

# NDS User Manuals

# Dashboard

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#### 1. Login Page

Website: https://nds.nanoprecisedataservices.com/login

#### **1.1. Nanoprecise Users**

Enter the provided Username & Password & Organization Name, which should be received by email from notifications@nanoprecisesc.com, and select "Sign In"

4	W.
Username/Email	
Password	
Organization Name	
Remember Me	Forgot Password?
Sig	in In
or Sig	n in with

#### Example email with credentials

NANOPRECISE DATA SERVICES
To: Dries Van Loon - 35E
Hello Dries_demo,
Greetings from Demo.
You have been granted the access to dashboard Use below credentials to access the dashboard
username: Dries_Demo
password:
organization name: Demo
With regards,
Demo Customer Support
https://nds.nanoprecisedataservices.com/login



#### 1.2. SSO users

Select Sign in with Single Sign On



Enter the "Organization Name" of the Company you are trying to access.

If Organization is setup for SSO, it will redirect you to the "Sign In" page of your company SSO.

- AN-	NANOPRECISE
Single Sign On	Sign in to your account
Grganization Name	Usernamo or email
ZRemember Me	Password
Submit	
Back to Login	Sign In

Once sign in is successful you will be automatically redirected to the Nanoprecise Main Page.

If you would like to setup SSO for your company, please contact your Nanoprecise representative or <u>customer-success@nanoprecise.io</u>.



# 2. Main Page

avigation	Company Selection									o ¢	
ENSOR MEALTH UMMARY NTERPRISE HEALTH	PLANTS © 0 Selected				Plant					Search	۹
JMMARY	D PLANT	HEALTH SCORE	HEALTH ST	ATUS	EQU	PMENT AFF	ECTED	PLANT REP	ORTS	NOTES	ACTIONS
JIPMILNT LIST	Stark Industries	59%				1		Co		Ē	I
				STARK	INDUSTR	RIES				Pla	nt
NUAL -	EQUIPMENTS		Equip	ment			Search		٩	PLANT HEAL	TH SUMMAR
UPMENT REPORTS	EQUIPMENT HEALTH STATUS	REMAINING USEFUL LIFE	UTILIZATION FACTOR	IDLE TIME	HISTORY	BAAGE	EQUIPMENT REPORTS	NOTES	ACTIONS	84.9 Health	96 %
	🖌 Motar 😑	53%	0.53		History	Ŧ	De		1		
	v Pump	86%	0.6	1	History	Ŧ	Ca	Ē	i	Healthy = 3	
	Gearbox	84%	0.57	1	History	Ŧ	D	F	1	Needs Mainte	nance · 1
	v Fan	85%	0.67	ŝ	History	Ŧ	G	Ē	1	Needs Attent Needs Immed	en - 0 Bate Attention - Ó
										No Data - 0 Learning - 0	
				Not	ificatio	0.5			_		
	NOTIFICATION LOGS	🛓 Downkaid Data	Set	DATA WITH	RESPECT TO	SELECTE	D DATE From 08/11,	2023	-	To 08/25/2023	
	PLANT EQUIPMENT CO	MPONENT DATE & TIME	ORAPH	<b>EVBJECT</b>	A	STATU	GEMINT FEEDBACK	MAINTER	NANCE DI	FEEDBACK IRATION(DAYS)	USER
	Stark Motor Mo Industries	tor NDE Aug 15 2023, 01:36:42 AM	vibration- epnak-+acc	ANOMA DETECTED: N Peak Alarr	anoAl R		P	Repi	air	ò i	tries_vanloor



# 2.1. Main parts, Plant, Equipment, Notifications.

**Main Page:** Consists of 3 main parts, **Plant, Equipment, Notifications,** showing current health status and insights, ordered on highest priority (lowest health score) Main goal is to drive the user towards the highest priority insights first.

**PLANT**: Provides an overall health score & health status for each plant under the company, organized by health score (worst first). The selected plant (default 1<sup>st</sup> one in list, but multiple can be selected) will populate the machine/equipment tab below as well as the "Plant Health Summary" on the right-hand.

- Plant list has all different plants under the company and has a checkbox in the front to select for which plant(s) you want to populate the equipment list
- Health Score: is a calculated number representing the health of a plant based on the health status of the equipment under the plant (Refer to Appendix C for more info)
- Health Status: the health status of the worst equipment under the plant
- Equipment affected: how many equipment have increased health status
- Plant Report: central location to store additional finding reports on a plant level
- Notes: Notes can be added on different levels of the hierarchy
- Action: Allows users to re-name the equipment & plant name

**PLANT HEALTH SUMMARY:** Total nr of equipment under each health status for the selected plant

**EQUIPMENT:** Based on the selected plants (can be multiple) the equipment will be listed organized based on the highest priority (lowest health score first)

- Equipment list is populated with all equipment from the corresponding selected plant in the Plant section
- Health Status: Defined by the active Fault Severity/stage (2/3/4) and Remaining Useful Life (Refer to Appendix C for more info)
- Remaining Useful Life (RUL): Remaining useful life of the most critical/degraded component in an equipment. Presented in percentage until 750 hours (+- 30 days), after which the RUL is shown is hours.
- Utilization Factor: Percentage number of running/total measurement points
- Idle time: Indication if equipment did not run in X-days (Refer to notifications settings)
- History: Summary of RUL and health status for the past 7 days, or per selected date
- Image: Equipment image
- Equipment Report: Analysis reports central location to store additional finding reports
- Notes: Notes can be added on different levels of the hierarchy
- Action: Allows users to re-name the equipment & plant name



**NOTIFICATIONS:** the notifications from the selected plant(s) (which the user has access too) will be displayed for the past 2 weeks with the latest available showing first

- Plant/equipment/component: where the notification was triggered.
- Data & Time: when the notification was triggered.
- Graph: Which graph triggered the notification (Hyperlink that bring you to component page)
- Subject: the subject of the notifications
- Acknowledgement status: Notifications can be acknowledge, indicating they have been reviewed (the mouse tip will show which user acknowledge it)
- Feedback: allows users to log follow-up actions that resulted of a notifications. User can select maintenance type (predefined), description, time range and resource, once saved it will show in the notification log making it possible to close the loop and keep track of actions taken and by who.

FEEDBACK					
Maintenance Type:		Select Maintenance Duratio	on:		
Repair - Add work order number!	~	08/25/2023 🗐	-	08/26/2023	đ
Description:		Select the resource:			
1234567890		Component			*
		-			ei ere
		c	LOSE	SAVE D	DELETE

- The time range for which notifications are displayed can be changed with the "From and To" date selectors
- The notification list can be downloaded by using "Download Data Set" option which will generated a csv file containing all the info displayed.



#### 2.2. Navigation, Setting and Info

Navigation: Allows quick access to different sections of the dashboard (options available depend on user rights and activated functionality)

**Company Selector:** If user has access to multiple companies, they can be selected from dropdown.



Settings & info: Different user and company settings as well as information on health status and notification types

Info: Contains info on Health Status, Fault Severity and Notification Triggers and Topics

e li	ремо 🔶				0		٠	
HELP INFORMATION								
We have developed a comprehensit internet of Things technology. Our t actions should be taken on rotating Based on the comprehensive signal Various health summary metrics in 1	ve condition-based maintenance pr mature algorithm provides not only equipment components as per ISC processing and transfer learning t the dashboard are linked to the fau	rogram incorporating predictive maintenance indications of any deterioration in a rotating e >-10816 and ASNT Standards. echniques, fault severity is analyzed and tren it severity as mentioned in the following table	to detect fatigue wear, br equipment, but also an ev: ded subject to ASNT stan a:	eakage and deterioration of any rotating eq aluation of the severity and recommendatio dards with proper severity stage categoriza	ulpment to ns for wh tion by o	with Indus en correc ur algorith	strial tive nm.	
Fault Severity	Remaining Useful Li	fe Health Status	Fault	Suggestion				
lower than stage 2	>75%	Healthy	Not Available	None				
stage 2	>50%	Healthy	Not Available	None				
stage 2 & fault anomaly detected*	>50%	Needs maintenance review	Applicable fault	Review maintenance plan and parts av	ailability			

#### Settings:



• Feedback Config to setup Maintenance types and actions



• Contact Us: Directly contact <a href="mailto:customer-success@nanoprecise.io">customer-success@nanoprecise.io</a>

ust saved \$500k thanks to you	guys
Geep up the terrific work @nanop Ve love your solution	precise!
Cancel	Send

• User Settings: Turn on descriptions, set default units, set Language







#### **Notification settings**

• Notification Alert: activate and manage Pop-up alerts





• Battery Notification: Setup notifications below certain battery level



• Idle Time: Setup for Idle time indication in equipment overview (X – days)

	Min	Max
Green	0	30
	Min	Мах
Yellow	31	60
	Min	Max
Orange	61	90
	Min	
Red	91	
Red	Min 91	



• Control Panel (DEMO Only): Simulate faults and trigger notifications.

Select Plant:		Select Equipme	nt:	
Stark Industries	¥.	Select Equipm	ient v	
Select Component:		Select Fault:		
Gearbox NDE	v	Bearing Inner	Race 🗸	
Email Address		Enter Number		
Select Fault:		Select Unit Type	e:	
NanoAl - Vibration RMS	¥	Acceleration	×	
Select Stages				
Q	Stage1	Stage2	Stageta	Above4
Send Alarm Notification				

#### User settings

- Change Password
- Raise Ticket/Issue: Create a ticket with Nanoprecise Tech Support

The second	
Dries Demo	
Māli ID	
dries@demo.io	
Subject	
Found issues wi	ith Display of Fault Mode
Issue Description	
When opening u	unbalance fault amplitude it shows a
incorrect name,	see attachment for more info
ttachment Imag	e/File

• Logout





## 3. Component Health Summary Page



Can be accessed by clicking on any equipment name



## 4. Navigation and General functionality

#### 4.1. Navigation

The different data sources can be selected individually, and the navigation tree will further expand to show all available options under that data type.





## 4.2. Trending Graph - Functionality





Legend for Vibration Graph	IS
<ul> <li>NanoAI Threshold</li> <li>Non Running RMS</li> <li>RMS</li> <li>Smooth RMS</li> </ul>	NanoAI - Self Adaptive Threshold (more info in Notification Manual) Non Running Points (RNR threshold on ACC or Sound RMS or Flux) Running Points (RNR threshold is self-adaptive based on clustering algo) Smooth Trend using EMA

Legend for Amplitude Graphs

Non Running AMP	Non Running Points (RNR threshold on ACC or Sound RMS or Flux)
AMP	Running Points (RNR threshold is self-adaptive based on clustering algo)
Smooth AMP	Smooth Trend using EMA

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#### 4.3. Spectrum and time wave form Graph



Zoom by "drawing a box", or horizontal or vertical "line" to keep the X or Y scaling fixed, "Double click" to zoom back out





#### 5. Vibration

#### 5.1. RMS, Peak, Kurtosis, Overall RMS

#### Different statistics values are processed form the Vibration time signal and available for review.



HEATTH SUMMARY	Mount Type -Vertical EQUIPMENT	COMPONENT	UNIT
C sector sector	Motor	Motor NDE V	Velocity (mm/sec)
	L		
🚱 RMS	From To		
A PEAK	07/27/2023 🖻 - 08/26	/2023 🖻	Email Alarm
UVERALL RMS	NanoAI Threshold		
	Non Running RMS     RMS	RM: Threshold Update : Augus	S st 02 2023 7:44:58 AM
AMPLIODE	Smooth RMS		
SPECTRUM		***	and the second
WATERFALL	Sec.	and the second second	* * * * * * * * * * * * * * * * * * *
	E .		
ALC: CONTRACT	<u>د</u> ۲		
(I) SOUND V	2		
8 TEMPERATURE	1		
	0		
a HUMIDITY	31 08 30 08 229 05 228 05 229 05 200 05 200 05 200 05 200 05 200 05 20000000000		
SPEED	8120 P 8120 P 8132 A 9131 P 9131 P 9131 P 9131 P	04435 04435 0511 0522 0534 05522 0552 0 0552 0 0552 0 0552 0 0552 0 0552 0 0552 0 0552 0 0552 0 0552 0 0552 0 0552 0 0552 0 0552 0 0 0552 0 0552 0 0552 0 0 0 0	0016 0028 0028 0028 0028 0028 0028 0028 002
- 14/101	ZZZŻŻŻŻŻ		BARARA PARAPARAA PAARAA PAARAAA PAARAA PAARAA PAARAA PAARAA PAARAA PAARAAA PAARAAAAAAAA
S. MILL			
III UPLOAD SPEED	Turn ON Distribution	Day Week	Month 6 Month Year

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## 5.2. Amplitude

- The amplitude graphs are dependent on the component that the sensor is monitoring. Each sensor is configured based on its location to cover applicable fault modes. For example, to cover antifriction bearing faults, the amplitude tab will show graphs for Bearing Inner Race, Bearing Outer Race, and Bearing Ball; to cover shaft faults, options such as unbalance, misalignment and looseness will be present.
- The amplitude graphs are used to calculate the RUL of a component. There are four stages for each fault. The RUL is being calculated as the time it takes to reach a Fault Stage 4. The equipment reaches an unstable point if the graph crosses over the Fault Stage 4 line.
- More info on how the Stage 4 threshold is initially set (during learning) and how it becomes self-adaptive after can be found in appendix D





#### 5.3. Spectrum



## 5.4. Waterfall Spectrum





## 5.5. Waveform





## 6. Sound

The acoustic emission data has a set frequency range of 20kHz – 40 or 80 kHz to capture the maximum amount of useful data, which is beyond human hearing range.



## 6.1. RMS

From	To		Ontion	ta listan t	time way	form	Email Alarm
02/24/2023 🖻 🗕	08/25/2023 @	/		lo iisten t	to time wave		
Aug 23 2023, 01:19:04 PM	A 🛛 🕹	$\odot$					
NanoAi     Sound     Smooth     Non Run	Threshold Sound ning Sound					0 <b>Q</b> + ()	== * *×==
						-	
40 Jun 14 12:40 PM Jun 15 10:54 PM Jun 15 10:54 PM Jun 15 10:54 PM Jun 10 05:07 PM	2 Jun 23 Licks M Jun 24 Licks M Jun 25 Licks M Jun 26 Licks M Jun 26 Licks M Jun 26 Licks M Jun 19 Disk2 M Jun	Jul 10 05:59 AM Jul 09 05:59 AM Jul 09 02:30 AM Jul 05 02:40 AM Jul 05 09:46 AM Jul 05 08:33 AM Jul 04 08:33 AM Jul 03 06:55 PM Jul 02 06:55 PM Jul 02 06:55 PM Jul 02 06:55 PM	Jul 19 04:38 PM Jul 19 04:38 PM Jul 19 02:27 AM Jul 19 02:25 PM Jul 15 02:52 PM Jul 15 02:52 PM Jul 15 02:52 PM Jul 14 02:53 AM Jul 14 02:53 PM Jul 12 12:43 PM Jul 10 06:31 PM	DUI 27 01:57 AM DUI 27 01:157 AM DUI 26 00:17 AM DUI 26 00:17 AM DUI 26 00:13 PM DUI 24 00:31 PM DUI 24 00:31 PM DUI 22 01:42 PM DUI 22 01:52 AM DUI 22 05:58 PM	Aug 00 00:45 AM Aug 00 00:55 AM Aug 00 00:55 AM Aug 00 00:55 AM Aug 00 00:55 AM Aug 00 00:25 AM Aug 00 00:22 PM Aug 00 00:22 P	Aug 19 07:53 PM Aug 18 05:00 AM Aug 18 05:00 AM Aug 17 01:14 AM Aug 17 01:14 AM Aug 15 10:21 AM Aug 15 10:21 AM Aug 13 02:43 AM Aug 11 11:08 PM Aug 11 11:08 PM	Aug 25 06:36 AM Aug 24 06:10 AM Aug 24 06:10 AM Aug 22 01:36 PM Aug 22 01:35 PM Aug 21 01:35 PM Aug 20 01:55 PM
	Turn ON Distribution	Day	Week	Month	6 Month	Year	



## 6.2. Spectrum



## 6.3. Waterfall Spectrum





#### 6.4. Time Wave Form



### 7. Flux

#### 7.1. RMS



## 7.2. Spectrum

## 7.3. Time waveform



#### 8. Temperature

Temperature graph represents surface temperature of each location on which the sensor is mounted.



#### 9. Humidity

The humidity graph represents the atmospheric humidity value near the sensor.





## 10. Speed

The speed graph provides RPM of the equipment, which can be extracted from the vibration or flux signal



## 11. Wi-Fi

The Wi-Fi graph provides the strength of the network. Higher values (greater than -70dBm) represent good connectivity.

02/25/2023	-     08/26/2023
0	WIFI SMOOTH WIFI
-20	
40 40	
-40 -60	Manager and the second states and the second states of the second states
-40 -60 -80	Ang 22 Ang 22 Ang 22 Ang 20 Ang 20 An



## 12. Upload speed

From	То	
02/24/2023 🖻	- 08/25/2023 🗐	
	UPLOAD SPEED	
_	SMOOTH UPLOAD SPEED	
(sdq)		
0000 C		10 m
0 2000 B		Contraction of the second
5 1000	and the second	Anna
0	App -	
		223 021 220 07 220 07 220 07 221 12 220 07 221 12 221 12 221 221
	9 PAM 9	22 AM 23 AM 24 PM 25 PM 26 AM 26 AM 26 AM 27 PM 26 AM 27 PM 28 PM 28 PM 29 PM 29 AM

Every data upload the upload speed is measured and displayed in trend.

#### **13. Battery**

The battery graph provides the status of battery life.





# 14. Appendix A: NanoAI Alarm & Adaptive fault amplitude threshold

# NanoAl Alarm

- Threshold is automatically updated every 30 days based on the data of the last 30 days
- Al trained model is used to capture the features of data
- Threshold is set/modified to adapt to the features
- No prior knowledge is required from customer
- Alarms will be automatically sent to customer if RMS/Peak hits the threshold
- Applies to RMS/Peak of vibration signals (acceleration & velocity) and RMS of ultrasonic signals



## **15. Appendix B: Dashboard Terminologies**

## **Vibration**

**Waveform:** A plot of amplitude versus time. The waveform illustrates how the vibration signal (i.e., acc., vel., and dis.) appears when graphed as amplitude over time.

**Spectrum:** A plot of amplitude versus frequency.

- The Spectrum is obtained by applying a Fast Fourier Transform (FFT) on Waveform, which breaks the signal down into specific amplitudes at various component frequencies.
- If a machinery problem exists, FFT Spectrum provides information to help determine the location of the problem, the cause of the problem, and, with trending, how long until the problem becomes critical.
- Because we know that certain machinery problems occur at certain frequencies, we analyze the FFT spectrum by looking for amplitude changes in certain frequency ranges.

**Frequency Spectrum Waterfall:** A three-dimensional plot in which multiple vibration spectra curves are displayed simultaneously.

- On the Nanoprecise Dashboard, vibration frequency spectrum waterfall plot covers multiple spectra for the last 7 days
- By using the frequency spectrum waterfall plot, it can show how the frequency spectral structure changes over time
- **RMS:** Root Mean Square is the square root of the average of the squared values of the vibration waveform. RMS describes the vibration energy in the machine. The higher the vibration energy, the higher the vibration RMS is.
- **Peak:** Peak value in time domain. The maximum excursion of the time wave from the zero or equilibrium point in the time domain.
- **Kurtosis:** Kurtosis is a statistical parameter used to characterize a signal. Kurtosis provides a measure of the "peakness" of a vibration signal. Signals that have a higher kurtosis value have more peaks that are greater than three times the RMS value, which are, for mechanical vibration signals, the impulses introduced by the mechanical impacts, indicating the potential mechanical fault.
- Amplitude: The maximum amplitude for the fault characteristic frequencies and its harmonics up to 10th order. This amplitude describes the severity of a specific fault mode. Nanoprecise uses such amplitudes for RUL calculation.



# <u>Sound</u>

**Time Waveform:** The Acoustic Emission (AE) waveform illustrates how the AE signal appears when graphed as amplitude over time.

**Frequency Spectrum:** A plot of amplitude in micro voltage versus frequency. The AE spectrum describes the amplitude at each frequency component.

**Frequency Spectrum Waterfall:** A three-dimensional plot in which multiple AE spectra curves are displayed simultaneously.

- On Nanoprecise Dashboard, AE frequency spectrum waterfall plot covers multiple spectra for the last 7 days
- By using the frequency spectrum waterfall plot, it can show how the frequency spectral structure changes over time
- **RMS:** Root Mean Square is the square root of the averaged of the squared values of the AE waveform. RMS describes the AE energy emitted by the machine. The higher the AE energy, the higher the AE RMS is.



# 16. Appendix C: Health Status & Health Score & RUL Calculation

#### Health Status:

Fault Severity	Remaining Useful Life	Health Status	Fault	Suggestion
lower than stage 2	>75%		Not Available	None
stage 2	>50%	Healthy	Not Available	None
tage 2 & fault anomaly detected*	>50%	Needs maintenance review	Applicable fault	Review maintenance plan and parts availability
tage 3	>750 hours	Needs maintenance review	Applicable fault	Review maintenance plan and parts availability
tage 3	251-750 hours	Needs attention	Applicable fault	Schedule maintenance activity
tage 3	<250 hours		Applicable fault	Repair immediately
tage 4	Ó		Applicable fault	Repair immediately

#### Health Score:

Health score on Plant level is the average rating of each equipment health status under the plant.

Assuming Plant A has 4 different equipment in it. Each equipment has 4 health modes with following health modes and associated score of ranking.

- Healthy 3
- Needs maintenance review 2
- Needs attention 1
- Needs immediate attention 0

If two equipment are in the healthy mode, 1 is in Needs maintenance review mode and 1 is in Needs attention mode then he health score will be calculated by averaging the total score.

In this case = 3 + 3 + 2 + 1 / 12 = 0.75 = **75** is the health score



# Remaining Useful Life:

Fault Stage	Predicted RUL in hours RUL Representation on Dashboard			
Stage 1	NA Percentage			
Stage 2	NA Percentage			
Stage 2	>750	Percentage		
Stage S	<750	Hours		
Stago 4	>750	Percentage		
Stage 4	<750	Hours		
Noto 1	By NA for Stage 1 and Stage 2, it means the RUL will be represented in			
Note I	in hours.			
Noto 2	Two factors are taken into consideration for RUL calculation: Absolute Amplitude			
Note 2	and Relative Amplitude Increasing Trend.			
Note 2	750 hours is around one month, being treated as the boundary to have RUL in			
Note 3	percentage or in hours.			
	, immediate action with a field check is			
Note 4	ed fault amplitude would be significant.			
	When the RUL is represented in percentage, continuous monitoring is need			
Note 5	without immediate action with field check as the detected fault amplitude would			
	be relatively flat.			
	Variance in RUL is only applicable to RUL representation in <i>hours</i> , indicating the			
Note 6	variance/accuracy of predicted RUL. RUL in <i>percentage</i> has no variance because			
	rrent Amp)/(Stage 4 Amp Threshold)			

# Table C.1 RUL Representation on Dashboard



# **17. Appendix D: Fault Amplitude Stage Thresholds**

#### Below info is also available on dashboard under the "info" button



We have developed a comprehensive condition-based maintenance program incorporating predictive maintenance to detect fatigue wear, breakage and deterioration of any rotating equipment with industrial internet of Things technology. Our mature algorithm provides not only indications of any deterioration in a rotating equipment, but also an evaluation of the severity and recommendations for when corrective actions should be taken on rotating equipment components as per ISO-10816 and ASNT Standards.

Based on the comprehensive signal processing and transfer learning techniques, fault severity is analyzed and trended subject to ASNT standards with proper severity stage categorization by our algorithm. Various health summary metrics in the dashboard are linked to the fault severity as mentioned in the following table:

Fault Severity	Remaining Useful Life	Health Status	Fault	Suggestion
lower than stage 2	>75%	Healthy	Not Available	Noné
stage 2	>50%	Healthy	Not Available	None
stage 2 & fault anomaly detected*	>50%	Needs maintenance review	Applicable fault	Review maintenance plan and parts availability
stage 3	>750 hours	Needs maintenance review	Applicable fault	Review maintenance plan and parts availability
stage 3	251-750 hours	Needs attention	Applicable fault	Schedule maintenance activity
stage 3	<250 hours		Applicable fault	Repair immediately
stage 4	Q	leedsimmediate siterii	Applicable fault	Repair immediately

\*fault anomaly detected: fault amplitude data exceeds NanoAl Amplitude threshold

The following quotes from ASNT standards are used to categorize fault severity stages: Bearing wear stage for single highest bearing fault frequency harmonic amplitude (mm/s peak) vs shaft rotational speed

Note: If feedback is provided to the specific notification through the notification log and the selected maintenance type has "Reset Fault Detection" activated, then all data till that time will be discarded and learning will be restarted.

RPM	Stage 1	Stage 2	Stage 3	Stage 4
900	0.826	(891)	©.429	6.858
1200	0.863	1.776		7.112
1800	1.016	2.030		8128
3600	1.27	2.54		10.16

We extract a wide range of features such as rms and kurtosis from raw data, amplitudes of fault-related frequencies from FFT and Hilbert transform, and RPM extraction algorithm with satisfactory accuracy to determine the current severity and to predict the remaining time to maintenance so as to better serve our clients. Available historical data and run to failure test data are also employed to further improve the performance of our algorithm. Our condition monitoring industry experts are working together with our algorithms to provide tailor-made solutions to our clients.

For further help and clarification, Contact us

# Adaptive fault amplitude threshold

- Threshold is automatically updated based on the real data
- Al trained model is used to capture the features of data
- Threshold will be lifted if fault is above stage 3, yet amplitude is flat (to avoid false positives)
- Updated threshold will be used for fault detection & RUL calculation with new data