



Introduction

In this case study, Machinery Diagnostics Institute (MDI) was commissioned to address a high vibration issue on a kiln hood fan at a construction plant located in Queensland, Australia. Effective vibration analysis plays a crucial role in identifying such issues before they lead to further damage or unplanned downtime.

Analysis

MDI utilized the following condition monitoring solutions to analyze the kiln hood fan and determine the root cause of its elevated vibrations:



AC292

*Premium compact size
accelerometer, 100 mV/g, $\pm 5\%$*



MH137-1A

*Curved surface mounting
magnet, 15 lbs (6.8 kg)
pull strength*



CB108-C395-006-K2C-SF

CB108 coiled cable with C395 connector on the left, a safety feature in the middle, and a K2C connector on the right, 6 ft. (1.8 m) length

CommTest vb7 Data Collector

Machine Info. Kiln Hood Fan #1

Date 29.04.2023

Speed 1451 RPM

No. of blades 8

Angle between Blades 45 Degree

Rotor Weight N/A Kg

Rotor Diameter N/A cm

Device Used Commtest VB7

Original Run (O)	(1X) Amp mm/s	Phase
FDEH	10	349
FDEV	11	350
FNDEH	3.18	226
FNDEV	4.9	220

Trail weight	230 gm	270°	Removed	
Trail Run (O+T)	(1X) Amp	Phase	Estimated Correction Weights	
FDEH	14.1	318	259 gm	169°
FDEV	14.1	318	217 gm	180°
FNDEH	4.1	180	277 gm	291°
FNDEV	5.3	202	685 gm	175°

Speed of
1099 Rpm
60 %

Correction Weight	210 gm	180			Speed of 1099 Rpm 60 %
Correction Run	(1X) Amp mm/s	Phase	Estimated Weights		
FDEH	6.8	249	gm	°	
FDEV	7.1	350	gm	°	
FNDEH	1.8	183	gm	°	
FNDEV	2.3	173	gm	°	

Trim Weight	100 gm	180°		
Trim Run	(1X) Amp mm/s	Phase	Speed of 1451 Rpm 80 %	
FDEH	0.9	64°		
FDEV	0.9	61°		
FNDEH	0.9	200°		
FNDEV	0.6	190°		

Final Readings	(1X) Amp mm/s	Overall	Units	Speed of 1451 Rpm 80 %
FDEH	0.9	1.1	mm/s	
FDEV	0.9	1.1	mm/s	
FNDEH	0.9	1	mm/s	
FNDEV	0.6	0.9	mm/s	

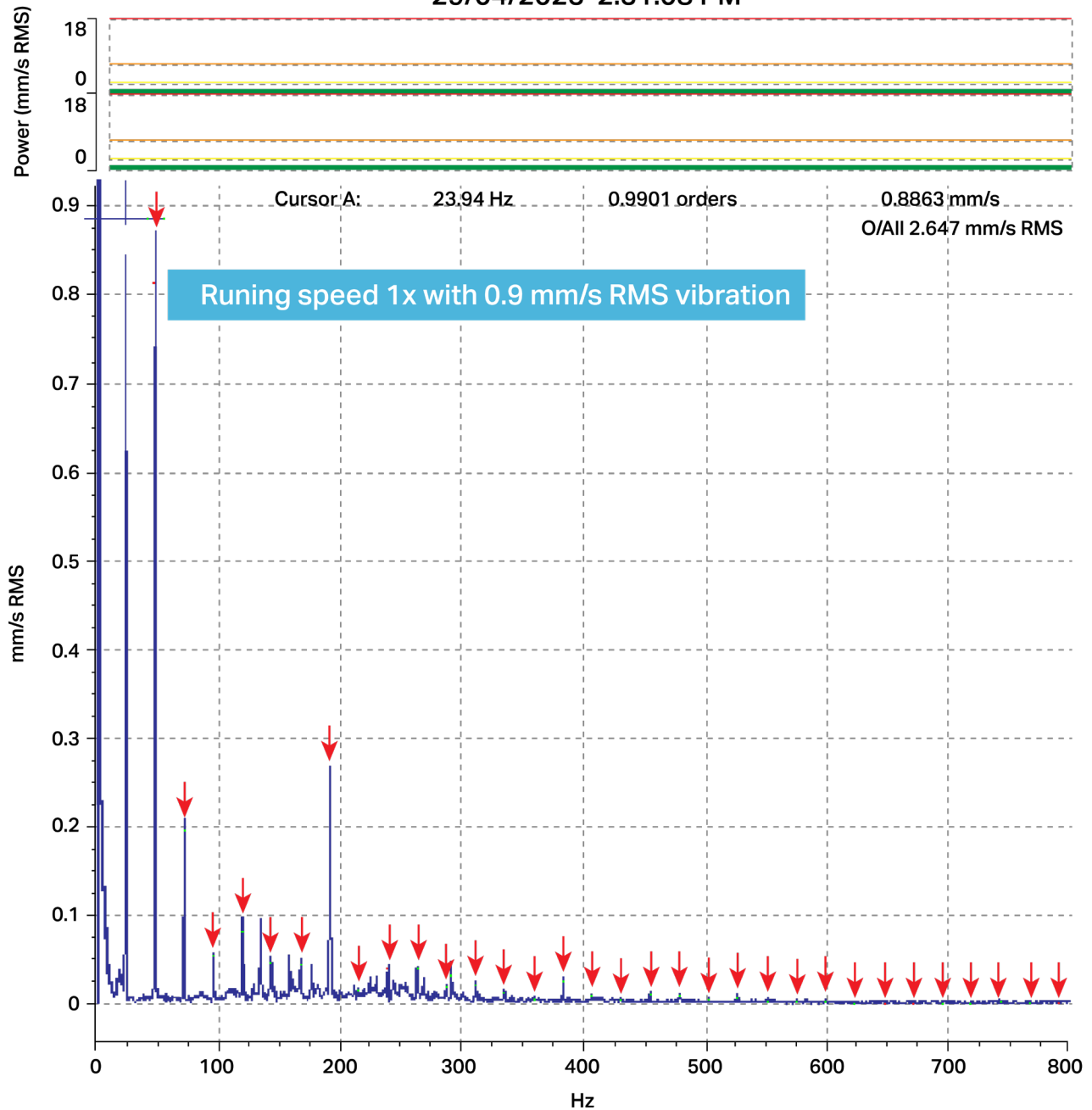
Machine Layout



The Fan Drive End (FDE) - horizontal direction - vibration spectrum shows vibration levels of 0.9 mm/s RMS at the running speed of 1451 RPM - 80% - after fan balancing:

Vibration levels after fan balancing

Kiln Fan no. 1 - Fan DE - Horizontal - Vel Spec/Wfm 800 Hz
29/04/2023 2:31:08 PM

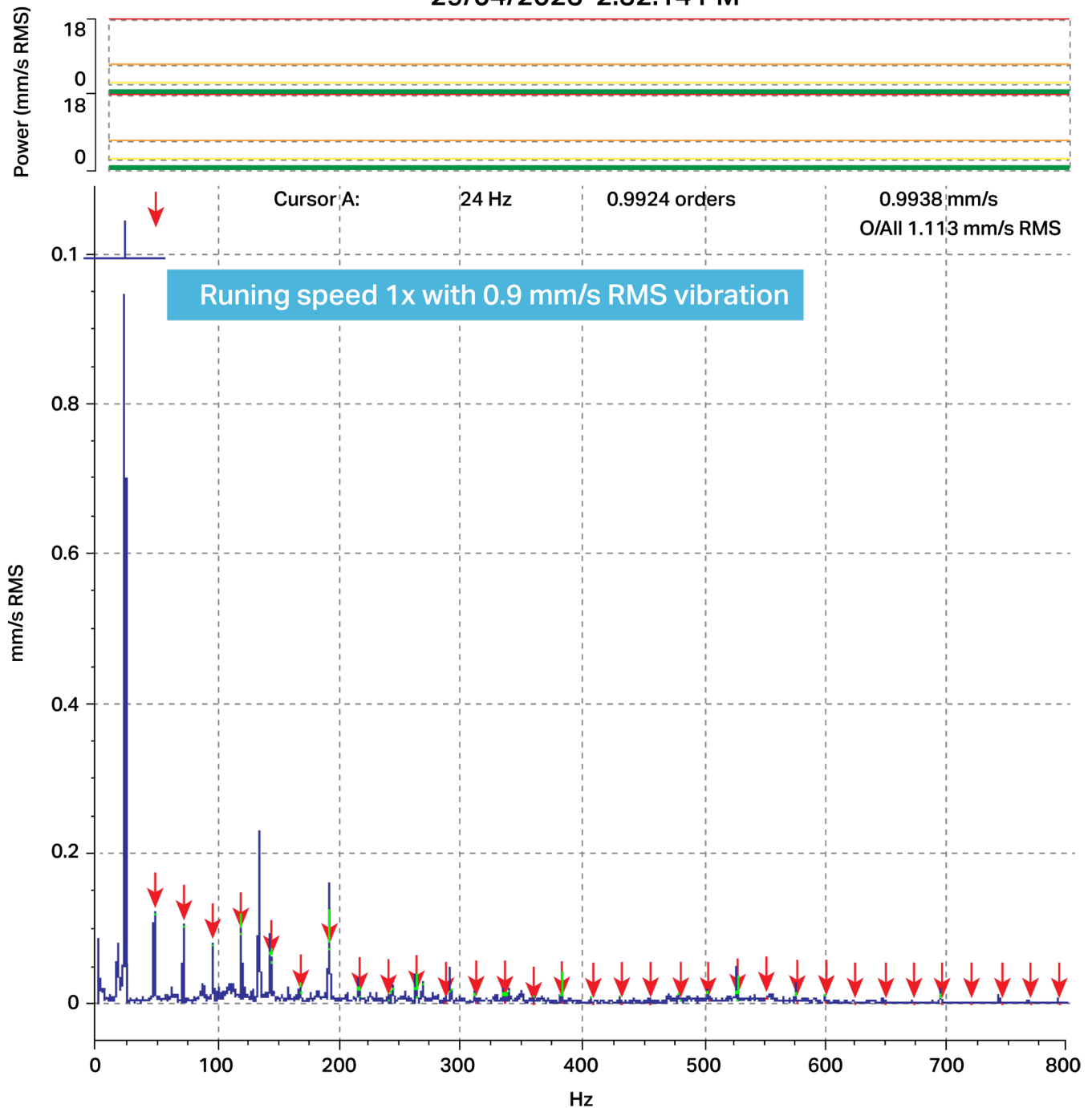


Spectrum shows 1x and 2x, which could be caused by minor misalignment

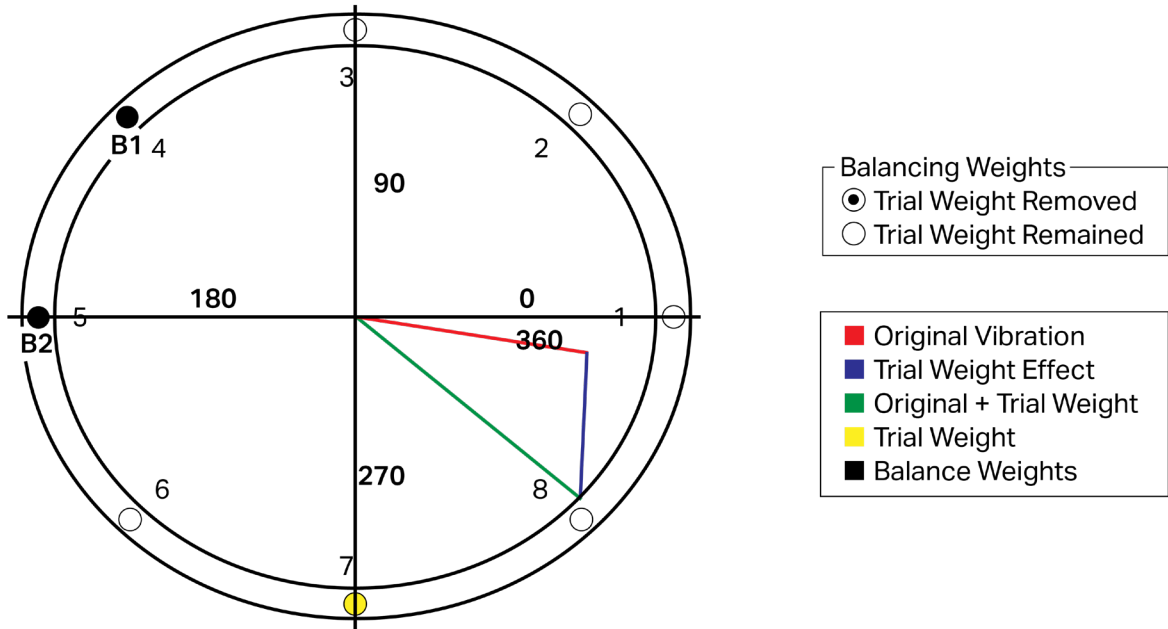
The Fan Drive End (FDE) - horizontal direction - vibration spectrum shows vibration levels of 0.9 mm/s RMS at the running speed of 1451 RPM - 80% - after fan balancing:

Vibration levels after fan balancing

Kiln Fan no. 1 - Fan NDE - Horizontal - Vel Spec/Wfm 800 Hz
29/04/2023 2:32:14 PM



Polar Plot



Influence Coefficient

0.032@357 deg mm/s/g

Original Vibration	Red
Original Vib. + Trial Weight	Blue
Trial Weight Effect	Green

Standards

								Velocity		10-1000 Hz f > 600 rpm 2-1000 Hz f > 120 rpm
			D					11	0.44	
			C					7.1	0.28	
								4.5	0.16	
			B					3.5	0.11	
								2.8	0.07	
								2.3	0.04	
								1.4	0.03	
			A					0.71	0.02	
								mm/s rms	inches/s rms	
rigid	flexible	rigid	flexible	rigid	flexible	rigid	flexible	Foundation		
pumps > 15 kW radial, axial, mixed flow				medium sized machines 15 kW < P ≤ 200 kW		large machines 300 kW < P < 50 MW		Machine Type		
integrated driver		external driver		motors 160 mm ≤ H < 315 mm		motors 315 mm ≤ H				
Group 4		Group 3		Group 2		Group 1		Group		

Comments and Recommendations

The fan shows acceptable vibration levels according to the ISO 20816-3 Standard at 80% of its running speed (approximately 1451 RPM). However, at 60% of the running speed (around 1080 - 1099 RPM), the vibration levels were relatively high. This is due to the fan operating near the natural frequency of the machine base, causing resonance. To avoid resonance issues, it is recommended to avoid running the fan in the 1080 - 1099 RPM range.