



Reliability Maintenance Team

No.1 DRYER. DRAA

Drying Air Fan

5031-3181



Online Vibration

Case Study

Report Prepared by: Chris Bennett
Stuart Walker
Geoff Copeland
Dave Shevels
Dean Whittle



RMS

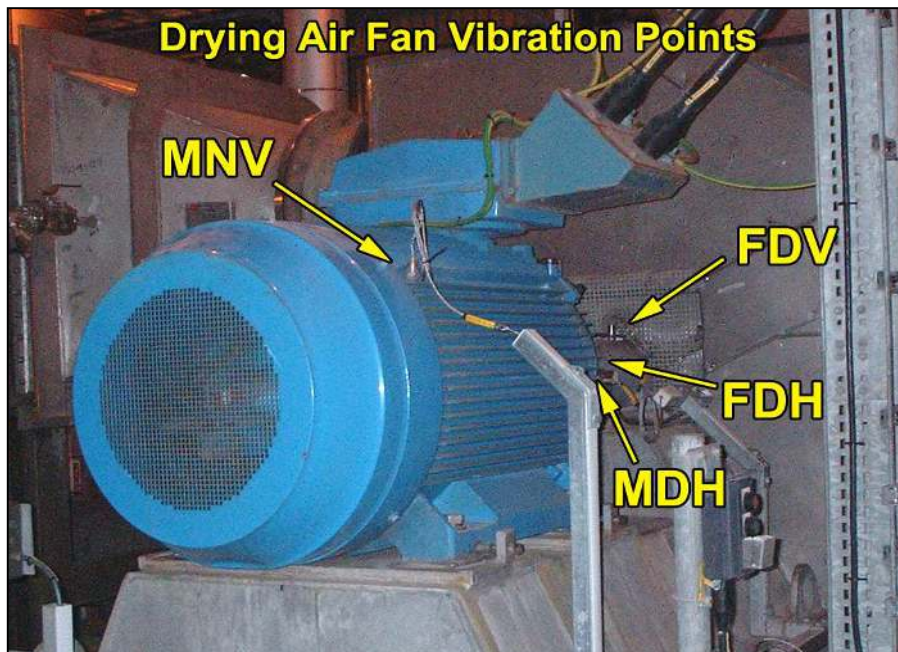


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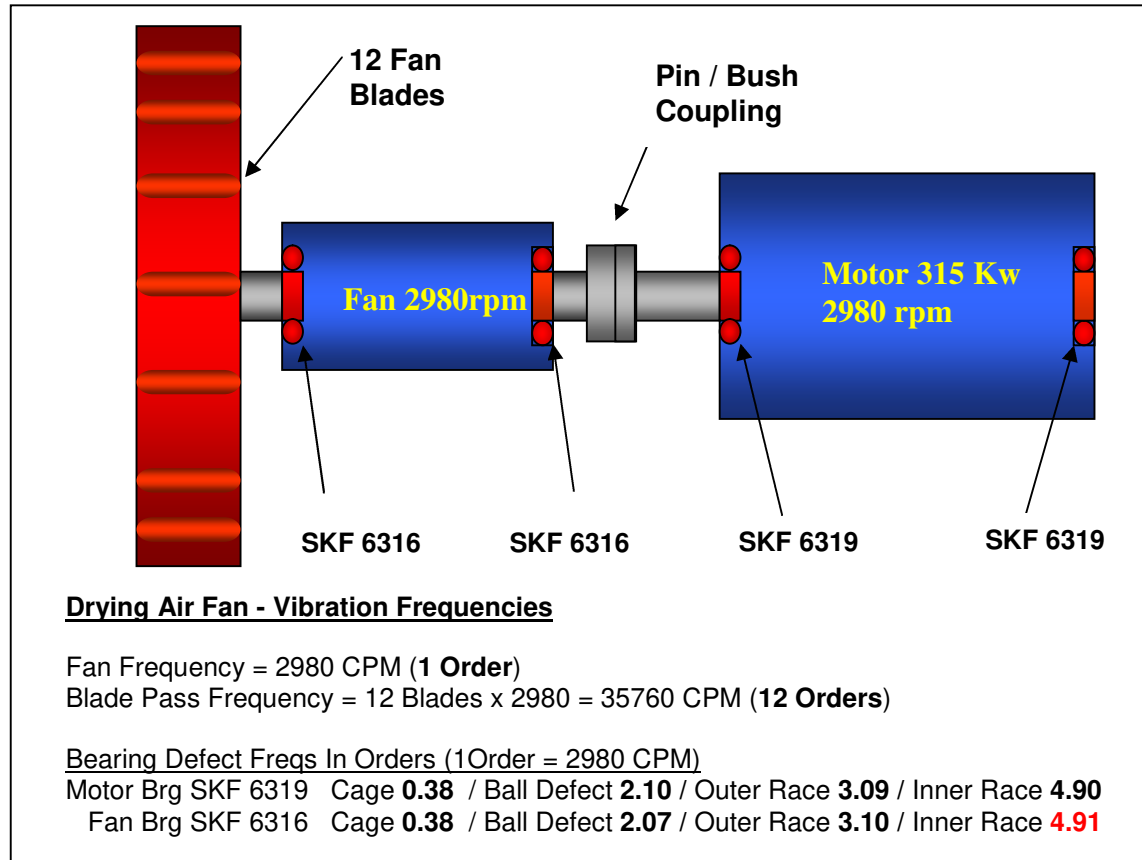


5031-3181 Drying Air Fan (Online Case Study)

The Drying Air Fan is situated on the 5th Floor of the DRAA Plant. The fan supplies hot air to No.1 Dryer which removes moisture from the Adipic Acid product. This fan is critical in sustaining the operation of this plant; failure of this fan would result in a premature outage of the No.1 Dryer Plant.



The above Photo illustrates the position of the fixed online vibration sensors that are fitted to the fan and motor (i.e. MNV = Motor Non Drive End Bearing Vertical).



The above diagram shows the configuration of the Drying air fan. The above configurations, speeds, bearing details etc have being entered into the online system to assist in fault diagnostics.

In November 2001 the Drying Air fan sensor (**Fan Non Drive End Fan Vertical**) entered into an alarm condition, the system automatically started rapid data collection. Two parameters were initially in alarm PK-PK Waveform, (Peak to Peak Value of time waveform measured in G's) and HFD Ultrasonic (High Frequency Detection measured in G's Peak) Below is the **Online watch** screen showing the status of monitored plant.

DUPONT ONLINE RMS.rbm - Online Watch

Working Folders: E:\vbmsuite\CustData\DUPONT ONLINE

Auto Alert

Areas:

- DRAA - DRY ADIPIC ACID
 - 5031-3103 - DRY REF CRYSTALS AGI HYD DRIVE
 - 5031-3110 - DRY REF SLURRY PUMP
 - 5031-3161 - DRY REF CENT M/LIQ REC PUMP
 - 5031-2255 - SALT LOADING SUMP PUMP No.1
 - 5031-3181 - DRYING AIR FAN
 - MTR - 5031-3181 MOTOR
 - FAN - 5031-3181 FAN
 - FDH - FAN DE HORIZONTAL
 - FNV - FAN NDE VERTICAL**
 - 5031-3186 - COOLING AIR FAN
 - 5031-3194 - EXHAUST AIR FAN
- RECT - REACTION
- CRD - CRUDE
- NACG - NACS PURGE & COGA
- ABS - ABSORPTION

Units

FNV - FAN NDE VERTICAL GS AC: 5.981 Gs pk RPM: 2980.00
Last Report: 03-Jan-02 12:42:50 GS DC: 11.545 volts Load: 100.00

Data Collection Sets:

Description	Urgency	Last Report	RPM	Predicate
STANDARD	Critical	03-Jan-02 12:42:50	2980.00	Time-based

Analysis Parameters - Table | Analysis Parameters - Face Plate

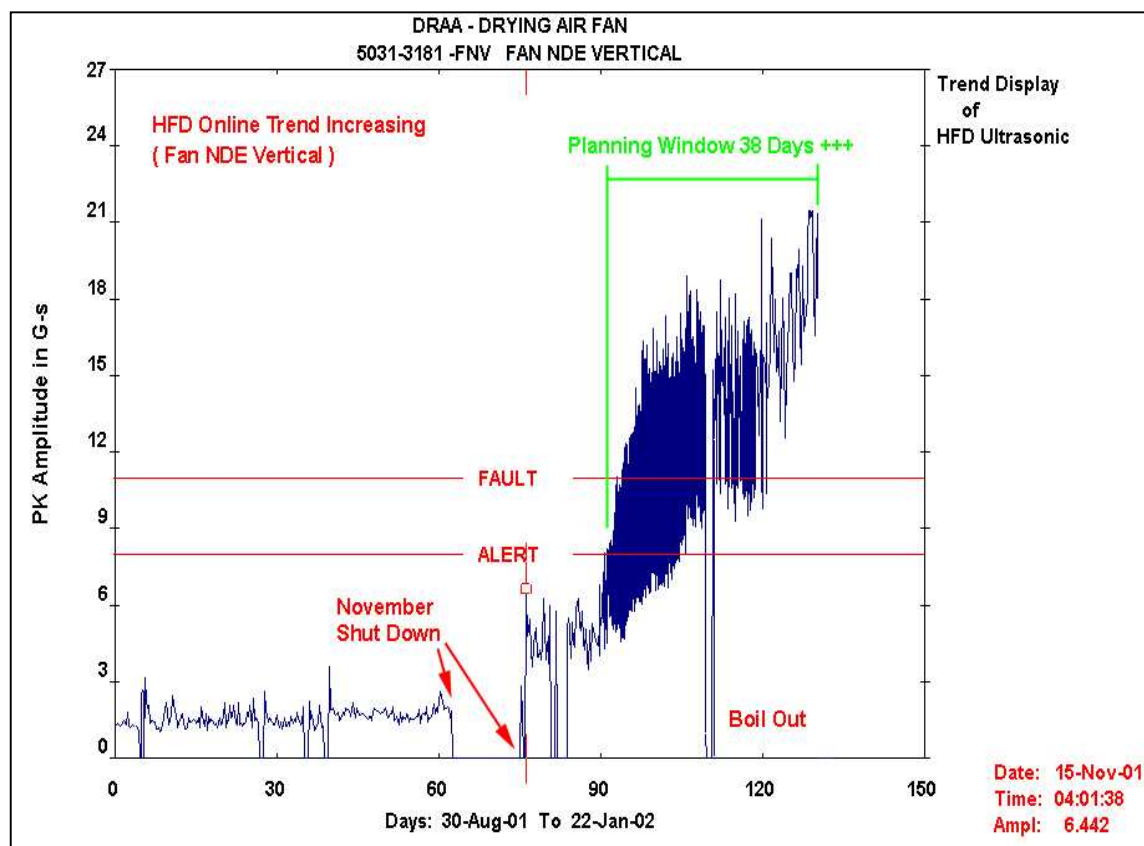
Analysis Parameters (for selected data collection sets):

#	Description	Last Report	Status
1	Overall Level	2.330 mm/s rms 03-Jan-02 09:21:18	[Icon]
2	Sub_1xRPM	1.392 mm/s rms 03-Jan-02 09:21:18	[Icon]
3	2xRPM	0.135 mm/s rms 03-Jan-02 09:21:18	[Icon]
4	3-6xRPM	0.227 mm/s rms 03-Jan-02 09:21:18	[Icon]
5	7-20xRPM	0.659 mm/s rms 03-Jan-02 09:21:18	[Icon]
6	21-70xRPM	1.601 mm/s rms 03-Jan-02 09:21:18	[Icon]
7	HFD Ultrasonic	16.258 Gs pk 03-Jan-02 09:21:18	[Icon]
8	Waveform Pk-Pk	30.328 Gs pk 03-Jan-02 09:21:18	[Icon]

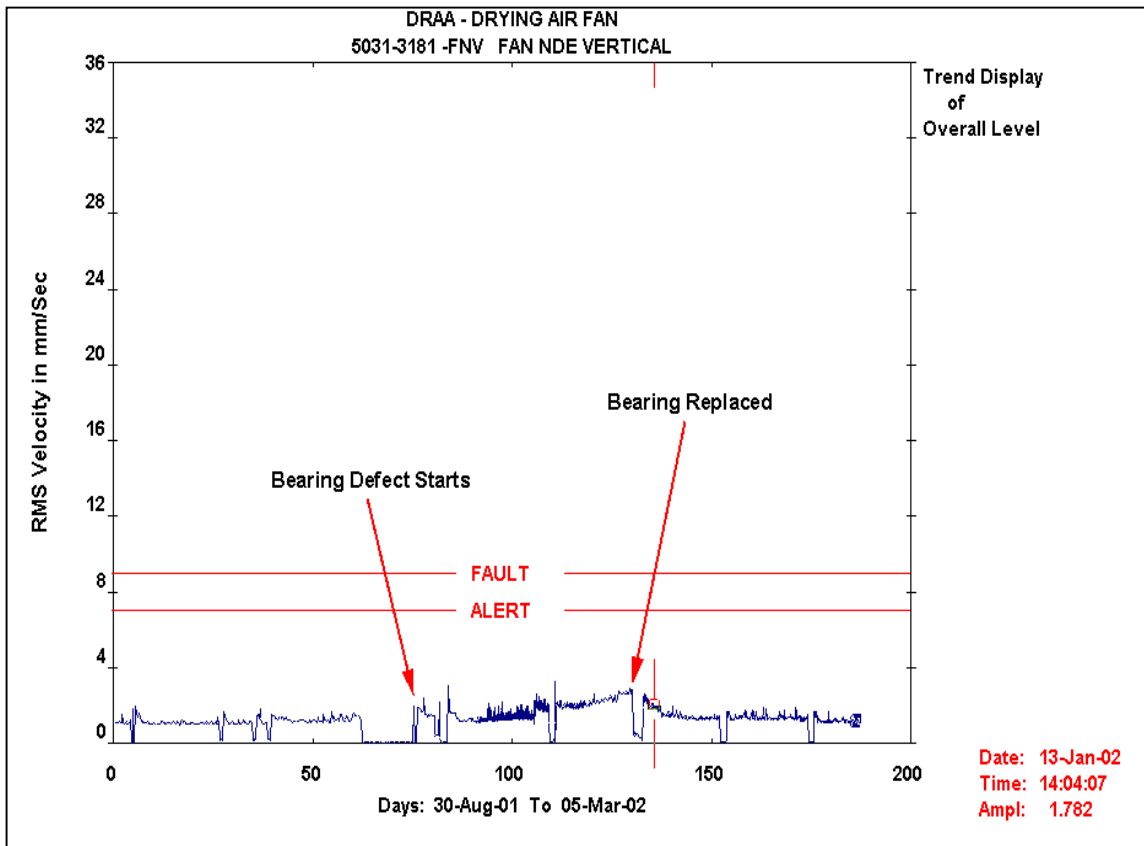
Two Parameters suggest a high frequency impacting problem present.

Note: Overall level is low

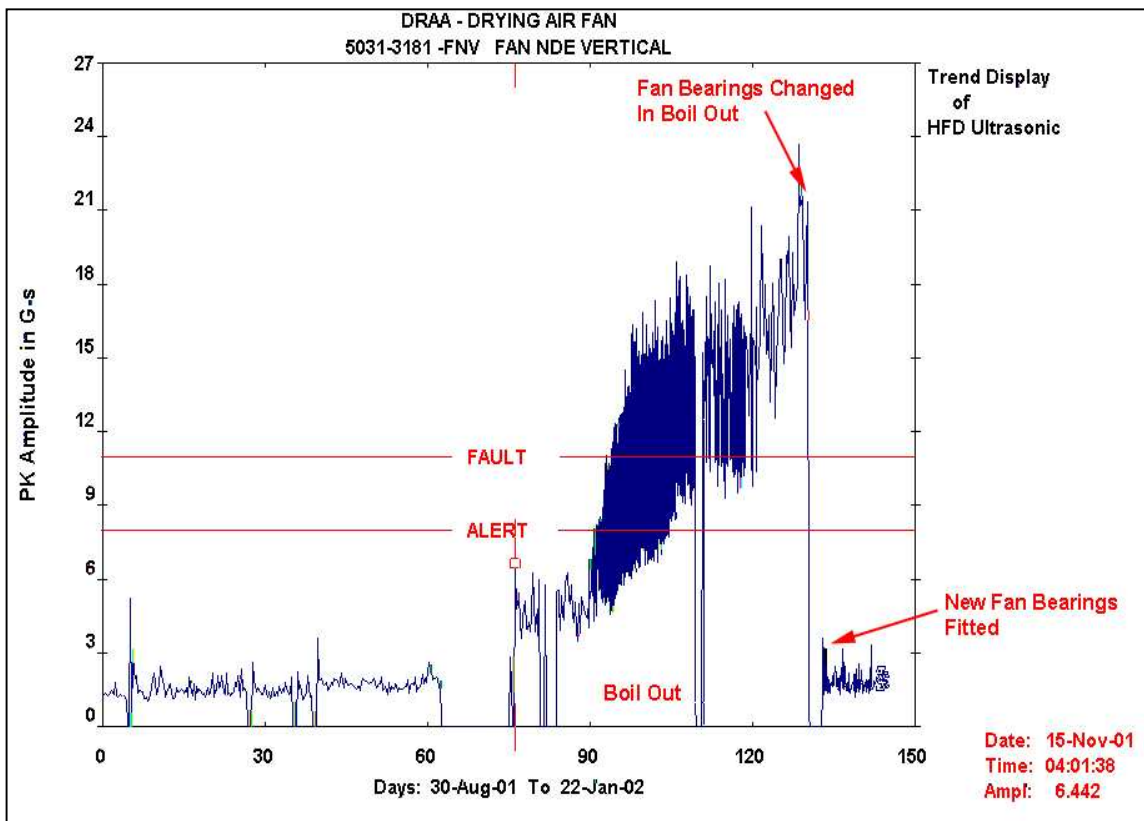
Online Watch Screen



The above online trend is taken off the Fan Non Drive End Sensor; note the step change in vibration after the November Shutdown. The trend above also shows the possible planning options.

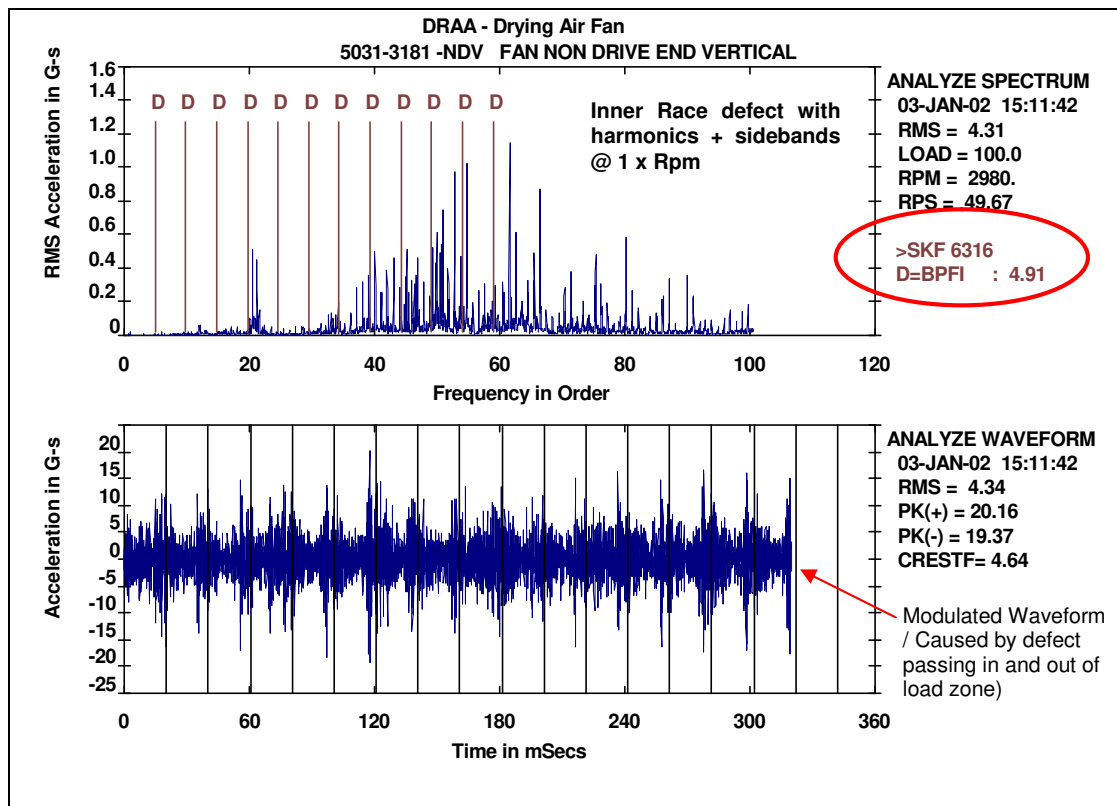


Above trend shows overall level of vibration as bearing defect degrades. Note only a minor change in overall vibration levels.

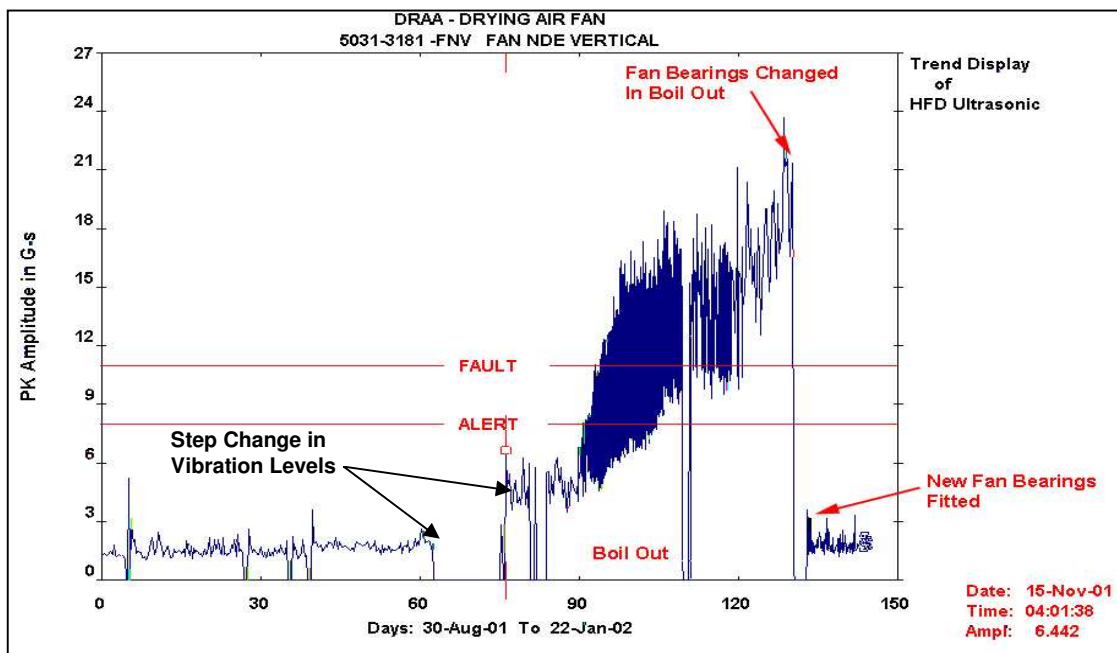


HFD Trend clearly shows bearing defect degrading.

The next step is to analyse the data to pinpoint why the vibration levels were increasing. Spectrum and Time Waveform analysis was used for this. Below is a spectrum and waveform taken from the online system. (Fan Non Drive end vertical Bearing.)



The spectrum above shows multiple harmonics starting from 4.91 orders. This pointed towards a possible bearing defect, all the bearing defect frequencies were overlaid and a match was found with the inner race of the fan bearings (**Skf 6316**). The data indicated that an **inner race defect** was present at the Fan NDE.



After discussions with production and maintenance, it was decided to take advantage of the next boil out and replace the fan bearings within this **planned shutdown**. Boil outs are dictated by production parameters, they are however useful for minor

maintenance work. Carrying out the fan bearing changes at this time incurred no downtime because it was a planned outage.

After the Job was completed the fan bearings were inspected for the predicted damage. Below is a photo of the inner race off the fan NDE bearing.

