



## Structure Report (Multi Equipment)

**For: PMP01 - Centrifugal Pump A; PMP02 - Centrifugal Pump B; PMP03 - Centrifugal Pump C; VEO-BW-BC-1 - BC-1 Distillate Pump; 005 - Demo Equipment**

Includes analysis for the latest measured values

Generated On **2018-06-22**  
Generated By **Petar Spaseski**

Prepared By \_\_\_\_\_

Checked By \_\_\_\_\_

## Introduction

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Vivamus vel purus eget ipsum rutrum fermentum nec id nunc. Nulla iaculis magna non ligula consequat, nec porta nulla porttitor. Pellentesque massa neque, pharetra non dui in, molestie porta nunc. Etiam leo tellus, viverra ut leo fermentum, aliquam porttitor arcu. Vestibulum convallis libero non dui commodo dictum. Cras vulputate leo neque, sed malesuada tortor pulvinar ac. Mauris erat nulla, dignissim eu finibus eget, finibus vel nunc. Nullam at malesuada nibh, et suscipit orci. Curabitur porttitor iaculis justo eu efficitur. Nullam fermentum pretium venenatis.

# Equipment Condition Summary Trend

PMP01 - Centrifugal Pump A	<b>1</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
	2018-05-25	2018-04-19	2018-03-19	2018-02-19	2018-01-19
PMP02 - Centrifugal Pump B	<b>1</b>	<b>3</b>	<b>2</b>	<b>1</b>	
	2018-04-19	2018-03-19	2018-02-19	2018-01-19	
PMP03 - Centrifugal Pump C	<b>2</b>	<b>2</b>	<b>1</b>	<b>4</b>	
	2018-04-19	2018-03-19	2018-02-19	2018-01-19	
VEO-BW-BC-1 - BC-1 Distillate Pump	<b>2</b>	<b>1</b>	<b>2</b>		
	2017-12-14	2017-12-13	2017-11-30		
005 - Demo Equipment	<b>1</b>				
	2018-05-10				

## Condition and Recommendations

Equipment						
Action	Failure Type	Failure Mode	Severity	Action Type	Urgency	
<b>VEO-BW-BC-1 - BC-1 Distillate Pump</b>						<b>2</b>
Analysis Summary:	Overall velocity levels were acceptable this survey (5.7mm/s RMS at NDE), with the dominant vibration primarily at shaft rotation speed. Rotational vibration levels have remained relatively stable since the last survey (22 Dec 2015). Very low level vibration at 231Hz was evident, which may indicate an initial defect on the NDE bearing inner race. This has remained stable since last survey. The sensor at the drive end was giving a faulty signal.					
Monitor for any further deterioration in balance or bearing condition.	SPO	BRF		FA	ANO	
Inspect sensor on DE bearing and repair/replace as required.	SYS	BRRRD		LE	AWC	
<b>PMP02 - Centrifugal Pump B</b>						<b>1</b>
Analysis Summary:	Vibration levels were within acceptable limits. No defect symptoms were evident.					
<b>PMP03 - Centrifugal Pump C</b>						<b>2</b>
Analysis Summary:	Vibration at 82Hz and harmonics was evident at the non drive end, suspected to be 2 times electrical line frequency. Vibration at 26Hz was evident at the drive end bearing, suspected to be 2 times motor speed. Vibration at rotation speed and harmonics was evident at low levels.					
Continue to monitor.	SYS	BRF	VSF	O	NAR	
<b>005 - Demo Equipment</b>						<b>1</b>
Analysis Summary:	all good					
<b>PMP01 - Centrifugal Pump A</b>						<b>1</b>
Analysis Summary:	Pump has been refurbished					
Continue to monitor	SYS	MM	AF	FA	ANO	

## Overall Value Summary Table

### VEO-BW-BC-1 - BC-1 Distillate Pump

Parameter	Data Collected	Acceleration	Velocity	Demodulation
1H- Motor NDE Horizontal (AVDT)	2018-04-07 02:26:45	22.7715 (m/s <sup>2</sup> )	23.6056 (mm/s)	0.2466 (du_g)
2H-Motor DE Horizontal (AVDT)	2018-04-07 02:27:59	24.114 (m/s <sup>2</sup> )	19 (mm/s)	0.2412 (du_g)
2V-Motor DE Vertical (V)	2017-12-14 01:56:58		0.6544 (mm/s)	
2A-Motor DE Axial (V)	2017-12-14 01:57:10		1.3983 (mm/s)	
3H-Pump DE Bearing Horizontal (AVDT)	2018-04-07 02:27:21	28.8856 (m/s <sup>2</sup> )	5.9525 (mm/s)	0.2506 (du_g)
3V-Pump DE Bearing Vertical (V)	2017-12-14 01:57:30		1.0571 (mm/s)	
3A-Pump DE Bearing Axial (V)	2017-12-14 01:57:39		1.3059 (mm/s)	
4H-Pump NDE Bearing Horizontal (AVDT)	2018-04-07 02:27:41	28.3199 (m/s <sup>2</sup> )	6.1535 (mm/s)	0.2411 (du_g)
5H-Pump Housing Horizontal (A)	2017-12-14 01:57:55	1.343 (m/s <sup>2</sup> )		

**PMP02 - Centrifugal Pump B**

Parameter	Data Collected	Acceleration	Velocity	Demodulation
Motor NDE Horizontal	2018-04-19 10:59:17	1.0485 (m/s <sup>2</sup> )	2.2681 (mm/s)	0.0044 (du_m/s <sup>2</sup> )
Motor DE Horizontal	2018-04-19 10:59:36	1.2554 (m/s <sup>2</sup> )	2.3513 (mm/s)	0.004 (du_m/s <sup>2</sup> )
Motor DE Vertical	2018-04-19 10:59:53	N/A	2.4048 (mm/s)	N/A
Motor DE Axial	2018-04-19 11:00:11	N/A	1.8726 (mm/s)	N/A
Pump DE Horizontal	2018-04-19 11:00:31	1.0099 (m/s <sup>2</sup> )	1.711 (mm/s)	0.0042 (du_m/s <sup>2</sup> )
Pump DE Vertical	2018-04-19 11:00:47	N/A	1.7212 (mm/s)	N/A
Pump DE Axial	2018-04-19 11:01:05	N/A	1.8211 (mm/s)	N/A
Pump NDE Horizontal	2018-04-19 11:01:19	0.7971 (m/s <sup>2</sup> )	1.7526 (mm/s)	0.0047 (du_m/s <sup>2</sup> )
Pump NDE Vertical	2018-04-19 11:01:39	N/A	1.9352 (mm/s)	N/A

**PMP03 - Centrifugal Pump C**

Parameter	Data Collected	Acceleration	Velocity	Demodulation
Motor NDE Horizontal	2018-04-19 11:02:39	0.3676 (m/s <sup>2</sup> )	0.7016 (mm/s)	0.0034 (du_m/s <sup>2</sup> )
Motor DE Horizontal	2018-04-19 11:02:54	0.4548 (m/s <sup>2</sup> )	0.7244 (mm/s)	0.0034 (du_m/s <sup>2</sup> )
Motor DE Vertical	2018-04-19 11:03:09	N/A	0.7258 (mm/s)	N/A
Motor DE Axial	2018-04-19 11:03:26	N/A	0.6586 (mm/s)	N/A
Pump DE Horizontal	2018-04-19 11:03:41	0.371 (m/s <sup>2</sup> )	0.6741 (mm/s)	0.0034 (du_m/s <sup>2</sup> )
Pump DE Vertical	2018-04-19 11:03:56	N/A	0.6833 (mm/s)	N/A
Pump DE Axial	2018-04-19 11:04:11	N/A	0.6597 (mm/s)	N/A
Pump NDE Horizontal	2018-04-19 11:04:27	0.3956 (m/s <sup>2</sup> )	0.6716 (mm/s)	0.0036 (du_m/s <sup>2</sup> )
Pump NDE Vertical	2018-04-19 11:04:42	N/A	0.6788 (mm/s)	N/A

**005 - Demo Equipment**

Parameter	Data Collected	Acceleration	Velocity	Demodulation
Motor NDE Horizontal	2018-05-10 12:38:36	1.0719 (m/s <sup>2</sup> )	3.0115 (mm/s)	0.0044 (du_m/s <sup>2</sup> )
Motor NDE Vertical	2018-05-10 12:38:43	N/A	2.9755 (mm/s)	N/A
Motor NDE Axial	2018-05-10 12:38:49	N/A	2.7926 (mm/s)	N/A
Motor DE Horizontal	2018-05-10 12:38:55	0.9891 (m/s <sup>2</sup> )	2.7388 (mm/s)	0.0042 (du_m/s <sup>2</sup> )
Motor DE Vertical	2018-05-10 12:39:01	N/A	2.7133 (mm/s)	N/A
Motor DE Axial	2018-05-10 12:39:07	N/A	2.7164 (mm/s)	N/A



**PMP01 - Centrifugal Pump A**

Parameter	Data Collected	Acceleration	Velocity	Demodulation
Motor NDE Horizontal	2018-05-25 09:51:13	1.1315 (m/s <sup>2</sup> )	3.2896 (mm/s)	0.0037 (du_m/s <sup>2</sup> )
Motor DE Horizontal	2018-05-25 09:51:19	1.1214 (m/s <sup>2</sup> )	3.2606 (mm/s)	0.0036 (du_m/s <sup>2</sup> )
Motor DE Vertical	2018-05-25 09:51:24	N/A	3.3731 (mm/s)	N/A
Motor DE Axial	2018-05-25 09:51:30	N/A	3.3395 (mm/s)	N/A
Pump DE Horizontal	2018-05-25 09:51:36	1.1348 (m/s <sup>2</sup> )	3.2699 (mm/s)	0.0039 (du_m/s <sup>2</sup> )
Pump DE Vertical	2018-05-25 09:51:42	N/A	3.4115 (mm/s)	N/A
Pump DE Axial	2018-05-25 09:51:48	N/A	3.3655 (mm/s)	N/A
Pump NDE Horizontal	2018-05-25 09:51:54	1.1018 (m/s <sup>2</sup> )	3.3381 (mm/s)	0.0038 (du_m/s <sup>2</sup> )
Pump NDE Vertical	2018-05-25 09:52:00	N/A	3.3245 (mm/s)	N/A

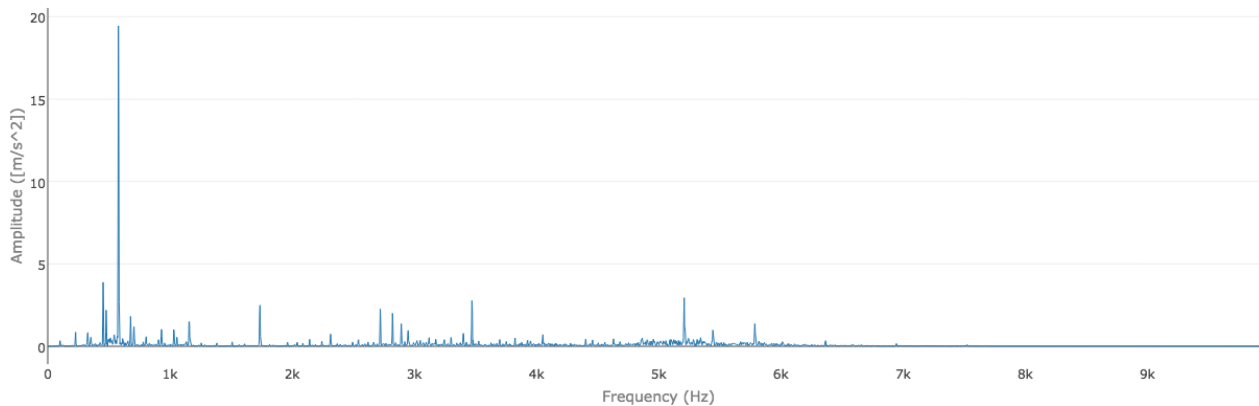
# Spectras

## VEO-BW-BC-1 - BC-1 Distillate Pump

### 1H- Motor NDE Horizontal (AVDT)

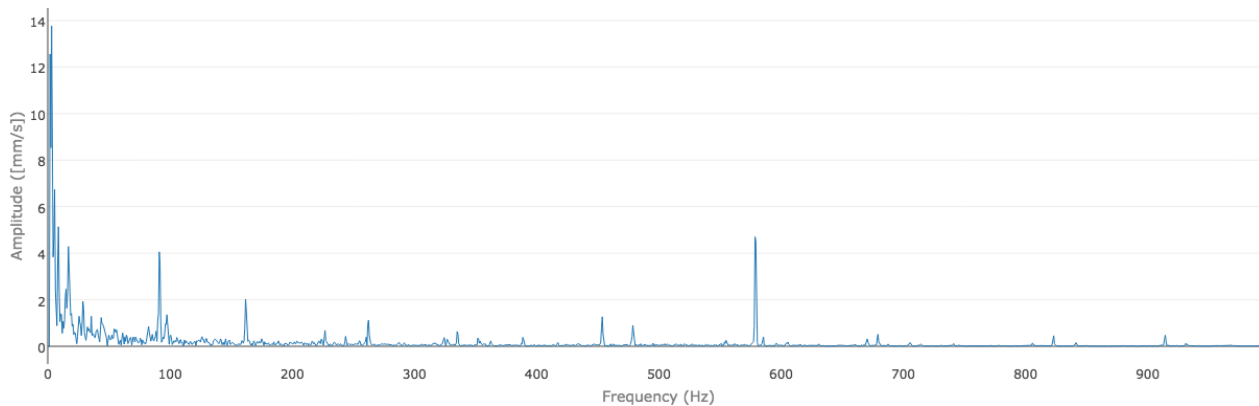
Acceleration Spectrum

Date Collected 2018-04-07 02:26:45



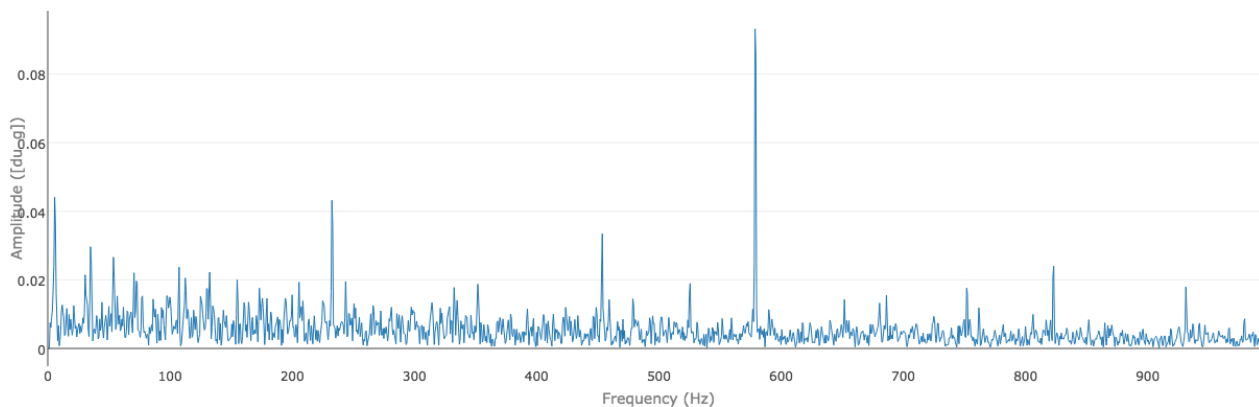
Velocity Spectrum

Date Collected 2018-04-07 02:26:45



Demodulation Spectrum

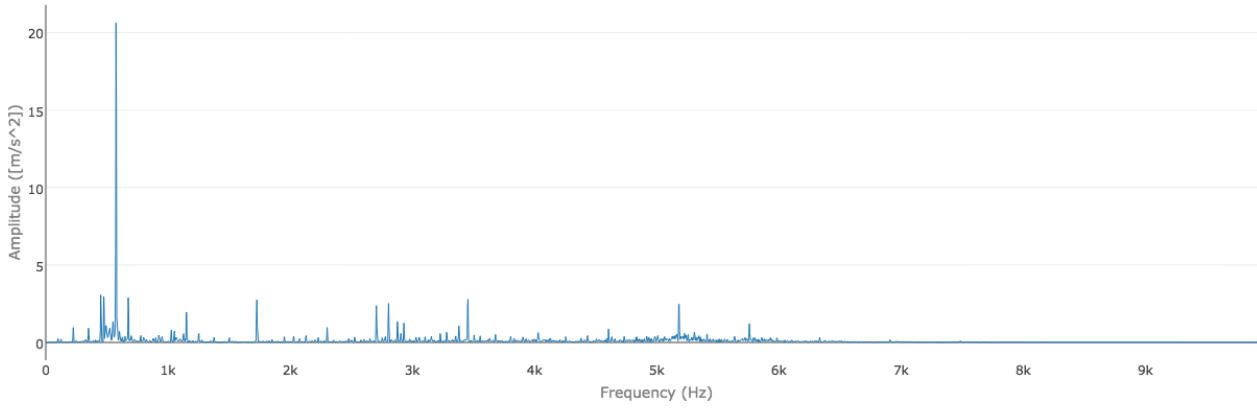
Date Collected 2018-04-07 02:26:45



## 2H-Motor DE Horizontal (AVDT)

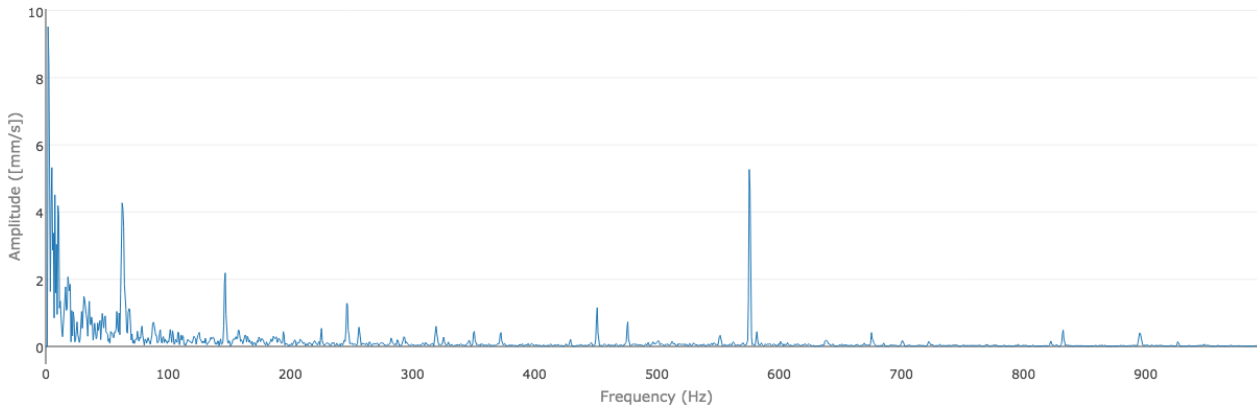
Acceleration Spectrum

Date Collected 2018-04-07 02:27:59



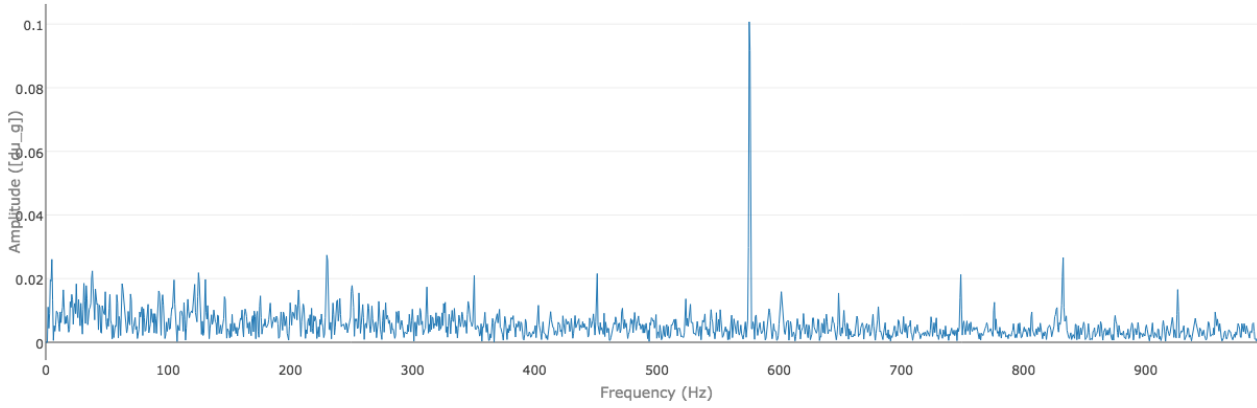
Velocity Spectrum

Date Collected 2018-04-07 02:27:59



Demodulation Spectrum

Date Collected 2018-04-07 02:27:59

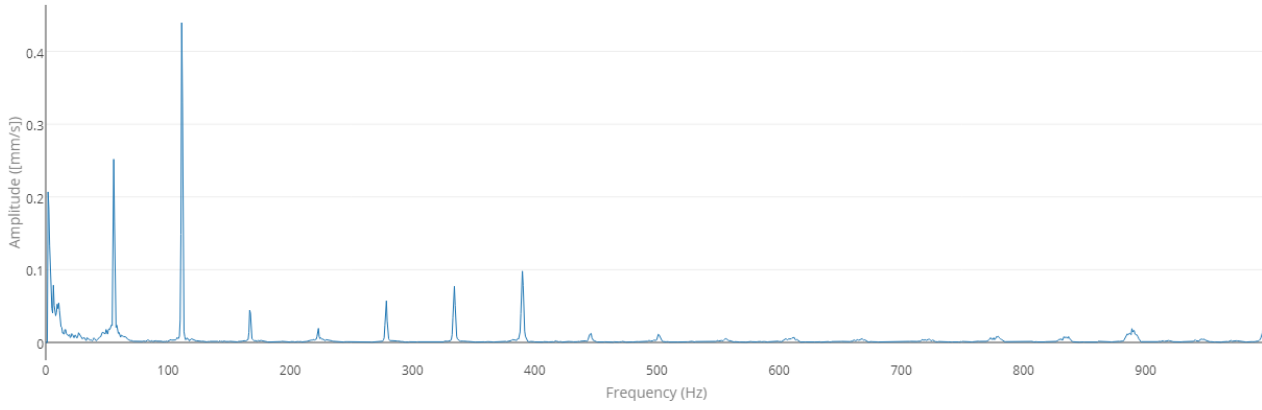


# 2V-Motor DE Vertical (V)

Velocity Spectrum

Date Collected

2017-12-14 01:56:58

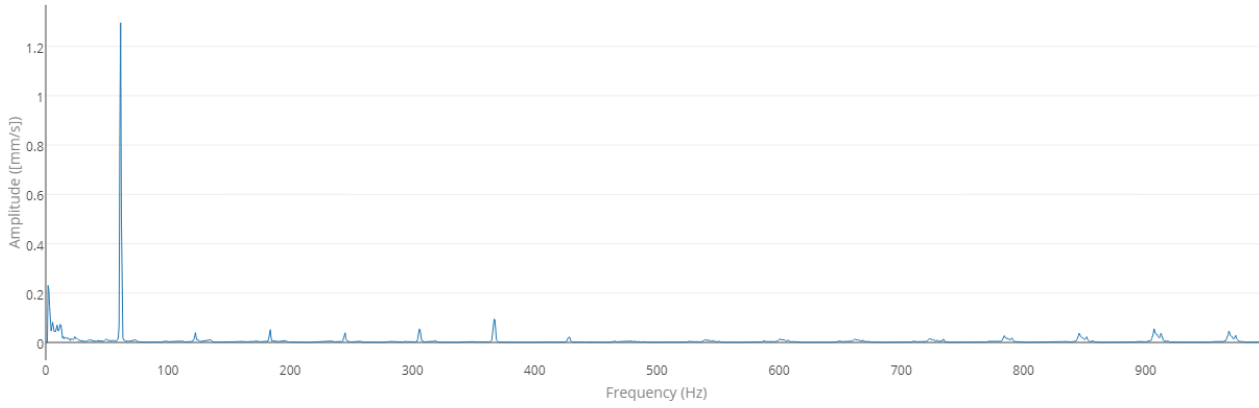


## 2A-Motor DE Axial (V)

Velocity Spectrum

Date Collected

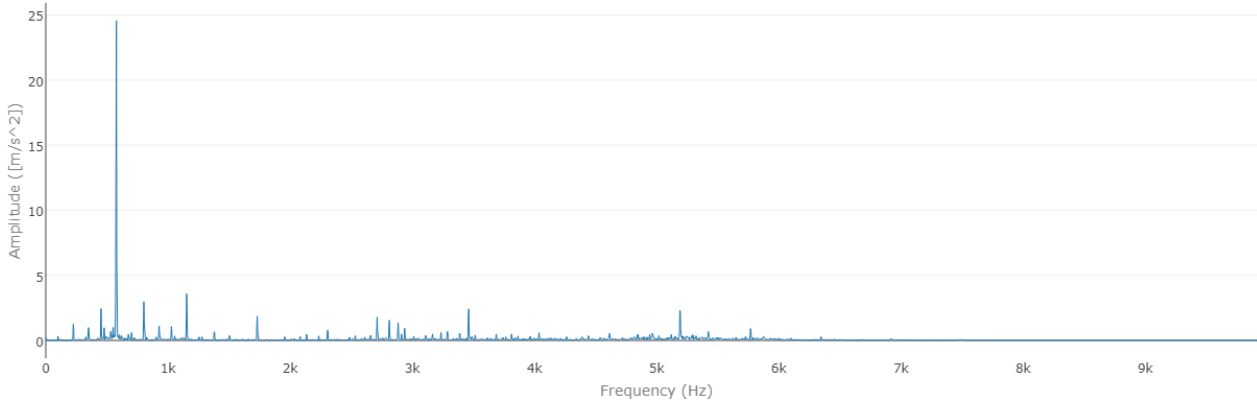
2017-12-14 01:57:10



### 3H-Pump DE Bearing Horizontal (AVDT)

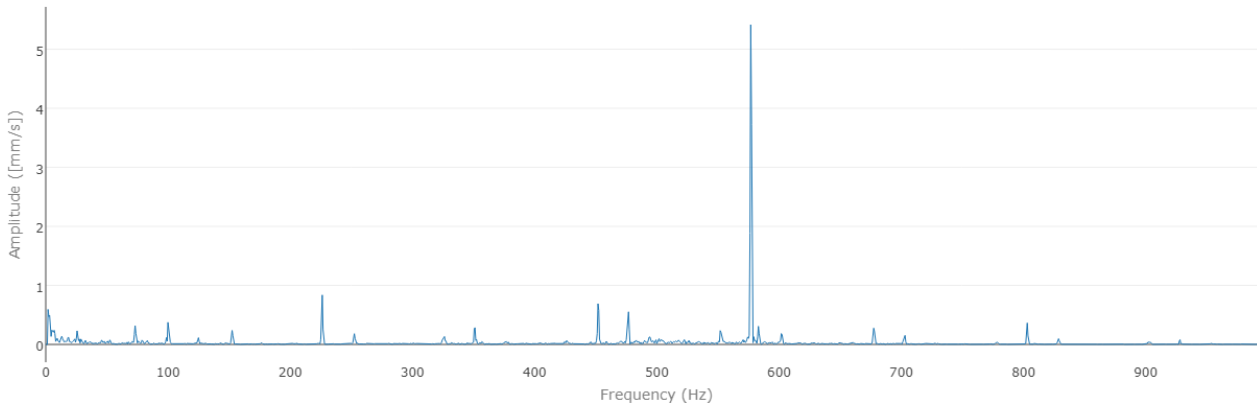
Acceleration Spectrum

Date Collected 2018-04-07 02:27:21



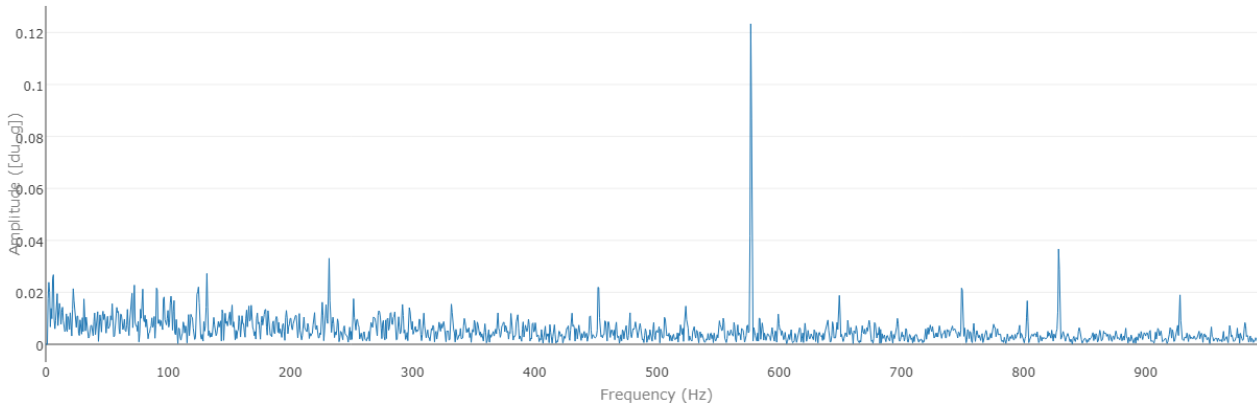
Velocity Spectrum

Date Collected 2018-04-07 02:27:21



Demodulation Spectrum

Date Collected 2018-04-07 02:27:21

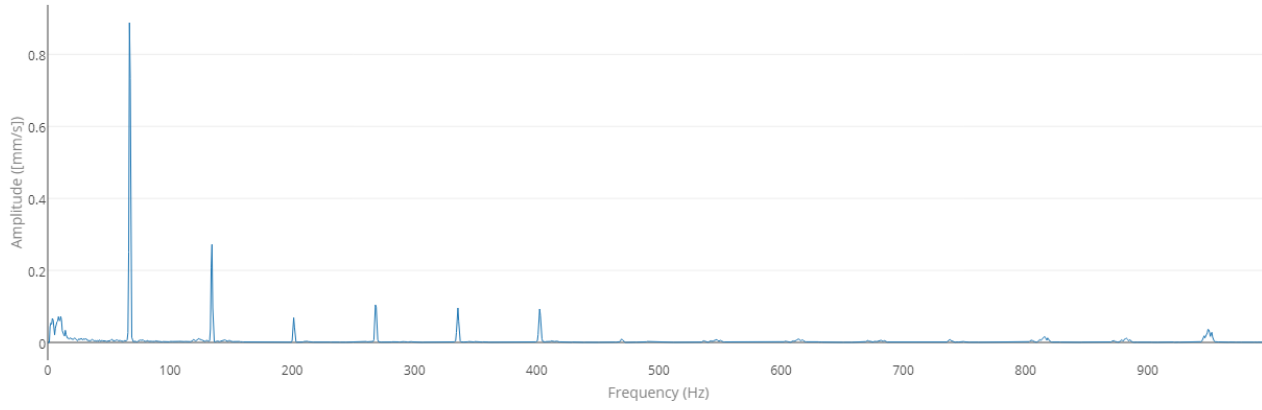


### 3V-Pump DE Bearing Vertical (V)

Velocity Spectrum

Date Collected

2017-12-14 01:57:30

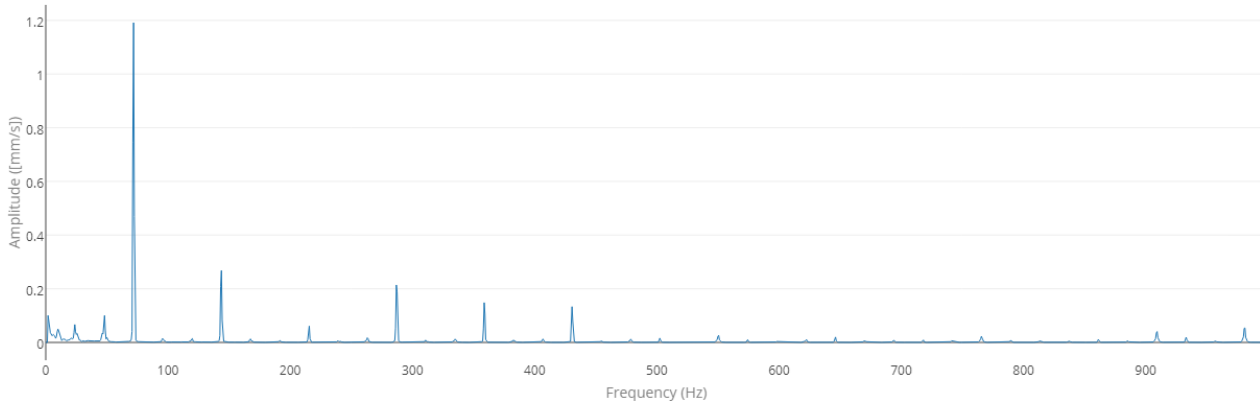


### 3A-Pump DE Bearing Axial (V)

Velocity Spectrum

Date Collected

2017-12-14 01:57:39

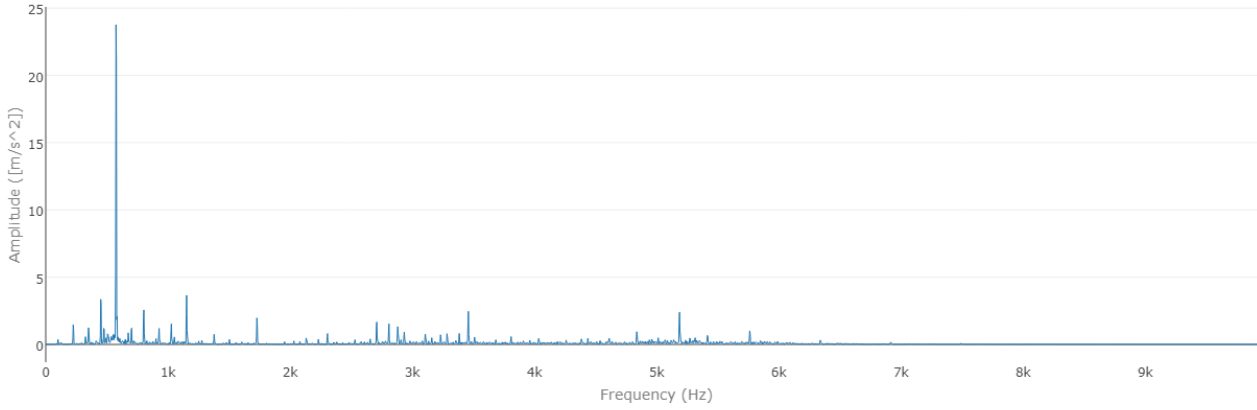




### 4H-Pump NDE Bearing Horizontal (AVDT)

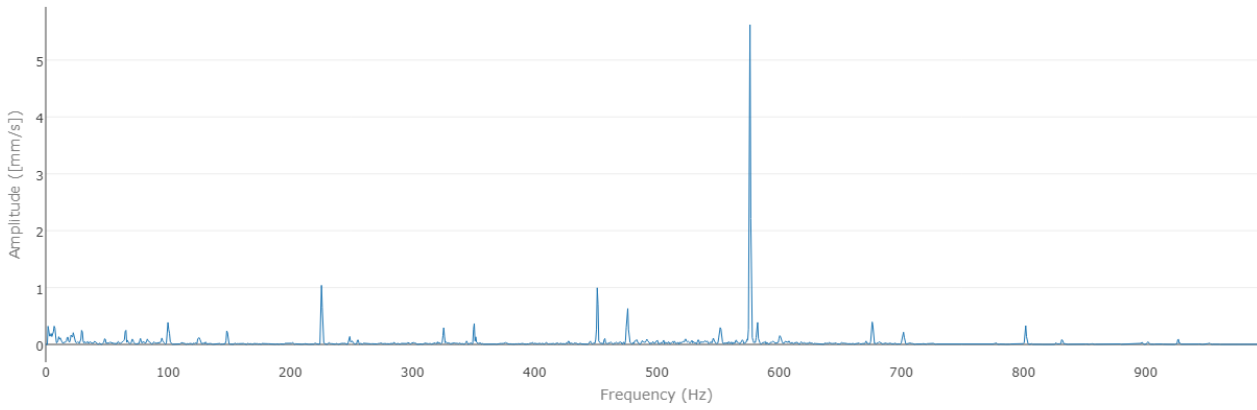
Acceleration Spectrum

Date Collected 2018-04-07 02:27:41



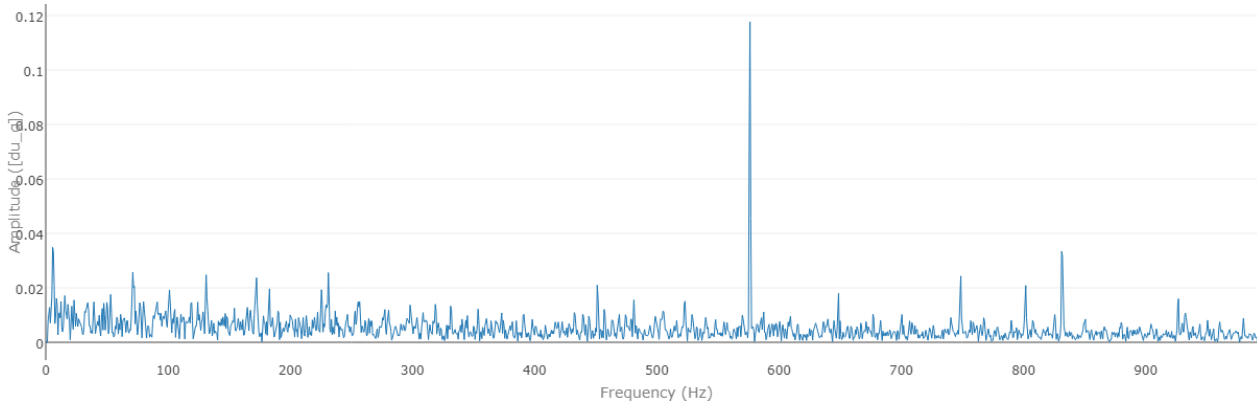
Velocity Spectrum

Date Collected 2018-04-07 02:27:41



Demodulation Spectrum

Date Collected 2018-04-07 02:27:41

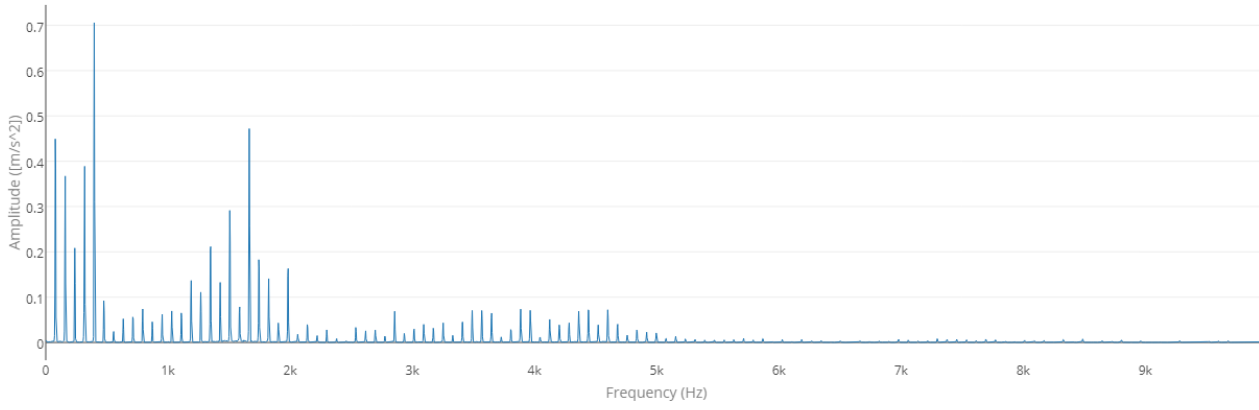


# 5H-Pump Housing Horizontal (A)

Acceleration Spectrum

Date Collected

2017-12-14 01:57:55

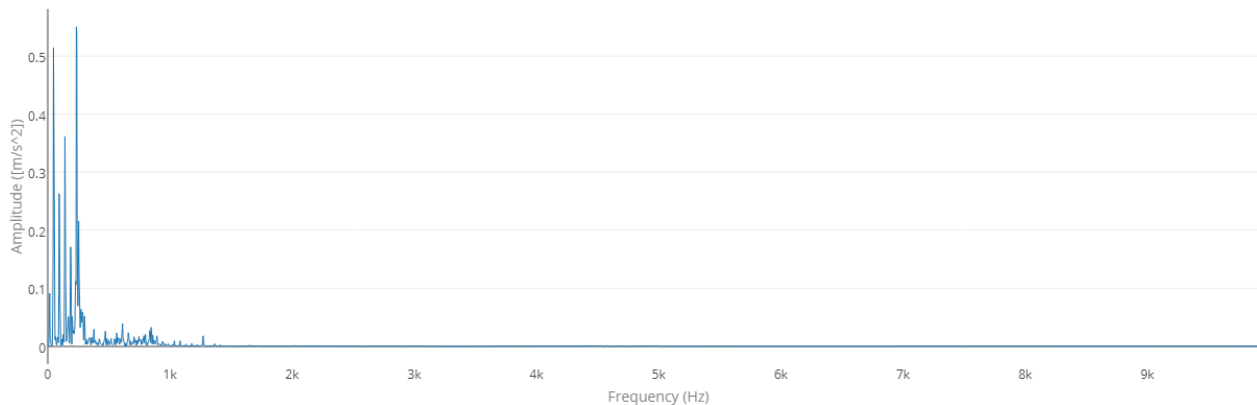


# PMP02 - Centrifugal Pump B

## Motor NDE Horizontal

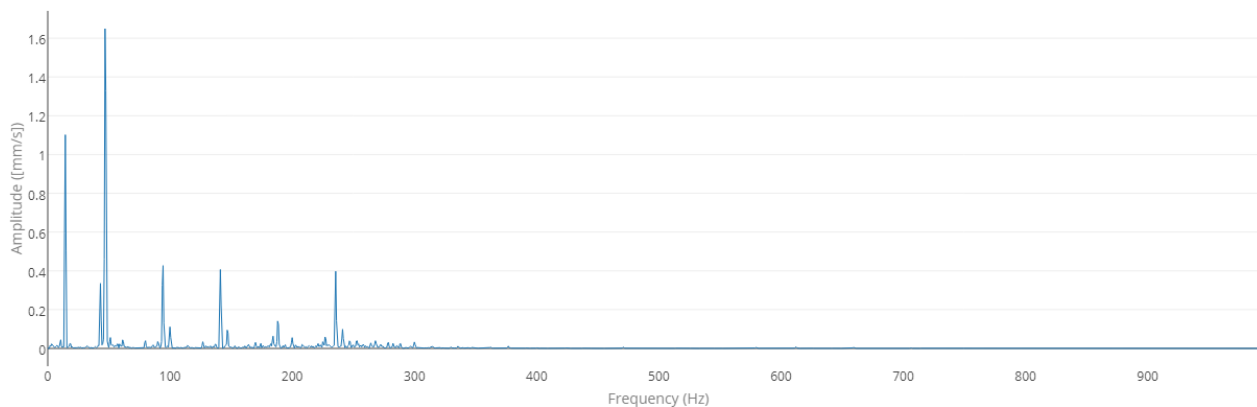
Acceleration Spectrum

Date Collected 2018-04-19 10:59:17



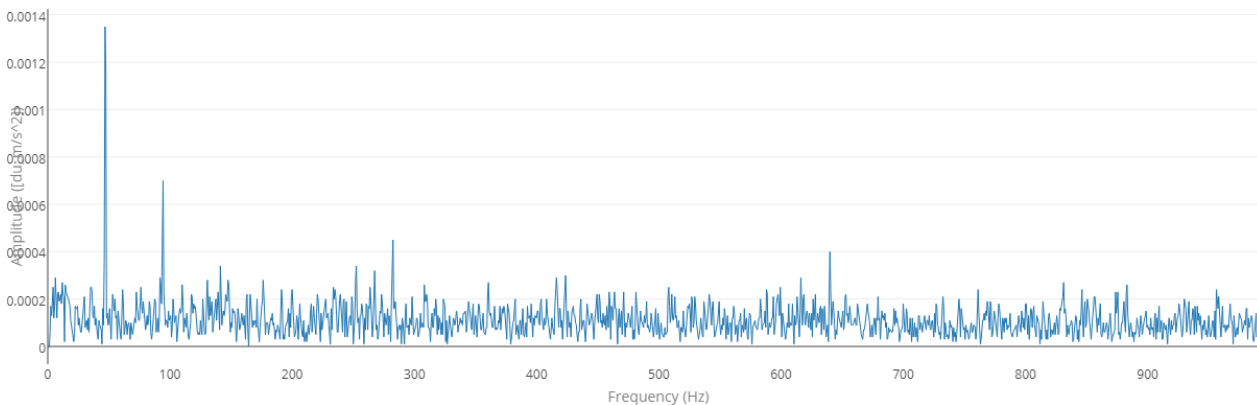
Velocity Spectrum

Date Collected 2018-04-19 10:59:17



Demodulation Spectrum

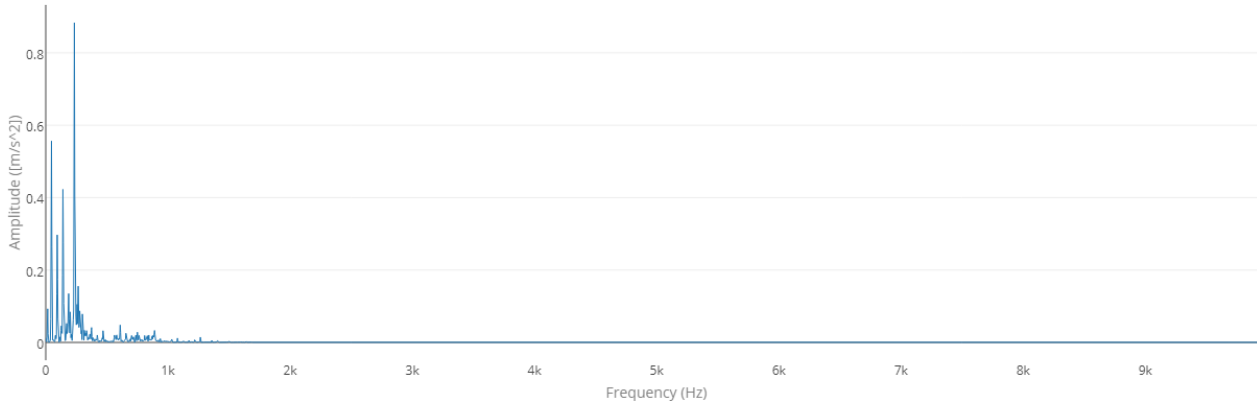
Date Collected 2018-04-19 10:59:17



# Motor DE Horizontal

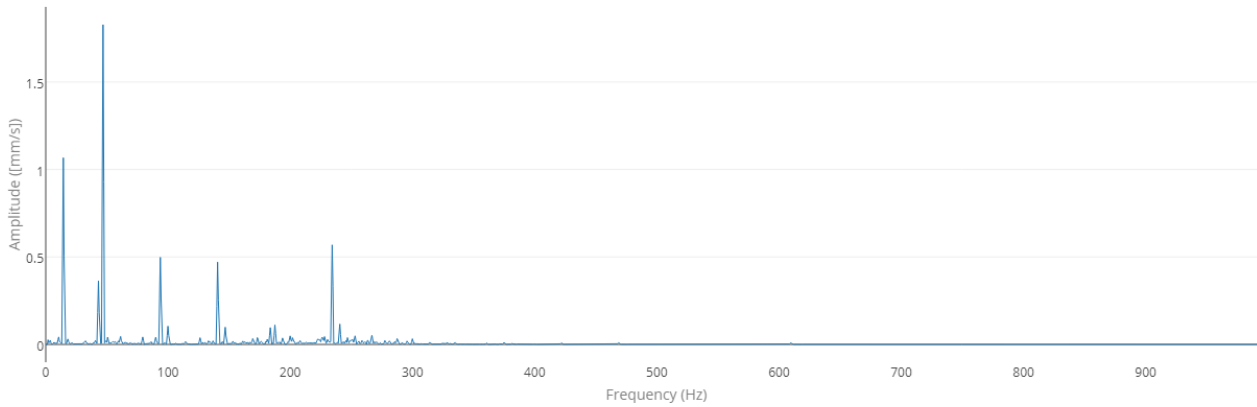
Acceleration Spectrum

Date Collected 2018-04-19 10:59:36



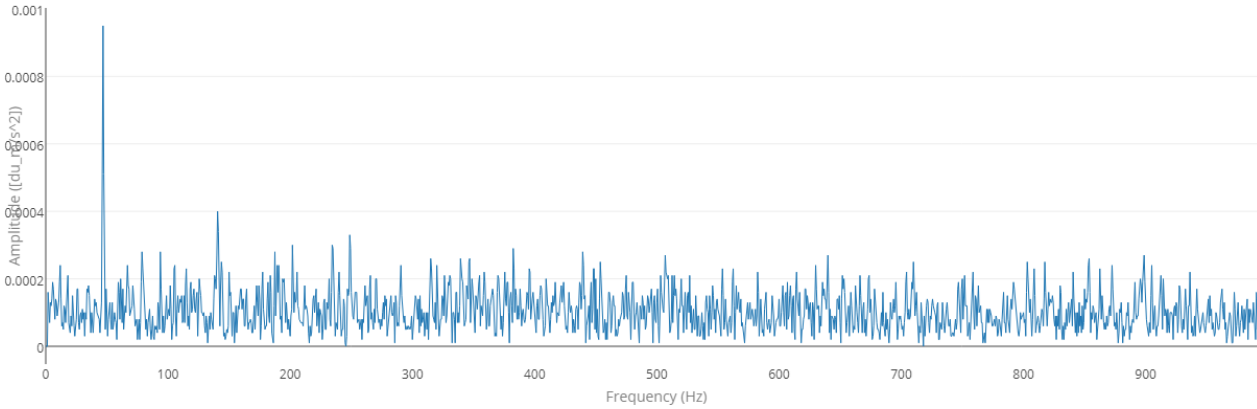
Velocity Spectrum

Date Collected 2018-04-19 10:59:36



Demodulation Spectrum

Date Collected 2018-04-19 10:59:36

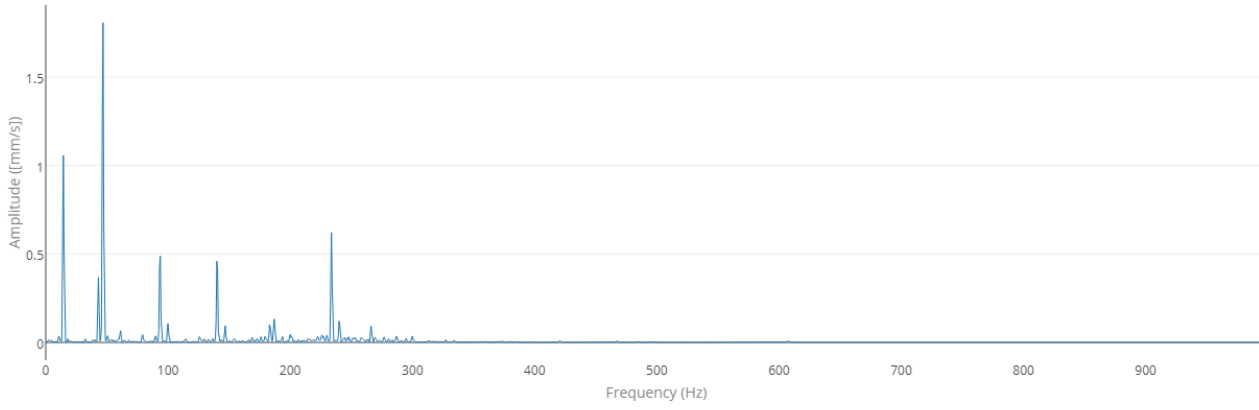


# Motor DE Vertical

Velocity Spectrum

Date Collected

2018-04-19 10:59:53

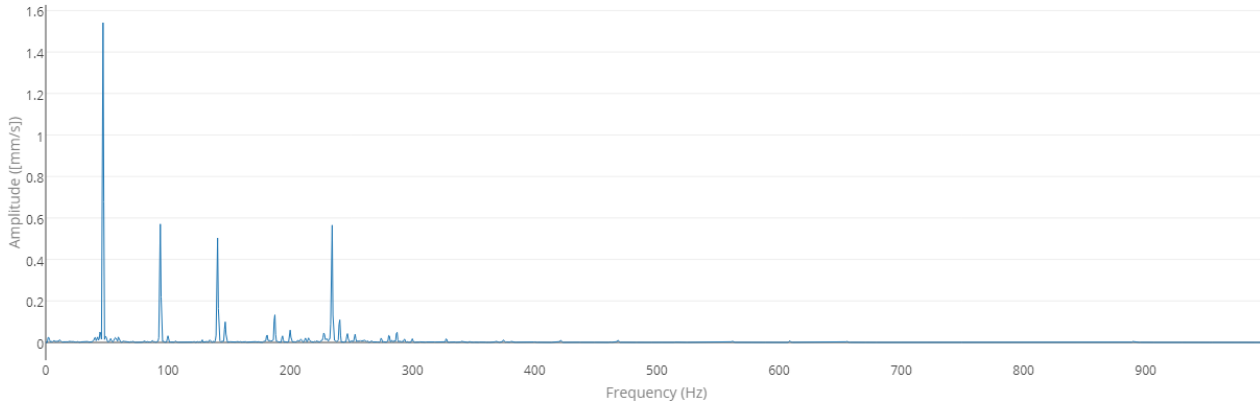


**Motor DE Axial**

Velocity Spectrum

**Date Collected**

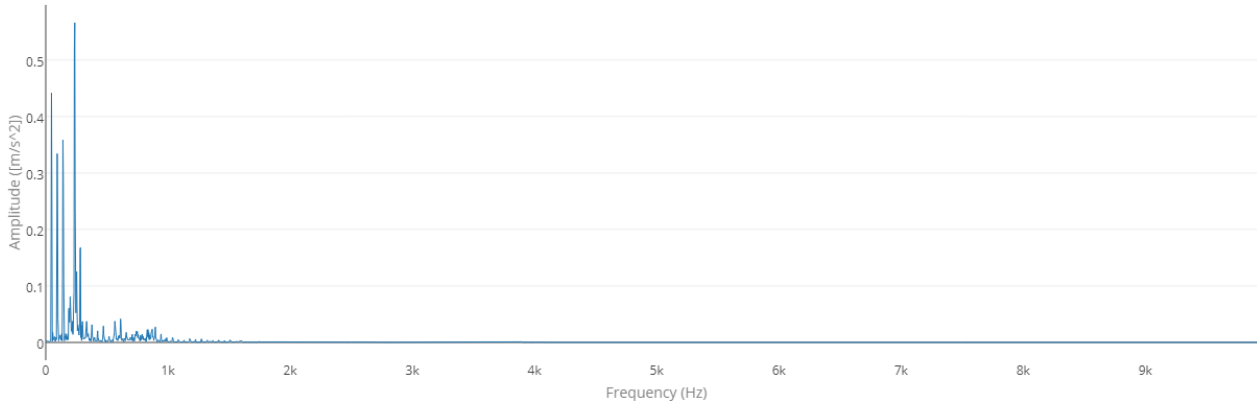
2018-04-19 11:00:11



# Pump DE Horizontal

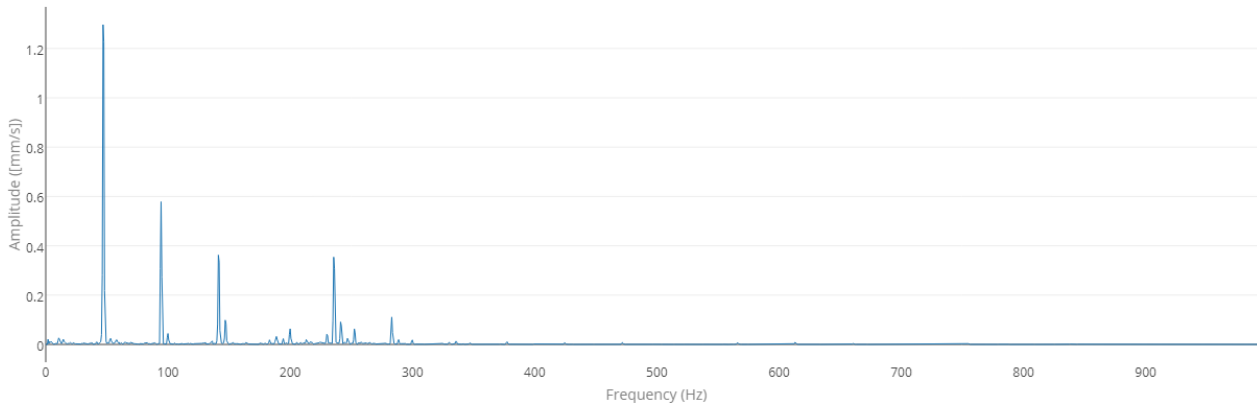
Acceleration Spectrum

Date Collected 2018-04-19 11:00:31



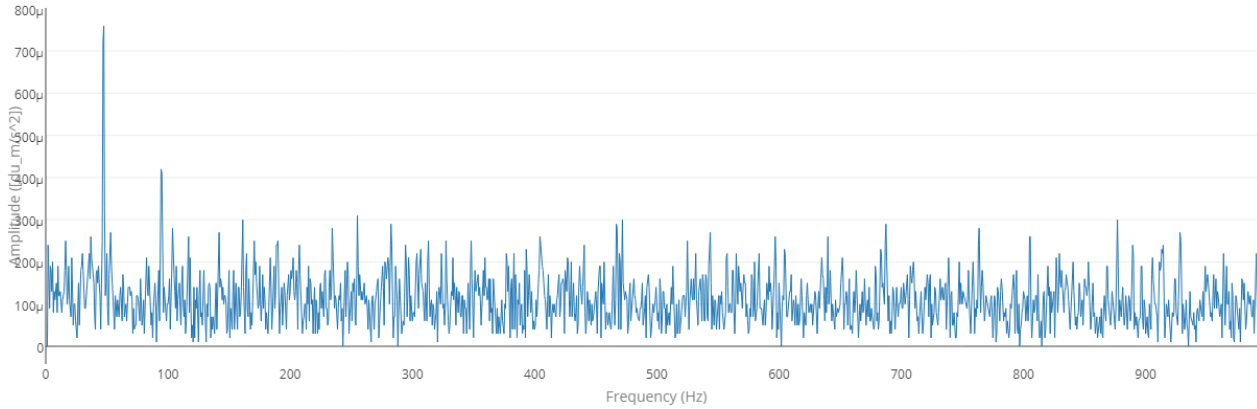
Velocity Spectrum

Date Collected 2018-04-19 11:00:31



Demodulation Spectrum

Date Collected 2018-04-19 11:00:31

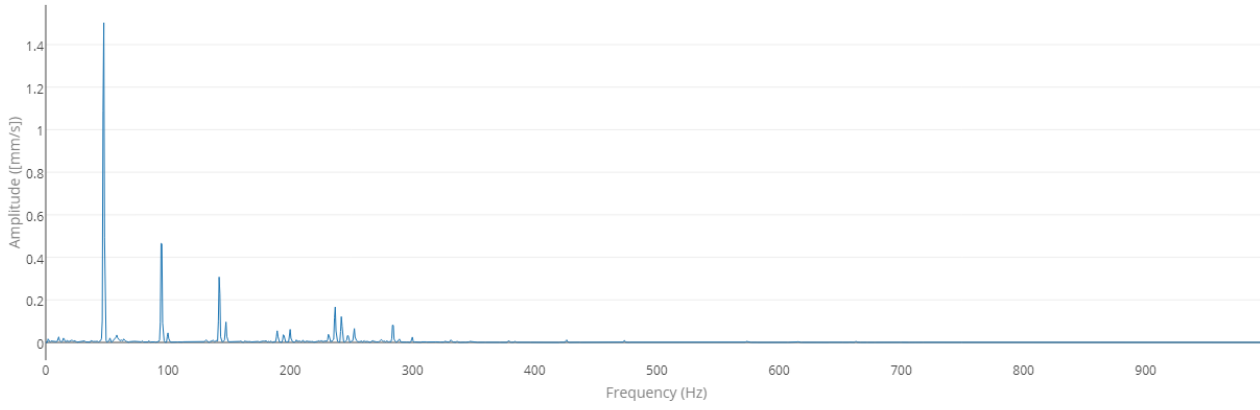


**Pump DE Vetical**

Velocity Spectrum

**Date Collected**

2018-04-19 11:00:47



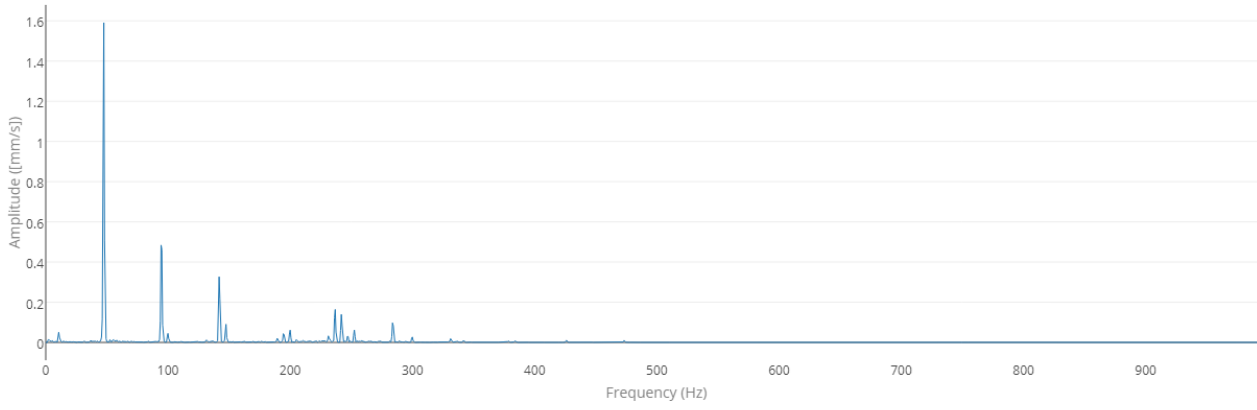


# Pump DE Axial

Velocity Spectrum

Date Collected

2018-04-19 11:01:05

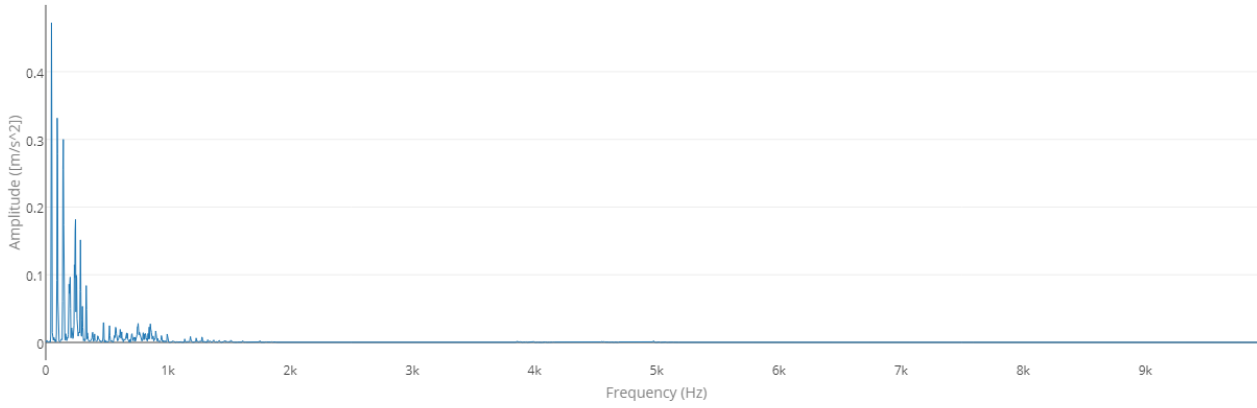


# Pump NDE Horizontal

Acceleration Spectrum

Date Collected

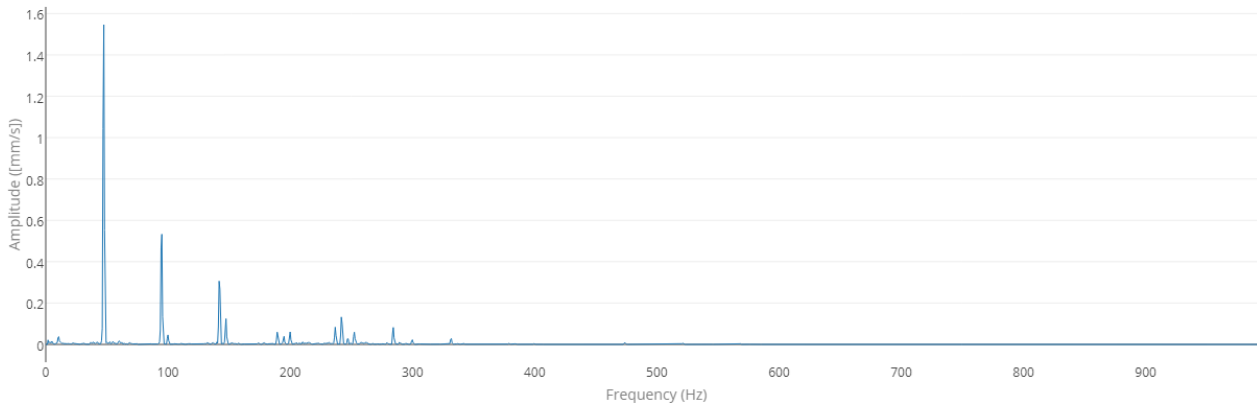
2018-04-19 11:01:19



Velocity Spectrum

Date Collected

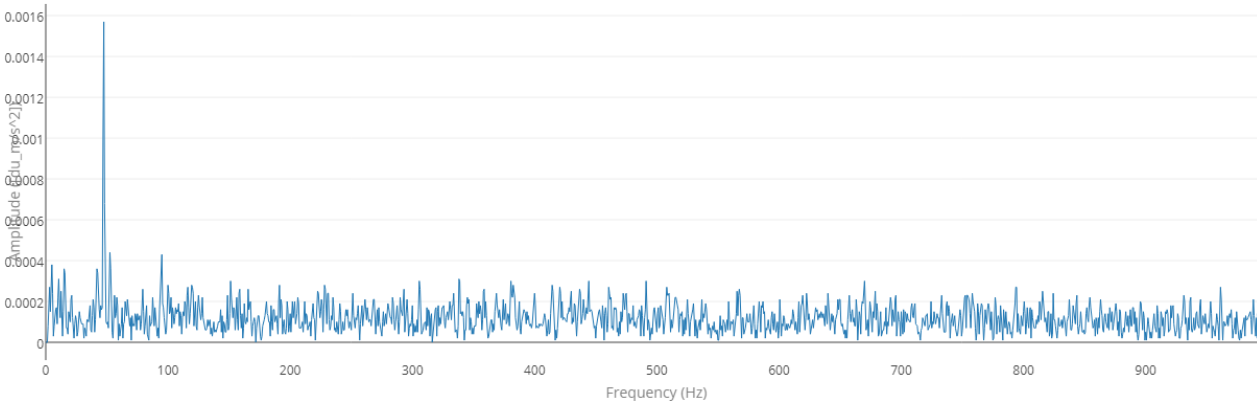
2018-04-19 11:01:19



Demodulation Spectrum

Date Collected

2018-04-19 11:01:19

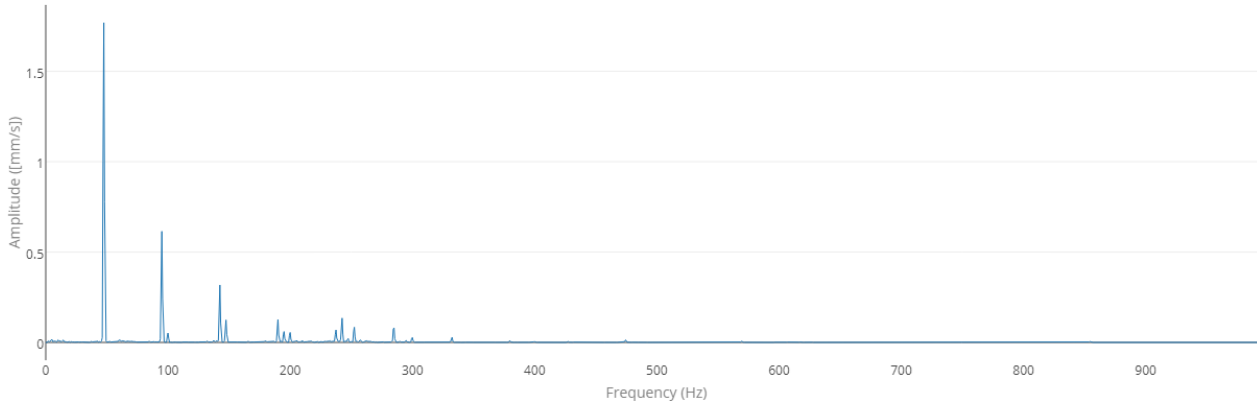


# Pump NDE Vertical

Velocity Spectrum

Date Collected

2018-04-19 11:01:39



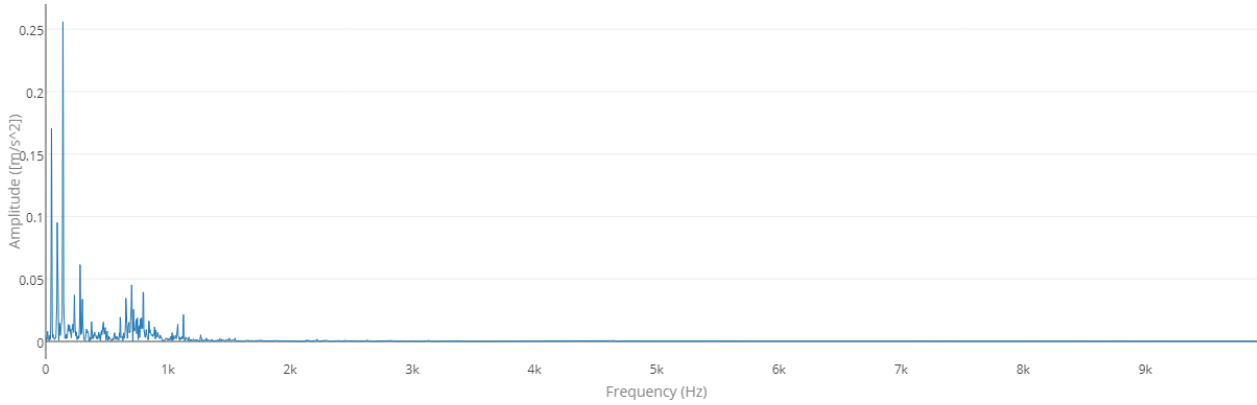
# PMP03 - Centrifugal Pump C

## Motor NDE Horizontal

Acceleration Spectrum

Date Collected

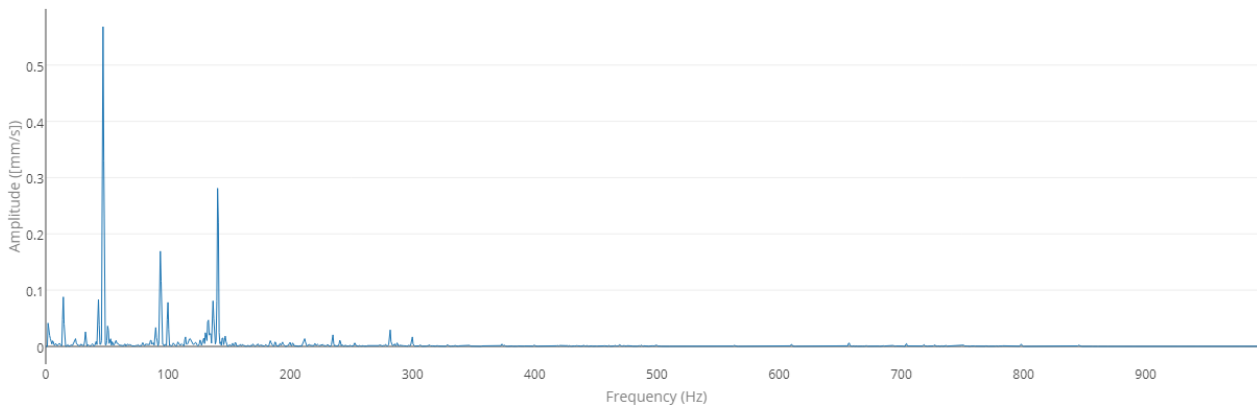
2018-04-19 11:02:39



Velocity Spectrum

Date Collected

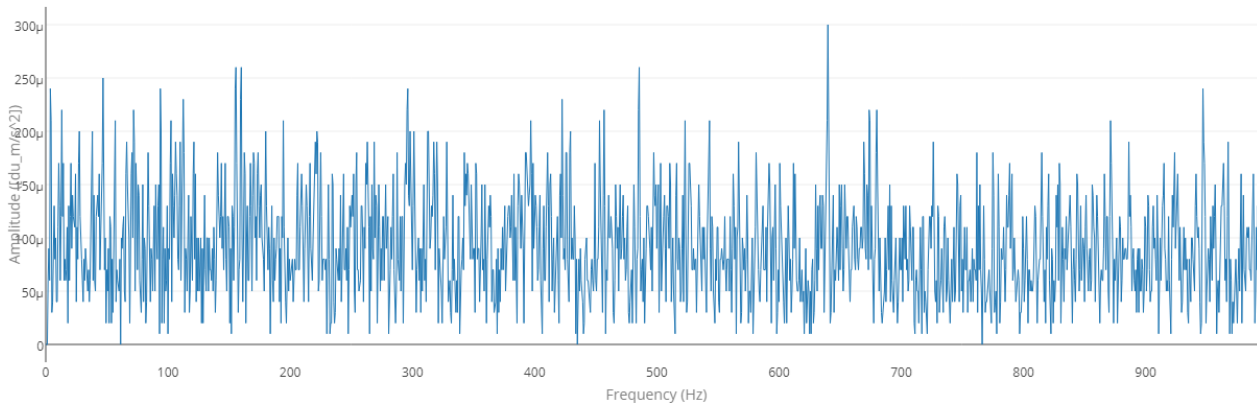
2018-04-19 11:02:39



Demodulation Spectrum

Date Collected

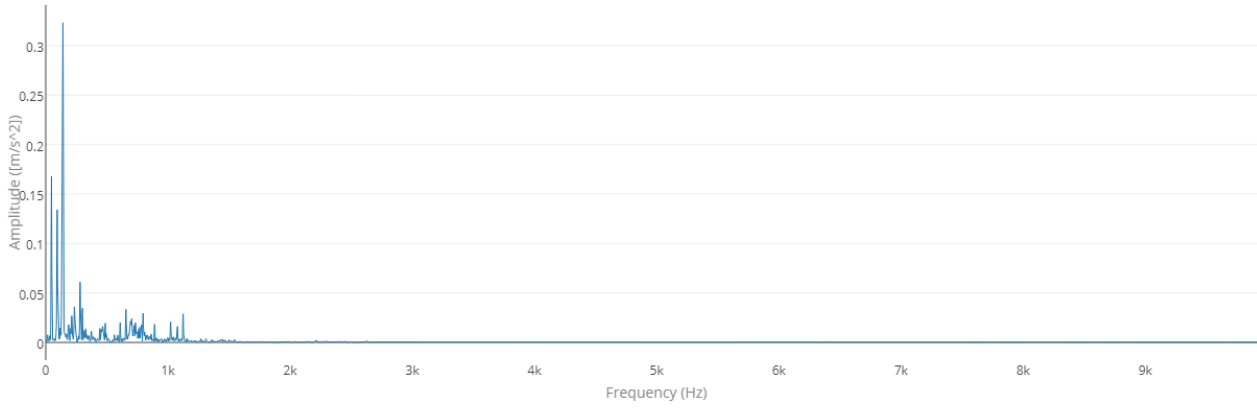
2018-04-19 11:02:39



# Motor DE Horizontal

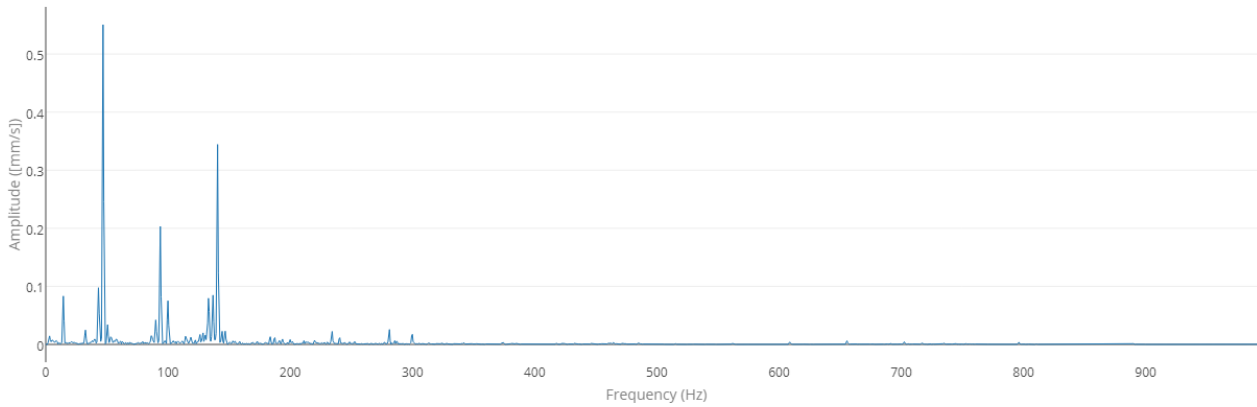
Acceleration Spectrum

Date Collected 2018-04-19 11:02:54



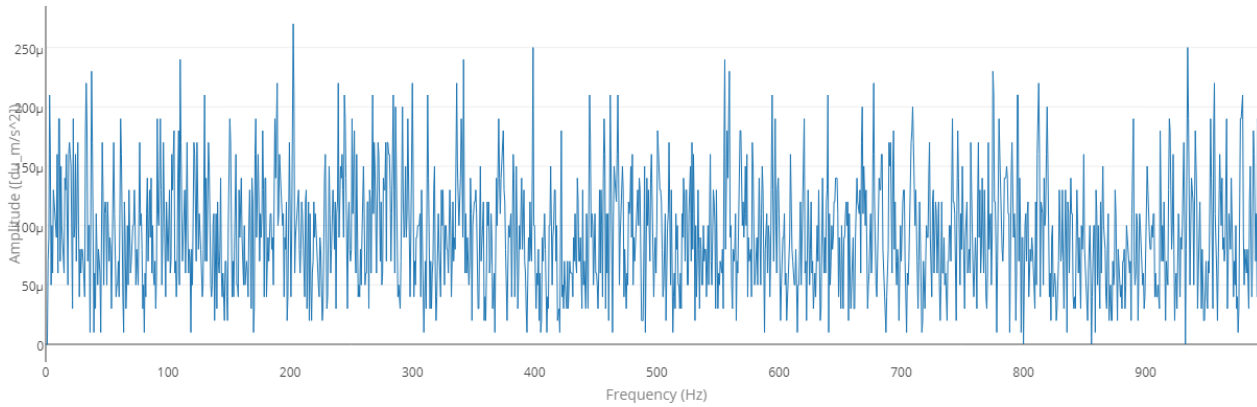
Velocity Spectrum

Date Collected 2018-04-19 11:02:54



Demodulation Spectrum

Date Collected 2018-04-19 11:02:54

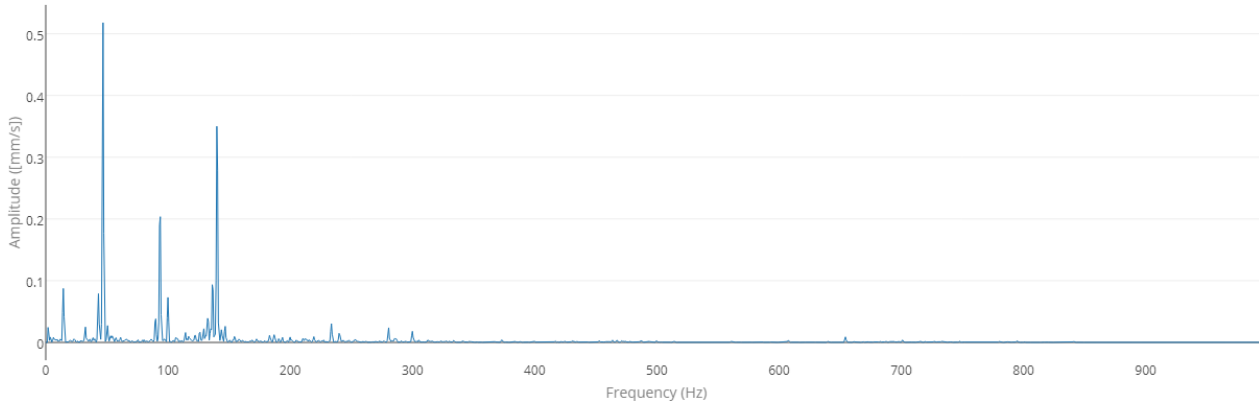


**Motor DE Vertical**

Velocity Spectrum

**Date Collected**

2018-04-19 11:03:09

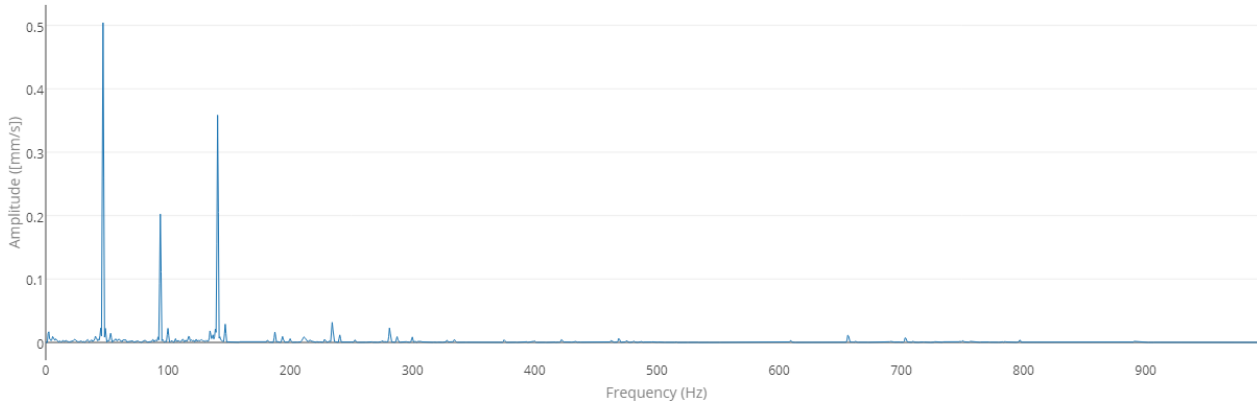


**Motor DE Axial**

Velocity Spectrum

**Date Collected**

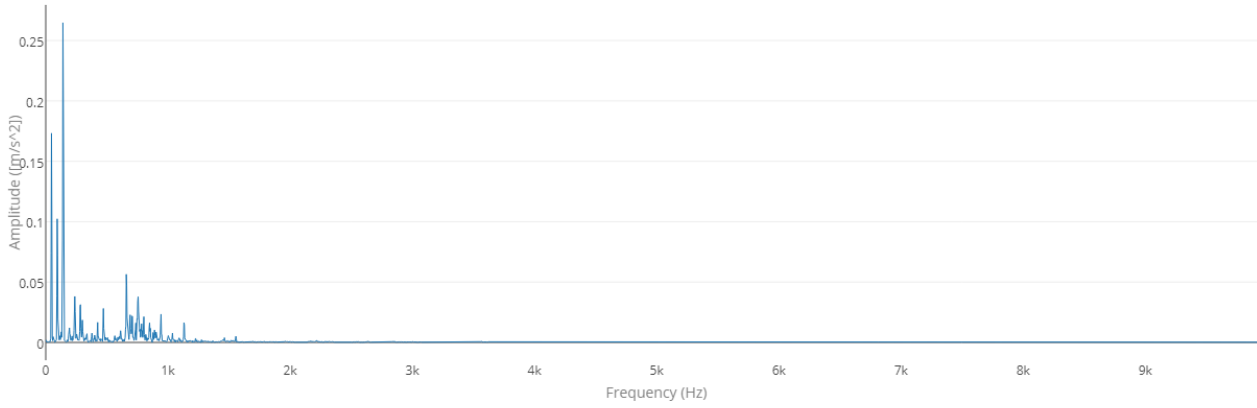
2018-04-19 11:03:26



# Pump DE Horizontal

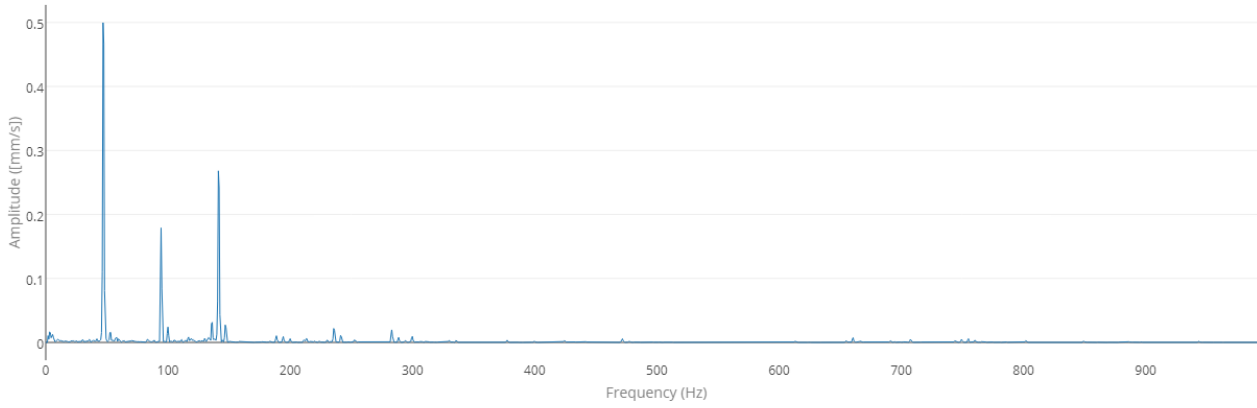
Acceleration Spectrum

Date Collected 2018-04-19 11:03:41



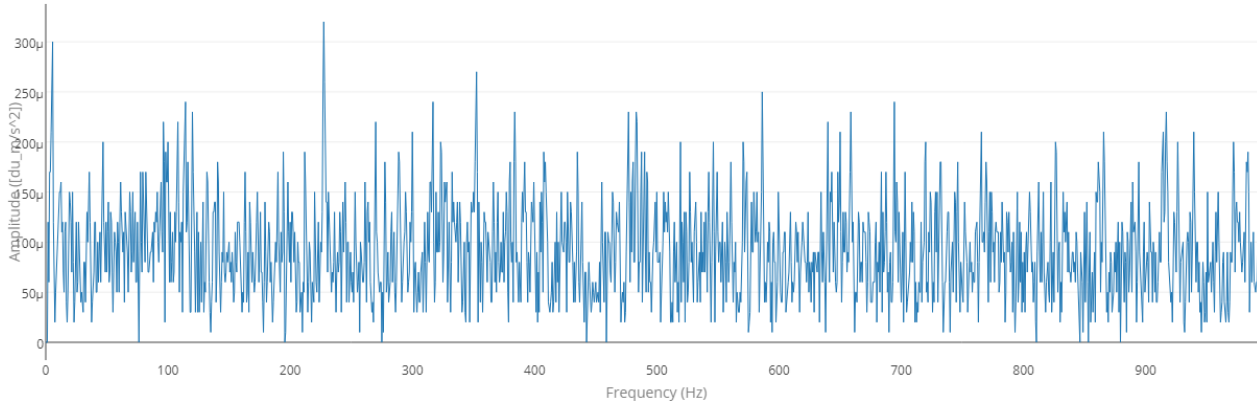
Velocity Spectrum

Date Collected 2018-04-19 11:03:41



Demodulation Spectrum

Date Collected 2018-04-19 11:03:41



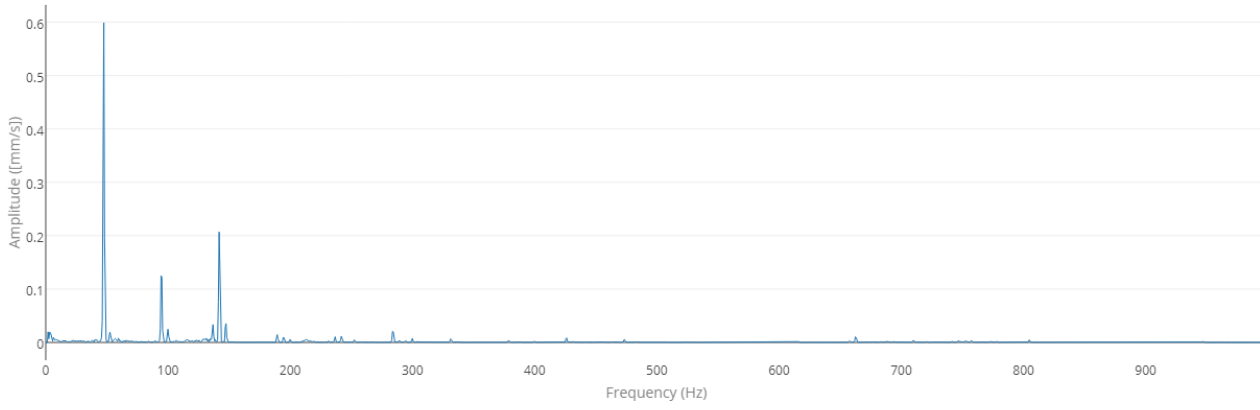


**Pump DE Vetical**

Velocity Spectrum

**Date Collected**

2018-04-19 11:03:56

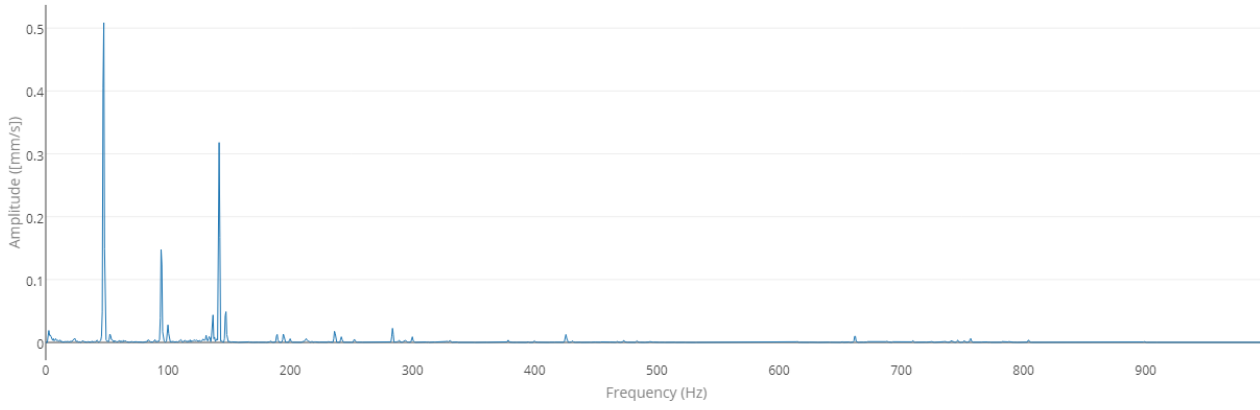


# Pump DE Axial

Velocity Spectrum

Date Collected

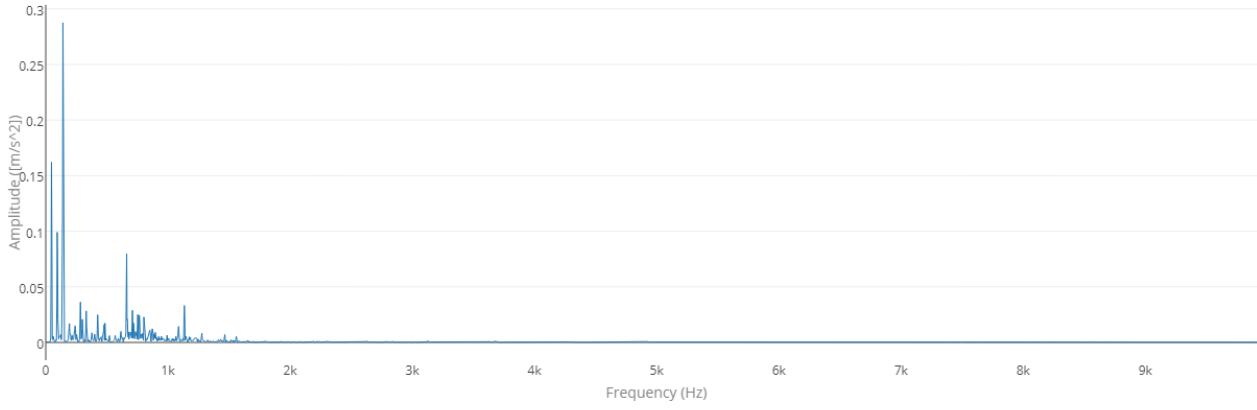
2018-04-19 11:04:11



# Pump NDE Horizontal

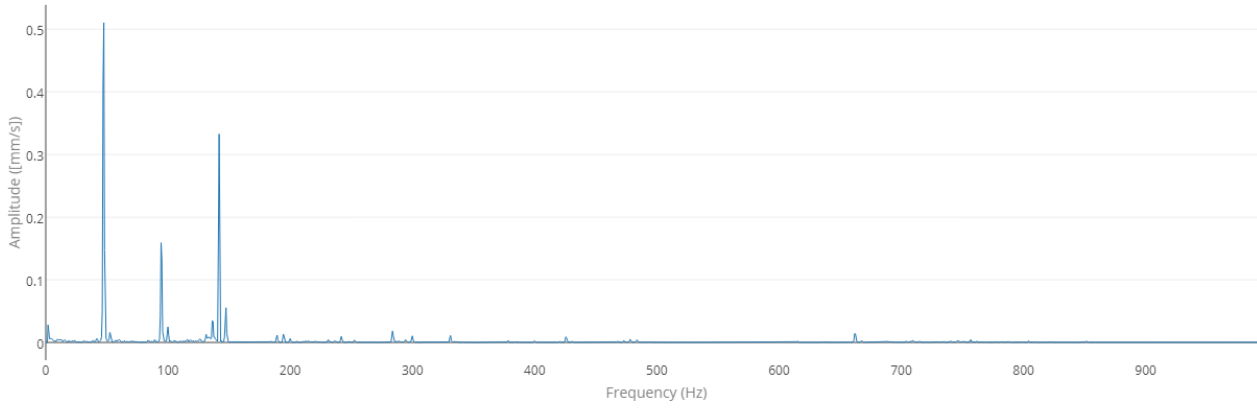
Acceleration Spectrum

Date Collected 2018-04-19 11:04:27



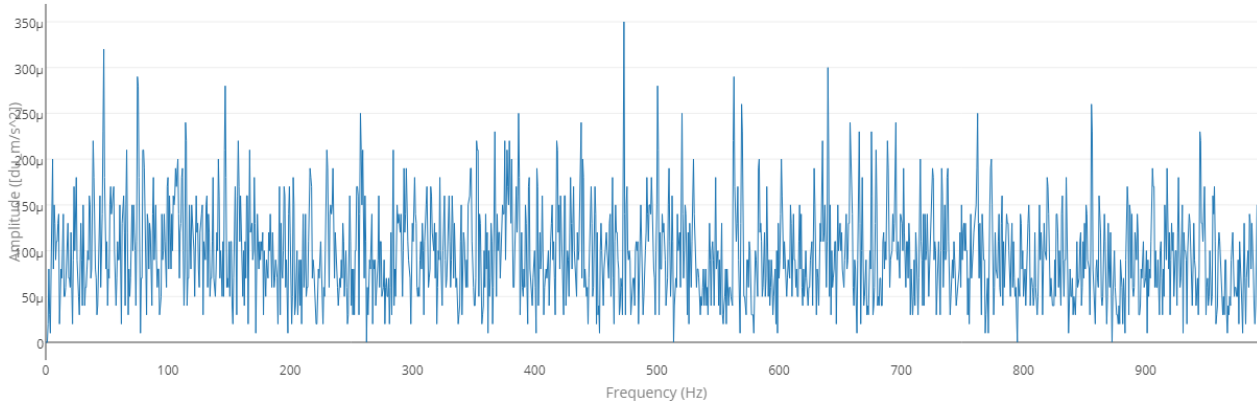
Velocity Spectrum

Date Collected 2018-04-19 11:04:27



Demodulation Spectrum

Date Collected 2018-04-19 11:04:27

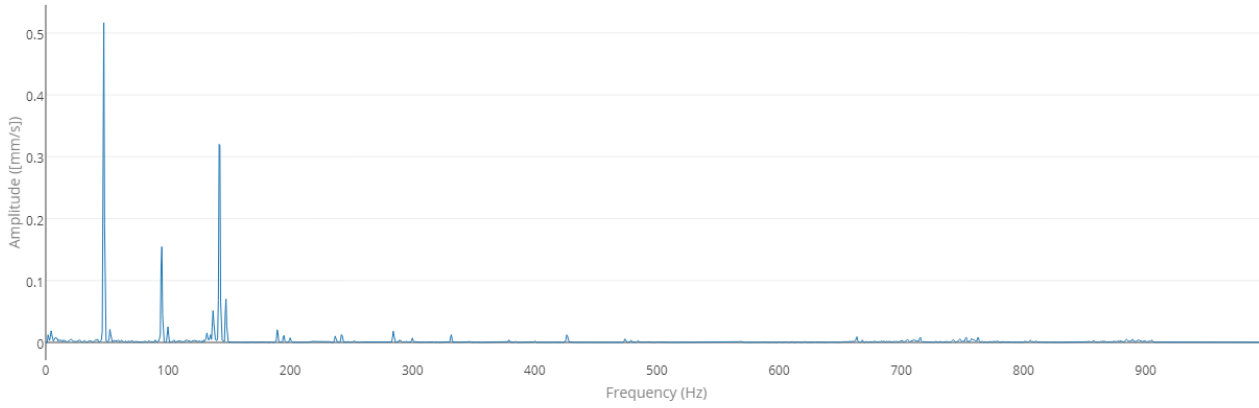


# Pump NDE Vertical

Velocity Spectrum

Date Collected

2018-04-19 11:04:42



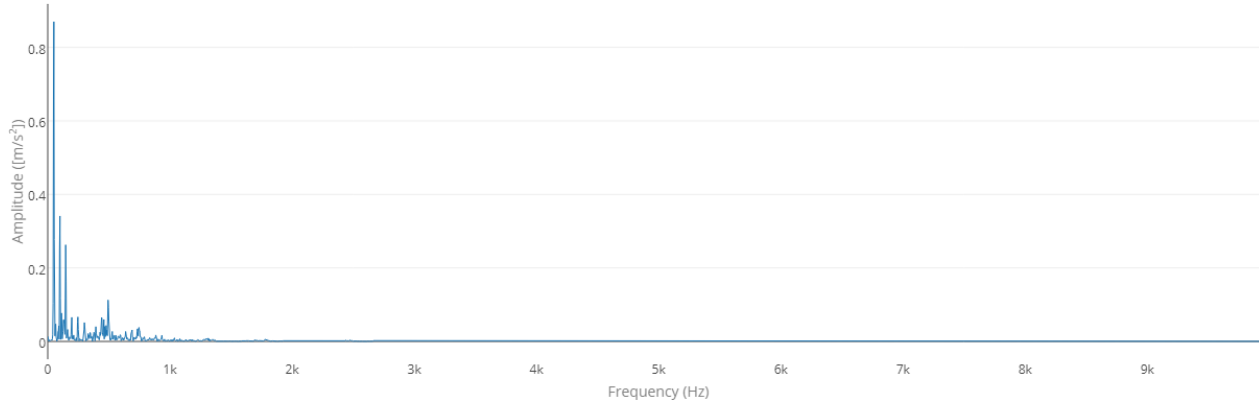
# 005 - Demo Equipment

## Motor NDE Horizontal

Acceleration Spectrum

Date Collected

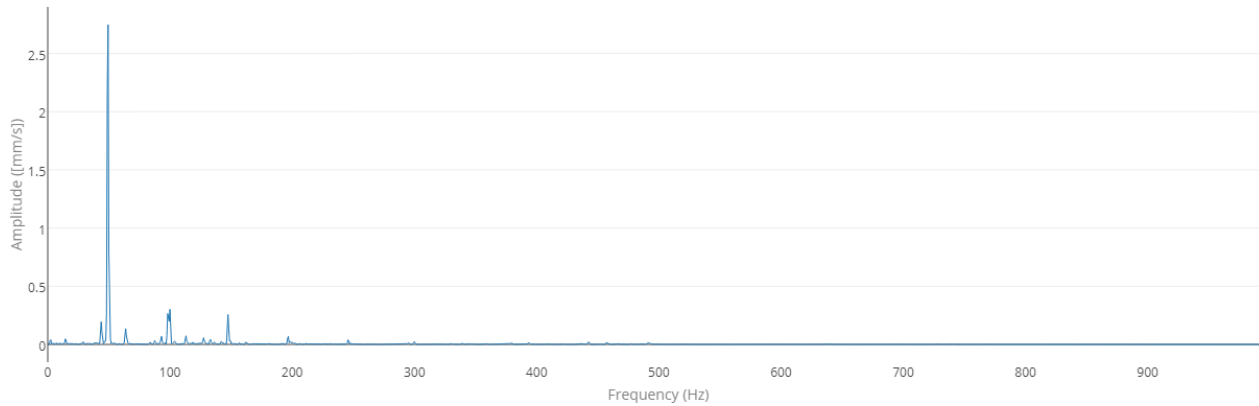
2018-05-10 12:38:36



Velocity Spectrum

Date Collected

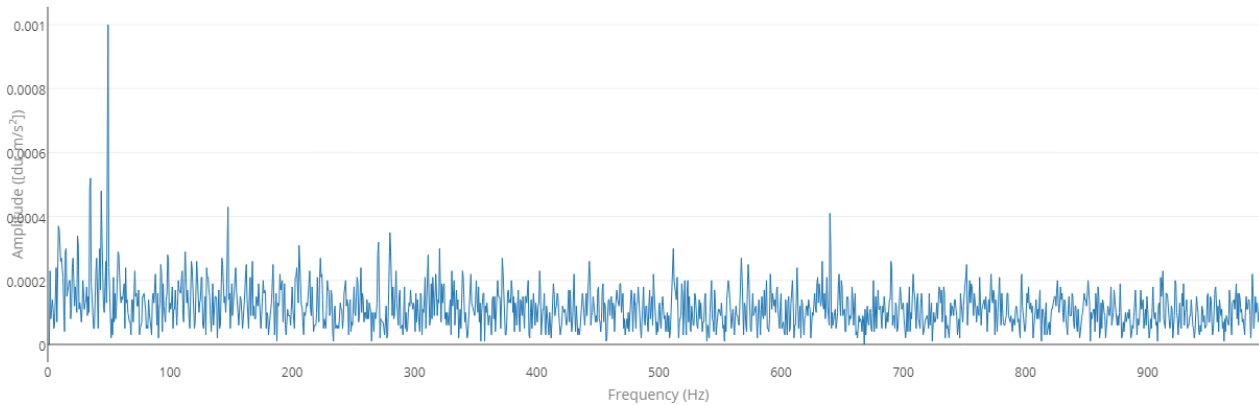
2018-05-10 12:38:36



Demodulation Spectrum

Date Collected

2018-05-10 12:38:36

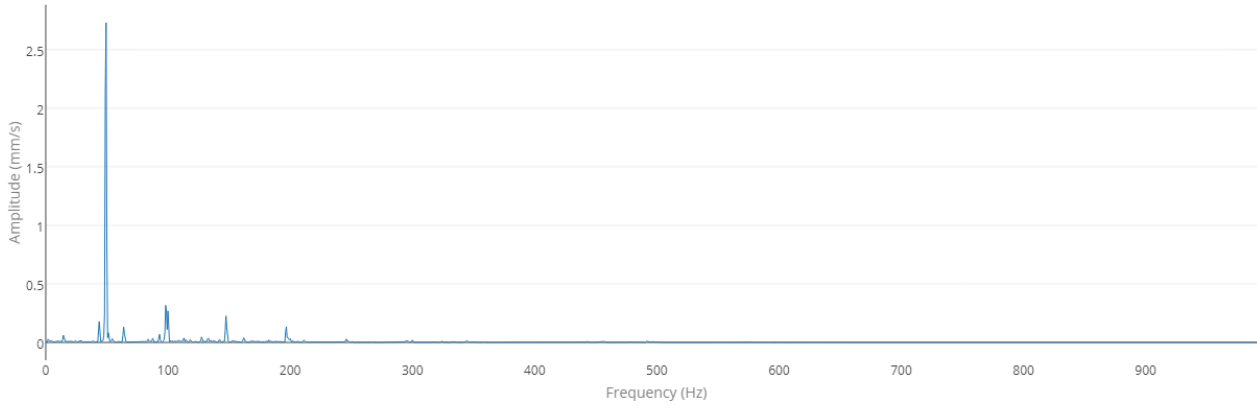


# Motor NDE Vertical

Velocity Spectrum

Date Collected

2018-05-10 12:38:43

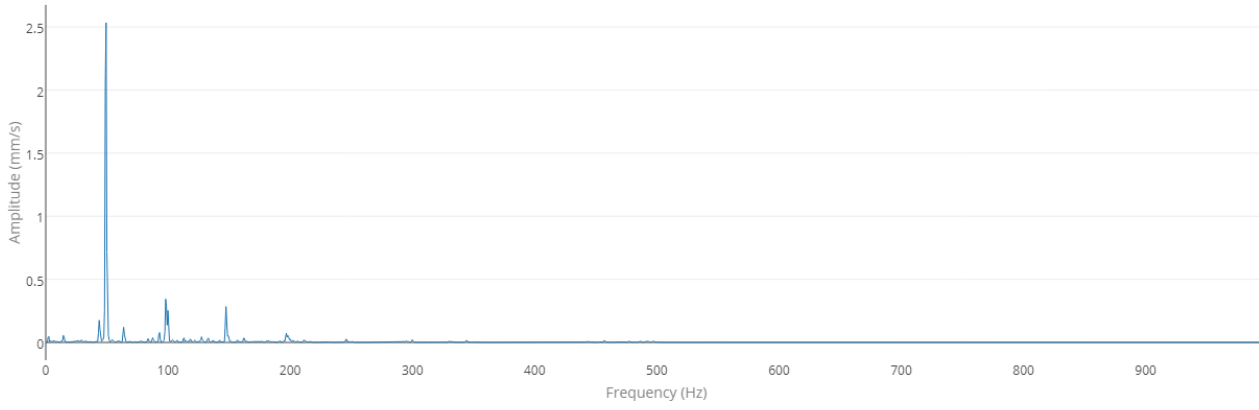


**Motor NDE Axial**

Velocity Spectrum

**Date Collected**

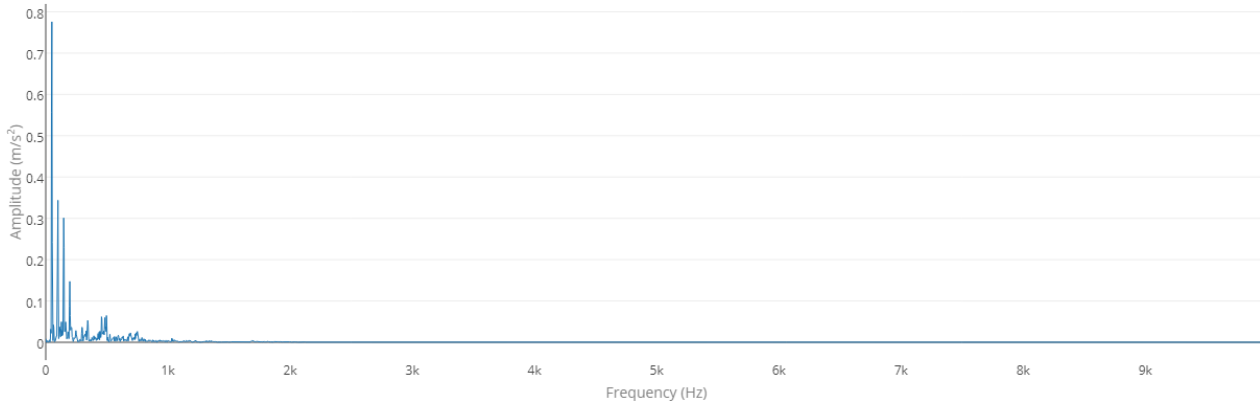
2018-05-10 12:38:49



# Motor DE Horizontal

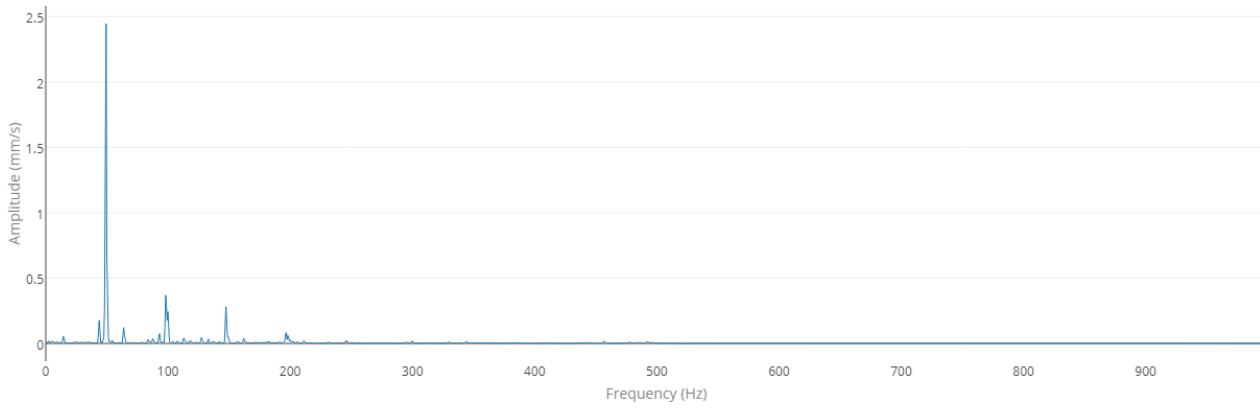
Acceleration Spectrum

Date Collected 2018-05-10 12:38:55



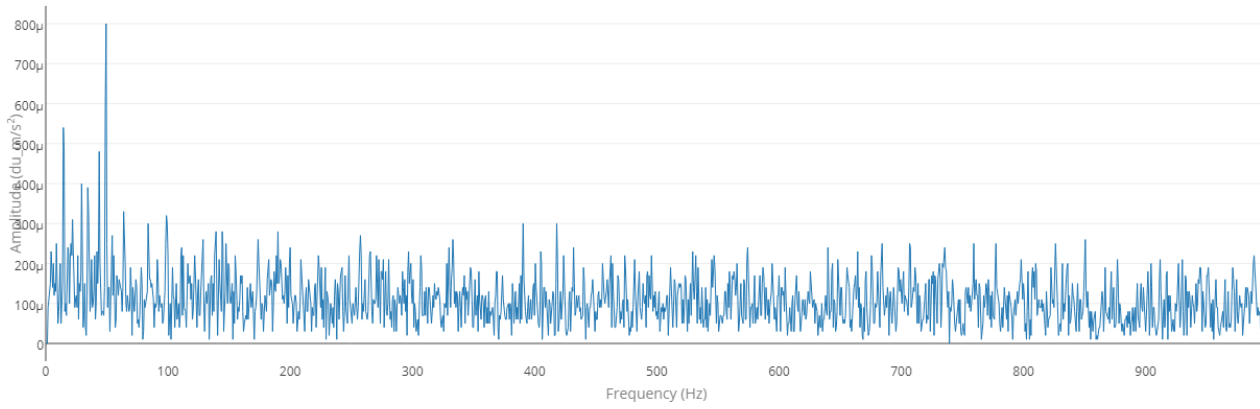
Velocity Spectrum

Date Collected 2018-05-10 12:38:55



Demodulation Spectrum

Date Collected 2018-05-10 12:38:55



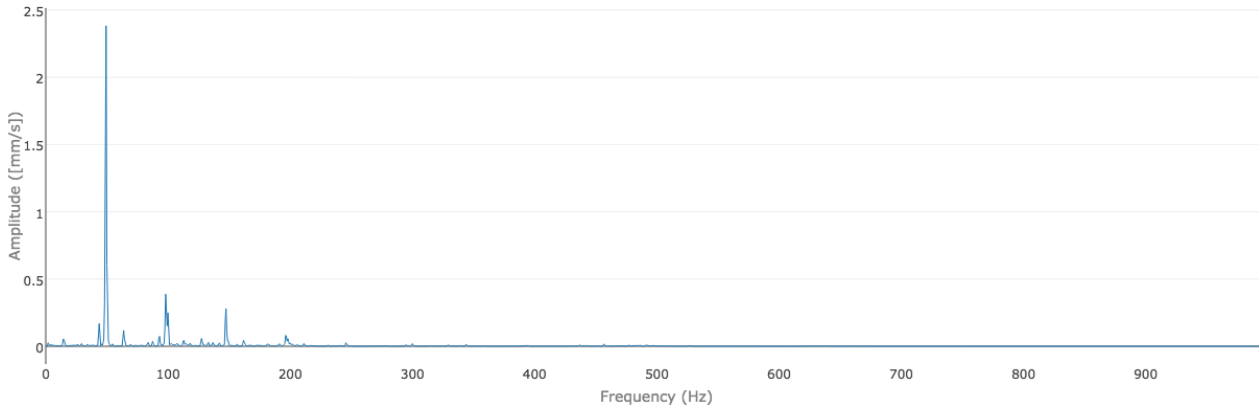


# Motor DE Vertical

Velocity Spectrum

Date Collected

2018-05-10 12:39:01

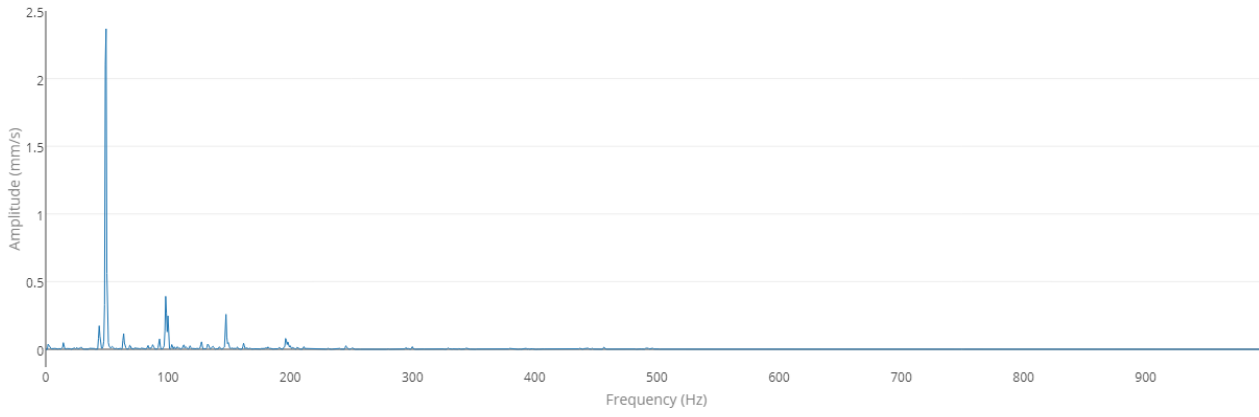


# Motor DE Axial

Velocity Spectrum

Date Collected

2018-05-10 12:39:07

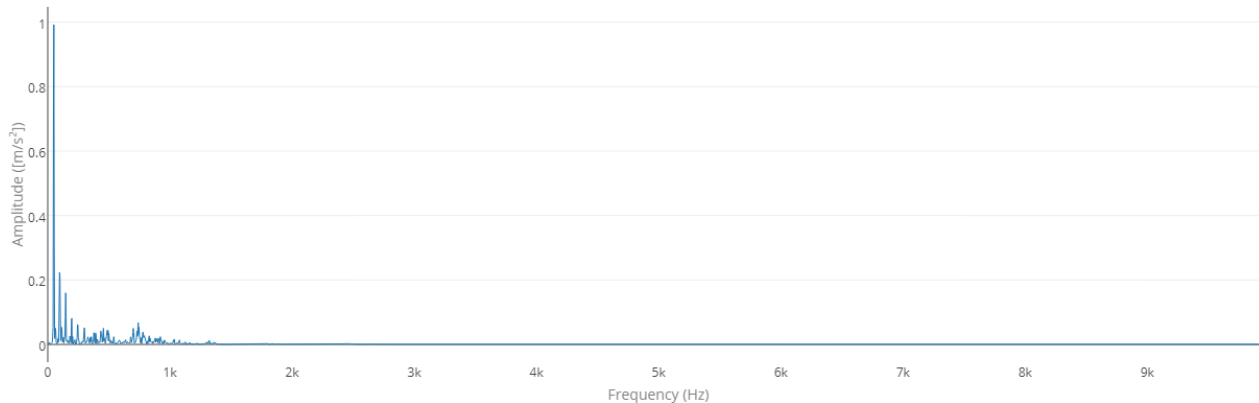


# PMP01 - Centrifugal Pump A

## Motor NDE Horizontal

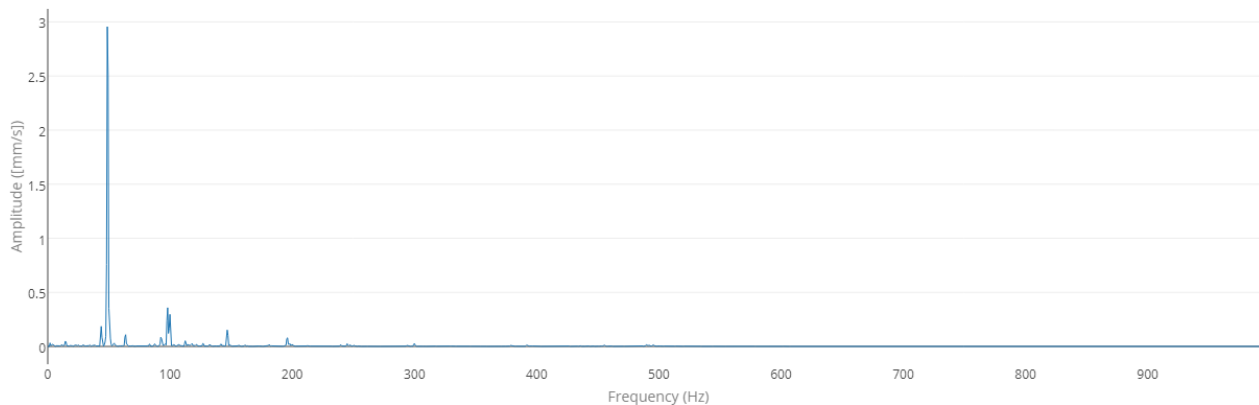
Acceleration Spectrum

Date Collected 2018-05-25 09:51:13



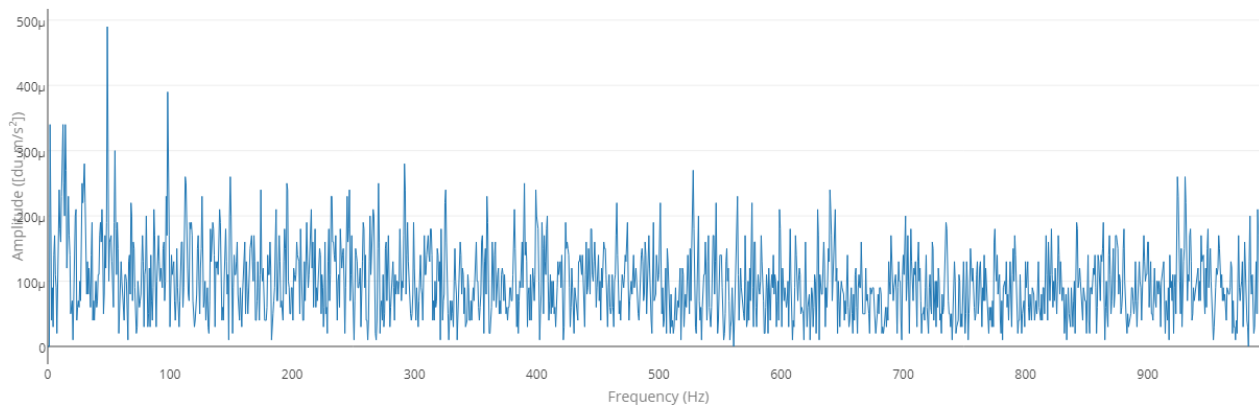
Velocity Spectrum

Date Collected 2018-05-25 09:51:13



Demodulation Spectrum

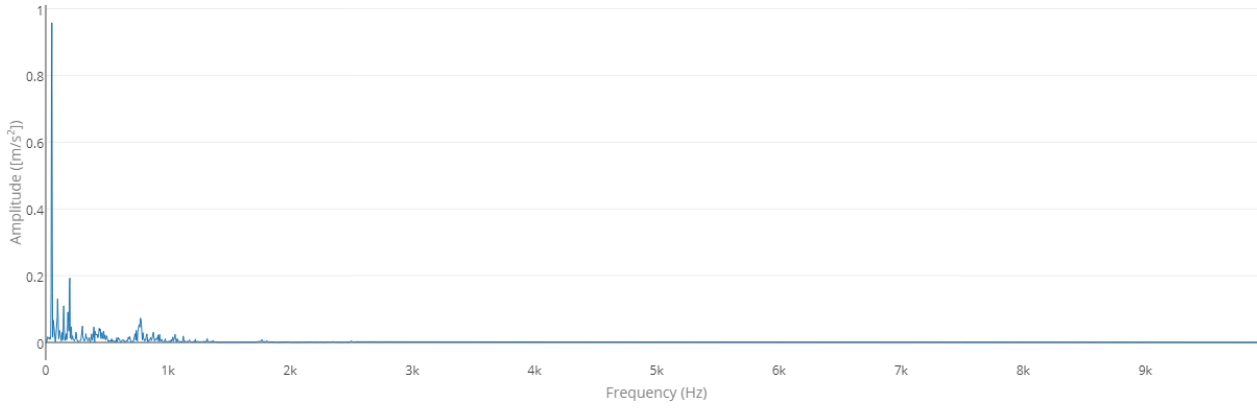
Date Collected 2018-05-25 09:51:13



# Motor DE Horizontal

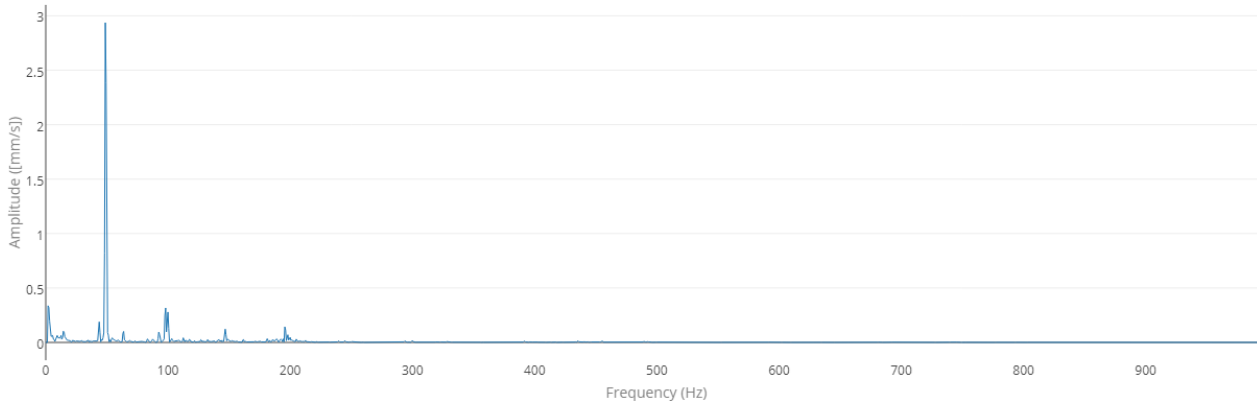
Acceleration Spectrum

Date Collected 2018-05-25 09:51:19



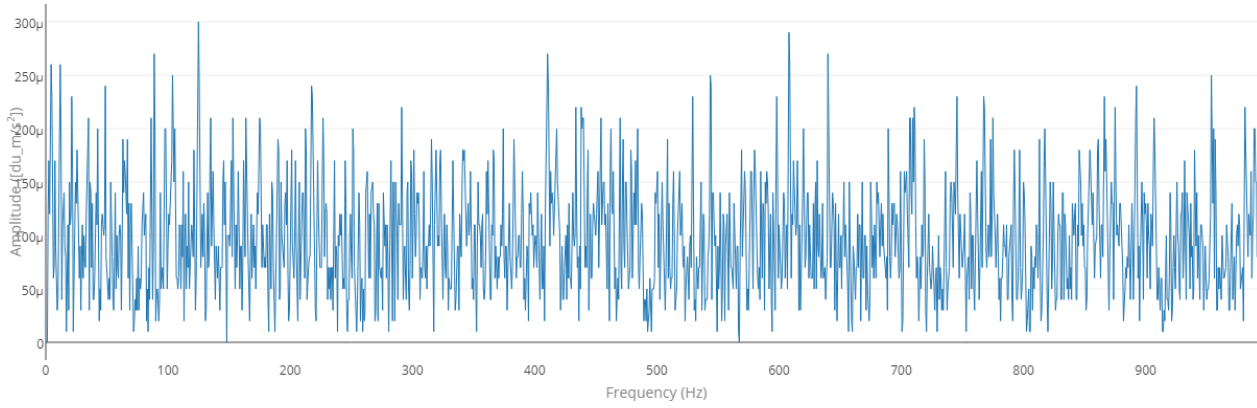
Velocity Spectrum

Date Collected 2018-05-25 09:51:19



Demodulation Spectrum

Date Collected 2018-05-25 09:51:19

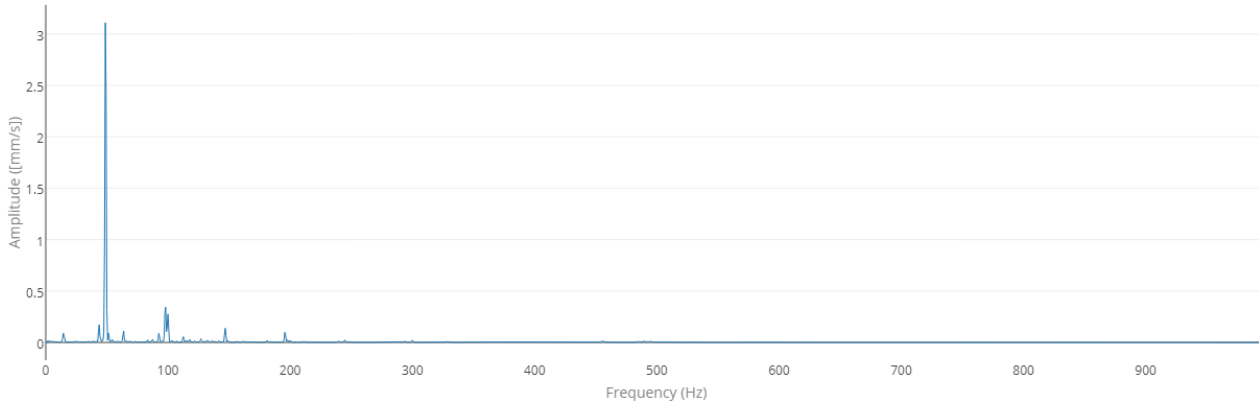


**Motor DE Vertical**

Velocity Spectrum

**Date Collected**

2018-05-25 09:51:24

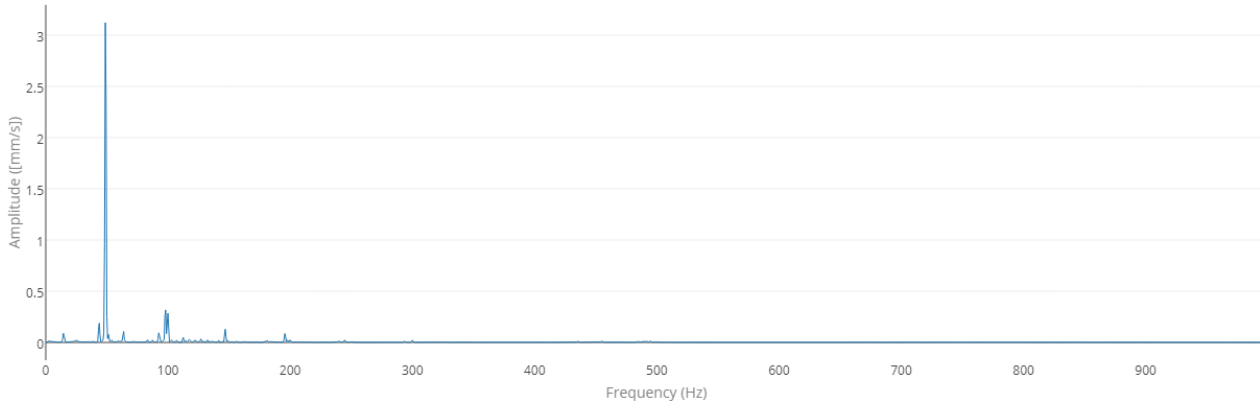


# Motor DE Axial

Velocity Spectrum

Date Collected

2018-05-25 09:51:30

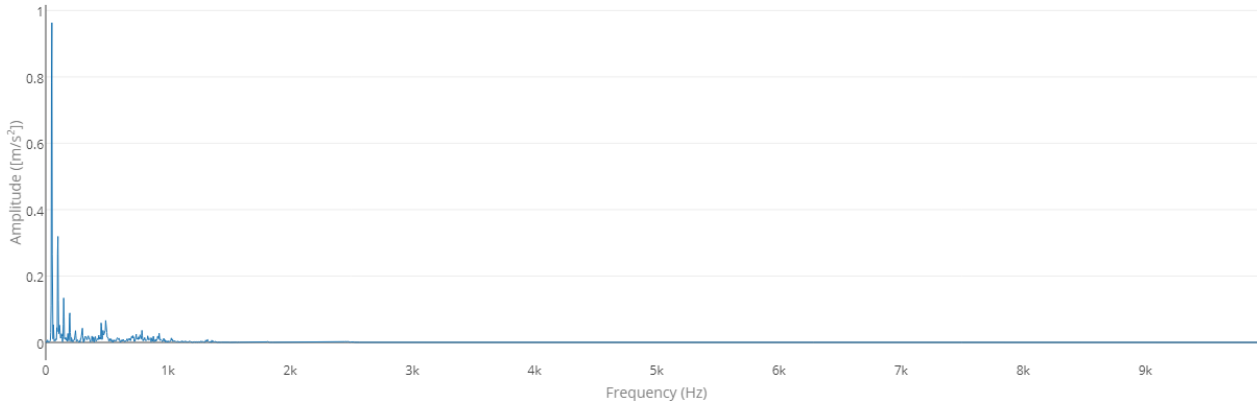


# Pump DE Horizontal

Acceleration Spectrum

Date Collected

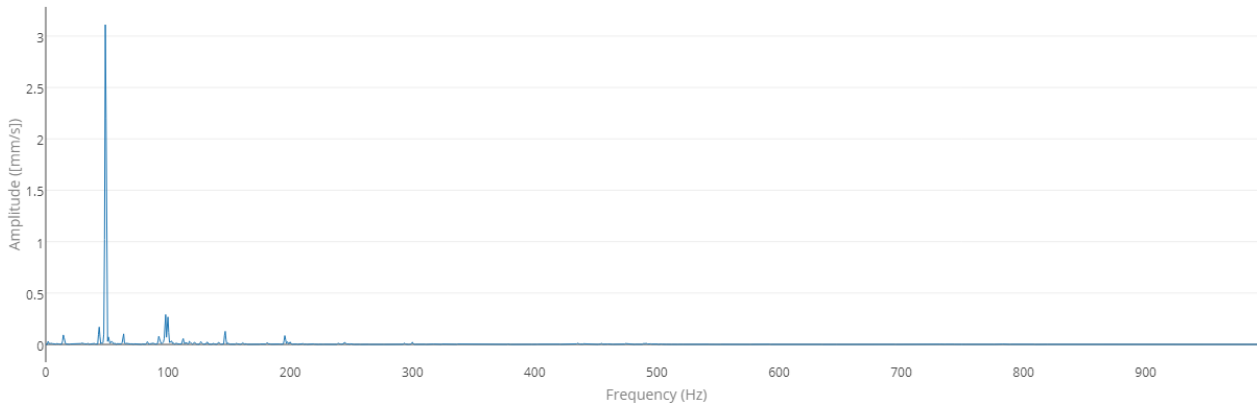
2018-05-25 09:51:36



Velocity Spectrum

Date Collected

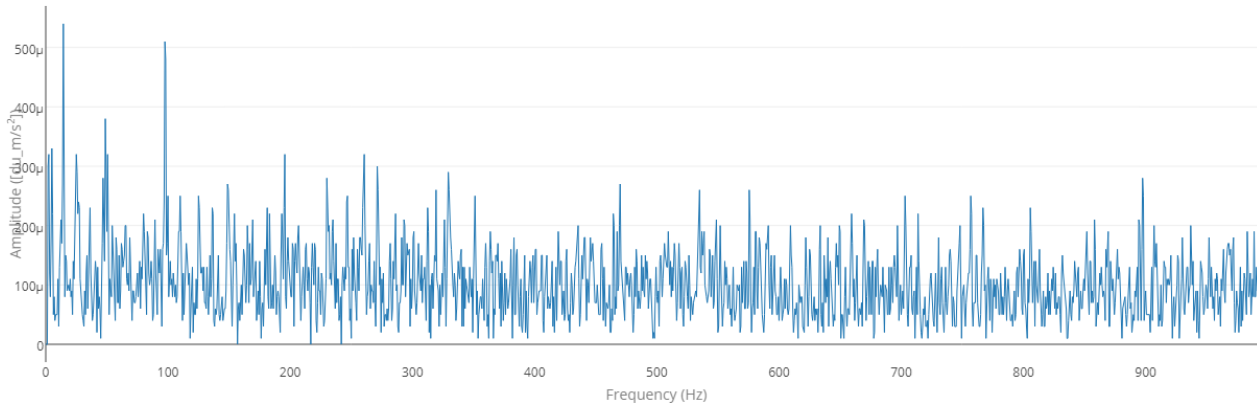
2018-05-25 09:51:36



Demodulation Spectrum

Date Collected

2018-05-25 09:51:36

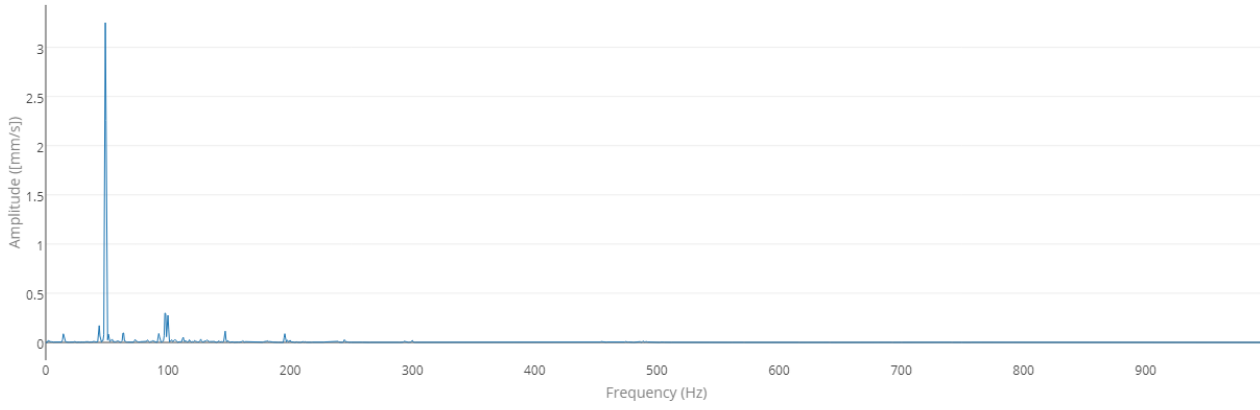


**Pump DE Vetical**

Velocity Spectrum

**Date Collected**

2018-05-25 09:51:42



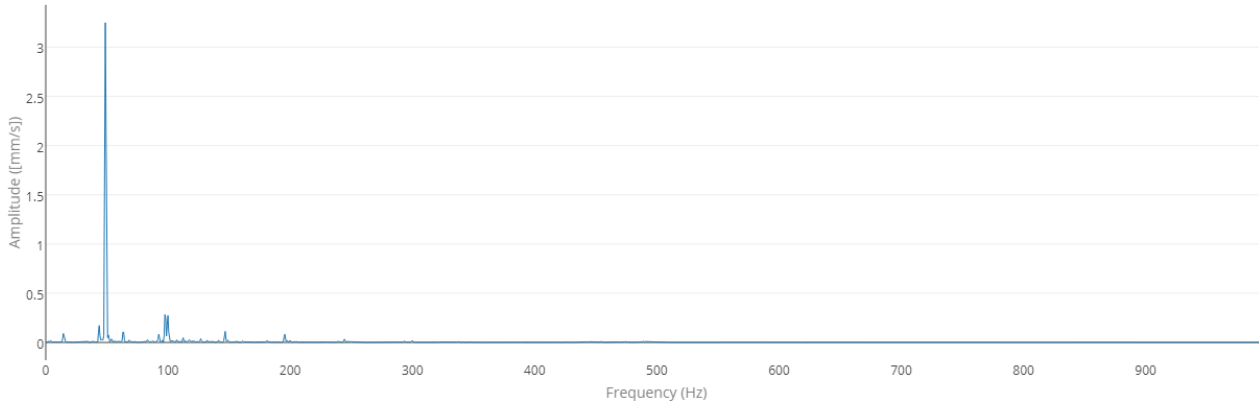


# Pump DE Axial

Velocity Spectrum

Date Collected

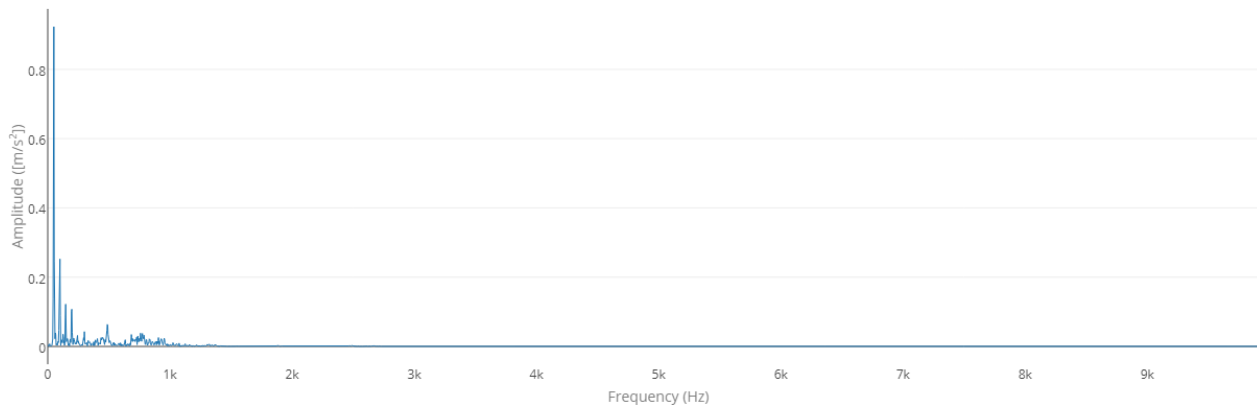
2018-05-25 09:51:48



# Pump NDE Horizontal

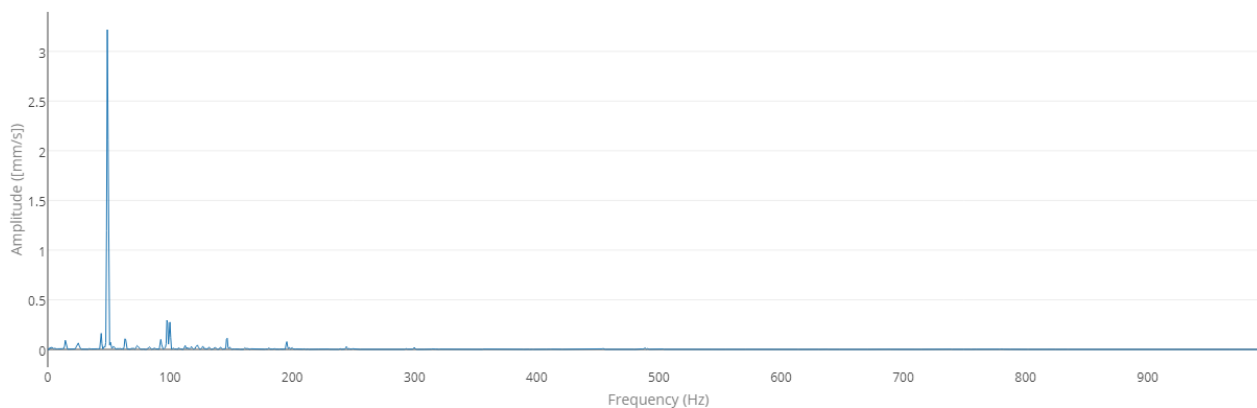
Acceleration Spectrum

Date Collected 2018-05-25 09:51:54



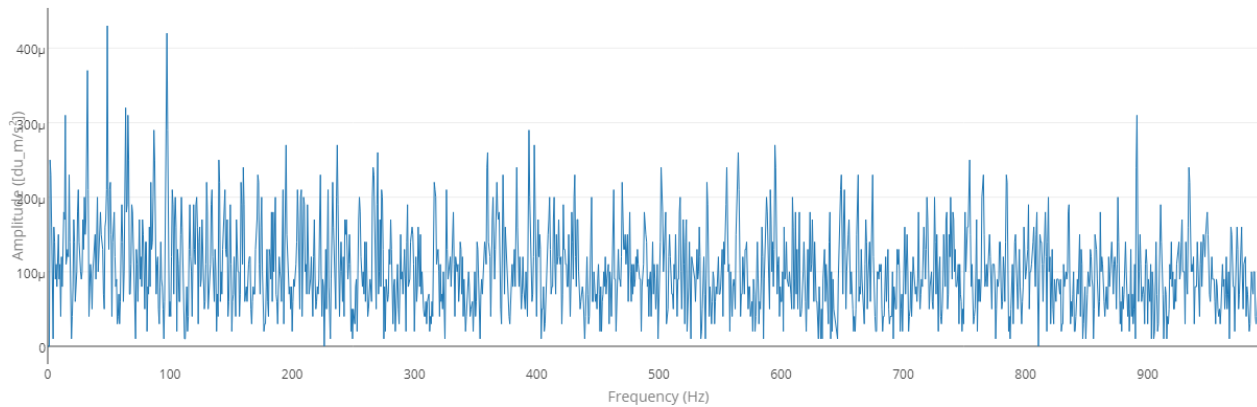
Velocity Spectrum

Date Collected 2018-05-25 09:51:54



Demodulation Spectrum

Date Collected 2018-05-25 09:51:54

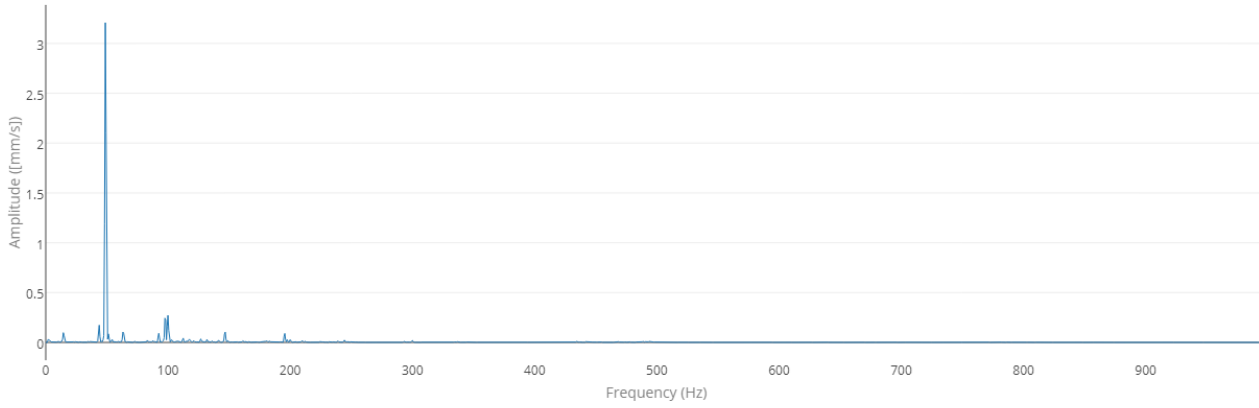


# Pump NDE Vertical

Velocity Spectrum

Date Collected

2018-05-25 09:52:00



# Evidence

## VEO-BW-BC-1 - BC-1 Distillate Pump

054ac798-0778-4b7e-8699-9002c46f339e\_1-22-14.jpeg

Date 2018-03-16



bearing-failure-3-e1395089166302.jpg

Date 2018-03-16

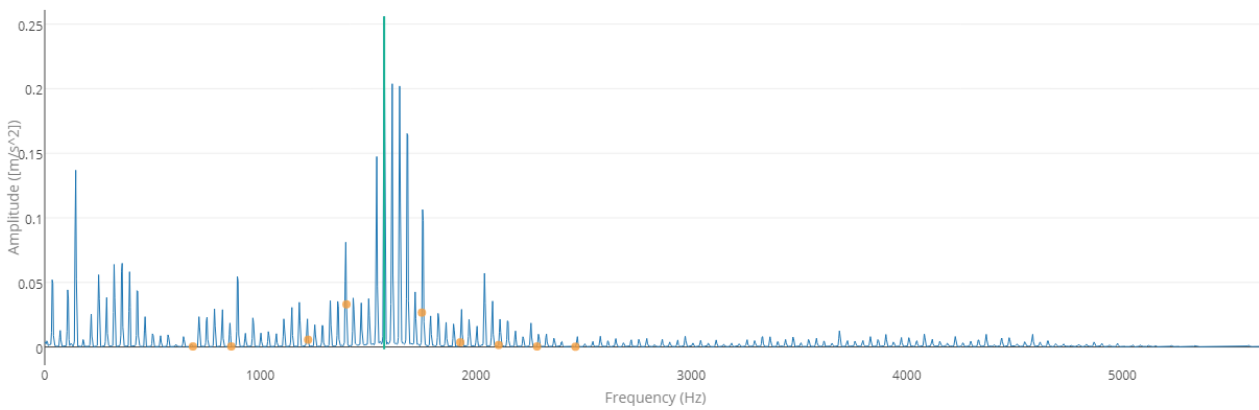


DemoDoc.docx

Date 2018-03-16

4841\_Acceleration.jpeg

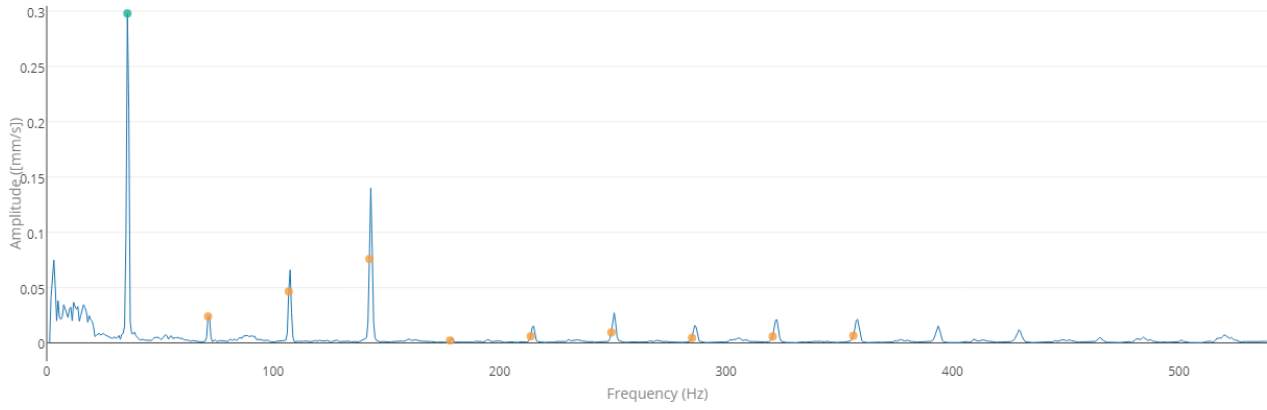
Date 2018-03-16







Acceleration spectrum for BC-1 Distillate Pump for data collected on: 2017-12-14 01:56:36

4838\_Velocity.jpeg

Date 2018-03-16



Velocity spectrum for BC-1 Distillate Pump for data collected on: 2017-12-14 01:56:36

Definition of Condition Codes					
<b>1</b>		(1) Good and Stable	<b>2</b>		(2) Initial Fault detected (P)
<b>3</b>		(3) Deteriorating	<b>4</b>		(4) Approaching Failure (F)





Definition of Failure Mode Codes			
<b>BDD</b>	Belt Drive - Damage	<b>BDM</b>	Belt Drive - Misalignment
<b>BDP</b>	Belt Drive - Pulley	<b>BDT</b>	Belt Drive - Tesion
<b>BRF</b>	Bearing – Friction	<b>BRRRD</b>	Bearing – Race/Roller Defect
<b>BRS</b>	Bearing – Setup	<b>BW</b>	Bearing - Wear
<b>ERB</b>	Electrical - Rotor bar	<b>ERI</b>	Electrical - Rotor Issue
<b>ESI</b>	Electrical - Stator Issue	<b>FBPI</b>	Flow - Vane / Blade Pass Issue
<b>FT</b>	Flow - Turbulence	<b>GTI</b>	Gear - Tooth Issue
<b>MBS</b>	Mechanical - Bent Shaft	<b>MM</b>	Mechanical - Misalignment
<b>R</b>	Resonance	<b>RL</b>	Rotational Looseness
<b>SL</b>	Structural - Looseness	<b>SSF</b>	Structural - Soft Foot

Definition of Failure Type Codes			
<b>SPO</b>	Sporadic	<b>SYS</b>	Systematic

Definition of Severity Codes			
<b>AF</b>	Advancing Fault	<b>DEF</b>	Defect
<b>EF</b>	Early Fault	<b>SF</b>	Serious Fault
<b>VSF</b>	Very Serious Fault		

Definition of Action Type Codes			
<b>FA</b>	Failure Avoidance	<b>IMP</b>	Improvement
<b>LE</b>	Life Extension	<b>O</b>	Other
<b>REP</b>	Repair		

Definition of Urgency Codes			
<b>ANO</b>	Action Next Opportunity	<b>ANS</b>	Action Next Shutdown
<b>AWC</b>	Action When Convenient	<b>IA</b>	Immediate Action
<b>NAR</b>	No Action Required		

Definition of Value Limits Colors			
	<b>Nominal</b>		<b>Investigate</b>
			<b>Warning</b>
			<b>Alarm</b>

**Disclaimer:**  
 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aliquam vel velit at risus cursus hendrerit ut nec tellus. Pellentesque eget nunc euismod, efficitur lectus ut, tristique lorem. Mauris et aliquam dui, in imperdiet est. Phasellus sapien libero, tincidunt sit amet efficitur non, pulvinar id massa. Fusce eu porttitor nunc, quis pharetra libero. Mauris iaculis dui vitae dolor gravida pulvinar.