CASE STUDY
COKER JET PUMP MOTOR

CURRENT SIGNATURE ANALYSIS PAYS OFF

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Shiny new
Jet Pump and motor


When things go well,
this happens every few hours

When things don’t go well,
this could be the result

INFORMAL OPERATIONAL SURVEY

Keep your jet pump running between use?

Start your jet pump every time you drill a drum?

- Start across the line?
- Soft-start or VFD?

Have an installed spare jet pump and motor?

Know how long it will take to replace the motor when it is pre-planned?

Estimate how long it will take to replace the motor due to an unexpected outage?

Experienced any problem with your jet pump motor?

Satisfied that your motor is healthy?

CASE STUDY

FOUR DRUM COKER, BUILT IN 1970

15 HOUR CYCLES

SINGLE TRAIN JET PUMP AND MOTOR

MACHINISTS REPORTED MOTOR EXHIBITING HIGHER THAN NORMAL VIBRATION

ENGINEERING ASKED I&E FOR HELP EVALUATING VIBRATION

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I&E Actions

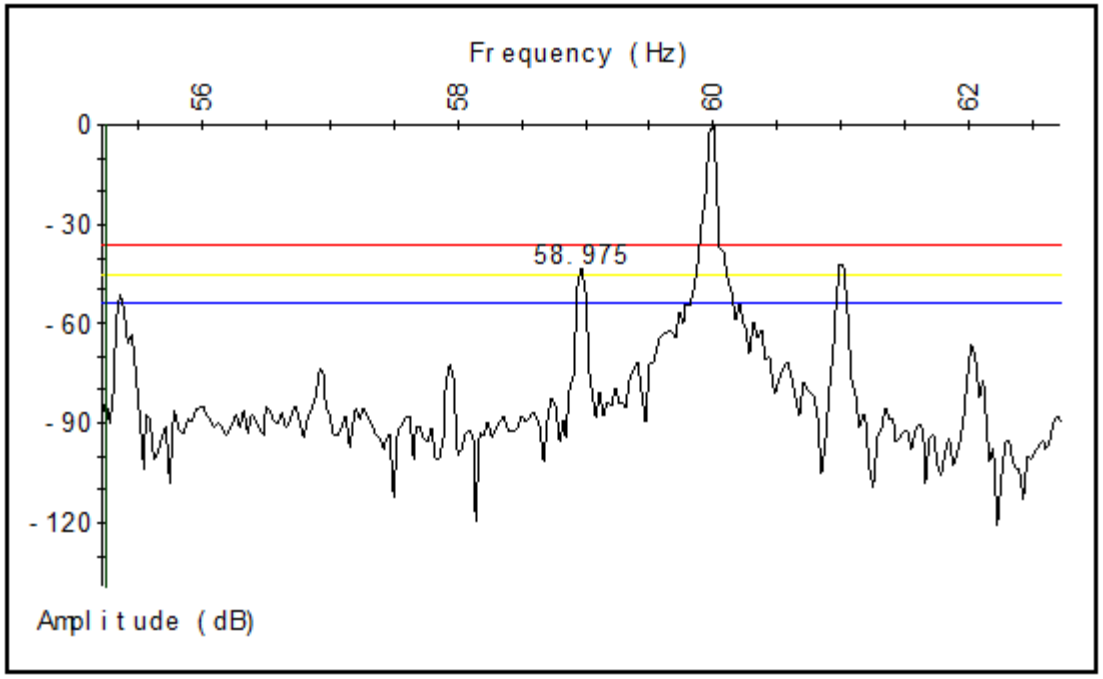
In between cycles, took off-line readings using PdMA tester: Megger, PI, Series Resistance, Series Inductance, Capacitance

All readings normal

During drilling cycle, captured current signature with PdMA at the same time the machinists took vibration readings.

Identified Pole Pass frequency marker in signature. This is an indication of a rotor circuit flaw causing an ‘anomoly’ that reflects back into the stator current.

CASE STUDY



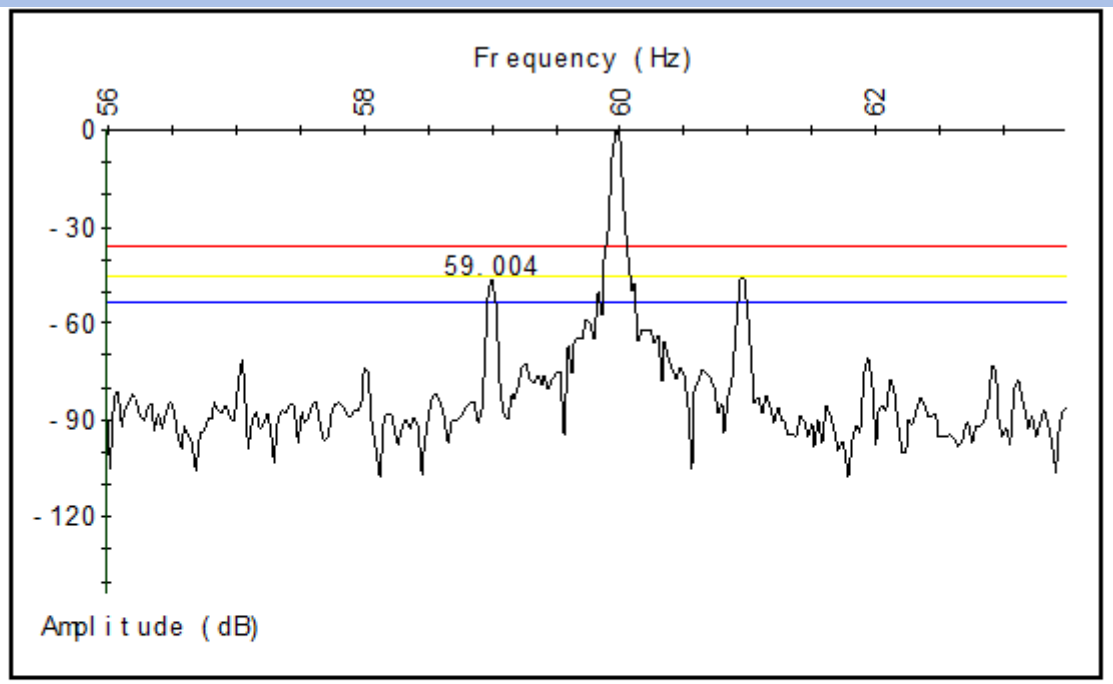
	Frequency	I 1		Speed (NP)	3575.00
RMS Amps		628.93		Speed (RPM)	3569.25
% FLA		98.73		Slip (%)	0.85
Cursor	55.254	-83.19			
Peak dB Level	60.000	46.34			
	58.975	-43.09			

>-54 db = Rotor good

-45 db = Caution, some rotor bar damage

-36 db = Severe, imminent failure possible

CASE STUDY



	Frequency	I 1			
RMS Amps		614.08		Speed (NP)	3575.00
% FLA		96.40		Speed (RPM)	3569.24
				Slip (%)	0.81
Cursor	55.986	-82.55			
Peak dB Level	59.971	46.50			
	59.004	-46.26			

>-54 db = Rotor good

-45 db = Caution, some rotor bar damage

-36 db = Severe, imminent failure possible

This reading was taken 1 year prior but no one followed up.

CASE STUDY

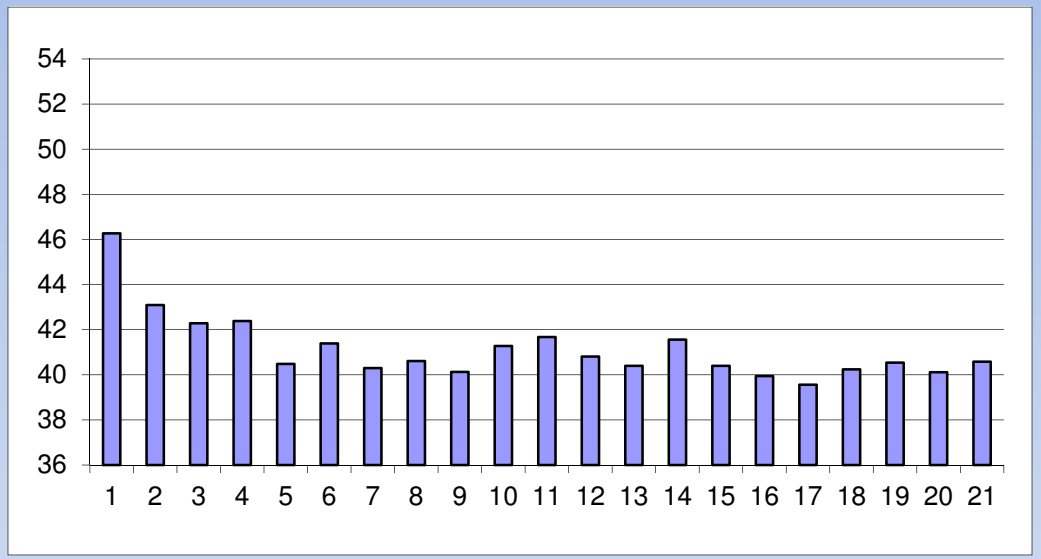
Facility decided to:

Order a new motor – initially 10 month lead time which would miss next turnaround window

Run motor continuously – anticipated cost about $200,000 from increased electrical use

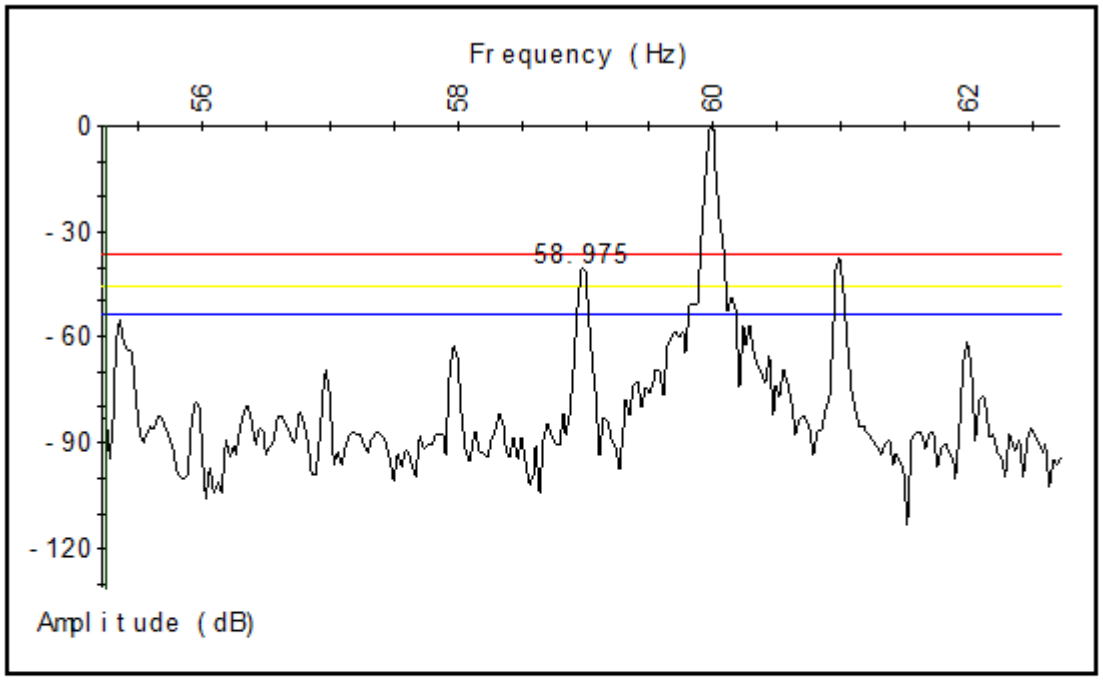
Monitor motor weekly to determine if motor health worsened

CASE STUDY



Monitoring after a few weeks indicated deterioration had pretty much leveled off. This was attributed to reduced thermal cycling and starting stresses due to running motor constantly.

CASE STUDY



	Frequency	I 1			
RMS Amps		614.14		Speed (NP)	3575.00
% FLA		96.41		Speed (RPM)	3569.25
				Slip (%)	0.85
Cursor	55.254	-82.77			
Peak dB Level	60.000	45.69			
	58.975	-39.91			

This reading was taken 1 month prior to replacement.

CASE STUDY

Good News:

Motor supplier was able to improve lead time enough to make turnaround window

New motor was received at refinery and replaced

Initial motor current signature of new motor indicated healthy rotor

Autopsy of suspected bad rotor confirmed conclusions made from the current signature analysis

Bad News:

Machinists inspection of jet pump during turnaround raised concerns about increased wear, presumably due to much higher than normal running hours.

CASE STUDY

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Motor Shop Inspection results:

5 locations where rotor bar connections had cracked

Several bars bent next to the end ring connection point

Serious overheating at multiple locations

CASE STUDY

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My Conclusions:

Fortunately, form wound rotors are tough, and can handle a lot of damage while still performing their job.

Predictive analysis is a good fit for rotor failures, as they tend to happen over an extended period of time.

Running jet pump motors continuously should help with motor longevity, but the cost seems too high.

A predictive maintenance approach can add significant value to refinery operations.

High quality training is foundational for a professional predictive maintenance organization.


Another day at the Office

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QUESTIONS OR COMMENTS