

Vibration Analysis, Reliability Centered Maintenance and Condition Monitoring Training 2020-21

IRD Mechanalysis
The Vibration People



“IRD ISO 18436 Category 2 training at Mumbai was thoroughly enjoyed by me. It has given me a very clear understanding of Vibration analysis.....”

K D Ansari
NTPC Rihand

“ We are able to clearly correlate our site vibration problems and the reasons behind them. It has given us very clear knowledge in Vibration measurement and analysis.....”

Ahadi Masurya
and Peter Stuart

Son Gas Power Plant
Tanzania

IRD Mechanalysis
is a provider of
Vibration monitoring
Instruments and
Vibration analysis
training services
since 1955

The problem

- All machines vibrate when they run
- An increase in vibration is a sign of trouble
- Each trouble has its own unique characteristics

Vibration analysis aims at measurement of vibration characteristics and get to the root of the problem



The solutions

- Vibration measurements
- Vibration analysis
- Other Condition Monitoring technique
- Failure Mode and Effect analysis (FMEA)
- Reliability Centered Maintenance
- Effective Preventive and Predictive Maintenance

IRD Offerings

- Vibration meters and analysers
- On-line Vibration Monitoring systems
- Skilled personnel in the field of vibration analysis and in situ balancing
- Vibration Condition Monitoring Training
- Certification ISO 18436

IRD Mechanalysis[®] Limited

Training can be delivered on-site at your premises or at a Hotel in a Public Training



Calendar for 2020-21

Sl No.	Programme	Date	Duration (Includes Training and Certification)	Venue
1	Vibration Analysis Level 2 to ISO18436-2	21-24 Jul 2020	4 days	Hilton Mumbai
2	Vibration Analysis Level 1 to ISO18436-2	25-28 Aug 2020	4 days	Park Hyatt Chennai
3	Vibration Analysis Level 2 to ISO18436-2	15-18 Sept 2020	4 days	Park Hotel Delhi
4	Vibration Analysis Level 3 to ISO18436-2	5-9 Oct 2020	5 days	Hilton Mumbai
5	Vibration Analysis Level 2 to ISO18436-2	3-6 Nov 2020	4 days	Country Inn and Suites Kota
6	Vibration Analysis Level 2 to ISO18436-2	15-18 Dec 2020	4 days	Park Hyatt Chennai
7	Vibration Analysis Level 3 to ISO18436-2	5-9 Jan 2021	5 days	Park Hotel Delhi
8	Vibration Analysis Level 2 to ISO18436-2	23-26 Feb 2021	4 days	Babylon Hotel Raipur
9	Vibration Analysis Level 1 to ISO18436-2	9-12 Mar 2021	4 days	Hilton Mumbai

Vibration analysis body of knowledge was well developed as early as 1960 by IRD Mechanalysis. However as application of Vibration analysis became widespread, ISO in 2003 defined the requirements against which personnel in the Vibration Condition Monitoring and Diagnostics technologies are to be Certified and Trained. Conformity assessment for Certification in Vibration Analysis will be performed by a body accredited to the requirements of ISO 18436-3. We provide Training and Certification in Vibration Condition Monitoring for all levels.

All these programmes can also be delivered at site for 5 to 20 persons.

IRD Mechanalysis created Vibration Analysis training in the 60s and were pioneers in training the world in Vibration Monitoring and Analysis. IRD Mechanalysis training programmes have been delivered to 40,000 plus persons around the world.

In India IRD is delivering these training since 1975 and boasts of training 4000 plus persons from all sectors of industries. The training programmes have been continuously modified and updated.

Following Faculty members will conduct above training programmes:

M P Srivastava, Managing Director, IRD Mechanalysis Ltd. Trained to Level 5 by former IRD Mechanalysis Inc. USA

Misal Anand, Director Operations, IRD Mechanalysis Ltd, Trained to Level 3 to ISO18436

IRD Mechanalysis Board of Certification (IMBoC) is a 'Not for Profit' body comprising of eminent persons from Industry, Academics and Business. The board supervises the entire training and certification process in accordance with ISO 18436 and ISO / IEC 17024.



Chief Trainer's profile

Mr. Murari Prasad Srivastava
MD, IRD Mechanalysis

Mr. M P Srivastava is a Postgraduate from IIT Kharagpur in 'Maintenance Engineering and Management'. He did his graduation in Electrical Engineering from Bihar University and has 39 years of industrial experience in Plant Maintenance, Learning Management, Sales and Marketing, Education Management and Six Sigma continuous improvement. His expertise includes Cadre Building, Development and application of Predictive Maintenance Technologies and Equipment Reliability. He was involved in development and application of Predictive Maintenance Technologies for the Government owned Steel Company (SAIL) in the 80's and more recently in upgrading maintenance management at Tata Power on RCM lines. During the past 30 years while he was working in several companies, he was also acting as internal consultant and trainer of managers and key personnel. Over 1000 people from 60 plus companies have attended his training courses and workshops.

Mr. Srivastava has helped some of the leading companies in upgrading maintenance management on reliability lines. The names include Essar Steel and Tata Power. While at Essar Steel he set up Reliability cell in each division and also oversaw Six Sigma Continuous Improvement. He supervised 4000 plus DMAIC projects which brought 55 million dollars savings for the company. He was also instrumental in spreading of RCM and FMEA knowledge across plant for young engineers which helped improve operation and maintenance practices.

Mr Srivastava is trained to Level 5 in Vibration Condition Monitoring by IRD Mechanalysis USA. He is also a Six Sigma Black Belt. He has performed vibration analysis on 100 plus process plant equipment and balanced about 30 plus rotors including several hydro turbines. Mr Srivastava has conducted more than 40 training programmes in Vibration Condition Monitoring and related topics. Mr Srivastava has authored 20 papers in Maintenance management, Condition Monitoring and Reliability. These have been presented and published in National and International Journals / conferences.

Mr Srivastava has served as Maintenance Engineer for Tata Motors, General Manager for IRD Mechanalysis (India) Ltd, Director at Indian Institute for Production Management, Vice President for Essar Group and then consultant to Tata Power and Siemens. He is currently the Managing Director at IRD Mechanalysis Ltd.



Course Content

Main Heads	Detailed topics	Vibration Analysis Level 1 ISO 18436 with Certification	Vibration Analysis Level 2 ISO 18436 with Certification	Vibration Analysis Level 3 ISO 18436 with Certification	Vibration Analysis Level 4 ISO 18436 with Certification
Principles of Vibration	Basic motion	*	*	*	
	Period, frequency	*	*	*	
	Amplitude: peak, peak-to-peak, r.m.s.	*	*	*	
	Parameters: displacement, velocity, acceleration	*	*	*	
	Units, unit conversions	*	*	*	
	Time and frequency domains	*	*	*	
	Vectors, modulation			*	*
	Phase		*	*	*
	Natural frequency, resonance, critical speeds	*	*	*	*
	Force, response, damping, stiffness			*	*
	Instabilities, non-linear systems				*
Data acquisition	Instrumentation	*	*	*	*
	Dynamic range, signal-to-noise ratio			*	*
	Transducers	*	*	*	
	Sensor mounting, mounted natural frequency	*	*	*	
	Fmax, acquisition time		*	*	
	Proximity sensor conventions		*	*	
	Triggering		*	*	
	Test planning		*	*	*
	Test procedures	*	*	*	*
	Data formats		*	*	
	Computer database upload/download	*			
	Recognition of poor data	*	*	*	
Reference standards	ISO		*	*	*
	IEC		*	*	*
	Relevant national standards		*	*	*
Signal Processing	R.m.s./peak detection				*
	Analog/digital conversion				*
	Analog sampling, digital sampling		*	*	*
	FFT computation			*	*
	FFT application	*	*		
	Filters: low pass, high pass, band pass, tracking		*	*	*

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Signal Processing	Anti-aliasing		*	*	*
	Bandwidth, resolution		*	*	*
	Noise reduction				*
	Averaging: linear, synchronous time, exponential		*	*	*
	Dynamic range		*	*	*
	Signal-to-noise ratio				*
	Spectral maps			*	*
Condition monitoring	Computer data base set-up, computer database maintenance			*	
	Equipment evaluation and prioritization		*		
	Monitoring programme design		*	*	*
	Alarms set-up: narrowband, envelope			*	
	Baseline assessments, trending		*	*	
	Route planning		*	*	
	Alternative technologies: oil analysis, infrared thermography, motor current analysis and acoustic emission			*	*
	Fault condition recognition	*	*		
Fault analysis	Spectrum analysis, harmonics, sidebands		*	*	*
	Time waveform analysis			*	*
	Phase analysis			*	*
	Transient analysis			*	*
	Orbit analysis			*	*
	Shaft centreline analysis			*	*
	Enveloping			*	*
	Mass unbalance		*	*	
	Misalignment		*	*	
	Mechanical looseness		*	*	
	Rubs, instabilities			*	*
	Bearing defects: rolling element, journal		*	*	
	Electric motor defects		*	*	*
	Flow induced vibration, aerodynamics and liquids			*	*
	Gearbox analysis		*	*	
	Resonance and critical speeds		*	*	*
	Turbomachinery			*	*
General fault recognition	*				

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Corrective action	Shaft alignment		*	*	
	Field balancing		*	*	*
	Replacement of machine parts			*	
	Flow control			*	*
	Isolation and damping			*	*
	Resonance control			*	*
	Basic maintenance action	*	*	*	
Equipment knowledge	Electric motors, generators and drives	*	*	*	
	Pumps, fans	*	*	*	
	Steam turbines, gas turbines		*	*	
	Compressors	*	*	*	
	Reciprocating machinery		*	*	
	Rolling mills, paper machines, other process equipment	*	*	*	
	Machine tools	*	*	*	
	Structures, piping	*	*	*	
	Gearboxes	*	*	*	
	Rolling element bearings		*	*	
	Journal bearings		*	*	
	Gearing		*	*	
	Couplings, belts		*	*	
Acceptance testing Equipment testing and diagnostics	Test procedure	*	*		
	Specifications and standards		*	*	
	Reporting		*	*	
	Impact testing		*	*	*
	Forced response testing		*	*	*
	Transient analysis			*	*
	Transfer functions				*
	Damping evaluation				*

Course Content

Main Heads	Equipment Reliability and FMEA
Reliability Centered Maintenance	Introduction to Reliability
	Reliability, Availability and Maintainability
	Why machines fail - Bathtub Curve
	Functions and functional failure
	FMEA - Failure Mode and Effect Analysis
	Reliability Centered Maintenance (RCM) decision diagram
	Condition Monitoring - Task recommendation
	Revision of plan
	Implementation and change management
Additional Topics	IRD Mechanalysis Vibration Technology 1 (VT1) - Similar to Category 2 of ISO 18436
	IRD Mechanalysis Vibration Technology 2 (VT2) - Similar to Category 3 of ISO 18436
	Integration of Condition Monitoring technique for root cause analysis and early warning
	Equipment FMEA - Failure Mode and Effect Analysis - 1 day
	Effective Preventive and Predictive Maintenance - 2 days
	Introduction to Terotechnology - 1 day
	Senior Management awareness programme on Condition monitoring - Half day compact capsule

Details on additional topics

RCM (Reliability Centered Maintenance) is extremely relevant and goes beyond sophisticated software available in market to simple understanding at shop level. IRD helps in reorganising **Preventive and Predictive Maintenance** in the work place using **RCM and FMEA**. Vibration Condition Monitoring along with other Condition Monitoring Technique takes a front seat in assuring Reliability of Equipment and enhancing Uptime.

Integration of Condition Monitoring Techniques for Root Cause Analysis and Early Warning is an important programme that is normally delivered in 3 days. It discusses three important condition monitoring technique - **Vibration, Oil monitoring and Analysis and Thermography**. Then it goes ahead and discusses how these three can be used together judiciously to come to root cause and also provide early warning.

Senior Management awareness on Condition monitoring - Half day compact capsule is strongly suggested for senior personnel from Operation, Maintenance, C&I and Maintenance Planning. Senior VPs, GMs and AGMs looking after these functions cannot spare full 3 days. But understanding the nuances of Condition Monitoring for better management is essential. This programme aims at exactly that.

Course content can be designed to suit organisation's requirements

IRD Mechanalysis The Vibration People

Pioneers in the field of Vibration based Condition Monitoring Solutions since 1955

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