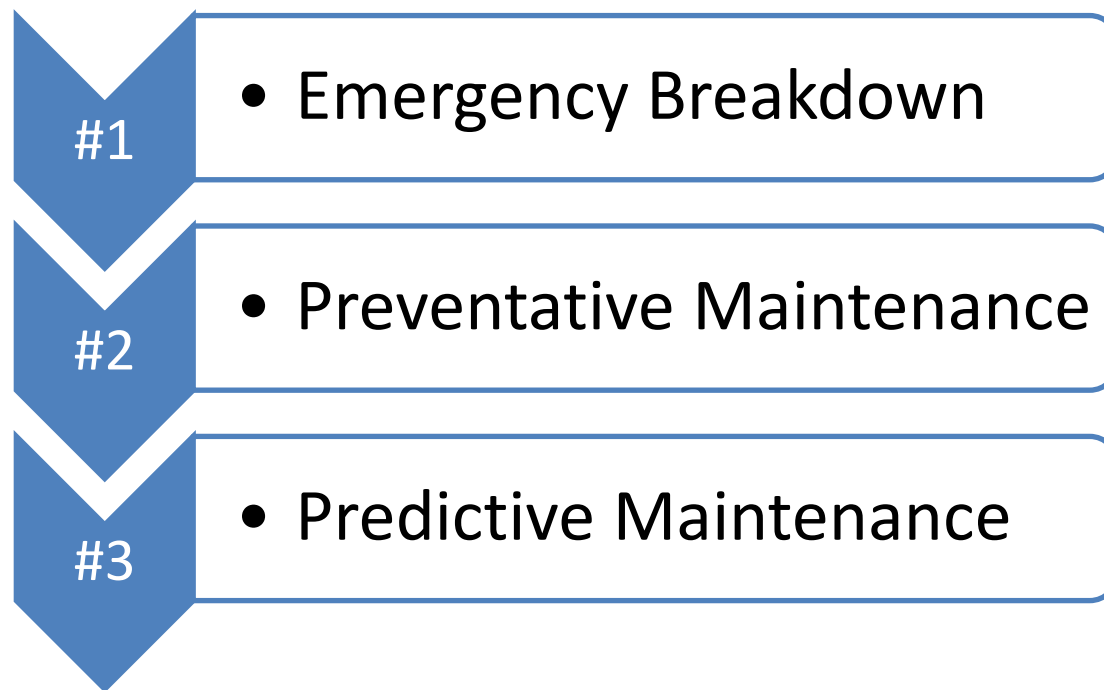




FAIRBANKS NIJHUIS™

CONDITION MONITORING



- Emergency Breakdown

- Emergency Breakdown

#1 Economic Impact

Premium for required repairs & parts

Labor - Overtime

Fees and fines for out of compliance

Premium repair and service center charges

Next Day and emergency shipping charges

- Emergency Breakdown

#2 Manpower Impact

- Interrupts scheduled work load
- Costly errors due to tired and overtaxed labor pool

- Preventative Maintenance

- Preventative Maintenance

#1 Economic Impact

- + Reduces the risk of Emergency Repairs
- + Keeps equipment in top running condition
- + Reveals problematic issues
- Parts replaced prematurely
- Equipment down time that is not required
- Highest risk of failure (equipment restart)

- Preventative Maintenance

#2 Manpower Impact

- + Scheduled maintenance
- + Reduced overtime
- Increased manpower doing non-required service

- Predictive Maintenance

- Predictive Maintenance

#1 When

Run time vs Calendar

- Predictive Maintenance

#2 Vibration Monitoring and Analysis

Excess vibration = shorten equipment life

Detect bearing issues prior to failure

Detect imbalance

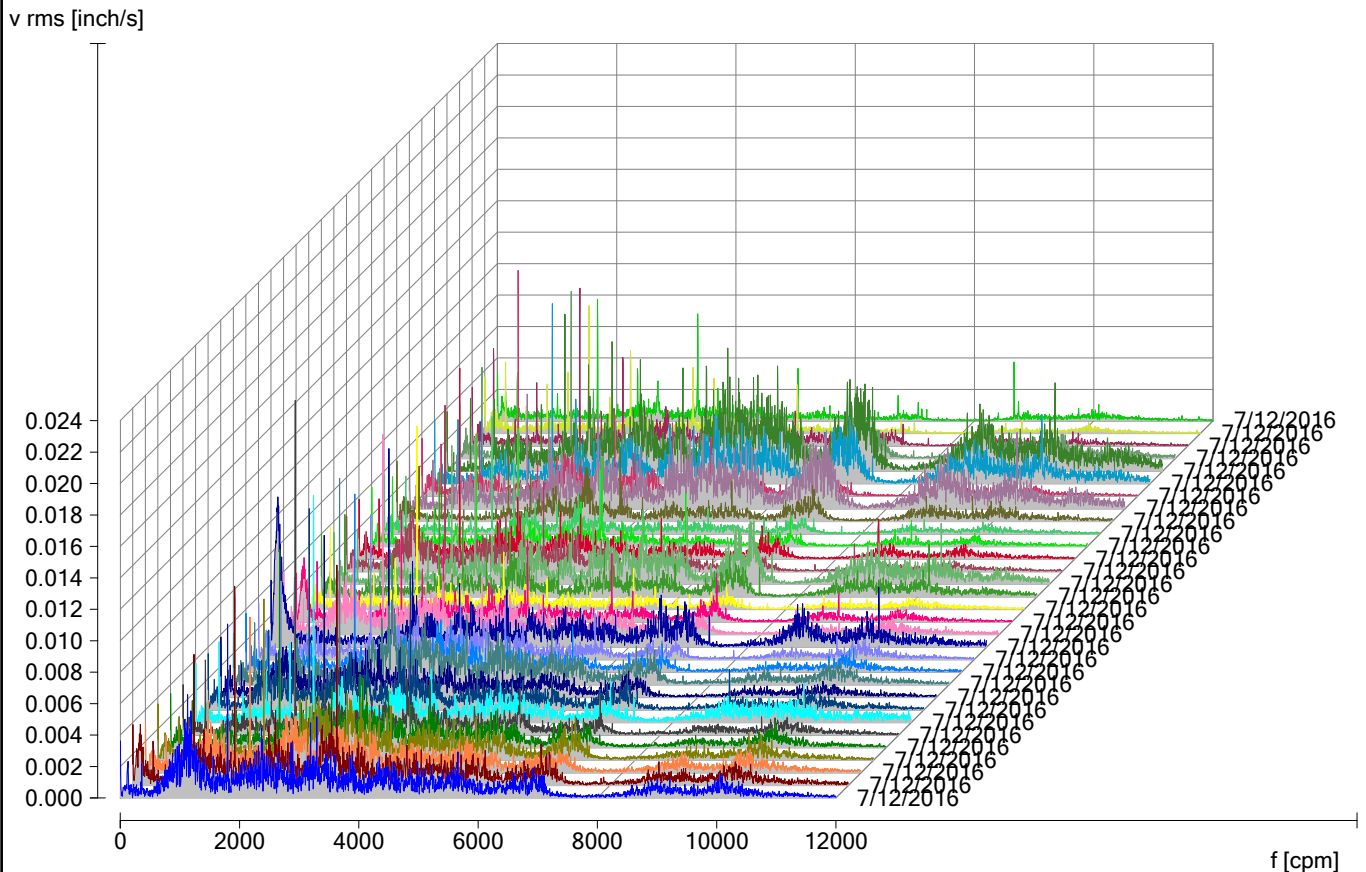
Detect wear

Detect hydraulic issues

Detect electrical imbalance or FVD issues

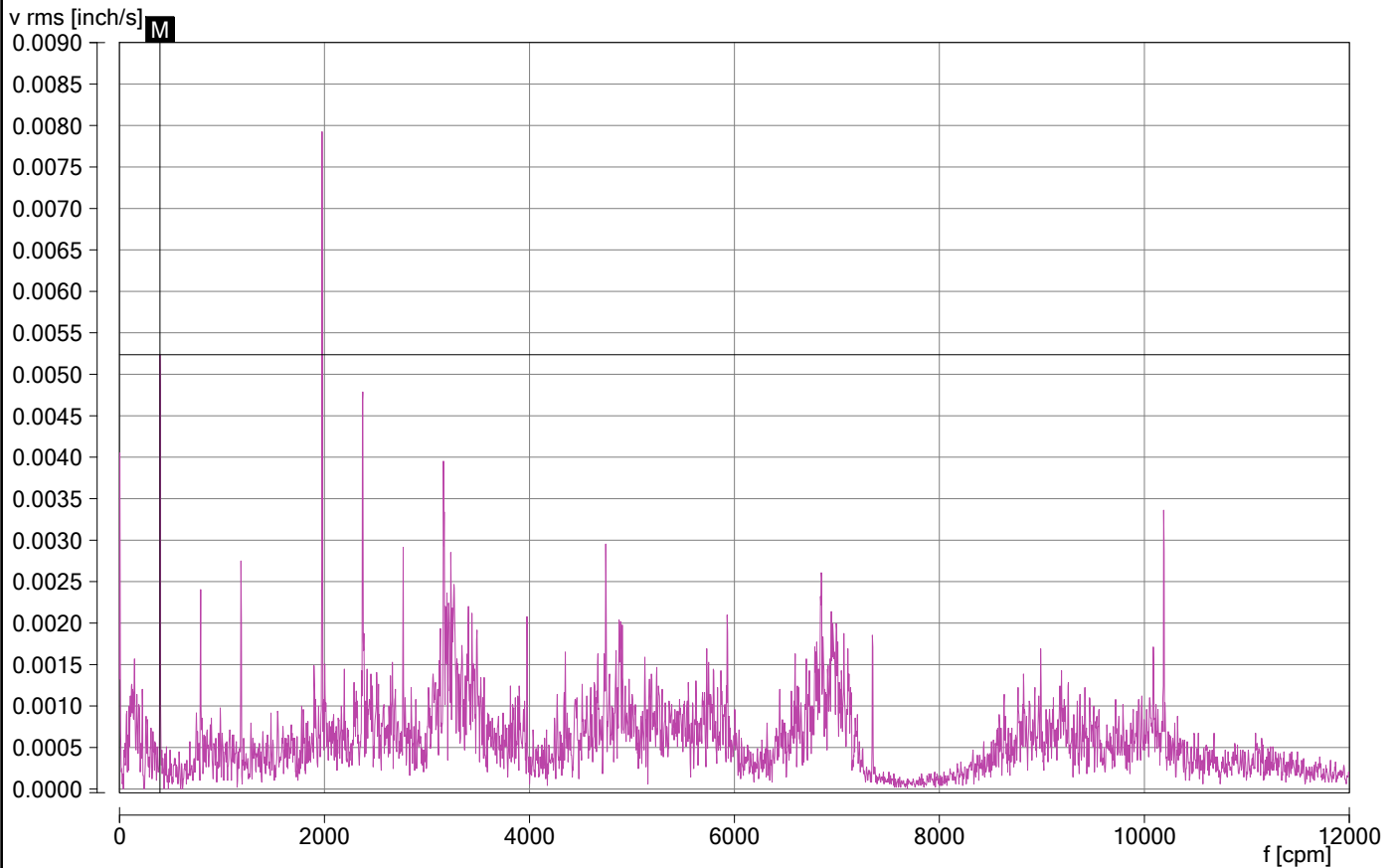
Measurement date and time: 7/12/2016 9:00:01 AM ,7/12/2016 9:02:28 AM ,7/12/2016 9:11:04 AM ,7/12/2016 9:18:41 AM ,7/12/2016 9:28:12 AM ,7/12/2016 9:37:18 AM ,7/12/2016 9:47:48 AM ,7/12/2016 10:10:12 AM ,7/12/2016 10:19:17 AM ,7/12/2016 10:25:45 AM ,7/12/2016 10:30:29 AM ,7/12/2016 10:35:20 AM ,7/12/2016 10:41:19 AM ,7/12/2016 10:49:28 AM ,7/12/2016 10:53:08 AM ,7/12/2016 11:02:14 AM ,7/12/2016 11:08:10 AM ,7/12/2016 11:18:49 AM ,7/12/2016 1:00:03 PM ,7/12/2016 1:02:52 PM ,7/12/2016 1:06:28 PM ,7/12/2016 1:11:05 PM ,7/12/2016 1:15:17 PM ,7/12/2016 1:19:54 PM ,7/12/2016 1:28:17 PM ,7/12/2016 1:32:21 PM ,7/12/2016 1:34:28 PM ,7/12/2016 1:38:17 PM ,7/12/2016 1:47:22 PM ,7/12/2016 1:49:46 PM ,7/12/2016 1:52:57 PM

PENTAIR\Newtown Creek \Pump # 4 7-12-16 A\Influent Pump Station\48" 5712DV\Top Pump Bearing\HI Y (2)\1120 Spectrum HP 120 12000 Freq 3200 lines



Main Cursor X [cpm] = Not Active
Y [inch/s] = Not Active

Measurement date and time: 7/12/2016 10:53:08 AM

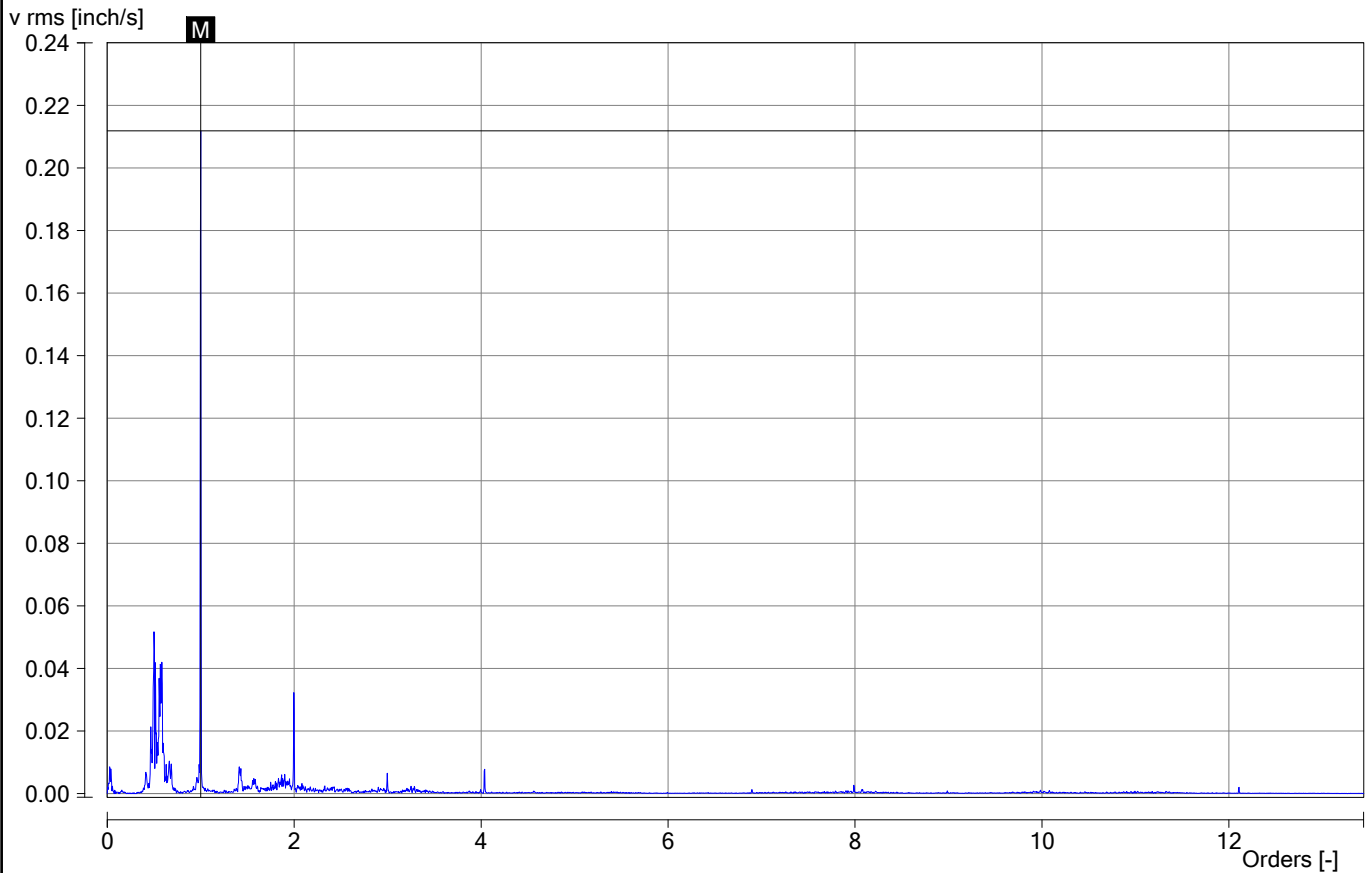
PENTAIR\Newtown Creek \Pump # 4 7-12-16 A\Influent Pump Station\48" 5712DV\Top Pump Bearing\HI Y
(2)\1120 Spectrum HP 120 12000 Freq 3200 lines

Main Cursor	X [cpm]	= 393.75
	Y [inch/s]	= 0.01
Delta Cursor	X [cpm]	= Not Active
	Y [inch/s]	= Not Active
RPM		= 395
RMS	Y [inch/s]	= 0.03

channelNo. A

1		
2	1976.25	0.01
3	393.75	0.01
4	2373.75	0.00
5	3.75	0.00
6	3161.25	0.00
7	10188.75	0.00
8	3168.75	0.00
9	4743.75	0.00
10	2767.50	0.00
	3232.50	0.00

Measurement date and time: 4/28/2016 2:16:42 PM

PENTAIR\Livingston PS\Raw Water Pump #2\River Intake Station\15 H 7000 9 stage\Top Motor Bearing\X (4)\1119
Spectrum HP 60 24000 Freq 3200 lines

Main Cursor	X [-]	= 1.00
	Y [inch/s]	= 0.21
Delta Cursor	X [-]	= Not Active
	Y [inch/s]	= Not Active
RPM		= 1785
RMS	Y [inch/s]	= 0.24

channelNo.	A	
	X [-]	Y [inch/s]
1		
2	1.00	0.21
3	0.50	0.05
4	0.58	0.04
5	0.51	0.04
6	0.57	0.04
7	0.55	0.04
8	2.00	0.03
9	0.47	0.02
10	0.53	0.02
	0.53	0.02

- Predictive Maintenance

#3 Alignment

Increases bearing life

Reduces shaft &/or coupling failure

Reduces vibration

Equipment life increased

- Predictive Maintenance

#3 Alignment

Increases bearing life

Reduces shaft &/or coupling failure

Reduces vibration

Equipment life increased

Soft foot?

- Predictive Maintenance

#4 Oil and Grease
Analyze

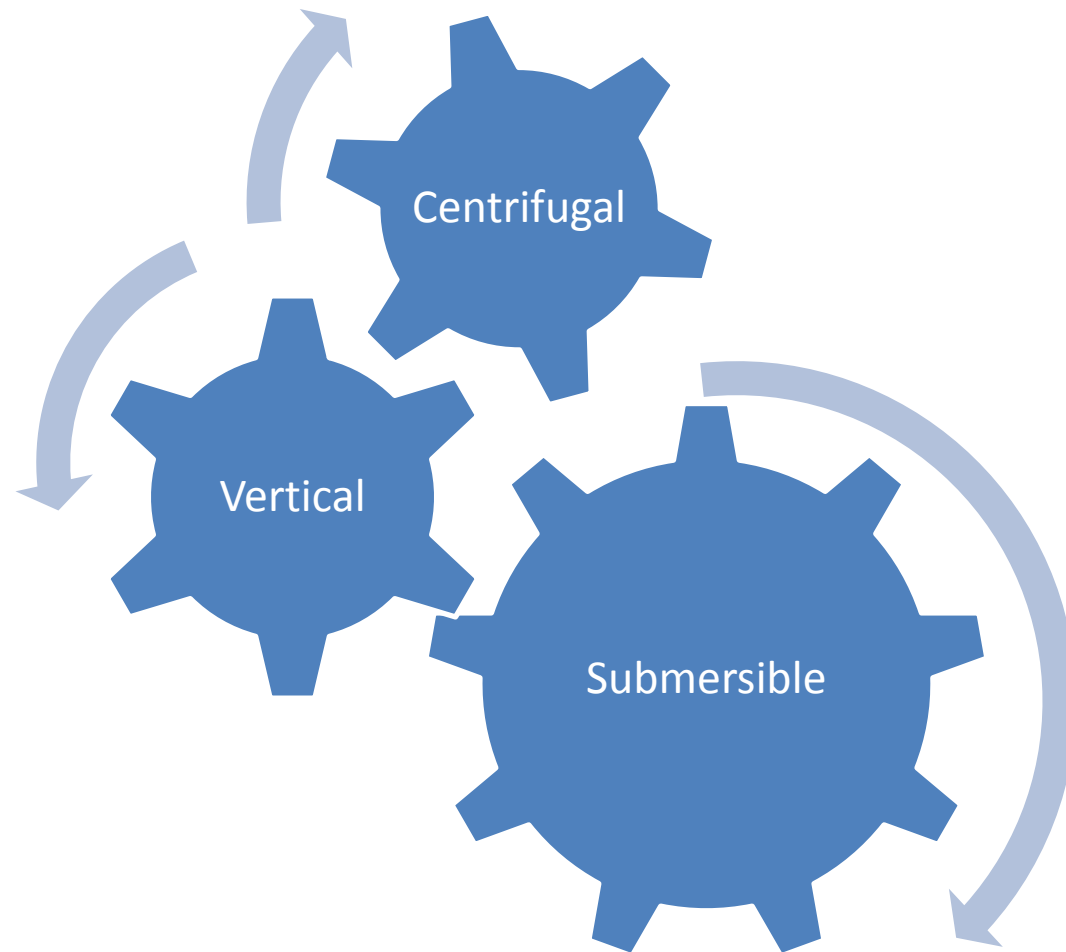
- Predictive Maintenance

#4 Thermal Imaging

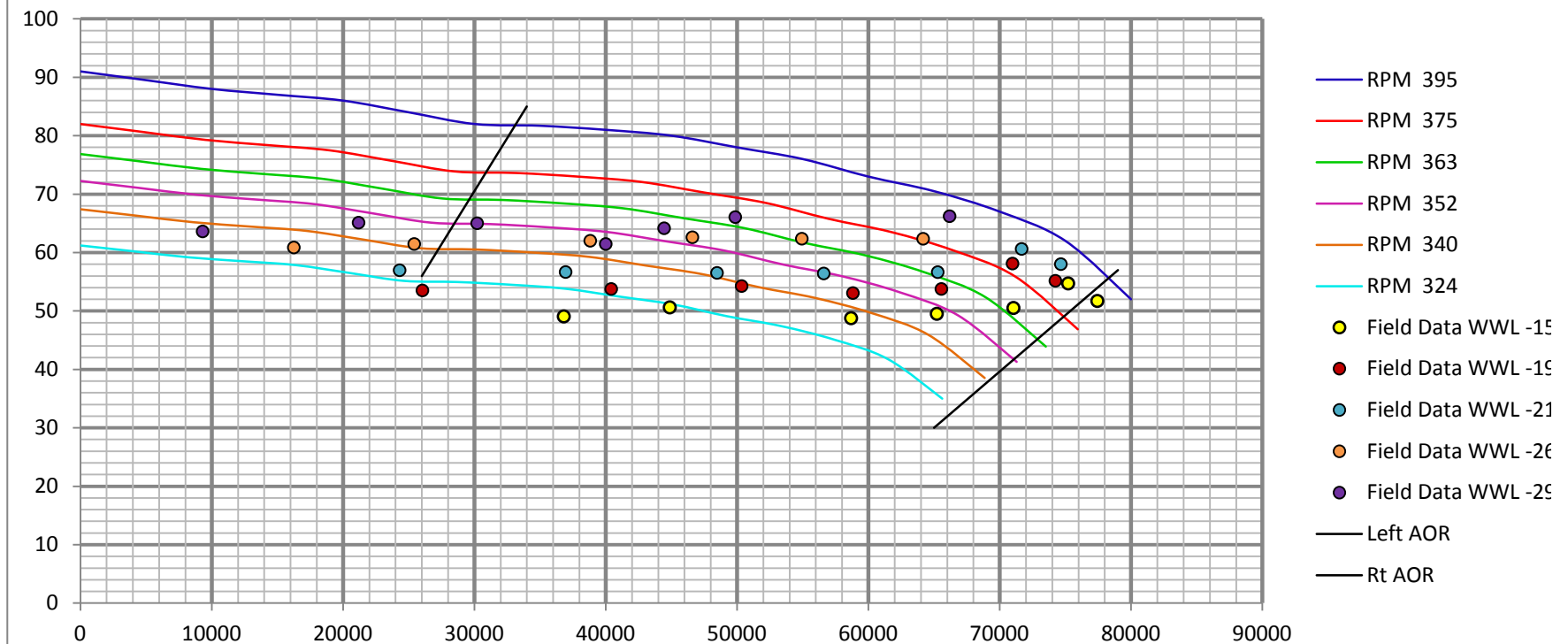
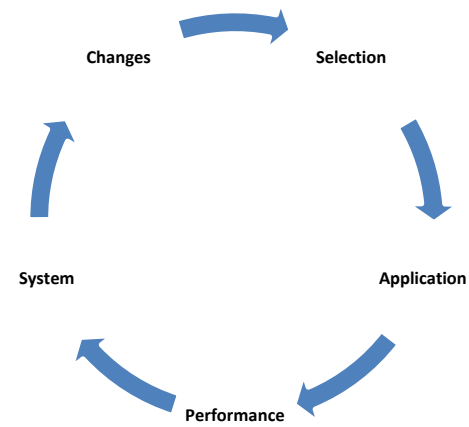
Reveals hot spots

Heat = Energy = Wear

Detects heat related issues prior to failure

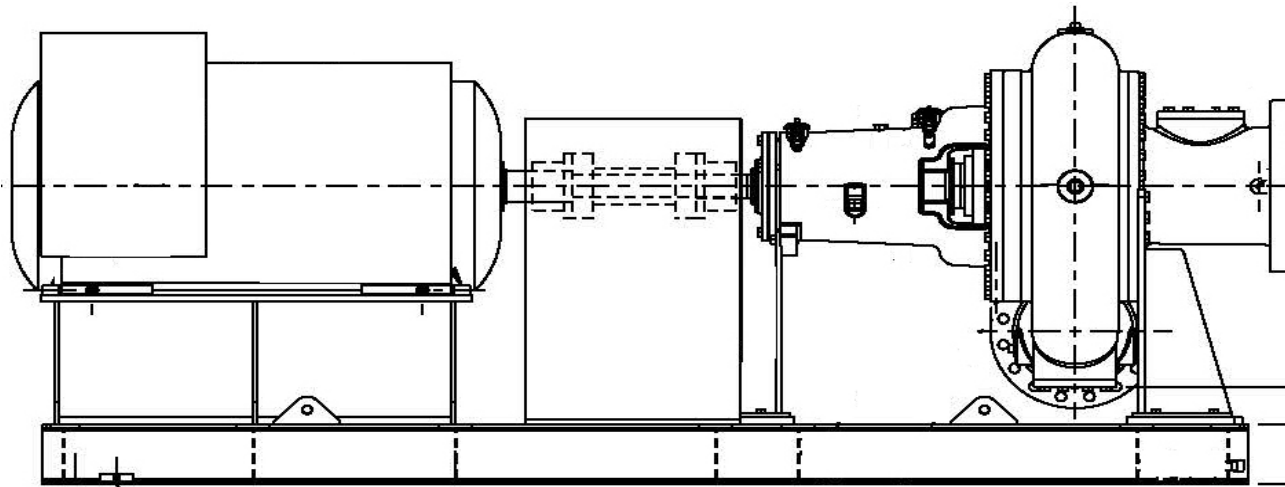


- Field Performance



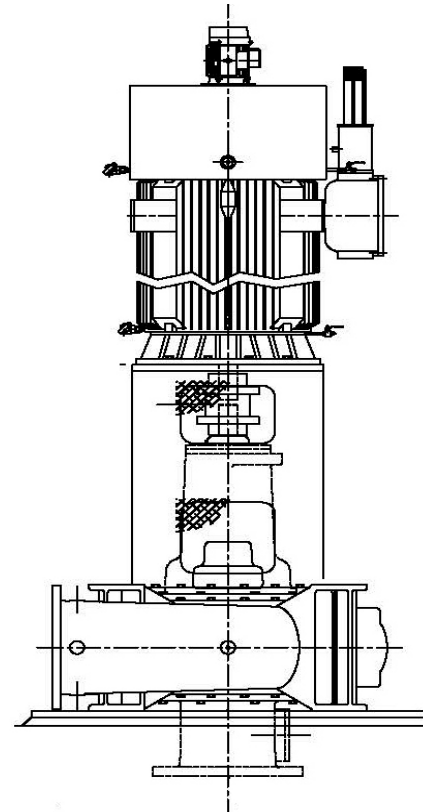


Horizontal





Vertical







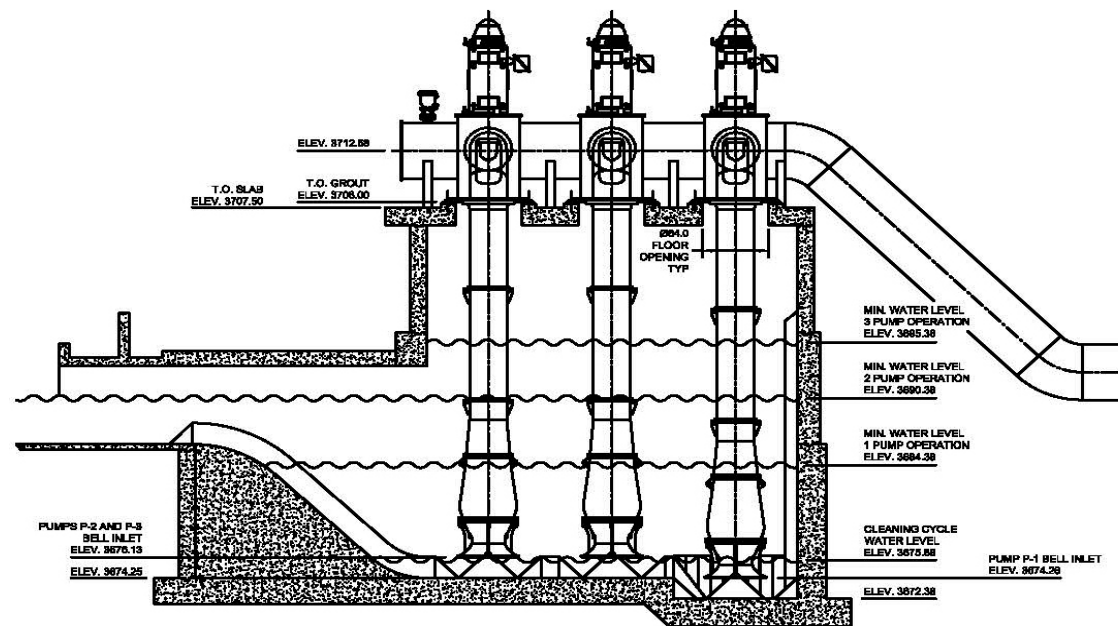
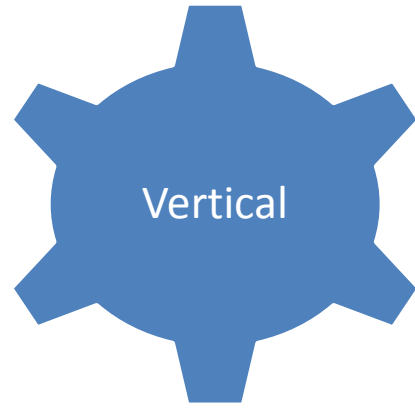










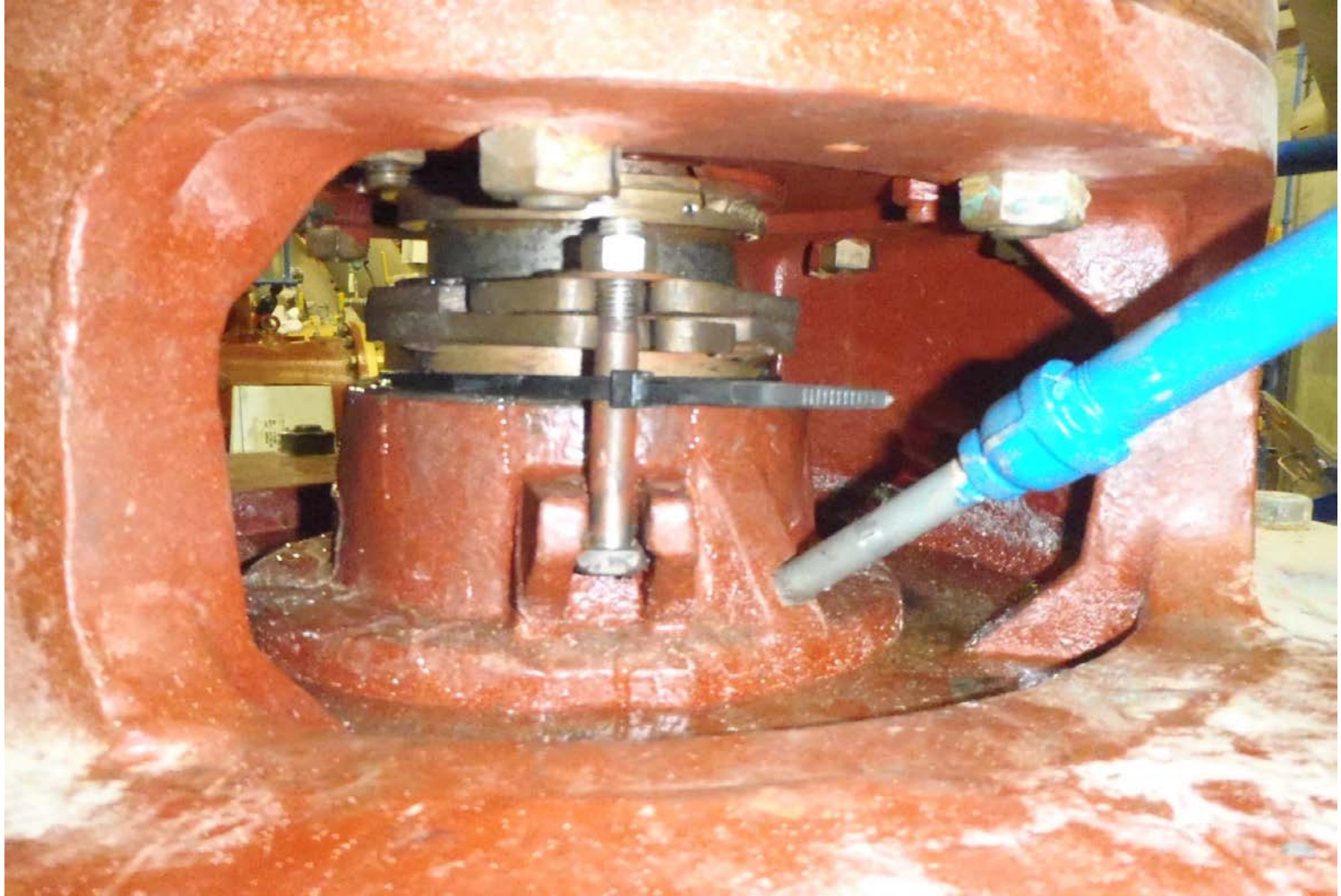


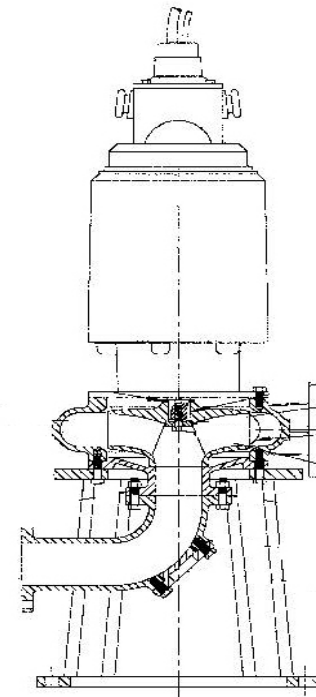
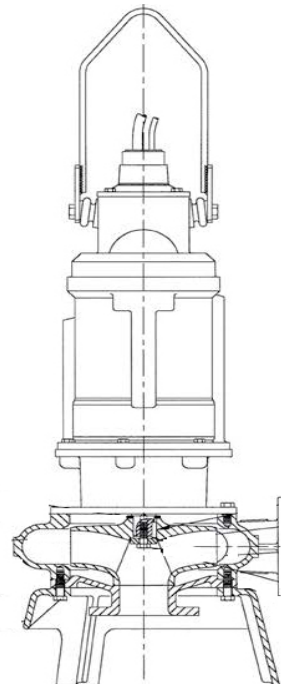
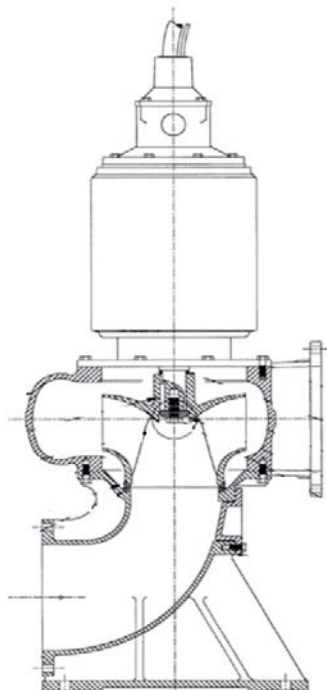
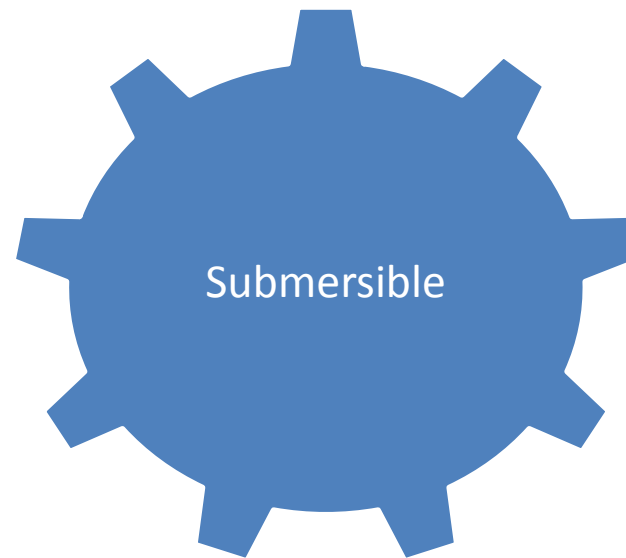












MAINTENANCE

General

With proper application of the pump/motor unit and proper installation of all the protective devices, no periodic maintenance of the equipment is necessary.

Should the moisture detector indicate intrusion of moisture, the pump should be shut-down as soon as possible. Oil should be drained from the motor by removing the oil cavity inspection plug. With the motor in position with the inspection plug hole at the top, refill the seal chamber with oil and place the unit back in service. (In some cases, the seal faces require time to seal properly and some water may have passed by the seal faces into the seal oil chamber causing an alarm to signal.)

Note that all mechanical seals must seep to provide lubrication to the rotating faces. This is trapped in the oil chamber between the inner and outer seals. During the initial run-in period, new seals may seep enough to cause the moisture alarm to go off. This is normal, change the oil and put the unit back into service.