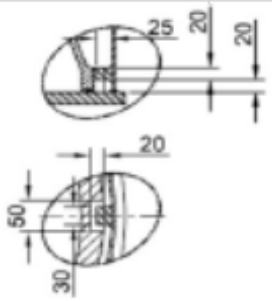
2. Technical Data Sheets

Axial-Flow Submersible Pump	Technical Data Sheet of Pump Project: Robinson Dry Dock				APE pumps
Ref: No.	SE23266-21	Qty	2	Date	02.06.2021

Sl No.	Defination	Data	Unit	Remarks
1	Pump Model	**WVP-130-30 (P30)**		
2	Capacity	6120	m3/hr.	1700 L/S
3	Total Head	6.5	mtr.	21.32 Ft
4	Speed	730	RPM	
5	Efficiency	78	%	
6	Pump input Power at Duty Point	143.06	KW	
7	NPSHR	7.16	mtr.	
8	Minimum Submergence	2300	mm	
9	Pump Type	Submersible		Axial-Flow
10	Impeller Type	Opened		
11	Installation	Outdoor		
12	Water Chemistry	Sea Water		
13	Specific Gravity	1.03		
14	Range of Operation	Please refer attached performance curve		
15	Motor Rating	185	KW	295 H.P.
16	Recommended Column Size	1100	mm	
17	Maximum allowable Sphere Shize	180	mm	
18	**Material Of Construction**	**Bowl Casing**		Duplex SS, ASTM A890 Gr. 4A
19		**Impeller**		Duplex SS, ASTM A890 Gr. 4A
20		**Shaft**		Duplex SS , UNS S 31803
21		**Wearing ring**		Duplex SS, ASTM A890 Gr. 4A
22		**Seal**		Double Machanical Seal (Sic v/s Sic)
23				
24		**INSPECTION AND TEST**		
25		Visual Inspection		
26		Dimensional Inspection		
27		Hydro test of pressure components		
28		Impeller Dynamic Balancing		
29		Freeness test of rotating assembly		
30		Performance test of pump assembly		

Standards : IEC 60034, NEMA,IS *Tolerance : As per IEC, IS





DETAIL-"X"
Latch & Lock Arrangement 4-Places on C

DESCRIPTION.	UNIT	E20075
Flow	m3 / Hr.	6120 (1700 L/S)
Total Bowl Head	mtr	6.5
Speed	RPM	730
Type Of Equipment		Axial Flow Submersible Pump
MODEL		WVP-130-30(P30)
Number of Stage		1
Pump Input at Duty Point	KW	143.06
Minimum Submergence	mm	2300
MOTOR RATING 50 Hz, 380 V	KW	220
MOTOR SPECIFICATION		
Degree of Protection		IP 68
Insulation Class		F
Cable Length		10 Mtr.
Voltage / Phase / Frequency		400 / 3 / 50
Motor Rating KW		220
RPM		770
Starting Method		VFD

Sl No.	DIMENSIONS	WVP-130-30 (P30)
1	A (mm)	950
2	B (mm)	1000
3	C (mm)	2018
4	D (mm)	3018
5	E (mm)	950
6	MS (mm)	2300

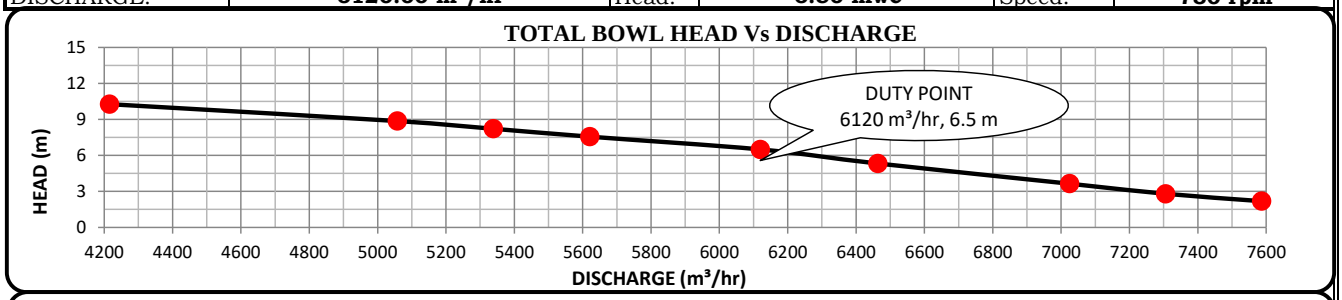
		No.	REVN.	SIGN / DATE
				SCALE : NONE
				NAME / DATE
GENERAL ARRANGEMENT DRAWING OF DEWATERING SUBMERSIBLE PUMP			DRAWN :	**DS** 27-May
			CHECKED :	**AM** 27-May
			APPROVED :	**AM**
Robinson Dry Dock	<= PROJECT		Drg. No.	**SE233266-21**
			Page 1	REVN NO. **0**

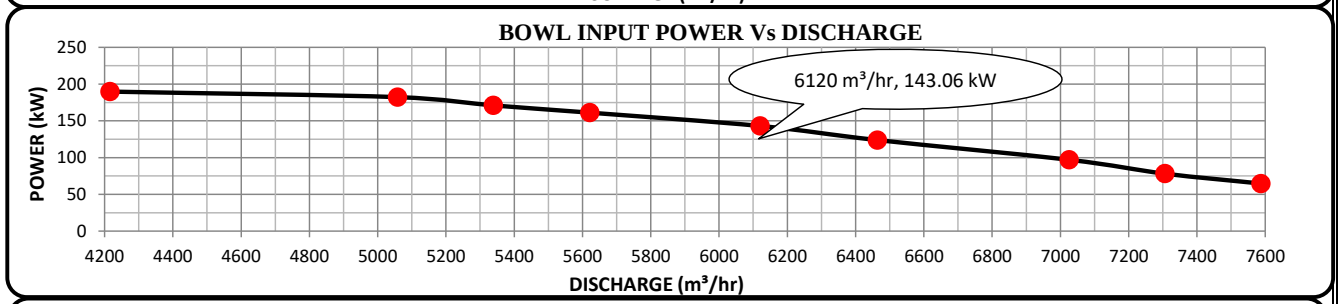
Submersible Motor	Technical Data Sheet of Motor Project: Robinson Dry Dock				
Ref: No.	SE23266-21	Qty	2	Date	02.06.2021

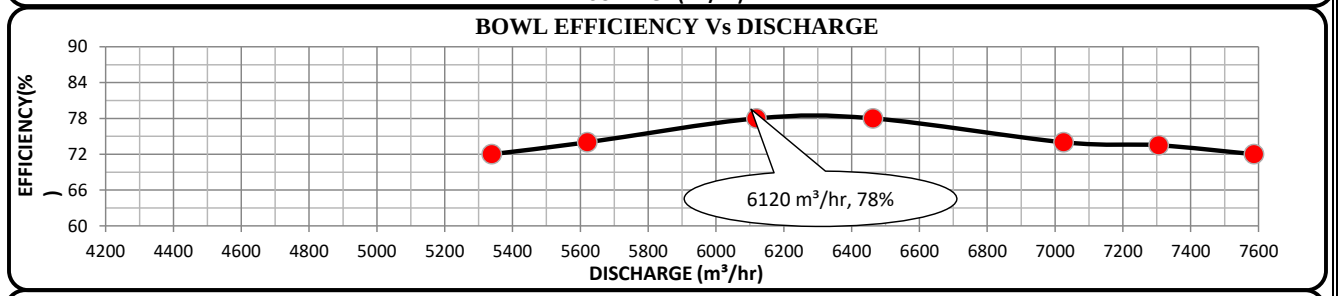
Sl No.	Defination	Data	Unit	Remarks
1	Motor Rating	220	KW	295 H.P.
2	Enclosure	Tatally Enclosed		
3	Method of Cooling	CACW		Submersible
4	No. of Poles	8		
5	Speed	742	RPM	
6	Frequency	50	Hz	± 5%
7	Phase	3	Ph	
8	Installation	Outdoor		
9	Rated Voltage	400	Volt	± 10%
10	Starting Method	Soft Starting		
11	Drive System	Direct Coupled		
12	Starting Current	1573	Amp	
13	Rated Current	242	Amp	
14	Slip	1.6	%	
15	**Load Characaristics**	**Load %**	**Efficiency**	**Power Factor**
16		100	92.6	0.82
17		75	92.6	0.80
18		50	91.0	0.71
19	Rated Torque	245.0	Kgm	
20	Starting Torque	200% of FLT		
21	Maximum Torque	250% of FLT		
22	Motor GD2	68	Kg-m2	
23	Direction of Rotation	CCW		When Viewed from Top
24	Degree of Protection	IP68		
25	Service Factor	1.05		
26	Insulation Class	F		Resin Rich varnish treated, Tropicalized
27	Maximum Ambiant Temp	40	Deg C	
28	Humidity	100	%	
29	Noise Level	90	db(A)	At no load
30	Vibration Level	63.5	micron	
31	Temperature Rise	105	Deg C	res.method
32	Bearing Temperature Rise	70	Deg C	
33	Bearing Type	Antofriction		SKF/FAG-MFG.
34	Bearing Lubrication	Grease		
35	**Accessories**			
36	Bearing Temperature detector RTD PT100 (For DE & NDE)			
37	Winding Temperature Detector RTD PT100 (Two Point / Phase - R,S,T)			
38	Leakage Detector (Float Type - NO/NC signal) and Moisture Probs (4-20 mA signal)			
39	Vibration Sensors			
40	Submersible Power Cable			
41	Submersible Sensor Cable			

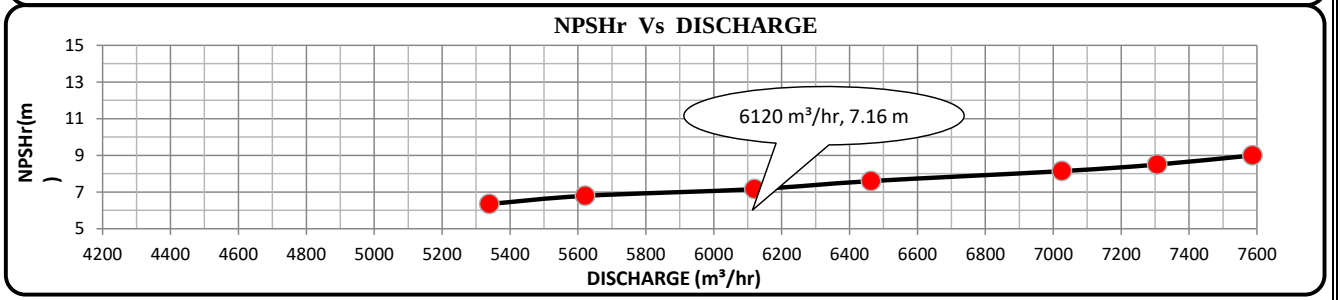
Standards : IEC 60034, NEMA,IS *Tolerance : As per IEC, IS

		Revision	1	Date:	12-Jun-21
DOC. NAME	**PERFORMANCE CURVE OF Axial-FLOW SUBMERSIBLE PUMP**				
MODEL:	**WVP-130-30 (P30)**	Sp. Gr.	1.00	No. OF STAGE:	**1**
DISCHARGE:	**6120.00 m³/hr**	Head:	**6.50 mwc**	Speed:	**730 rpm**









Client: H&I
Project:Robinson Dry Dock

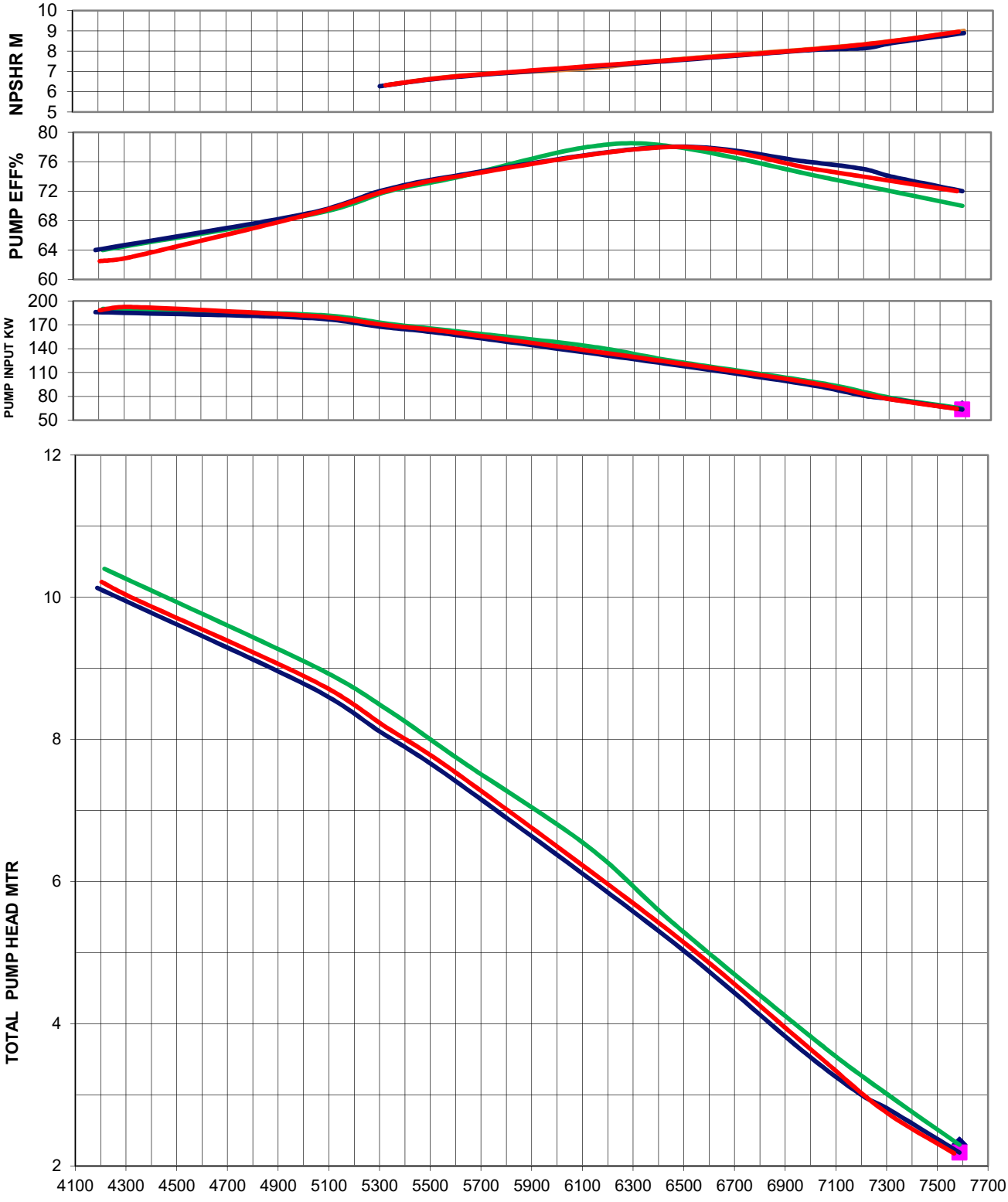
VARIABLE SPEED CURVE

PUMP MODEL- 1-Stg, WVP-130-30 (P30)(Variable Speed Curve at 730 R.P.M, 728 R.P.M, 725 R.P.M

==> 728 RPM Curve, 4320 M3/hr. @ 10Mtr. Head

==> 725 RPM Curve, 7200 m3/hr. @ 3.0 Mtr. Head

==> 730 RPM Curve, 6120 m3/hr. @ 6.5 Mtr. Head



3. **Lead Time**
   Delivery Period – 24 – 28 weeks from date of order
   Pump assembled in South Africa

4. **Warrantees/Guarantees**
   Standard Warranty is 18 months from the date of supply or 12 months from the date of commissioning, whichever comes first.

5. **Aftermarket Support Services, Spares Availability, Maintenance and Repairs**
   APE has a fully equipped workshop in Johannesburg with service technicians as well as field service technicians to attend to breakdowns on site. Refer attached maintenance manuals.

6. **Additional Corrosion Protection Measures**
   No additional corrosion protection offered.

7. **Life expectancy in marine conditions**
   For life expectancy in marine condition: Duplex SS & SS 316 make pumps durable in marine environments with long service life. In similar applications where similar pumps have been supplied by the OEM, pumps are running satisfactory with preventive yearly maintenance

8. **Technical Review Clarifications**
   Some technical review clarifications requested by the Employer was impractical to include in the body and format of this revised OEM submission due to either disrupting the flow to this document or it being a query that will be dealt with more in detailed design and not perhaps material to the selection of the equipment.

   Where we were unable to include in the sections of this OEM submission, we include the full query list as annexures to this document.
   - Annexure 1 – TNPA PM queries ref TNPA 879 – Letter 008(H&)
   - Annexure 2 – Contractor's response to TNPA queries in annexure 1, ref 331/ak/006/2022

ANNEXURE 1

TRANSNET
national ports authority

H&I Civil Engineering (Pty) Ltd
Hillcrest Estate,
Tygerberg Valley Road
Durbanville
Cape Town
7551

Date: 21 February 2022

Enquiries:
Deepthi John
Email: Deepthi.John@transnet.net
Tel : +27 72 305 5034

Attention: Mr Faizel Isaacs
Tel: +27 82 616 0026
Email: fisaacs@hiconstruction.co.za
Doc No: TNPA 879 – Letter 008(H&I)

Dear Sir,

Contract Number : TNPA 879
Description of Works : Design, Development, Procurement, Construction and commissioning of the Robinson Dry Dock Dewatering System in the Port of Cape Town

Subject: OEM Submission for Approval – Main Pumps – APE

The *Project Manager* acknowledges the receipt of the *Contractor*'s email on 16 February 2022, at 19:02, relating to the OEM Submission for Approval – Main Pumps – APE (ref IA331-DS-003).

We have reviewed the Contractor's submission in line with NEC clause 21.2. Below are comments from the team and items that require clarification and further information:

1. Provide references where APE pumps have been used usefully before (as per the specification).
2. Provide inputs/ parameters for determination of static head.
3. Provide inputs/ parameters for determination of system curves.
4. Pump capacity is 1700l/s @6.5m as per the specification, this must be confirmed on the system curve.
5. Provide simulation/ models proving the dock can be emptied within 4 hours. The submission states that the pump is able to do it.
6. Page 6 of 60 shows a 185kW motor while page 8 of 60 shows 220KW, which is correct?
7. Page 9 of 60 refers to the use of soft starters, VSD/ VFD is required.
8. Does maximum allowable sphere size refer to solids handling capacity?
9. Confirm that all parts in contact with sea water are made from duplex stainless steel.
10. Provide the duration for life expectancy.
11. What is the guaranteed bearing life?
12. What testing method (and specification) will be used on the pump?
13. The insulation rating is F whereas the specification calls for H.

14. Rectify and provide clarity on the comments on the submitted document, OEM Submission for Approval – Main Pumps – APE (ref IA331-DS-003).

Based on the submitted information the Project Manager is not able to accept the submission as it is not in accordance with the Works Information. The Project Manager requests that the Contractor provide further information and address the above comments from the team.

Regards

D John

D. John
NEC Project Manager

Distribution:	NEC Project Manager –TNPA: D. John	Contractor: F. Isaacs	Engineer: M. Lengane
Cost Engineer: M Juqu	Contracts Lead: R. Hendriks	Program Manager: X Ntshokoma	Planner: M Mararakanye

Haw & Inglis Civil Engineering (Pty) Ltd

Our Ref: 331/ak/006/2022 via email

4 March 2022

The Project Manager
Transnet National Ports Authority
Division of Transnet SOC Ltd
34 South Arm Road
Cape Town
South Africa
8000

Attention: **Mrs Deepthi John**
Deepthi.John@transnet.net

TNPA 879/CIDB: DESIGN DEVELOPMENT, PROCUREMENT, CONSTRUCTION AND COMMISSIONING OF THE ROBINSON DRY DOCK DEWATERING SYSTEM, PORT OF CAPE TOWN

OEM Clarifications – APE (Main Pump)

Dear Deepthi,

Subsequent to receipt of your correspondence, your ref TNPA 879 – Letter 008(H&) received 21 February 2022, we provide clarification as requested:

1. Response By OEM:
   Completion certificates from some end users are attached. Refer ***Annexure 1***

2. Response by Designer:
   Please refer Basis of Design Report P07551-WAT-BOD-001-B

3. Response by Designer:
   Please refer Basis of Design Report P07551-WAT-BOD-001-B – Figure 3.1

4. Response by Designer:
   Please refer Basis of Design Report P07551-WAT-BOD-001-B – Figure 3.1

5. Response by Designer:
   Dock draw-down schedule (based on conservative assumptions) was provided.

CONTACT DETAILS
| +27 (0)21 976 1110
| +27 (0)861 444 768
| mail@hiconstruction.co.za
| www.hiconstruction.co.za

BUSINESS DETAILS
BBBEE LEVEL 1
Company Reg | 1969/008806/07
VAT Reg | 4630102129

POSTAL ADDRESS
Private Bag X3,
Durbanville, 7551
Hillcrest Estate,
Tygerberg Valley Road

6. Response By OEM:
   We provide both 185kW and 220kW motor ratings for fixed and variable speed drives respectively. 220kW will be provided in this application.

7. Response By OEM:
   We provide both applications. VSD/VFD application on this project.

8. Response By OEM:
   Correct

9. Response By OEM:
   Confirmed

10. Response By OEM:
    With proper preventive maintenance and timely replacement of spare parts offered pumps can run more than 20 years.

11. Response By OEM:
    50,000 working hours

12. Response By OEM:
    Standard QAP for Pump testing is attached. Refer ***Annexure 2***

13. Response By OEM:
    Motor will be supplied with Class H insulation.

14. Response to comments on OEM submission:(revised OEM submission IA331-DS-003 Rev 02 attached as ***Annexure 3***):
    14.1. Page 3 comment #1 – corrections made on annexure 3
    14.2. Page 3 comment #2 – corrections made on annexure 3
    14.3. Page 3 comment #3 – corrections made on annexure 3
    14.4. Page 3 comment #4 – corrections made on annexure 3
    14.5. Page 3 comment #5 – corrections made on annexure 3
    14.6. Page 4 comment #1 – corrections made on annexure 3
    14.7. Page 4 comment #2 – corrections made on annexure 3
    14.8. Page 7 comment #1 – motor can run dry for approximately 1hr, but thereafter it is advisable to have a minimum velocity of 0.3m/sec. There is no instance where dry running is envisaged.
    14.9. Page 7 comment #2 – point is taken. Statement is based on information provided by H&I.
    14.10. Page 12 comment #1 – With proper preventive maintenance and timely replacement of spare parts offered pumps can run more than 20 years.

Yours faithfully,
For H&I CIVIL ENGINEERING (PTY) LTD

F Isaacs
Project Manager

cc
Morena Lengane Morena.Lenagne@transnet.net
Ronel Hendricks Ronel.Hendricks@transnet.net
Michael Mararakanye Michael.Mararakanye@transnet.net
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Document Control TNPADocControlCT@transnet.net

ANNEXURE 1

WIROON & GWYNESS COMPANY LIMITED
บริษัท วิรุฬห์ แอนด์ เกวนเนส จำกัด
80/30 Tiwanon48 Rd., T.Thasai, Muang, Nonthaburi 11000 Thailand. Tel.0-2952-2561 Fax.0-2952-3273
Email: info@wgflow.com, Website: www.wgflow.com

NO. WG / MS-15001

TO WHOM IT MAY CONCERN

SUPPLY CERTIFICATE

We hereby certify that model Axial Flow Submersible Pump - bottom suction type coupled, manufactured and supplied by "WPIL LIMITED of INDIA".

The principle characteristics of equipment as supplied and installed are.

1. Drainage pump

Location of Pump Station	:	Hua Ko Station, Samut Pra Kan Province, Thailand
Contract Parties	:	Samutprakan Provincial Administration
Date of delivery	:	November 2011
Number of unit	:	1 Set
Type	:	Axial Flow Submersible Pump
Model	:	P36
Rated capacity	:	3 m^3/sec.
Rated head	:	3 m.
Rated Power	:	132 kW
Operation perfaormance	:	Handling sewage/drainage water, commissioned in December 2011 and has been running satisfactorily.

2. Drainage pump

Location of Pump Station	:	Bang Ta Nai and Bang Sai Station, Nonthaburi Province, Thailand
Contract Parties	:	RID Nonthaburi
Date of delivery	:	November 2012
Number of unit	:	4 Sets
Type	:	Axial Flow Submersible Pump
Model	:	P20
Rated capacity	:	1 m^3/sec.
Rated head	:	4 m.
Rated Power	:	55 kW
Operation perfaormance	:	Handling sewage/drainage water, commissioned in September 2012 and has been running satisfactorily.

WIROON & GWYNESS COMPANY LIMITED
บริษัท วิรุฬห์ แอนด์ เกวนเนส จำกัด
80/30 Tiwanon48 Rd., T.Thasai, Muang, Nonthaburi 11000 Thailand. Tel.0-2952-2561 Fax.0-2952-3273
Email: info@wgflow.com, Website: www.wgflow.com

3. Drainage pump

Location of Pump Station	:	Bang lane Station, Nakhon Pathom Province, Thailand
Contract Parties	:	Rid Nakhon Pathom
Date of delivery	:	January 2013
Number of unit	:	10 Sets
Type	:	Axial Flow Submersible Pump
Model	:	P20
Rated capacity	:	1 m3/sec.
Rated head	:	3 m.
Rated Power	:	45 kW
Operation perfaormance	:	Handling sewage/drainage water, commissioned in January 2013 and has been running satisfactorily.

4. Drainage pump

Location of Pump Station	:	Kud Chiang Sa Station, Roi Et Province, Thailand
Contract Parties	:	RID
Date of delivery	:	May 2013
Number of unit	:	5 Sets
Type	:	Axial Flow Submersible Pump
Model	:	P36
Rated capacity	:	3 m^3/sec.
Rated head	:	4 m.
Rated Power	:	185 kW
Operation perfaormance	:	Handling sewage/drainage water, commissioned in September 2013 and has been running satisfactorily.

Given on this 6th February 2015

(Mr. Jirawich Kasuwan)
Director

SAHAKIM MOTOR CO.,LTD.
46-52 ถ.เฉลิมเขตร์ 3 แขวงวัดเทพศิรินทร์ เขตป้อมปราบศัตรูพ่าย กรุงเทพฯ 10100
โทร.02-621-5761-8 แฟกซ์ 02-621-5770 เลขประจำตัวผู้เสียภาษี 0105512000836
www.sahakimmotor.co.th

Ref. No : SKM6109001

Date September 3rd, 2018

COMPLETION CERTIFICATE

To whom it may concern,

We hereby certify that the model Submersible Centrifugal Pump – bottom suction type manufactured and supplied by **"WPIL LIMITED of INDIA"**

The principle characteristics of equipment as supplied and installed are :-

1. Location of Pump Station : **TUB MAR RAYONG PROVINCE, THAILAND (Royal Irrigation Department)**
2. Contract parties : **Saha Kim Motor Co.,Ltd.**
3. Date of Delivery : **August, 2017**
4. Number of Unit : **5 Nos.**
5. Pump Type : **Axial flow submersible centrifugal pump**
6. Rated Capacity : **5m3/sec**
7. Motor Rating : **340kW, 12 Pole, 50Hz, 3 Ph, 380 Volt**
8. Operation Performance : **Commissioned in July, 2018 and has been running satisfactory**

Saha Kim Motor Co.,Ltd.

บริษัท สหคิมมอเตอร์ จำกัด
SAHA KIM MOTOR COMPANY LIMITED

Yos Thanarakchoke

Managing Director

ANNEXURE 2

		MANUFACTURING QUALITY PLAN FOR SUBMERSIBLE PUMP			**QP No.**				**Customer**				
					Rev. No.	**0**	**Date**		**P.O. No.**				
		Job No.			**Pump Model**				**Project**				
SL. NO.	COMPONENT & OPERATION	CHARATERISTICS	CLASS	TYPE OF CHECK	QUATUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
									M	**C**	**O**		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**	
1.0	**Raw Material**												
1.1	Casing/Impellers/ Shaft	Mechanical & Chemical Properties	Critical	Mechanical & Chemical	1/Heat	Apprd. Data Sheet/ Appd Drg.	Relevant Material spec.	Compliance Certificate	P	V	V	Compliance Certificate	
2.0	**Inprocess inspection**												
2.1	Impeller	Dynamic Balancing	Critical	Balancing	100%	ISO 1940	ISO 1940 Gr 6.3	Balancing certificate	P	V	V	Compliance certificate	
2.2	Hydro Test of Pressure Parts	Leak Tightness	Critical	Testing	100%	Manufacturer test procedure	No Leakage	Hydrotest certificate	P	V	V	Test at 1.5XShut Off, Duration -30min	
3.0	**Final Inspection**												
3.1	Performance Test of complete pump Set	Q Vs H, Q Vs N, Q Vs P, Noise, Vibration,	Critical	Performance Test	100%	Manufacturer Test Procedure	IS 5600	Performance Test Report	P	W	W		
3.5	Complete Pump & Accessories	Painting	Major	Visual	100%	As per Manufacturer Procedure	Procedure no. WI 9.2.138.	--	P	-	-		
		Packaging	Major	Visual	100%	As per Manufacturer Procedure	As per Procedure	Packing Slip	P	-	-		

NOTES:

1. This QAP is also applicable for spares if ordered.
2. Dynamic Balancing of Impeller—Single Plane Balancing in case of D/B>6 & Two Plane Balancing in case of D/B<6 where D is Impeller OD & B is Impeller Volute width
3. Manufacturer to test all Pump sets and one Pump set per type, selected randomly shall be offered for witness . Pump set up to 15 KW rating shall not be offered for witness and only Manufacturer internal test report shall be presented for review.

LEGEND: M: MANUFACTURER/SUB CONTRACTOR C: CONTRACTOR/ THIRD PARTY INSPECTION AGENCY O: OWNER/ CONSULTANT P: PERFORM V: VERIFICATION OF REPORTS W: WITNESS IR : INTERNAL RECORD MTC : MANUFACTURER TEST CERTIFICATE	MANUFACTURER SEAL AND SIGN	NAME & SIGN OF APPROVING AUTHORITY & SEAL
		Format no.

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APE pumps

Mather+Platt

Submersible Axial flow column pumps WQDWM
Submersible Propeller Pumps WQDWA

Installation and Operating Instructions
For
Submersible Motor & Pump

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NOTE: - APE designs are being continuously improved and are thus subject to change without notice.

The pump sets/motor designed as per customer requirements will not exactly match the data provided in the manual.

1 General

These **Installation and Operating Instructions** contain basic instructions of safety hints which must be observed during transport, installation & commissioning. For this reason it is essential that they are read by the installing technician as well as by relevant skilled operators or users. They should also be always available where the unit is installed.

Safety Instructions which might cause danger to life in case of non-observance have been specifically highlighted with the general danger symbol.

The presence of a dangerous voltage is identified with the safety
l

This symbol indicates the danger of an explosion occurring,

ATTENTION ***Appears at safety hints, the non- observance of which could damage the unit or affect its functioning.***

NOTE ***Used for important pieces of information.***

1.1 Correct usage of the products

In the case of any faults arising, the APE units should be immediately be taken out of use and secured. The fault should be immediately rectified or, if necessary, contact your APE service centre/ firm.

ATTENTION ***Repair work on explosion-proof motors may only be carried out in authorized work-shops by qualified personal using original parts supplied by the manufacturer.***
Otherwise the ex-approvals are no longer valid.

ATTENTION ***After repair work in not authorized workshops by not qualified personnel the ex-approvals is no longer valid. After such repair the unit must not be operated in hazardous areas.***

ATTENTION ***All regulations and guidelines, which may vary from country to country must be followed without exception***

Limitations: Fluid temperature maximum 40° C (104° F)
Immersion depth maximum 20 m (65 ft)

For the operation of units as explosion-proof execution the following applies:
In hazardous areas care must be taken that during switching on and operation of the pumps the pump section is filled with water (dry installation) or alternatively is submerged or under water (wet installation with cooling jacket. Other types of operation e.g. snore operation of dry running are not allowed.

For the operation of explosion-proof submersible pumps in wet-well installation without cooling jacket applies:
It must be ensued that the motor of the ex-submersible pump is fully submerged during start up and operation.

For the operation of explosion-proof submersible pumps applies:
The temperature monitoring of the explosion-proof submersible pumps has to be carried out by **bimetallic temperature limiters** or thermostats accordingly connected to the suitable release device.

1.2 Application areas for the series WQDWM

The APE mixed flow column pump of the WQDWM series have been developed for the environmental protection, water supply, municipal sewage treatment and dewatering of the polders.

They are suitable for the following liquids:

- Raw water with solid or fibrous material.
- Sewage
- Surface water, rain water, drainage water
- Sludge

The WQDW are installed in **concrete sump** or **steel pressure pipe** using a suitable coupling ring

1.3 Application areas for the series WQDWA

APE submersible propeller pumps of WQDWA are designed for toes' applications where large water volumes must be pumped at low heads (up to 10 m/33 ft).

They are suitable foe following liquids

- Fresh and process water pumping
- Raw water for drinking water supply
- Surface and rain water

The WQDWM pumps are installed in a **concrete sump** or in a **steel pressure pipe** using a suitable coupling ring.

1.4 Technical Data

Please take the technical data and the weight from the nameplate. Please take the dimension of the units from the resp. dimension drawing.
The maximum noise level of the units of the series is </= 70Db (A).

2 TRANSPORT AND STORAGE

Depending upon the model and of installation, the units are prepared at the factory for vertical and horizontal transportation.

Depending upon the version, the units are fitted with a lifting hoop (serves for vertical installation), eyebolts (option) or attachment (horizontal installation), to which a chain can be fastened by means of shackles to transportation, installation or removal.

ATTENTION ***Instead of attachments swivels the pumps for vertical installation have hex screws as protection for the threads. These should not be removed.***

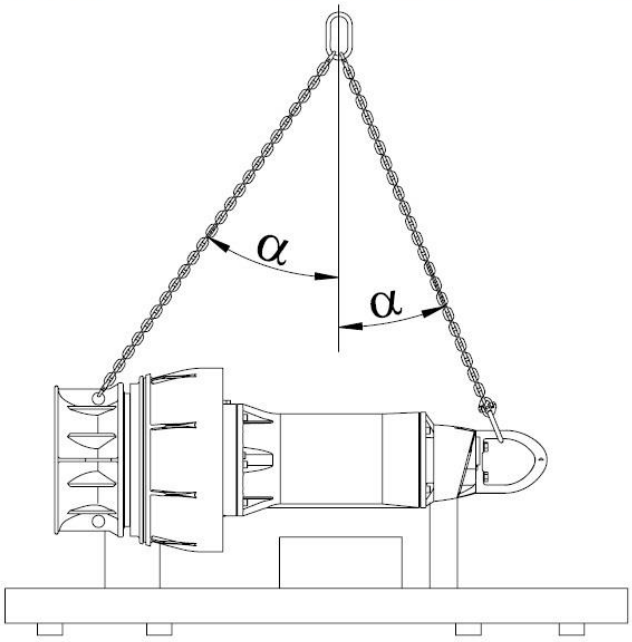


Figure 3 Transport in a horizontal manner WQDWA/WQDWM

ATTENTION ***α max. </=45°. The angle α between the centre line of the unit and the lifting tools should not exceed 45°.***

2.1 Transport securing devices

The motor connection cables are protected against the ingress of moisture along the cables by having the ends sealed at the works with protective covers.

These protective covers should only be removed immediately prior to connecting the pumps electrically.

ATTENTION ***These protective covers only provide protective against spray or similar and are not a water tight seal. The ends of the cables should not be immersed in water; otherwise moisture could enter the connection chamber of the motor.***

NOTE ***If there is a possibility of water ingress then the cables should be secured so that the ends are above the maximum possible flood level.***

ATTENTION ***Take care not to damage the cables or its insulation when doing this.***

In order to avoid damage to the pump shaft or the bearings during horizontal transport, the shaft is clamped in axial direction when leaving the works.
The transport securing device of the pump shaft should only be removed immediately before installation or connecting up the pump.

2.2 Storage of the units

ATTENTION ***APE products must be protected from weather influence such as UV from direct sunlight, high humidity, aggressive dust emissions, mechanical damage, frost etc. The APE original packaging with the relevant transport securing devices (where used) ensures optimum protection of the units, if the units are exposed to temperature under 0°C/32°F check that there is no water in hydraulics, cooling system, or other spaces. In the case of heavy frosts, the units and cable should not be moved if possible. When storing under extreme conditions, e.g. in tropical or desert conditions suitable additional protective steps should be taken. We would be glad to advice you further***

NOTE ***APE units do not generally require any particular maintenance during storage. After long storage periods (after approx. one year), the transportation locking device on the motor shaft several times in hand, and new lubrication oil or, depending on the version, a small amount of coolant (which also serves to cool or lubricate the mechanical seals) is applied to the sealing surfaces, thus ensuring perfect operation of the mechanical seals. The bearings supporting the motor shaft are maintenance-free.***

3 Monitoring System

3.1 Motor Monitoring System

Motor equipment:

Motors		**WQ**	
Monitoring		**Std**	
Stator	Bi-metallic	•	•
	Thermistors (PTC)	○	○
	PT 100	-	-
Seal Monitor	Separation Chamber	•	•
	Motor Chamber	○	○
	Connection Chamber	○	○
Bearing Temperature Upper/Lower	Bi-metallic	○	○
	Thermistors (PTC)	○	-
	PT 100	○	-

• = Standard
○ = Option
\- = not possible

3.2 Temperature monitoring of the stator

Thermal limiters protect the stator from overheating in case of asymmetric phase loading or voltage, continuous dry running or excessive temperatures in medium itself. The stator is equipped with three bimetallic thermal limiters (optional PTC) which are connected in series. Additionally it is possible to fit temperature dependent resistors (PT 100(not for Ex)) with linear characteristics.

3.3 DI-Electrode

The DI-electrodes carry out the seal monitoring function and signal the ingress of moisture into the motor by means of a special electronic device.

ATTENTION ***Thermistors or PT 100 devices must never be directly connected into the control or power system. They must always be connected to suitable evaluation device. The temperature limiting switches may only be operated as specified by manufacturer (See table below).***

Operating voltage**…AC/…DC** **…500 V ~/…101 V=**

Rated voltage **AC** **250V**

Rated current **AC COSØ= 1.0** **2.5A**

Rated current **AC COSØ= 0.6** **1.6A**

Max switching current at **in** **5.0A**

The thermal monitoring circuit (f1) must be wired into the motor contactors in such a manner that manual reset is required.

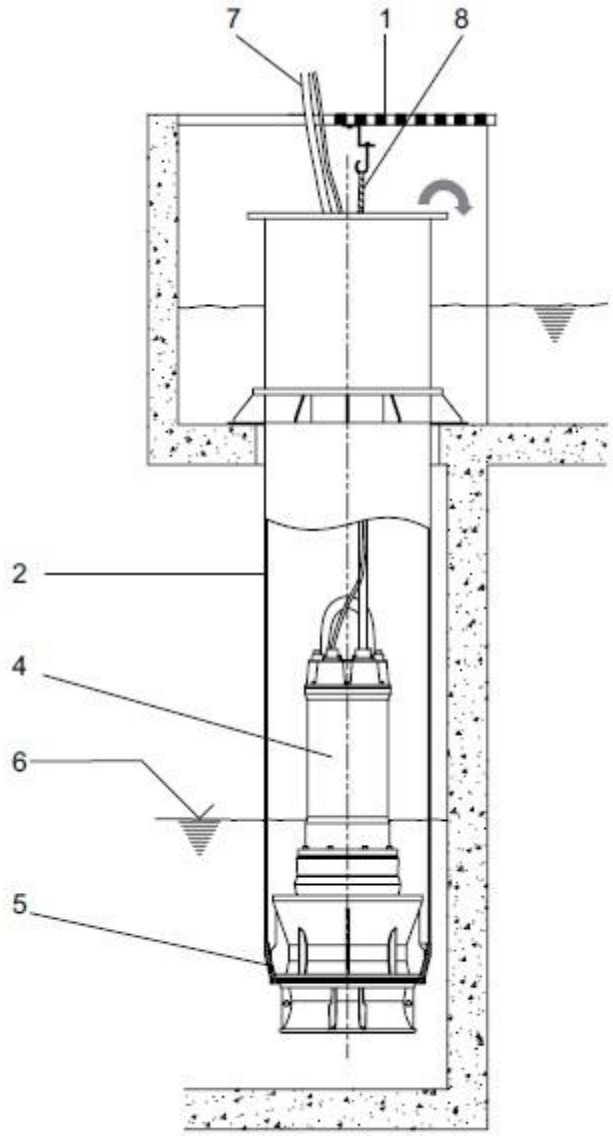
ATTENTION ***The maximum switching ability of the thermal sensors is 5A, the rated voltage 250 V. Explosion –proof motors which are connected to static frequency inverters must be fitted the thermistors. Activation must be by means of a thermistor protective relay device.***

3.4 Temperature monitoring of the bearings (Option)

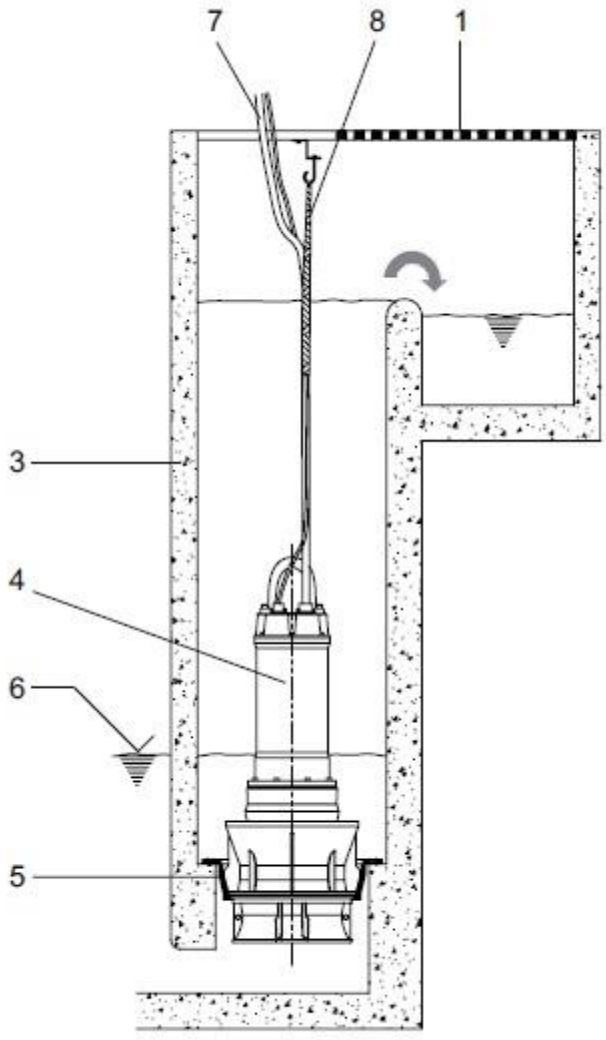
If bearing temperature monitoring is supplied, the standard version of the pump posses thermal limiter which opens at a pre-set temperature and is fitted into the bearing block. This allows switching off the motor to take place in plenty of time, e.g. where excessive bearing temperature due to wear occurs.

Switching temperature: Upper bearing=140°C/284°F Lower bearing=120°C/284°F

4 Installation examples with WQDWM and WQDWA submersible pumps



WQDWA/M in steel discharge pipe

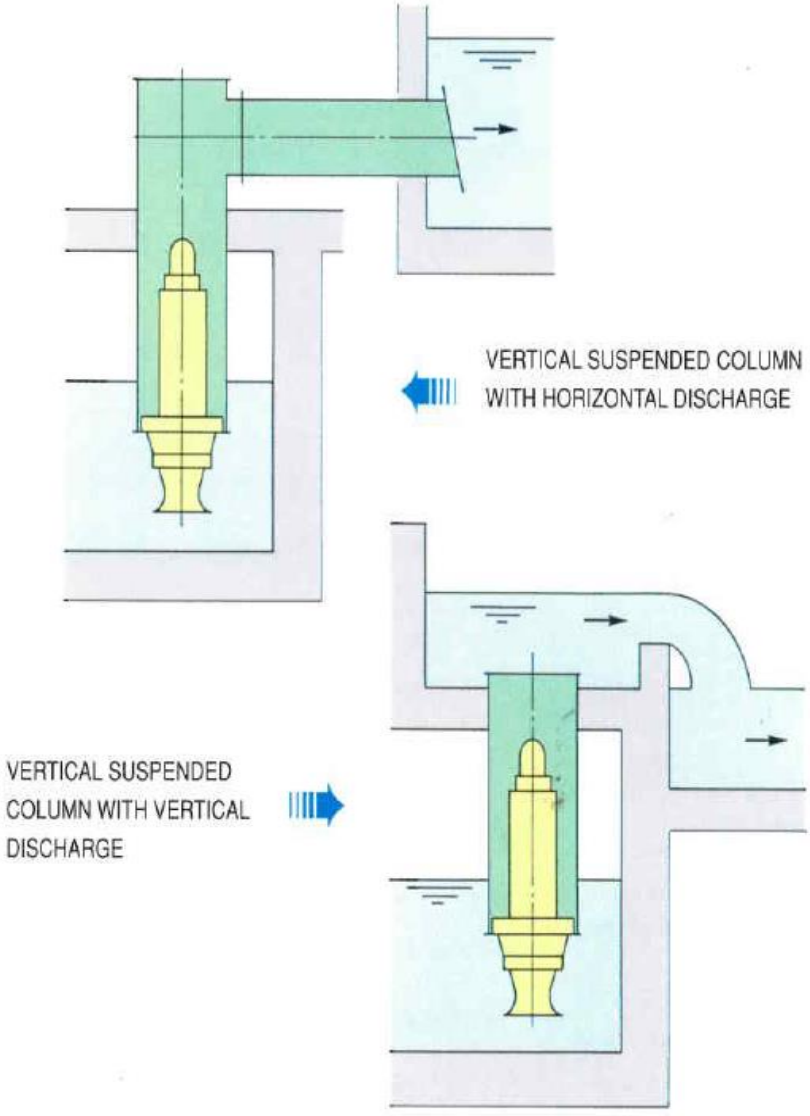


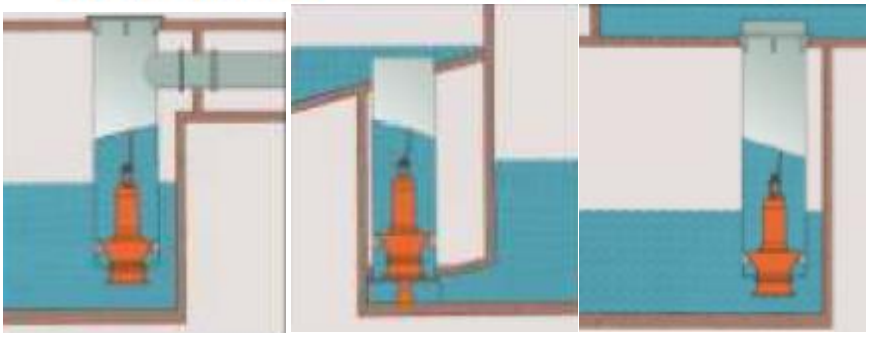
WQDWA/M in a concrete sump

Legend

1 Tank Cover
2 Discharge pipe(riser type)
3 Concrete sump
4 WQDWM/A Submersible pump
5 Coupling ring
6 Minimum water level(see installation drawing)
7 Connection Cable
8 Cable support (for fixing the power cable)

TYPICAL INSTALLATION





ATTENTION ***The power cables should be handled carefully during installation and removal of the pumps in order to avoid damage to the installation.***

- Fit a hoist to the submersible pump.
- With the aid of the hoist place the submersible pump carefully into prepared mounting frame and fasten .
- Fit the suction and discharge ports to the volute.

The coupling ring required for installation of the WQDWM/WQDWA submersible pump must already be installed as shown in fig. Before installation of pump a suitable support (hook) for the chain, as well as an opening and suspension (cable shock) for the cable must be provided in the pump or the riser pipe.
Before or during the installation the motor connection cables should be fitted on site with suitable strain relief (e.g. cable shocks). Particular care should be taken that the cable installation is not crushed or damaged by the weight of the hanging cable especially in the area of the cable inlet.

ATTENTION ***When raising the submersible pump out of the concrete sump of the discharge pipe with the hoist ensure that the connection cables are fitted out simultaneously as the pump itself is being raised .***

Lowering of the WQDWA and WQDWM submersible pump into the coupling ring

ATTENTION ***Before lowering the pump the direction of the rotation check should be carried out.***

- Draw the cable hose over the connection cable.

ATTENTION ***The steel riser pipe or the concrete sump must be cleaned thoroughly (builder's rubble etc.). To optimize the inflow and to reduce the noise level it is important that one pair of fins of the suction pipe are in line with the main flow direction of the inflow chamber. This must be observed when fitting the pump into the sump or into the steel discharge pipe.***

- Carefully lower the submersible pump with the hoist into the coupling ring in the sump. Take care that the cable is lowered simultaneously and cannot be lowered.
- Attach the lifting chain to the hook provided so that it cannot strike either the cable or the sump wall.
- Tension the pump cable and fasten to the hook provided with the aid of the cable sock. Where a steel pressure pipe is used the connection cable should be brought through the connection cable inlet and sealed off in a watertight manner.

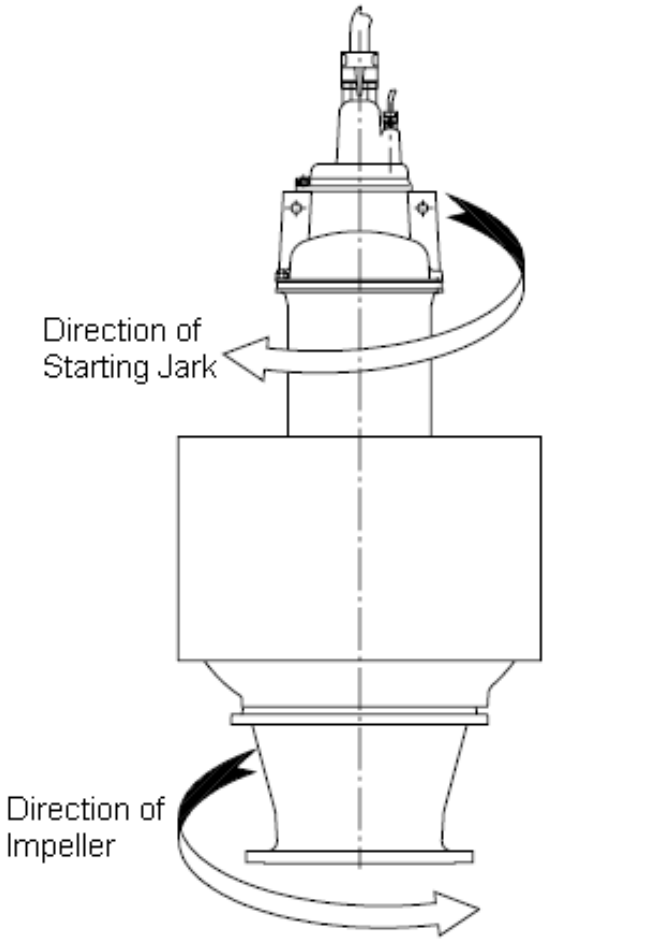
The connection cable should only be tightened sufficiently so that no tension acts at the cable inlet in the head of the pump, the connection should not strike the chain or the pump wall.

- If necessary, the steel is sealed off in the watertight manner.
- **Counter-Clock wise, when viewed from Top/Motor NDE**

DIRECTION OF ROTATION

Before lowering the pump into the sump, make electrical connections as indicated, and check the direction of rotation. This must be clockwise viewed from Suction End, Check impeller rotation by suspending pump from the lifting eyes, resting inclined on the floor, and start up for one second. The starting jerk should be clockwise viewed from driving.

Counter-Clock wise, viewed from Top/Motor NDE



Clock-Wise, viewed from Suction end

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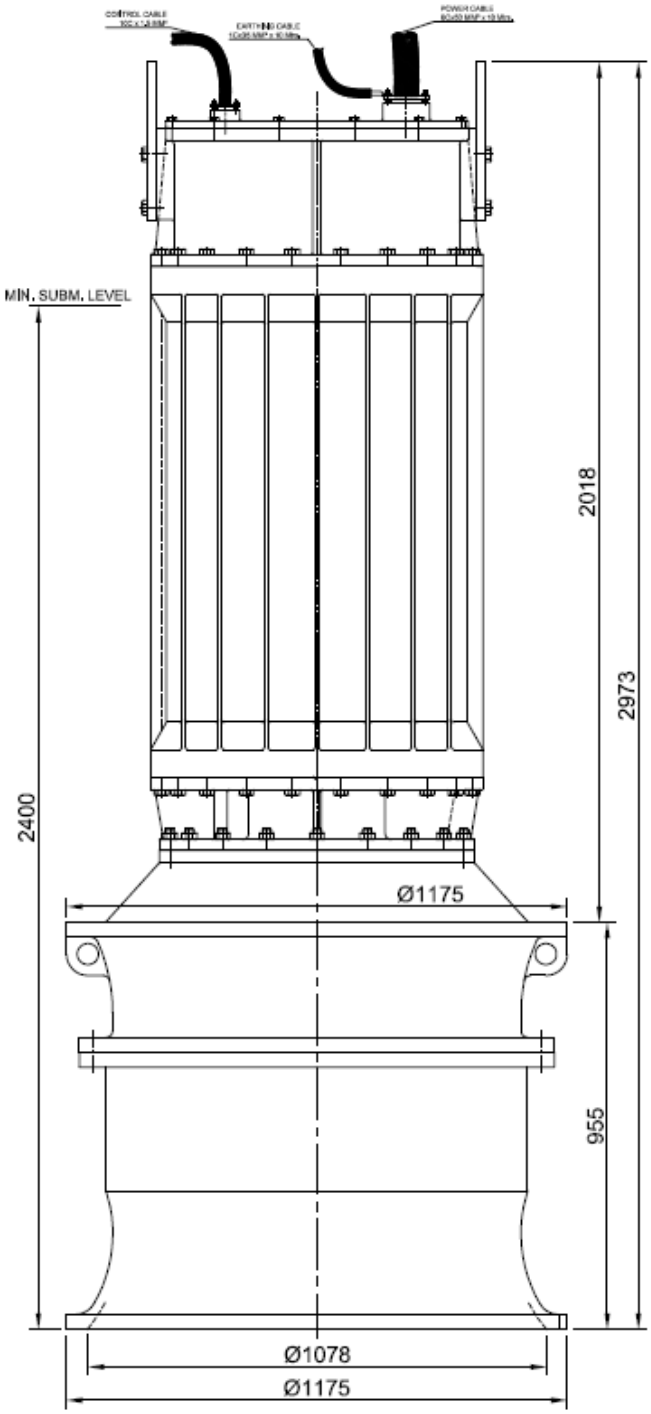
GA DRAWING MOTOR WITH PUMP



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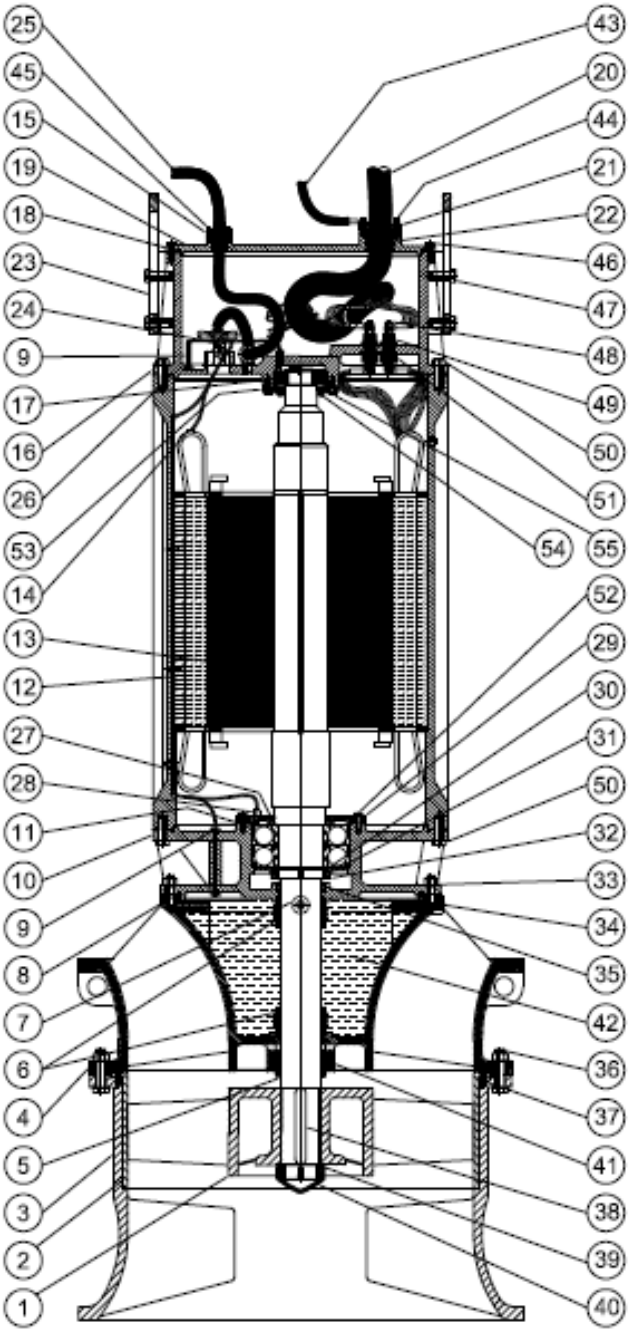
MOTOR & PUMP DRAWING



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PART LIST

NO.	DESCRIPTION
28.	BEARING TEMPERATURE SENSOR
27.	OIL SEAL
26.	"O" RING
25.	CABLE WIRE (Control)
24.	TERMINAL PLATE
23.	LIFTING LUG
22.	CABLE GROMMET
21.	CABLE GLAND
20.	CABLE WIRE (Power)
19.	COVER PLATE (Upper)
18.	"O" RING
17.	UPPER BEARING
16.	BEARING HOUSING/BRACKET (UPPER)
15.	CABLE GLAND
14.	WINDING TEMPERATURE SENSOR
13.	MOTOR ROTOR
12.	MOTOR STATOR
11.	LOWER BEARING (THRUST BEARING)
10.	BEARING HOUSING (LOWER/THRUST)
9.	LEAKAGE /MOISTURE DETECTOR SENSOR
8.	"O" RING
7.	PLUG FOR FILLING
6.	MECHANICAL SEAL
5.	MOTOR ROTOR SHAFT
4.	FLARE CUM DISCH. BOWL CASING
3.	SUCTION BELL/INLET NOZZLE
2.	LINER BOWL/BOWL WERAING RING
1.	PROPELLER (IMPELLER)

NO.	DESCRIPTION
55.	HEX. HD. CAP SCREW
54.	OIL SEAL
53.	BEARING COVER (Upper)
52.	HEX. HD. CAP SCREW
51.	TERMINAL BUSH CAP
50.	HEX. HD. CAP SCREW
49.	TERMINAL BUSH
48.	TERMINAL STUD BOLT WITH NUT
47.	HEX. HD. CAP SCREW
46.	HEX. HD. CAP SCREW
45.	STUD BOLT WITH NUT
44.	STUD BOLT WITH NUT
43.	CABLE WIRE (Earthing)
42.	TRANSARMER OIL (50 Ltr.)
41.	BUSH BEARING
40.	CAP NUT
39.	LOCK NUT
38.	KEY FOR PROPELLER
37.	CSK SUNK CAP SCREW
36.	HEX. HD. CAP SCREW
35.	OIL SEAL
34.	PLUG FOR VENT
33.	STUD BOLT WITH NUT
32.	BRG. LOCK NUT
31.	BRG. LOCK WASHER
30.	BEARING COVER/SHIELD (Lower)
29.	BEARING COVER (Lower)

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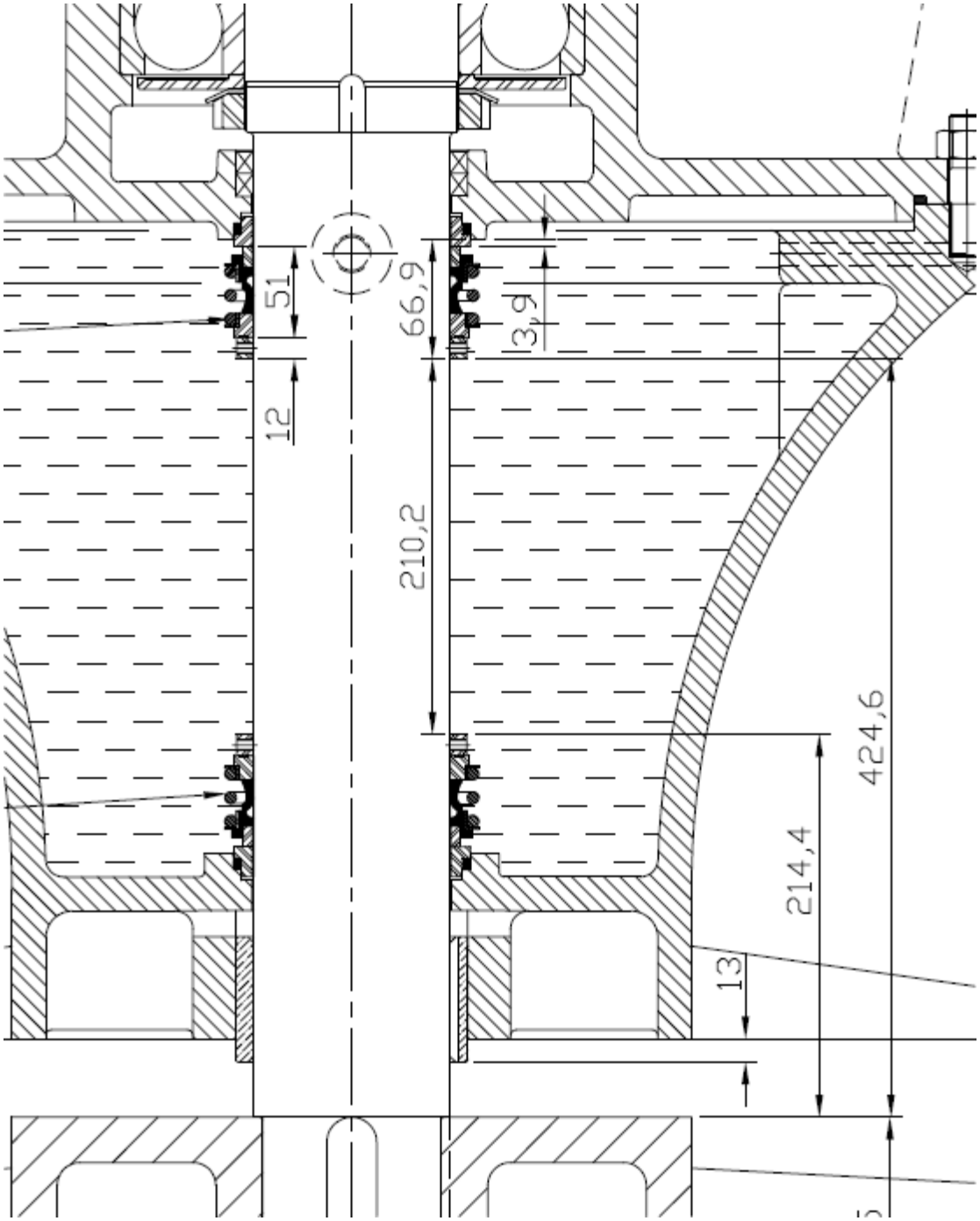
Installation of Mechanical Seal



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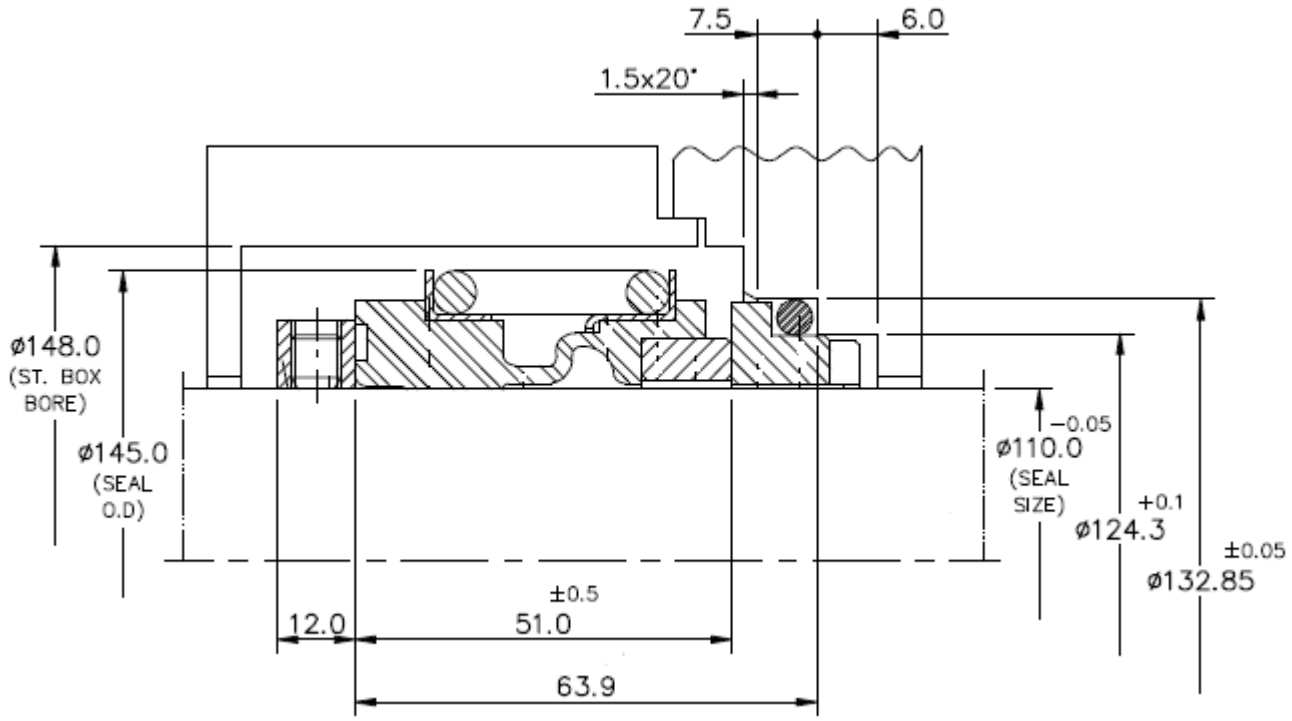
Drawing of Mechanical Seal



WQDWA/M - Submersible

SQUIRREL CAGE INDUCTION MOTOR

(Operation and Maintenance)

Project:

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SECTION 1. OPERATION

1.1 Installation and operating procedures
1.2 Initial starting procedures

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2.3 Insulation resistance
2.4 Recommended practice for drying
2.5 Lubrication and bearing
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3.9 Reassembly

SECTION 4. SERVICE GUIDE

SECTION 1. OPERATION

1.1 INSTALLATION AND OPERATING PROCEDURES

1.1.1 Before Starting The Motor For The First Time

a. Check the voltage and frequency of the line against the voltage and frequency designations on the motor and control nameplates. The motor will operate satisfactorily, but not necessarily in accordance with the standards established for operating at normal rating, with not more than a ±10% voltage variation and a ±5% frequency variation. Successful motor operation is also possible when the sum of the voltage and frequency variations do not exceed by ±10% the normal rating as stamped on the motor nameplate, provided the variation in frequency does not exceed ±5%.

b. Check all connections to the motor with the wiring diagram furnished with the Starters are certain that the motor is connected to the proper number of phases.

c. Be sure that all gaskets are in place and all bolts and screws are tight.

d. Be sure to re-grease or to fill the oil before the motor is run for the first time.

e. Inspect the motor for foreign materials and general cleanliness.
Be certain that there is no mechanical interference preventing rotation of the rotor.
Do not turn the rotor over by inching.

f. Check alignment of the motor and coupled load so that shaft and bearings of The motor will not be subjected to unnecessary strain and wear.

g. Space heaters should be turned off when motor is operating.

h. Be sure that the machine dry, particularly on the first and after the machine has stood idle for some time.
Take a mega ohm meter reading to determine the condition of the winding.

i. See if the rotor turns freely, when possible.

j. See that all auxiliary connections are correct and tight.

k. See hat drain and fill plugs or caps are in place and tight.

1.2 INITIAL STARTING PROCEDURES

1.2.1 Before Placing the Motor into Continuous Operation

a. Run motor without load to check connection, installation, and direction of rotation. Motor with straight radial blowers are suitable for either directional blowers can only be operated in the direction shown on the rotation plate attached to the motor.
If it is desired to reverse the direction of rotation, refer to the nearest APE office.

b. Operate the motor without load for approximately one hour to check for any unusual heating of bearings and winding.
This also permits lubrication warm up before torque is placed on rotating parts.

c. Check the bearing housing occasionally when the motor is first started under load, to be certain that overheating of the bearing does not occur.

SECTION 2. MAINTENANCE

2.1 MAINTENANCE

2.1.1 Periodic, systematic, and intelligent maintenance cannot be over emphasized as a major factor contributing to dependable and economical operation of your APE motor. Routine cleaning, lubrication, and inspection are preventive maintenance which keeps the motor in running condition and eliminates or greatly reduces repairs.

2.1.2 As an aid to systematic maintenance, it is desirable to keep records of all maintenance. These records sever as a guide to preventive maintenance and indicate what spare parts should be stocked to prevent lengthily motor outages.

2.1.3 Preventive maintenance should include routine check, the frequency of which depends on local conditions, for:
a. Cleanliness
b. Insulation resistance
c. Lubrication and bearing
d. Vibration
e. Surrounding factors such as excessive moisture, dust, etc.

2.2 CLEANLINESS

2.2.1 Dirt, dust, and oil are the greatest enemies of electrical equipment. When dirt or dust set on a machine, it may prevent heat dissipation and restrict ventilating passages. This in turn may lead to overheating and insulation breakdown.
Some types of dust are electrically conductive and also cause insulation breakdown.

2.2.2 Dust and dirt may be removed from electrical equipment with dry compressed air, with dry clothes or by brushing. The compressed air must be dry and at a low pressure (not over 25 P.S.I.) in order to prevent damage to the insulation. Grit, iron dust, graphite, lamp black and copper dusts should be removed by suction.
Hose tips for either pressure or suction should not be of metal.

2.2.3 Dust and dirt also have a harmful effect in that they tend to soak up oil or grease, forming, a gum which is not easily cleaned off. Oil is particularly damaging since it tends to deteriorate insulating varnish.

2.2.4 Oil or grease covered machines should be cleaned thoroughly and a fresh coating of insulating varnish applied. Usually most of the oil or grease can be removed with a cloth moistened with a solvent such as VM & P Naphtha. A brush should be used for surfaces difficult to reach by hand. Use a spray gun to clean inaccessible slots and passage.
After using the solvent, be sure to dry windings with dry compressed air.

2.2.5 Do not use a solvent which has toxic effects or which has a deteriorating effect on varnish.

2.3 INSULATION RESISTANCE

2.3.1 If the motor has been stored in a clean, dry location, drying of the winding insulation is seldom necessary. To determine if drying is necessary, check the insulation resistance with a mega ohm meter (Megger).
The insulation resistance can be measured by applying 1000V dc to the entire winding for one minute. This one minute reading is useful in evaluating insulation condition.

2.3.2 When comparisons are made between present and previous readings it is possible to observe the trend of the winding insulation condition. It is desirable when correlating successive or periodic readings to test at a definite voltage and time, and to record all other conditions.

Example :

100 megohms measured at 50℃

Fond megohms at 40℃

Conversion factor at 50℃ is 2.0 so megohms at 40℃ is 200 (2x100)

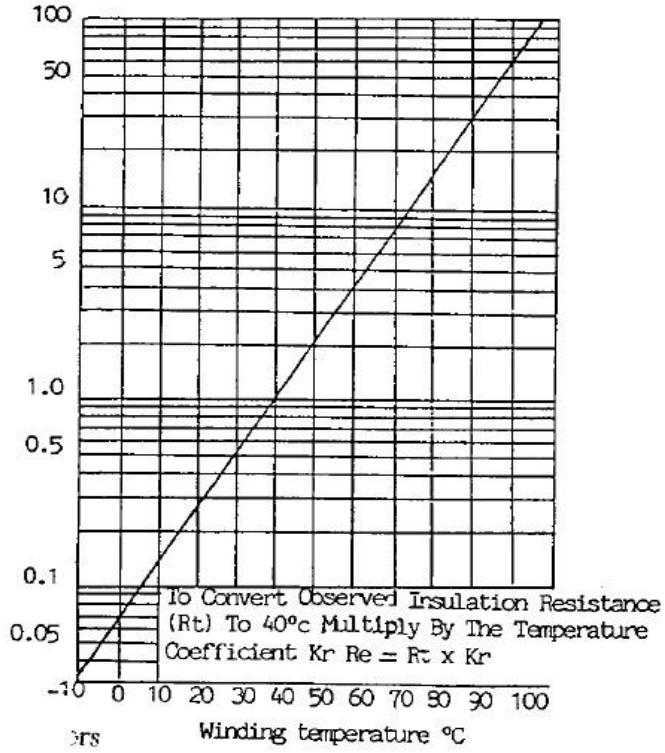


Fig. 1 Temperature Conversion Factors

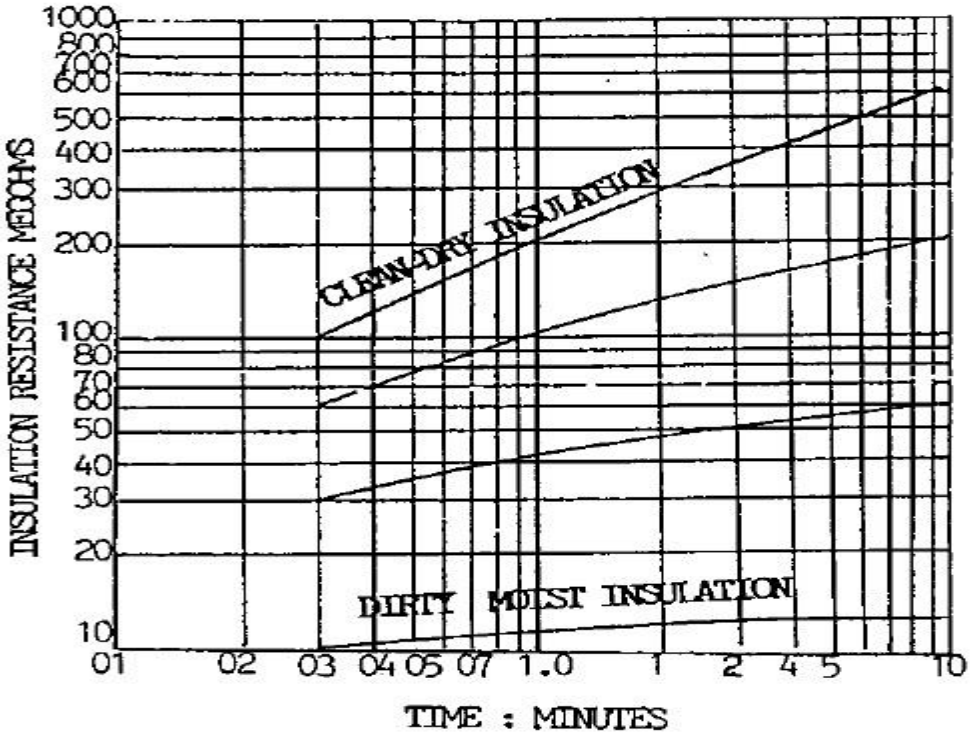


Fig. 2 Typical variation of PI

2.3.3 Recommended minimum insulation resistance in mega ohms, at 40°C (104°F) is equal to rated machine potential in kilovolts plus one in mega ohms. (Reference I.E.E.E., Guide No. 43).

2.3.4 Normally, both insulation resistance and polarization index values should be well above recommended minimum values. In the event the insulation resistance is below minimum or questionable, much can be learned by preparing a polarization index.

2.3.5 The polarization index is the ratio of the ten minute resistance value to one minute resistance value. It is useful in the appraisal of the winding for dryness and fitness for over-potential tests. A recommended minimum value is 2.0.

2.4 RECOMMENDED PRACTICE FOR DRYING

2.4.1 In the event, the insulation resistance value is lower than indicated above, drying is necessary. This may be accomplished by applying external heat or by circulating direct current through the coils.

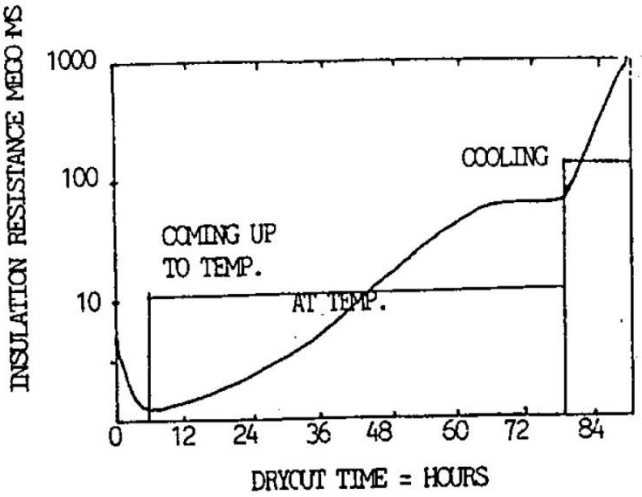


Fig. 3 Insulation resistance vs. drying time

a. External heat should be applied to the motor located in an enclosure.
Supply the heat from steam pipes or from electric strip heaters. Provide a vent in the top of the enclosure so that moisture evaporated from the winding may escape into atmosphere. The drying process should not be hurried or severe damage could occur to the winding. Sufficient time should be allowed for the process, and at no time should the temperature rise be allowed to reach a value greater than 105°C (221°F).

b. An alternative method of drying the winding requires current.
Frequency welding sets are available and can be operated in parallel, if necessary, to obtain the desired current.
For suitable drying temperature, the direct current (DC) should be about one half the rated alternating current (AC) value specified on the motor nameplate.
Do not exceed an insulation temperature of 75°C (167°F) if a thermometer is used for the reading.
2.4.2 Complete connections from current transformer and temperature detectors to the control board. Current flow can now be observed, along with periodic checks for winding temperatures.

2.4.3 The current must be limited so that maximum temperature rise of winding does not exceed 105°C (221°F).

2.4.4 The insulation resistance drops rapidly at first as the winding heats up, then rises slowly as the moisture is driven off, and finally levels off to a steady value.
Drying may be concluded when a-fairly steady value of insulation resistance is reached.

2.4.5 It is advisable to keep records of insulation resistances and conditions (humidity, temperature, etc.) under which it is taken about once a year.

2.5 LUBRICATION AND BEARING

2.5.1 Lubrication is one of the most important check points of proper maintenance and must be carried out in accordance with the instructions supplied with the machine. Lubrication is used in bearings to reduce friction and wear between rubbing surfaces and to carry off heat.

2.5.2 The need for cleanliness in working with bearings and lubricates is extremely important. Dirt and other foreign materials can severely shorten the service life of the bearing.

2.5.3 Periodically, the bearing lubricant should be checked to insure proper operation. If inspection indicates that the lubricant is dirty, it should be changed immediately. Always maintain the level shown on the gauge. It is especially important to check lubrication levels during the first few operating hours, since a dropping level may indicate leakage. It should be noted that motors may have a different lubricant level while running than while stationary.
This difference is usually shown by two marks on the level gauge.
The grade of lubricant used for each motor is given on the lubricant information.

Caution

Do not overfill or over grease bearing.

The lubricant pouring temperature must be lower than the ambient Air temperature.

Be very careful of this check in climates with severs winter temperature.

2.5.4 BEARING

2.5.4.1 Induction motor equipped with ball bearings are shipped with the bearing housing packed with grease. However, it is advisable to re-lubricate the bearing before placing into service.

2.5.4.2 For maximum service, motor should be lubricated at intervals determined by the type, size, and severity of service.

2.5.4.3 Under normal operating conditions it is only necessary to re-grease APE bearing motor according to Table 1.
The frequency of re-greasing should be dependent upon the speed and operation conditions. Excessive greasing is a mistake which contributes to motor failure. It overheats the bearings and contaminates the windings which may reduce service life.

2.5.4.4 Normal conditions are considered to include most ambient atmospheres and pertain requirements. Severe conditions include the following.
Extreme dust, dirt or other atmospheric contaminants.
Direct exposure to moisture beyond normal atmospheric humidity.
Shock, vibration or other loading beyond rated.
Extremes of operation cycle such as long shut-down, frequent starting or reversing.

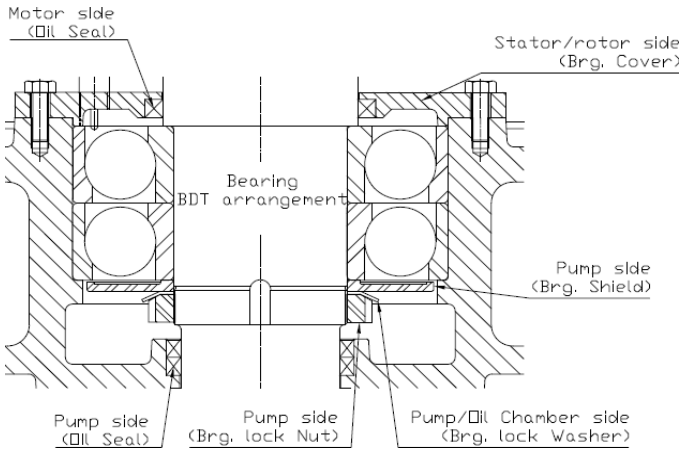
Table 1. Recommended Bearing Grease for Normal Conditions.
It is recommended that these greases or there equivalent be in ILJIN motor

Company	Normal Ambient Temperature -20℃ to +40℃ (-4°F to +105°F)
Shell Oil Co.	Alvania RL2
Mobil Oil Co.	Mobilux No.2
Kyodo Yushi Co.	Multemp SRL
Chevron Oil Co.	BRB No.2
The Texas Co.	AFB No.2

Recommended Re-Greasing schedule for Bearing

Bearing		Approximate hours of Operation	Replacement charge
Lower/Thrust Bearing (D.E.)	7324 BDT-C3	3500 - 4000	72x2=144g

Upper Bearing (N.D.E.)	NU-313 C3	17000-18000	23g



Grease Lubricated Bearing

Fig. 4

The following steps should be followed when greasing the motor. Refer to Fig. 4

a. Clean the exterior of the motor.

b. Remove both the lubrication fitting and the grease discharge/Bearing cover

c. If grease has hardened lubricant which has accumulated in the area around the relief plug with a wooden or plastic stick.
In severe condition, run the motor until the bearing chamber is warmed to the temperature which will allow the grease to flow more easily.

c. Re-grease motor with a low pressure grease gun.

d. Run motor for approximately 10 minutes to assure that excess grease has been expelled.

For optimum operation the bearing chamber should be three-quarters full of grease.

e. Replace lubrication fitting and drain.

NOTE: If the bearing is rough, the motor should be disassembled and the bearings replaced. Repack the bearings and the bearing chamber with enough grease to fill the chamber approximately three-quarters full at assembly.

2.5.5 Heating of Bearing

Bearings should be periodically checked for excessive heating. This is very important during the "run-in" period when overheating occurs most frequently. If overheating does occur, determine the cause immediately and take corrective measures.

2.5.5.1 Overheating of ball bearings - - It is always advisable to make frequent checks on bearing temperature.

Total bearing temperature rise should not exceed 70°C (158°F).
Cause of overheating will probably be one of the following.

a. Contamination of grease.
b. Insufficient amount of grease.
c. Too much grease causing churning.
d. Grease too stiff preventing free action in the bearing.
e. Excessive thrust due to misalignment or excessive imposed loads.
f. Actual bearing failure caused by broken ball, broken cage, or flat balls.
g. Heat from external source causing too high bearing temperature.

2.5.5.2 Causes in "a" are due to inferior grease which is not neutral or free of moisture, acid, or non-lubricating fillers. These characteristics cause the grease to turn rancid in a short period of time and may actually each and roughen the highly polished surface of the bearings. Some grease also tends to become tacky or gummy and prevent freedom of the ball or roller action.

2.5.5.3 To prevent difficulty from causes in "a", "b", "c", and "d", the bearing should be disassembled and thoroughly cleaned with petroleum solvent or flushing oil. It should then be refilled with a new, good grade of grease. Be sure that all solvent is removed before filling with grease. Fill housing to 2/3 full to obtain the best efficiency.

2.5.5.4 Bearing difficulty in "e" could be caused by misalignment of coupling. Do not exert pressure on one side of the frame to make it fit into an uneven base or floor. If frame distortion is excessive, bearing operation will be affected.

2.5.5.5 Difficulty in "f" should be remedied by replacing the bearing, determining the underlying cause, and taking the measures necessary to avoid recurrence of the

problem. Excessive temperature rise of the bearing caused by "g" can be reduced by removing the source of external heat.

2.6 VIBRATION

If vibration is produced by the motor running alone, check these possible causes:
a. Motor not properly shimmed.
b. A resonant mounting condition.
c. A sprung shaft.
d. Worn bearings
When vibration occurs with the load coupled to the motor, the following are possible causes:
e. Shafts of the motor and load are not properly aligned.
f. Unbalanced load.
g. Worn bearings on the motor and/or driven machine.
h. A resonant mounting condition, the effect of which is amplified when the motor is coupled to the load.

2.7 SURROUNDING FACTORS

2.7.1 Motors which are installed in locations with excessive humidity, dust, etc, should be inspected more frequently than machines operating in clean, dry locations. Checks should be made to make certain that lubricants are clean and that the windings are free of moisture and dirt. If unsatisfactory conditions are observed steps should be taken immediately to provide proper maintenance.

2.7.2 Motor installed outside is more susceptible to adverse conditions and should, therefore, be more frequently inspected.
Check for general cleanliness, proper lubrication, and to determine if protective painting is being affected.

SECTION 3. MACHINE DIS-ASSEMBLY AND RE-ASSEMBLY

SECTION DRAWING OF MOTOR

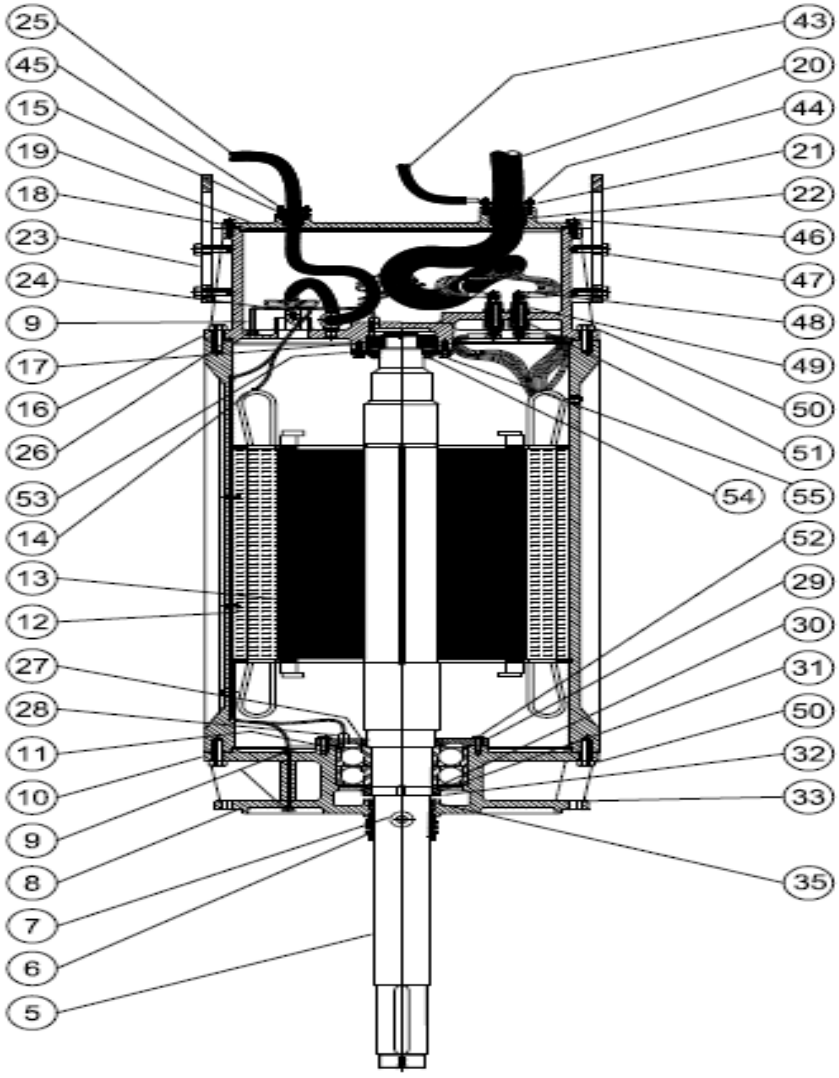


Fig. 5

MOTOR PART LIST

WPIL Limited

APE pumps

Mather+Platt

NO.	DESCRIPTION
26.	"O" RING
25.	CABLE WIRE (Control)
24.	TERMINAL PLATE
23.	LIFTING LUG
22.	CABLE GROMMET
21.	CABLE GLAND
20.	CABLE WIRE (Power)
19.	COVER PLATE (Upper)
18.	"O" RING
17.	UPPER BEARING
16.	BEARING HOUSING/BRACKET (UPPER)
15.	CABLE GLAND
14.	WINDING TEMPERATURE SENSOR
13.	MOTOR ROTOR
12.	MOTOR STATOR
11.	LOWER BEARING (THRUST BEARING)
10.	BEARING HOUSING (LOWER/THRUST)
9.	LEAKAGE /MOISTURE DETECTOR SENSOR
8.	"O" RING
7.	PLUG FOR FILLING
6.	MECHANICAL SEAL
5.	MOTOR ROTOR SHAFT

NO.	DESCRIPTION
55.	HEX. HD. CAP SCREW
54.	OIL SEAL
53.	BEARING COVER (Upper)
52.	HEX. HD. CAP SCREW
51.	TERMINAL BUSH CAP
50.	HEX. HD. CAP SCREW
49.	TERMINAL BUSH
48.	TERMINAL STUD BOLT WITH NUT
47.	HEX. HD. CAP SCREW
46.	HEX. HD. CAP SCREW
45.	STUD BOLT WITH NUT
44.	STUD BOLT WITH NUT
43.	CABLE WIRE (Earthing)
35.	OIL SEAL
33.	STUD BOLT WITH NUT
32.	BRG. LOCK NUT
31.	BRG. LOCK WASHER
30.	BEARING COVER/SHIELD (Lower)
29.	BEARING COVER (Lower)
28.	BEARING TEMPERATURE SENSOR
27.	OIL SEAL

3.2 CAUTIONS TO BE TAKEN FOR DISASSEMBLY AND REASSEMBLY

3.2.1 Preparation of tools, equipment, and materials for disassembly and reassembly.
Before proceeding to disassembly and reassembly, shall be studied and prepared the crane, power source and compressed air for work, etc… as well as tools, equipment and materials required for disassembly, reassembly and slinging.

3.2.2 Establishment of dismounting and remounting procedures.
Motor structure shall be fully understood referring to drawings and varied instruction manuals before commencing dismounting and remounting works.
After having fully studied procedures and methods of dismounting, remounting and slinging, and having drafted working process. Working master and workers shall be the personnel having a sufficient knowledge of dismounting and remounting works and duly qualified.

3.3.3 Matching marks to be identified when dismounting. Matching marks shall be clearly given when dismounting each fixing part in consideration of its mounting direction and other factors.
When remounting, these matching marks shall be referred to for confirming the positions.

3.3.4 Handling and custody of detached pieces

(1) Each time one dismounts, the quantity of respective pieces and there possible damages shall be carefully checked. Bolts, etc… shall be put into boxes or vinyl sacks with labels attached thereto indicating their positions to be mounted. It should be noted that there may be cases where loss of even one bolt or slight deterioration of pieces may bring forth a great difficulty for remounting.

(2) When dismounting and remounting, one shall proceed to slinging work after having well studied the weights of pieces, cross sectional area of wire rope, lifting position, and center of gravity. Slinging work shall be done with full care paying particular attention to safety and quality control of the pieces. Therefore, wire rope lifting bolts, lifting metals required for slinging work shall be those which will be carefully checked and serviced. They shall be in terms of weights of pieces and lifting angle.

(3) After having accomplished the dismounting work, each piece shall be put in order and be covered with vinyl sheet in order to prevent any intrusion of foreign matter, adherence of dusts and any possible deterioration. The pieces which are susceptible of rust shall be lightly applied with turbine oil.

(4) When remounting, each piece shall be sufficiently serviced and put in order. The pieces to which oil adheres shall be cleaned with washing oil and be air blown and cleaned for each remounting after having checked that there are no foreign matters and intruding into the motor.

(5) Cleaning shall be carried out using a vacuum cleaner or compressed air. Therefore the surfaces shall be perfectly cleaned with a dry, clean waste, etc. Take care not to deteriorate winding, bearing metal, etc. by a hard nozzle of air hose.

3.3 CARRYING MOTOR TO DISASSEMBLY PLACE

Disassembly of motor requires a place where the motor is to be disassembly and another place where detached pieces are to be stored. To that place, the motor shall be displaced according to the following procedures.

3.3.1 Isolation of the motor from driven machines, etc.

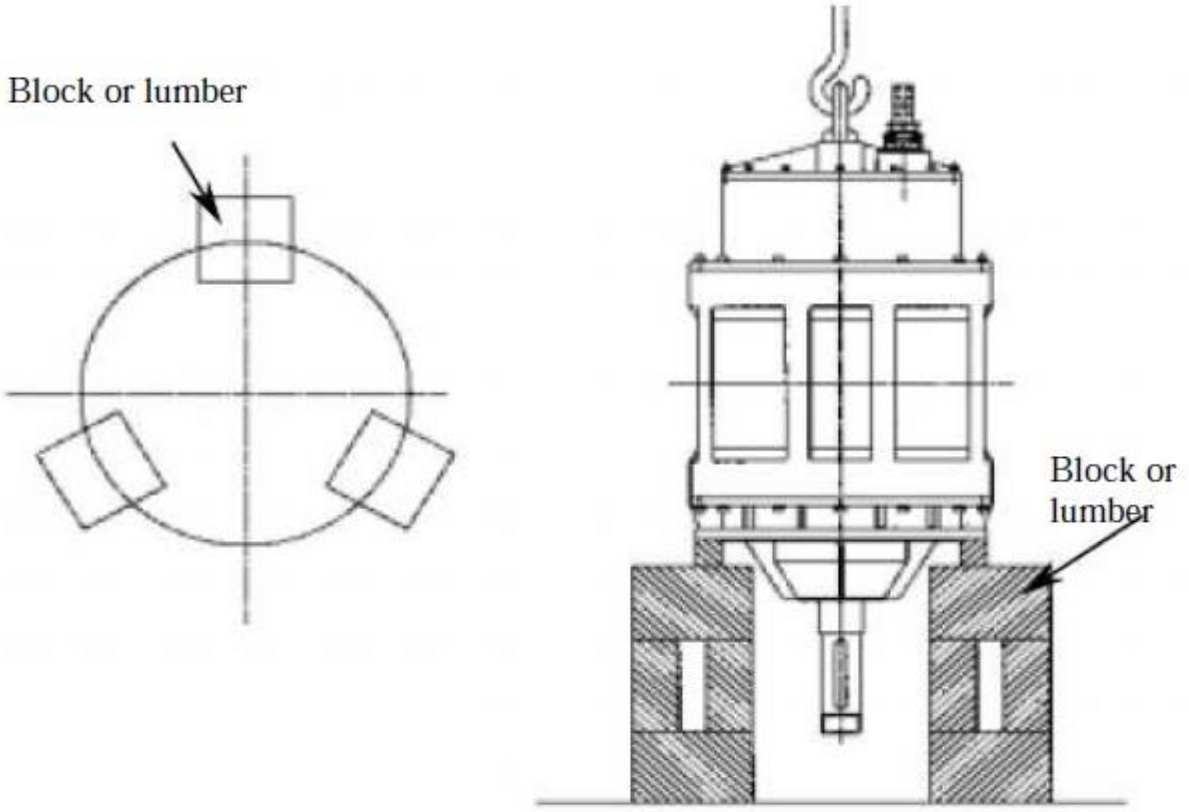
(1) First confirm that all the power sources connected to the motor are put to OFF position. Check thereafter the matching marks of distributing cables.
Apply a provisional insulation onto the connection of cable thus separated.
(2) After having confirmed the matching marks of Lock Nut (Part No.39 & 40 from pump part list) on pump side and those of Lock nuts. Check and record the state of centering before disassembly.
(3) Remove Hex Nuts (Part No. 33) from motor side. If feel the problem to remove the lock nuts, then remove Hex Hd. Cap screws (Part No.36 from pump part list) and remove suction bell also.
Note the all activity done then Motor will lead to lift up side of the rotor of the drive machine. In the event that this machine has thrust bearing (Part No. 11) at DE (Bottom) side with used Bearing Lock Nut (Part No. 32).
Well understanding the structure thereof, the drive machine rotor shall be prevented from being fallen down as case may be.

3.3.2 Displacement of motor

(1) Arrange, as shown in Fig.6 below, blocks or lumber which can support the motor as a whole, and this in the place where the disassembly shall be carried out. The height of blocks or lumber shall be determined in consideration of lock nut extraction allowance and the work to be done for disassembly at the level of lower part of bearing.

(2) Remove the tightening bolts for installation of motor, and lift it after having confirmed that it is completely isolated from the driven machine.

Lift it bringing full care to the lifting center and horizontality, displace it to the place, and put it horizontally.
The horizontally of motor shall be adjusted with a jack put on the floor beneath the flange face of the motor. Adjust moving this jack vertically and inserting liners on the block or lumber.



Example of arrangement of block or lumber when the motor is viewed from its top side

Fig. 6

3.4 DISASSEMBLY OF ACCESSORIES

Lock nuts extraction should be done beforehand for disassembly the lower part of bearing. Similarly, upper cover plate and upper NDE bearing housing should be detached prior to the disassembly the lower part of thrust/DE bearing and detached the cable connection from terminal board.

This disassembly shall therefore be executed according to the following procedures:

3.4.1 Extraction of Lower/thrust Bearing & Housing DE

(1) First remove bearing cover after detached screws, Bearing housing extraction being done in the Bearing thereby expanding its fitting outer diameter, the extraction work should be carried out promptly and carefully. Since the extracting method depends upon form and dimension of Bearing housing from bearing, fitting allowance/clearances with bearing, fitting length, etc., a minute study is necessary beforehand in order to decide the extracting procedures and determine the heating temperature, etc. of bearing housing. Here under, we describe an extraction work which is considered as the most popular.

(2) As illustrated in Figure 7 below, heat the housing with burner to extract it. Continue to heat it up to the predetermined temperature commencing from the outer circumference of bore and then heat them.
Chain block shall remain tightened.

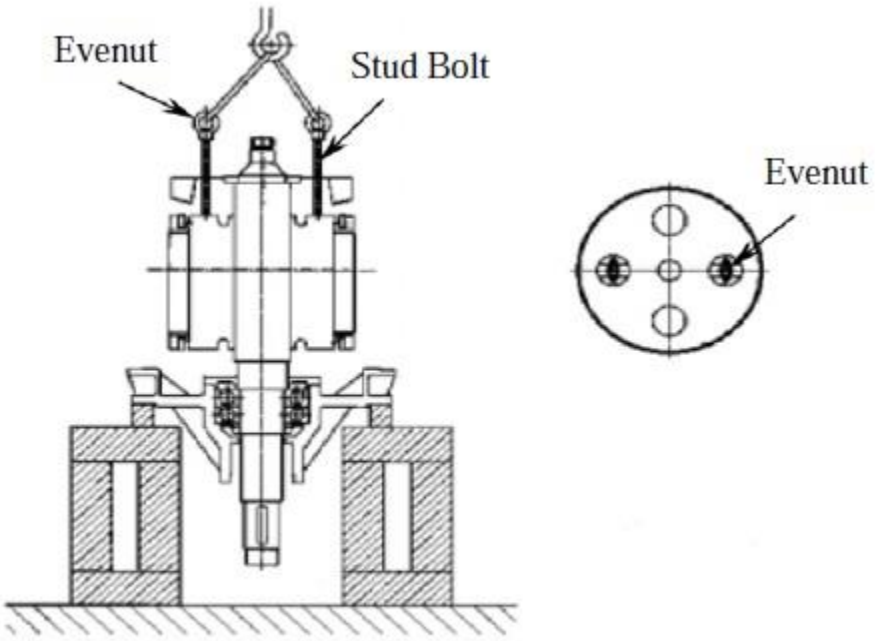


Fig. 7

Loosen a little chain block after having accomplished the heating. In case where there is possibility that the housing may fall down by its own heavy weight, In case where housing cannot move even if the chain block is lifting, extraction shall be done operating the jack/gripped another arrangement. If the load is too great for the jack, proceed the reheating.

3.4.2 Disassembly Upper Cover and Upper Bearing housing

In case of totally enclosed, the upper part of the motor is provided with upper cover, and the interior thereof is provided a upper bearing housing which is fitted onto shaft.

In some cases, the same upper covers are fitted for motors outer than totally enclosed, After having fully understood the construction thereof, proceed to dismantling of the upper cover and upper bearing housing.

3.5 DISASSEMBLY OF UPPER BEARING

3.5.1 Temporary supporting of rotor

Prepare a jack capable of supporting the weight of rotor, and take necessary steps to temporarily support the rotor, as is shown in Figure 8 above. Insert a steel ball between the center hole on shaft end face and the jack, in order to support the rotor. In this case, the rotor should not be lifted up by more than 3mm.

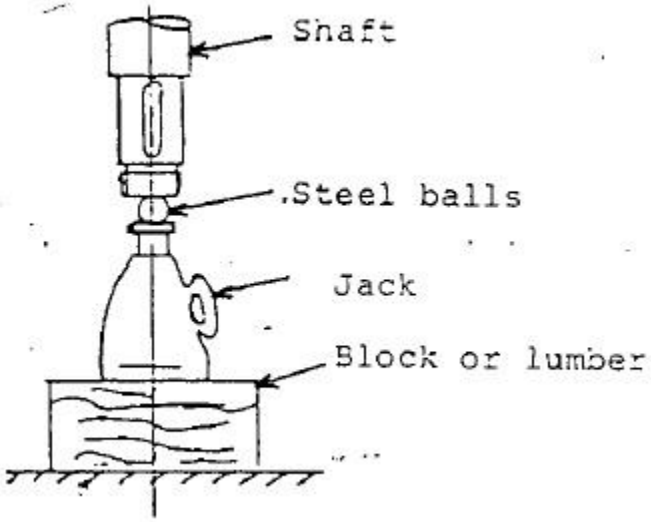


Fig. 8

3.5.2 Detach the upper bearing and bearing support (see sectional drawing of motor) in there assembled state respectively.
In general shaft current preventing insulation is provided at the level of upper guide bearing, and care must be taken not to deteriorate the insulating parts (insulating plate, bolts, washers, etc.).

3.5.3 First remove the tightening bolts of bearing housing and cover then detach the bearing housing and cover.

3.5.4 Remove the tightening bolts of upper bearing bracket, and then detach the upper bearing bracket after tightened jacking screws.

3.6 DISASSEMBLY OF STATOR

3.6.1 First remove the tightening bolts of lower bearing bracket.

3.6.2 Confirming the stator does not contact the rotor, slowly lifting the stator in axial direction, when the center of gravity of the stator on the stand confirming the stator can be lifted again after rotate to opposite side DE side is upper side for chain block. And then, press a shell into motor body by hydraulic press then pull-out is completed.

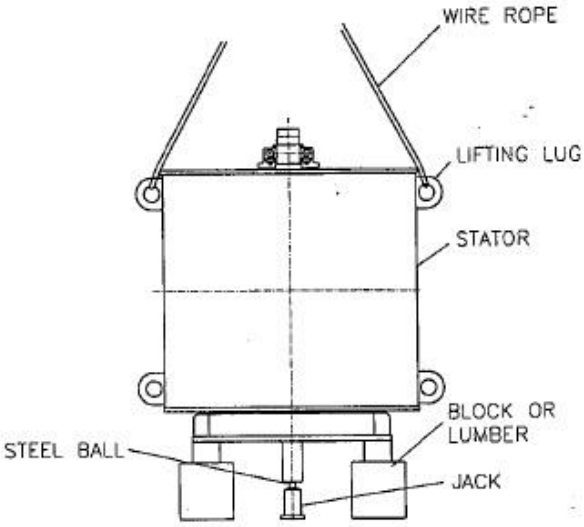


Fig. 9

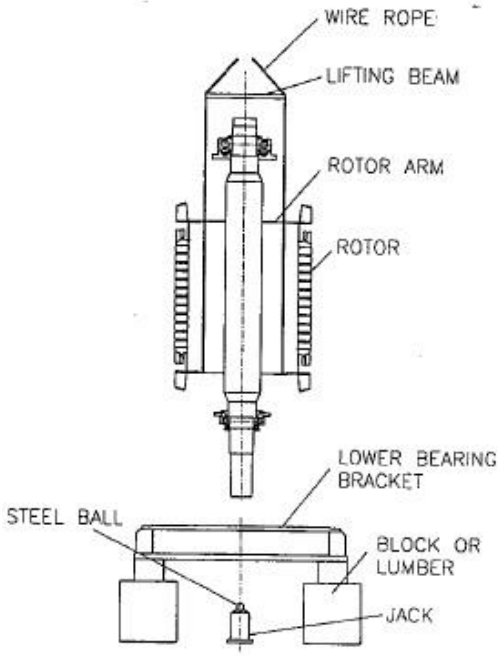


Fig. 10

3.7 ROTOR DISASSEMBLY

3.7.1 First remove the tightening bolts of lower bearing cover. And disassembly outer bearing cover of lower bearing.

3.7.2 Disassemble the lower bearing bracket, lock nut & lock washer etc., when the wire rope hang up onto arm of rotor, at the same time pull-out up or rotor as is shown in Figure 10.

3.8 REPLACING BALL BEARING

3.8.1 When removing or replacing a ball bearing there are several rules which should always be observed. Following these rules closely will prevent damage to the bearing or motor and result in longer bearing life.

3.8.2 When removing a bearing, always use an approved bearing puller. See Fig.11

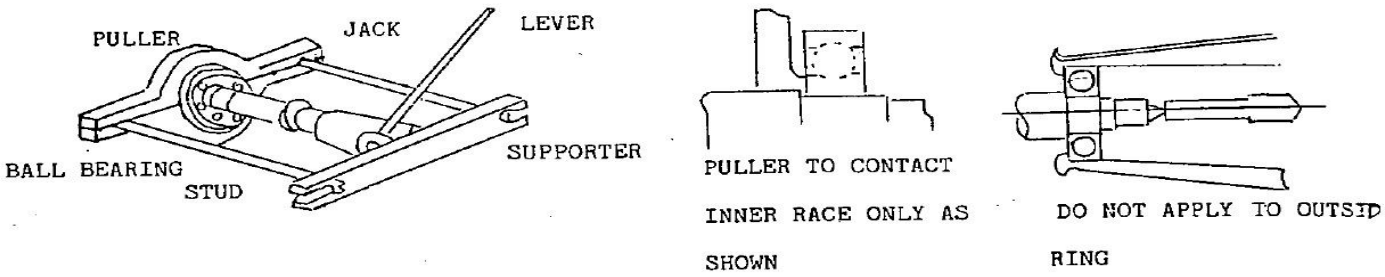


Fig. 11 Bearing puller

3.8.3 Never open the protective cover on new bearings where the bearing will be exposed to dust or dirt.

3.8.4 Always open the package in a clean place and do not remove bearing from package until ready to install.

3.8.5 Never try to clean a new ball bearing. The slashing oil on new bearings should not be removed.

3.8.6 Fill bearing chamber three-fourths full of clean grease. Do not pack bearing full of grease as this will cause overheating of the bearing.

3.8.7 Do not force a bearing onto a shaft by means of the outer race. Do not attempt to force the bearing on a badly worn shaft or a shaft which is too large for the bearing.

3.8.8 Pressing in or hammering in is a good method of installing a bearing.

3.8.9 In pressing in, coat the shaft with a thin film of oil.

3.8.10 Note that the metal tube fits against the inner race of the bearing don't consider outer race.
Do not hit the tube very hard. Just TAP it.

3.8.11 another method of installing ball bearings is to heat the bearing in an oven or oil bath so that it will slide onto the shaft. Before heating, be sure that bearing inner dia has been checked against shaft journal dimension to prevent too tight a fit after bearing cools.
Difference of bore to journal should be 0.0004 in tight to 0.0004 in loose.
Use a temperature of approximately 121°C (250°F).
Too high a temperature will damage the bearing and too low a temperature will cause the bearing to seize the shaft.

3.9 REASSEMBLY

3.9.1 Preparation the blocks or lumber.
Put the jack and steel ball in the center shaft and shaft height.

3.9.2 Put the lower bearing bracket on the block or lumber.

3.9.3 Assembly to be a backward of the disassembly.

SECTION 4. SERVICE GUIDE

The following chart lists various troubles that may occur, the probable cause, and suggested solution to the difficulty, this chart is intended both as a diagnostic aid and as a quick answer sheet. If source of malfunction is unknown, or cure is not achieved after using this chart, report matter to the nearest APE office.

Table 2 Trouble shooting table

Trouble	Probable Cause	Remedy
Failure to start	Loose, unattached or incorrectly fastened connections. Low lone voltage	Tighten all mechanical and electrical connections. Check panel meters.
motor overheating	Overloaded. Improper line voltage or incorrect frequency. Ventilation impeded by dirt. Unbalanced electrical power.	Shed or adjust load applied at control panel. Clean the motor.
Noise or overheated bearing	Misalignment between motor and driven machine. Excessive, low or improperly packed grease (if grease lubed.) Low oil level (if oil lubed) Improper fit of bearings (especially in oil grooves) or in babbit lines. Excessive belt tension or Excessive load side thrust. Foreign matter in oil.	Check alignment and correct as necessary. Clean and repack with proper viscosity. Check for damage. Drain and fill to correct level with correct viscosity. Check for scoring of bearing surfaces. Replace if damaged. Reduce belt tension or load side thrust. Check alignment and correct as necessary. Drain oil, flush clean and refill with recommended oil.
Abnormal noise or abnormal vibration	Foreign mater between fan other. Single phase operation	Disassemble and remove foreign object. Keep surroundings clean of any foreign matter. Stop the motor and restart. On single phase, motor will not start. In such a case, check if any phase in power source on motor has open circuit.

Continued

Trouble	Probable Cause	Remedy
Abnormal noise or abnormal vibration	Unbalanced electrical power	Check for unbalanced voltage.
	Air gap is unequal	Align the rotor to the center of the stator. If necessary, replace bearing.
	Loose coupling.	Tighten bolts securely.
Vibration	General	1ST., Measure amount incurred with vibrometer at sides of frame and bearing at shaft height. 2ND., As certain if source is in motor or in driven machine. 3RD., if vibration is in excess of those shown in Table 1, corrective measure must be taken.
	Improper alignment between motor and driven machine.	Measure around concentric periphery of coupling with either clamps and dial gage, or with feeler gage and straight edge. Realign if needed. Check vertical with a bubble scale or plumb bob.
	Loose or incorrect base attachment	Check and adjust.
	Worn bearings	Replace.
	Unbalanced load	Worn drive gears of the driven machine.
	Warped base.	If on either machine, the effect is magnified after coupling.
Poor overall performance	Excessive heat, humidity, dirt, etc., has adversely affected insulation.	Undertake a resistance check with a megger.
	Improper grounding by bolts only.	Add a ground strap.
	Wrong terminal lead hook-up. Improper rotation.	Reverse any two leads and observe direction of rotation. Refer to connection plate or to connection drawing.
Other electrical malfunctions, if not detected or remedied as above.	Open circuit in stator windings or in squirrel cage bars. Short circuit in rotor or stator.	Run a continuity check. Check condition of coils and bars. Repair if possible. If impractical, order renewal office. Remember to check nameplate plate.

WPIL Limited

APE pumps

Mather+Platt

1. Motor.
2. Cable junction chamber. The junction chamber is completely sealed off from the outside. The stator housing is also completely sealed off from the junction chamber.

2. Pump casing. Horizontally split axial flow casing with integral outlet guide vanes.
5. Propeller. Fixed three-bladed propeller. Propellers are available in different propeller angles to provide different mixing capacities. with swept-back blades for low
clogging performance.

7. Inlet cone. The uniquely contoured inlet cone minimizes dynamic loss and tip vortices.

6. Motor. Squirrel-cage induction motor with winding from 6 to 16 poles.

7. Cooling. Motor are cooled by surrounding liquid.
8. Pump/motor shaft. Common pump/motor shaft with compact seal design. Rotor and shaft dynamically balanced as an integral assembly.
9. Shaft sealing. Two independent mechanical face seals assembled in tandem provide reliable and durable sealing performance and maximum resistance to abrasion and thermal shock

APE Pumps Portfolio

APE pumps

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Company History

The Founder Company, PSV Services was originally established in 1988, and operated from Sebenza, Edenvale, South Africa.

The Company was involved in various fields of Activity, mainly supply of Pumps, Pump Spares, Valves, and Turnkey Electro-Mechanical Contracting.

Due to the Formation of NEPAD, by the SA Government and PSV Services Commitment to it, PSV Zambia, based in Kitwe was established, mainly to Service the High-Pressure Pump Division of the Zambian Copper Mines and the DRC Territories, with PSV Zambia having been running/operating successfully since then.

After a long and fruitful Company History, with PSV Services (PTY) LTD, having grown substantially, the Company listed with ALTX, as PSV Holding Limited in 2006.

The Founder Company PSV Services then moved to Wadeville, Germiston, to share premises with APE PUMPS, one of the Largest Pump Manufacturing Companies in South Africa, which had just been acquired by PSV Holdings LTD.

While the 2 companies were still running as separate Entities, they had a very close Relation together running a combined Machine and Assembly Shop.

With the new Acquisition of Mather & Platt SA the Pump Section of the PSV Holding Group of Companies, became the Major Force in Pump Manufacturing and Turnkey Water Projects to reckon with in Southern Africa.

Then in June, 2012, WPIL Limited, a major Indian Company, with about 60 years of Experience in Design, Developing, Manufacturing, Erection, Commissioning and Servicing of Pumps and Pumping Systems, invested in South Africa, by acquiring a Number of Companies in their Industry and were poised to further invest in their Local Manufacturing Capacity through Expansion and Development.

WPIL acquired the Shares of APE Pumps and Mather & Platt and with it the Business of PSV SERVICES with effect from June, 2012. All three of these businesses were trading under valid BEE Certificates at the time.

For further Information of the Purchase, please refer to the attached Letter, dated the 1st of February, 2013.

1st February 2013

WPIL Limited, a major Indian company with about 60 years in Designing, Developing, Manufacturing, Erecting, Commissioning and Servicing of Pumps and Pumping Systems, has invested in South Africa by acquiring a number of companies in their industry and they are poised to further invest in their local manufacturing capacity through expansion and development.

WPIL acquired the shares of APE Pumps and Mather + Platt and acquired the business of PSV Services with effect from June 2012. All three of these businesses were trading under valid BEE certificates at the time. The certificate for Mather + Platt expires and WPIL Limited commissioned Gestalt to access their transformation and to project managed their process of obtaining a new valid BEE certificate. We can place on record that Grant Thornton verification services have been contracted and the new certificate is expected in February 2013.

PSV Services has undergone an internal, re-structuring in terms of which PSV Services (Pty) Ltd has sold its business to APE Pumps (Pty) Ltd.

PSV will operate through APE Pumps and carry all work related history into the APE division. PSV entity will remain, and work as it has for the last 26years, but now through APE Pumps, with all the staff being implemented into the company APE Pumps.

We have operated as two company's since APE Pumps was brought in 2007, by PSV Holdings, so this transaction will not affect any clients at all.

The project division, also known as PSV Services, has also changed the name to APE Pumps (Pty) Ltd but again no personnel changes, or location has been altered.

We assure you of the same level of service from APE as you enjoyed with PSV Services.The registration number of APE Pumps (Pty) Ltd will remain the same as will the VAT number. The banking detail will however change to the following.

STANDARD BANK
BEDFORD GARDENS
ACCOUNT NUMBER: 02 253 1602
BRANCH CODE:018505

In terms of the Board Based Black Economic Empowerment Codes of Good Practise, EE Codes, WPIL South Africa (Pty) Ltd is classified as a start-up enterprise and therefor WPIL is exempt from the BEE codes for their first year of operation. The star-up exemption certificate is attached hereto for reference.

The business of PSV Services has been acquired by APE Pumps (refer to the attached letter) and is therefore trading under the APE Pumps BEE certificate. APE Pumps was verified as a QSE011 8486000 at their last verification in January 2012 (Certificate attached) and has since experienced significant growth. APE Pumps now far exceeds the maximum threshold for QSE's and had to commence with the additional transformation requirements to achieve a reasonable Generic BEE certificate. Gestalt is commissioned to project manage this transformation as well.

We placed on record that this process is processing well and APE Pumps is on track to obtain a valid BEE certificate of level 6 or better. This will be achieved in their current financial year ending 31 March 2013 and the commensurate BEE certificate will be available shortly thereafter.

For the sake of clarity, we can also confirm that the clients of APE Pumps (including PSV Services) will not be prejudiced in any way by the short delay in obtaining their new BEE certificate. The verification requirements are clear that a measure entity (meaning the clients of APE Pumps when doing their own BEE verification) get full preferential procurement recognition from any supplier with a BEE certificate that was valid at the start of their measure period or there-after.

Should you have any issues or concerns with respect to this correspondence feel free to contact the writer at any time.

Yours faithfully
Peter Robinson
Director

General Information

Details	APE Pumps
Business Name	APE Pumps (Pty) Ltd
Legal Entity	Private Company
Company Registration Number	2007/014880/07
Established	1952
Physical Address	26 Nagington Road Wadeville Germiston, 1422
Postal Address	P.O. Box 14733, Wadeville 1422 South Africa
Telephone Number	+27 11 824 4810
Facsimile Number	+27 11 824 2770
E-mail Address	info@apepumps.co.za
Directors	Mr. P Robinson Mr. P. Agarwal Mr. K.K. Ganeriwala

Commercial Information

Bank Details

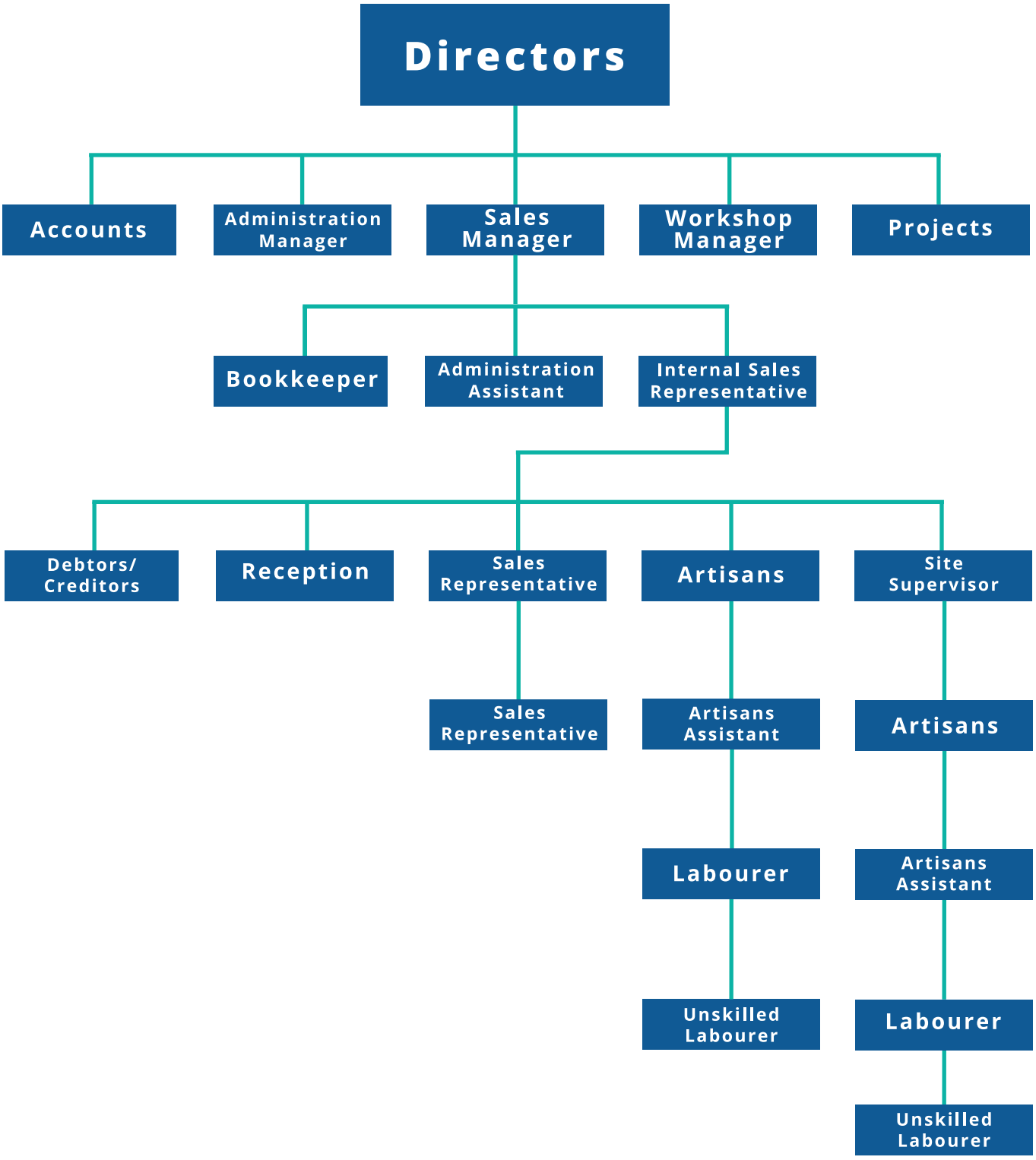
APE Pumps

Bank	Standard Bank
Branch	Bedford Gardens
Head Office Address	Rutland Gate Office Park 184 Hyde Lane Cnr Jan Smuts & William Nicol Avenues Hyde Park
Contact Person	Mr. Denesh Naidoo
Telephone Number	+27 11 280 4818
Facsimile Number	+27 86 507 9576

Insures

Company	Bannockburn Financial Services
Address	79 First Avenue Edenvale
Contact Person	Mr. Mike Wilson
Telephone Number	+27 11 452- 7581
Facsimile Number	+27 11 452- 7411

Head Office Organisation



Manpower Schedule

Technical Management
Administration Staff
Technical Supervisory Staff
Artisans
Semi-Skilled
Labourers

Engineers
Project Manager
Site Managers
Estimators
Planners
Surveyors
Procurement
Metallurgist
AQ/QC Specialist
Draughtsman Senior – Junior
Cad Operators
Technicians – Senior

Boilermaker
Bore – Mill Operator
Code 08 Drivers
Code 14 Drivers
Diesel Mechanics
Drivers Assistant
Electrician
Electrician (Wireman License)
Inspector (QC)
Instrument Fitter
Instrument Technician
Labourers
Mechanical / Maintenance Fitter
Pipe Fitter
Repair Shop Assistants (RSA)
Rigger
Semi-skilled Artisans
Supervisor Site
Toolmaker
Trade Assistants
Turner
Welder Coded
Welder Structural

Where required, APE utilize local labour on limited duration contracts, or contract labour to supplement core staff.

MAJOR COMPLETED PROJECTS ONLY BY PSV SERVICES AND APE PUMPS

Zimbabwe Power Corporation and Havelock Asbestos Mine Zimbabwe & Swaziland For Wright Dixon	Removal of 3.75MW steam turbines plus all auxiliary equipment, re-installation and Commissioning of all above equipment and new steam piping at Havelock Asbestos Mine Swaziland **Completed - 1988**	US$202’715-00
Botswana Meat Commission Lobatse Botswana for Wright Dixon	Installation of new Sulzer cooling towers installation of all auxiliary pipe work **Completed - 1989**	US$1’213’970-00
Sasol 1 Sasolbutg South Africa for Treatment (Pty) Ltd	Installation of fuel distribution network system 800 NB pipe all work in accordance to API 1104 **Completed - 1990-1991**	US$361’280-00

Mzuzu Water Water Treatment	Water Affairs Gullivar/Cilcon Joint Venture Mzuzu Water Treatment -Supply and installation of intake pipe work and valves -Supply and erection of two high level storage tanks and stands -Supply and installation of numerous pump stations -Supply and installation of pipe work 600-50NB for complete treatment works -Supply and installation of complete water dosing equipment -Complete electrical, mechanical and instrumentation control system **Completed - 1992-1994**	US$1’111’778-00
Josef Riepl Bau Ag Munich Germany	Installation of 700NB pipe 70 bar working pressure x 3 kilometers Plus all auxiliary equipment for Hydro - electric scheme at Wovwe- Chilumba Malawi. **Completed – 1994-1995**	US$182’703-00
Royal Swazi Sugar Simunye Swaziland	Drought relief pump station 4 off high flow pumps and 300m 1200 pipeline, all Electrical controls and Engineering design. This Project was carried out in 8 weeks from design to Commissioning. **Completed – 1995**	US$249’167-00

EMS – AEC Newco Project Fluropharm Pelindaba	Supply and install structural, piping and mechanical packages. **Completed – 1998**	US$966’667-00
National Starch Wadeville Gauteng	Supply and installation of mechanical structural, electrical and instrumentation – Glass dissolving packages plant. **Completed – 1998**	US$283’332-00
Blantyre Water Board Malawi	Installation of 35km of 700NB pipe 70 bar working pressure. All air valve chambers, crossover Tees and auxiliary equipment for Cathodic Protection on Duplication of pipelines. **Completed – 1998**	US$1’816’667-00
Mozal Main Substation Mozambique	Supply and Install Test and Electrical Work, Commissioning Of Lighting and small power installation Including transformer, Distribution Boards and Street lighting. **Completed – 1997-1998**	US$300’000-00

Ilios Oil Edible Oil Refinery Gauteng	Supply and Install Test and Commissioning of Structural, Electrical Mechanical, Piping, and Instrumentation Packages **Completed – 1998**	US$383’334-00
Coca Cola Nampula Mozambique	Electrical Installation at the new Coca Cola Bottling Plant. Design, supply, And install and commission Main incoming supply 33kv Transformer main distribution Board, cabling and reticulation Hvac system. **Completed – 1999**	US$597’000-00
Zomba Water Treatment Plant CMC/CCC Lahmeyer – Stewart Scott Joint Venture Zomba, Malawi	Turnkey Mechanical/Electrical New Water Treatment Plant Upgrade existing Plant New Intake Structure Pressure Reducing Station **Completed – 1999 – 2001**	US$1’400’000-00

CPMZ – Zimbabwe Beira Mozambique	Supply and Installation of New Fuel Receiving Station at Mutare – Zimbabwe: Installation of free issue Pig Receiver – Filtration units – Metering units and Prover Supply of all interconnecting pipe work. Supply and Installation complete Deluge System for fuel receiving station. **Completed – 2002**	US$320’000-00
CPMZ Zimbabwe	Supply of equipment and spares for high pressure pumps for transfer of fuel from Mozambique to Zimbabwe. Basic Engineering Re-design of pumps. **Completed – 2004**	US$920’000-00
Simunye Sugar	Supply and install 4 x Electric Actuator for main rive pumps And electrical control system **Completed – 2004** Annual supply of maintenance Spares for Mather & Platt irrigation Pumps **Completed**	US$70’000-00 US$1’000’000-00

PCI – Grinaker/Lta Augostinho Neto University – Luanda	Installation of 3-off pump stations with supply & manufacturing of PVC – interconnecting Pipe works etc. **Completed – 2004**	US$230’000-00
Department of Water Affairs	Contract Number W8404 Supply of Piping, Pipe Fittings & Valves **Completed – 2004**	US$3’078’000-00
Mopani Copper Mines Mufulira – Zambia	Supply and installation of 450NB High Pressure Rising Main in Mineshaft, including connections On to existing pump sets complete Length 550m. Removal of redundant 400NB Pipeline from Mine-shaft **Completed – 2007**	US$586’000-00
Mopani & Luan-shya Copper Mines	Ongoing Pump Refurbishment Projects for Mopani & Luanshya Mines “Pump Repairs at Mindola Workshops” MC2417.1 **Completed 2007**	US$14’000’000-00

Department of Water Affairs	Contract Number W8891 Supply of Piping, Pipe Fittings & Valves **Completed – 2009**	US$2’307’693-00
Mopani Copper Mines, Zambia	Renewing of Pump Refurbishment Project (MC2471.1) for 5 “years” (JBS 00095) which includes supply of all Pump parts & pump refurbishment at The Mindola Workshop in Kitwe. ***Completed***	US$32’000’000-00
R.S.S.C-Simunye/ Mhlume Sugar	Supply and installation of 3-off complete weir gate ass’blies with Driving equipment (including of closing Off 4,2m High River flow at each Weir) **Completed 2007**	US$188’500-00
Blantyre Water Board, Malawi	Manufacturing & supply of spare parts for Mather & Platt pumps And supply of 1-off complete Pump set With 3-stage PSV 80LF4 pump. **Project Ongoing**	US$ 566’426.00

Mopani CM Nkana	Manufacture & Supply of 2-off HPH 58 / 54-25-4 stage pumps with Internal parts all coated for acid water Pumping **Completed 2007**	US$325’000-00
NFC – African Mining, Chambi-shi CM, Zambia	Manufacture & supply of HPH 54-25-5+1 stag pump with supply of maintenance spares of HPH54-25 pumps **Completed 2009**	US$951’803-00
Dahlman The Netherland (For Abadan Refinery, Iran)	Manufacturing & Supply of 96-off Complete Swirl Vane Units, all Produced from Special Stainless Steel, including the investment casted Swirl Vane Component which is the “Heart” of large Filter/Scrubber Units For the Refineries **Completed 2010**	US$ 1’076’914.00

Lusaka Water & Sewerage Corp (In Joint Venture With Civil Partner RJR Construction, Zambia LTD)	The Contract is for the overhaul of Iolanda WTW, which delivers . The Major amount of potable Water to Lusaka. Next to the Civil Requirements, the Projects includes for the Mech/Electr. Supply & Installation of a New River Intake Pump Station (with APE Vertical Turbine Pumps) as well as Overhaul of other Pumps and Plants **Completed 2011**	US$ 2'810'000.00 (PSV-Involvement)
RSSC Simunye Sugar Swaziland	Refurbishment of a 1200 NB & 1500 NB – Larner Johnson Valve **Completed 2010**	US$ 100'000.00
Department of Water Affairs	New Contract NO: W10159 for the supply of PVC-Pipes, Pipe Fittings and Valves for 3 years **Completed 2012**	Appr. US$ 8'000'000.00 to 9'000'000.00
NICICO Iran Sungun Copper Mines	Supply/Manufacturing and Commissioning of 8 Slurry Pump Sets Complete with VSD's and Spare Parts **Completed 2014**	US$ 5'560'000.00

NICICO Iran Sungun Copper Mines	Supply of auxiliary Pump Sets for Sungun Copper Mine **Completed 2014**	US$ 1’200’000.00
Blantyre Water Board Malawi	Rehabilitation and Renewal Works, At CHILEKA PUMPING STATION, Incl all New High Pressure Pump Sets, With all Electrical and Civil Works / Supply Contract completed in Association with WPIL – India **Completed 2015**	US$ 6’880’000.00
Blantyre Water Board Malawi	Emergency Manufacture and Supply of Spares for existing Mather & Platt, Size 9” x 11” HP-Pump Sets, at Chile-ka Pumping Station. **Completed 2014**	US$ 218’000.00

Blantyre Water Board Malawi	Rehabilitation and Renewal Works at WALKER'S FERRY INTAKE – and HIGH LIFT PUMPING STATION, Incl. Installation and Completion Of part existing Mechanical Equipment With New Supply and Installation / Commissioning, of Electrical Equipment In Association with WPIL India. **Completed 2015**	US$ 4'484'000.00
Eigenbau On going	Supply 12 off Axil Flow Pumps. To replace existing APE Axil Flow Pumps Speed of Pumps increased, increase head And Flow of Pumps	R 4 500 000.00
Rand Water On going	Pump Overhaul Refurbishment of two Allis Chalmers 20" Split Case Pumps. Manufacturing of new Rotating Assembly Bearing Housings and Bush Bearings. Casings coated with Belzona Pump Assembly and Installation	R 5 000 000.00
Jet Mixer Project On Going	Supply 2 off Mixer Pumps 33mm Long 90 Kw Motor, Wet End and Columns Rotate on a Slewing Ring for Crude Oil Storage Tanks	R 15 000 000.00

Durban Heights On Going	Vertical Pump Refurbishment	R
Umgeni Waterloo	Supply, Install and Commission Pump Sets including Auxillaries at Waterloo Pump Station	R 14 600 514.00
Umgeni Ezakheni	Refurbishment of Raw Water Abstraction pump Station at Ezakheni Water Treatment Plant	R25 745 734.00
Umgeni La Mercy	Supply, install and Commission. The Pump Sets, Incl. Auxillaries at Verulam La Mercy Pumping Station	R68 742 486.00

APE / MATHER & PLATT PRODUCT LIST

We supply pumps and spares for the following manufactures:

Mather & Platt
KSB
Howden
Thompson Kelly & Lewis
Nowa
Wilden
Sulzer
APE
Weir: Harland (Salweir)
Envirotech
SPP (Sigmond Pulsometer)
Stork Pumps