

SPECIAL TESTING SERVICES

P&H INDUSTRIAL SERVICES EDMONTON SHOP



Saturation curve:

The saturation curve is measured by accelerating the motor to the full speed, increasing the voltage in small steps and recording the no load current. This test can be performed in our facility because of our stepless 3-phase voltage source 0 to 730 V or 0 to 5000 Volts.

This test is very important in redesigns to the higher horsepower. For example the increase of horsepower by 21% is an equivalent of increasing the voltage by 10%. The behavior of the redesigned motor can be exactly predicted by running the existing motor at higher voltage. The test will give future no load current, how close will the motor run to the saturation point, level of 120 Hz vibration, eventually the Friction and Windage losses.

BALDOR 350 hp, 4160 Volts



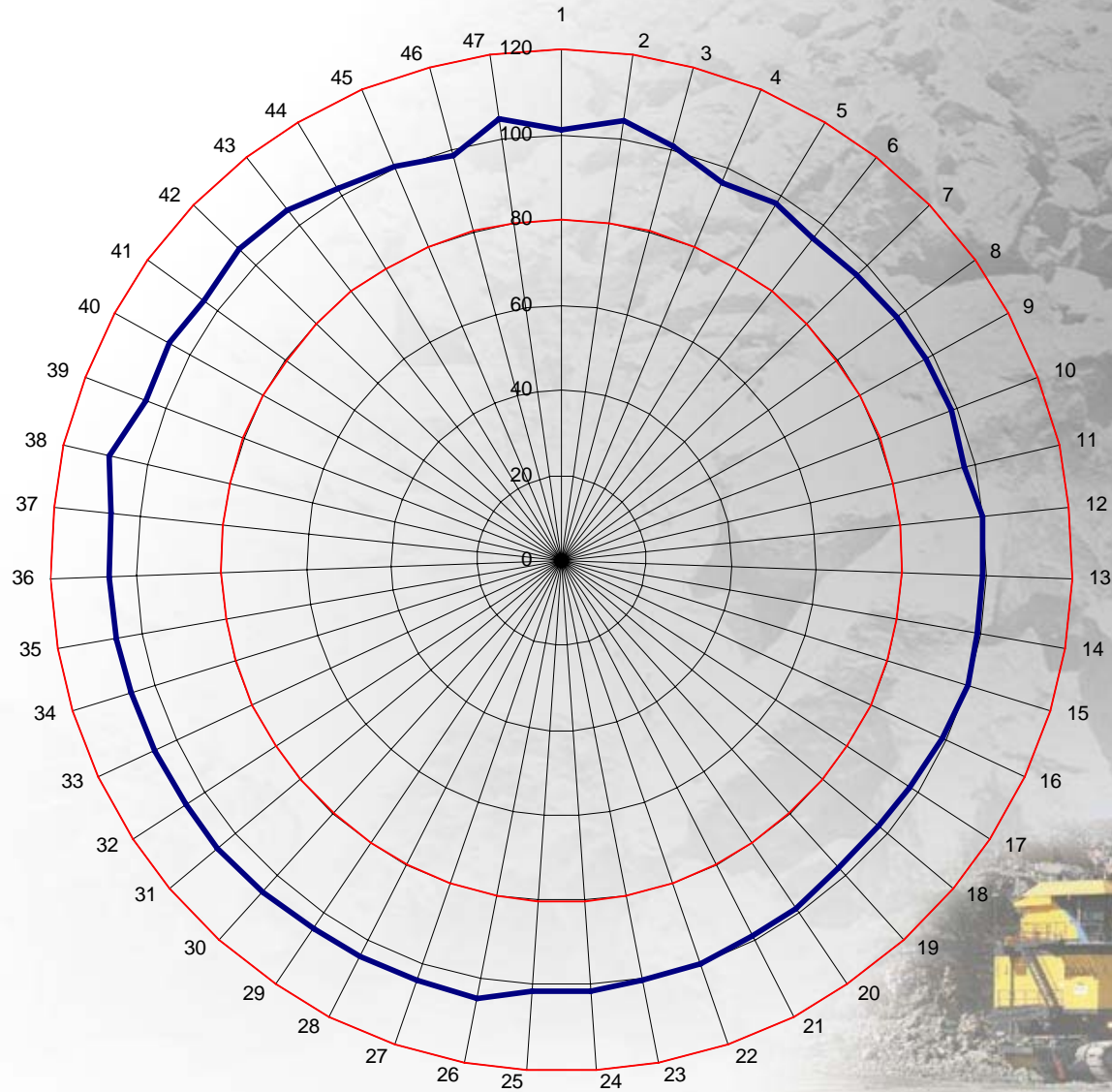
ROTOR BAR TEST

The Rotor bar test has been part of the P&H testing procedures for a period of time that allowed us to collect large amount of experimental data. This test measures the stray field over each bar and compares the amplitudes in the radar graph. The validity of the test has been confirmed by comparing the results with current analysis.

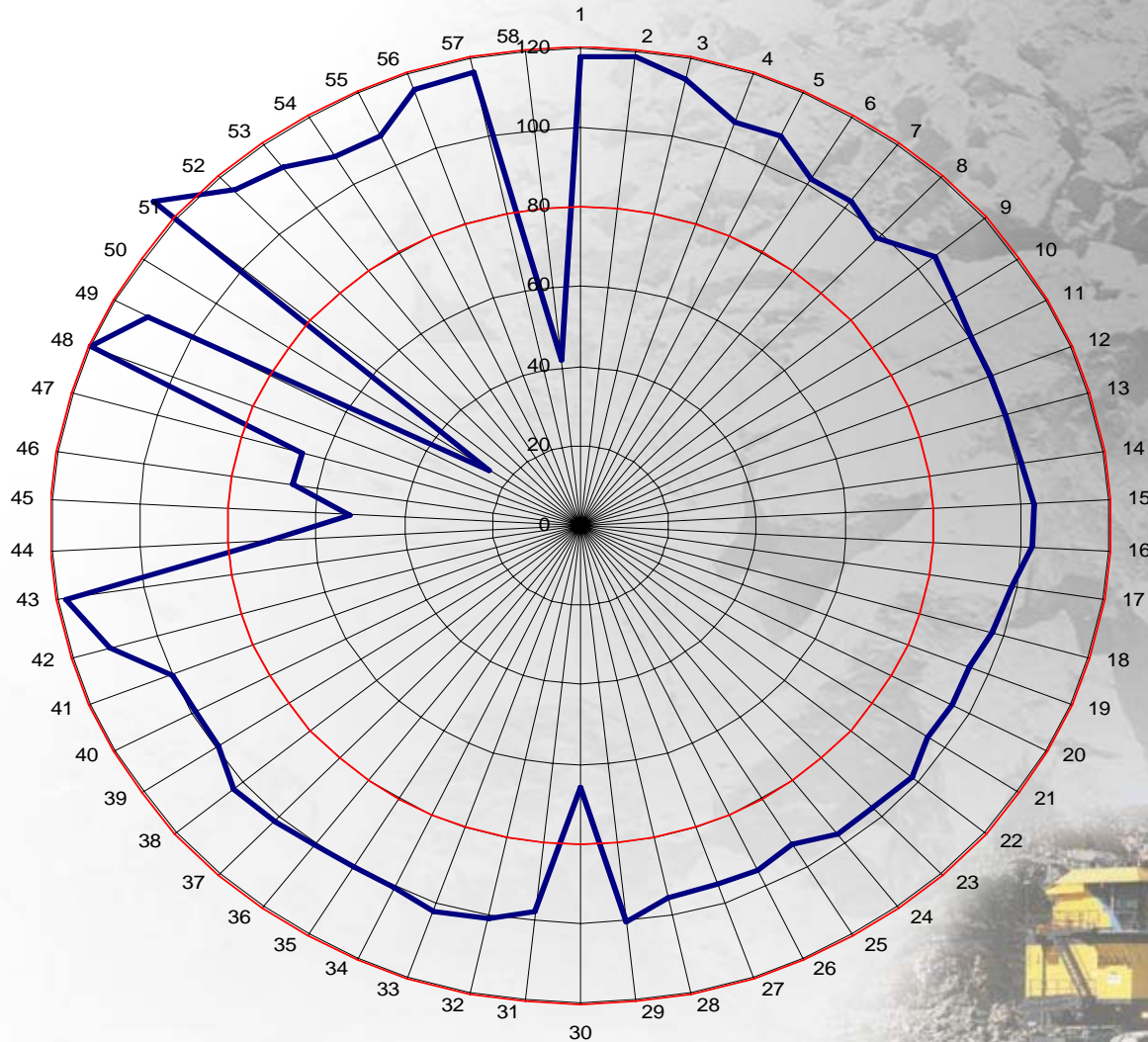
The unique feature of the test is that it assigns a numerical value to the condition of each bar, hence it can be repeated and the values can be trended.



NO BROKEN BARS



SEVERAL BROKEN BARS



LOAD TEST

A load test can be performed on majority of motors up to 1800 RPM below 500 kW (800 hp). Motors are laser aligned to the calibrated DC generator. The shaft output of the tested machine is exactly calculated from the output of the generator, including friction, windage, iron and copper losses of the generator.

By measuring the input to the tested machine the efficiency of the machine can be calculated and plotted.



DC MOTOR LOAD TEST RESULTS

[Click](#) to view test results

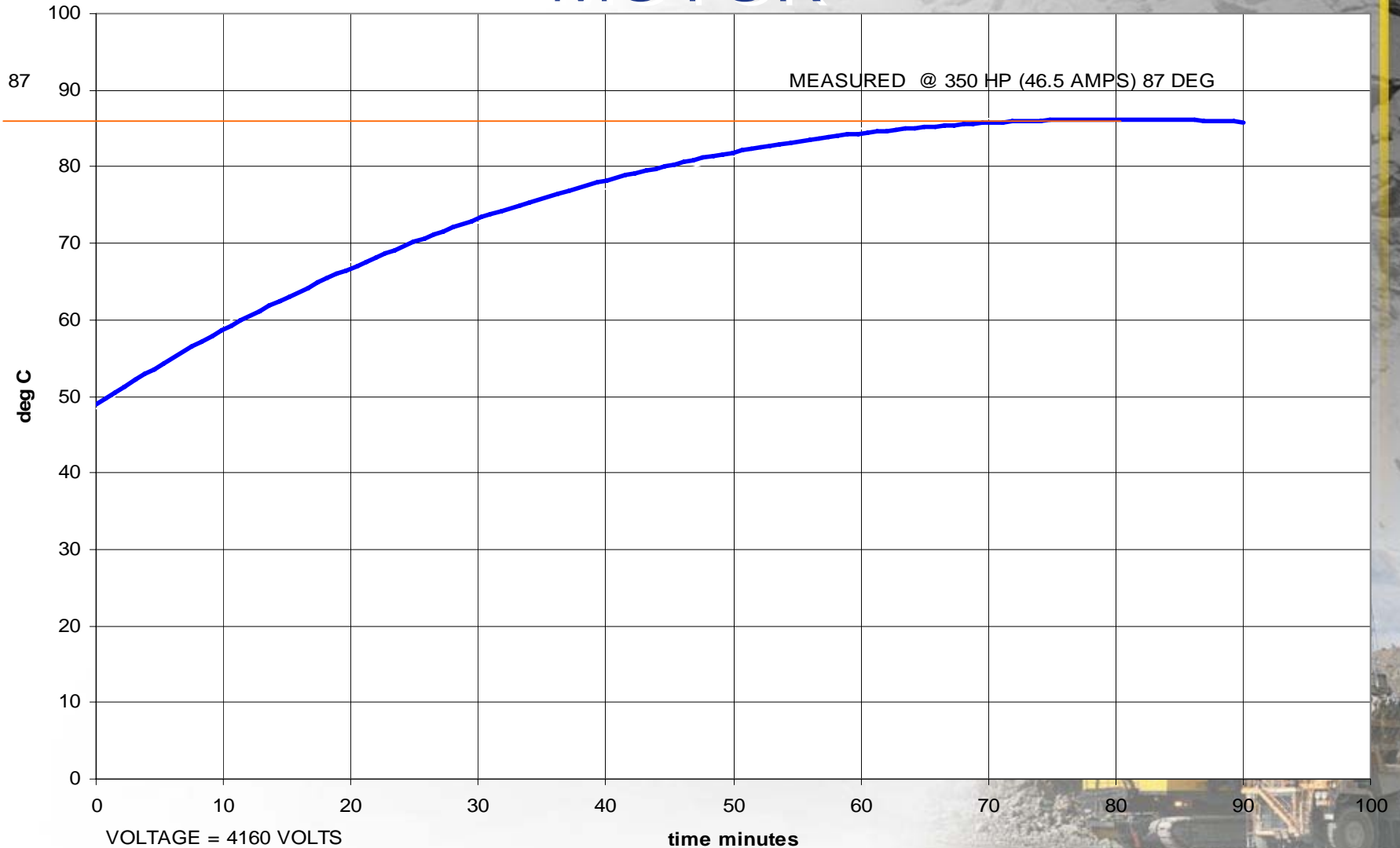


HEAT RUN

Is performed to find out the temperature rise of the winding above ambient. The limitations on RPM and the horsepower output are similar as in the case of the load test. Again the tested motor is coupled to the DC generator. In some cases, such as vertical motors and motors over 1800 RPM cannot be coupled to the generator.



TEMPERATURE RISE ON 350 HP MOTOR



CURRENT ANALYSIS

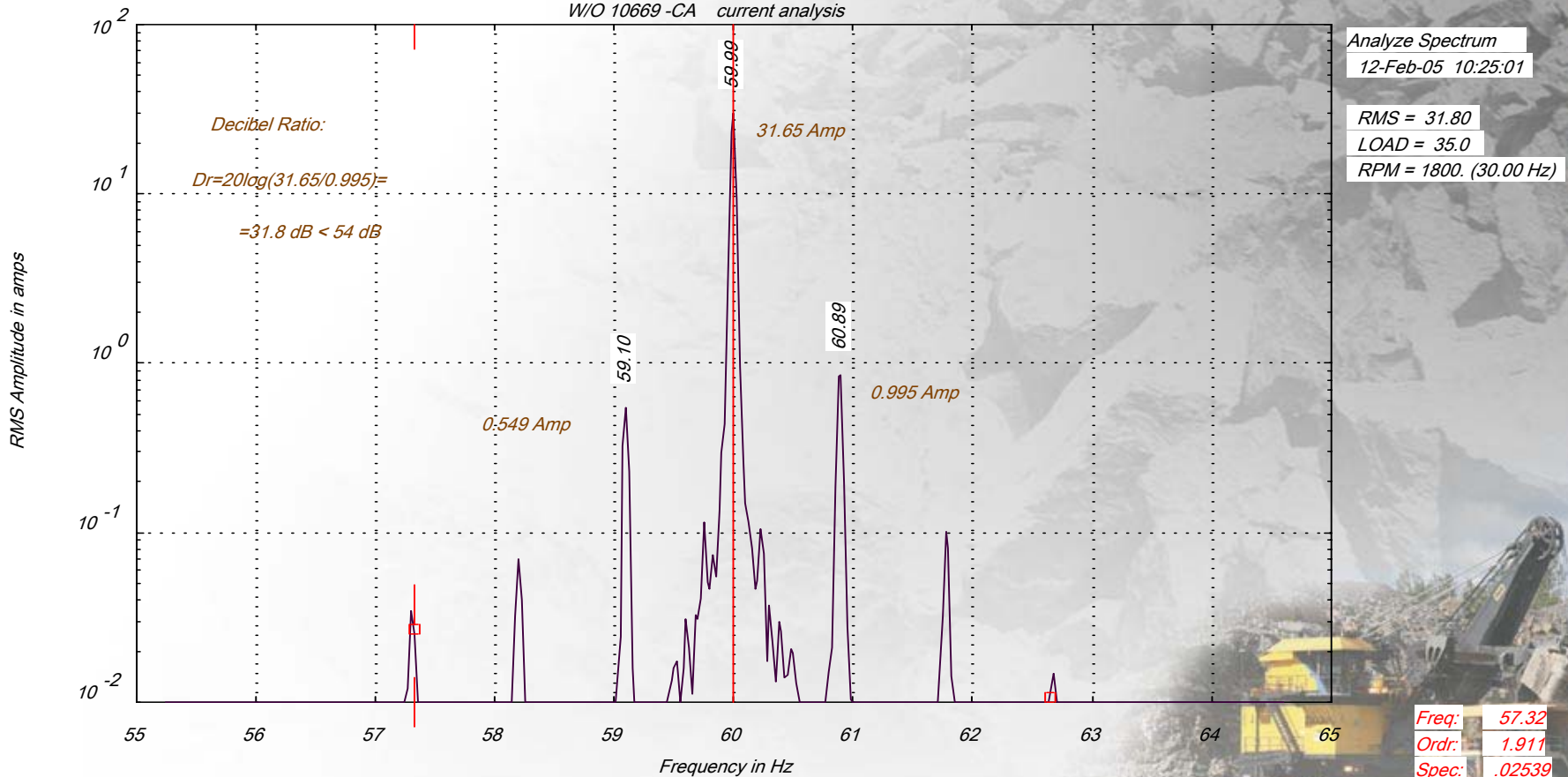
Besides our special Rotor Bar Test on a disassembled motor, we can test the integrity of the rotor cage by performing the Current Analysis on a motor coupled to our DC generator. The speed limit is again 1800 RPM; the output limit is about 2500 hp. The Rotor Bar Test as described above can be complimented by the current analysis under load (see below).

The current analysis is not limited to the shop, we perform current analysis routinely in the field on loaded motors.

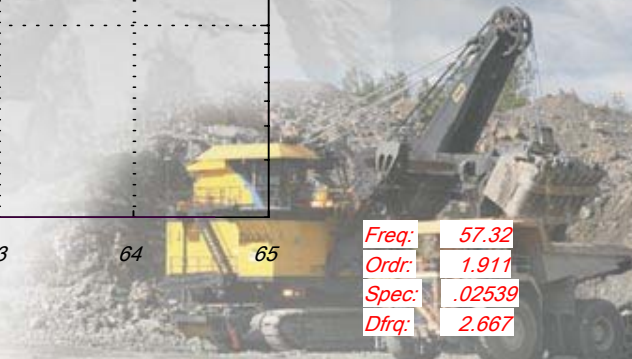


CURRENT SIGNATURE ON A MOTOR WITH 1 BAR BROKEN

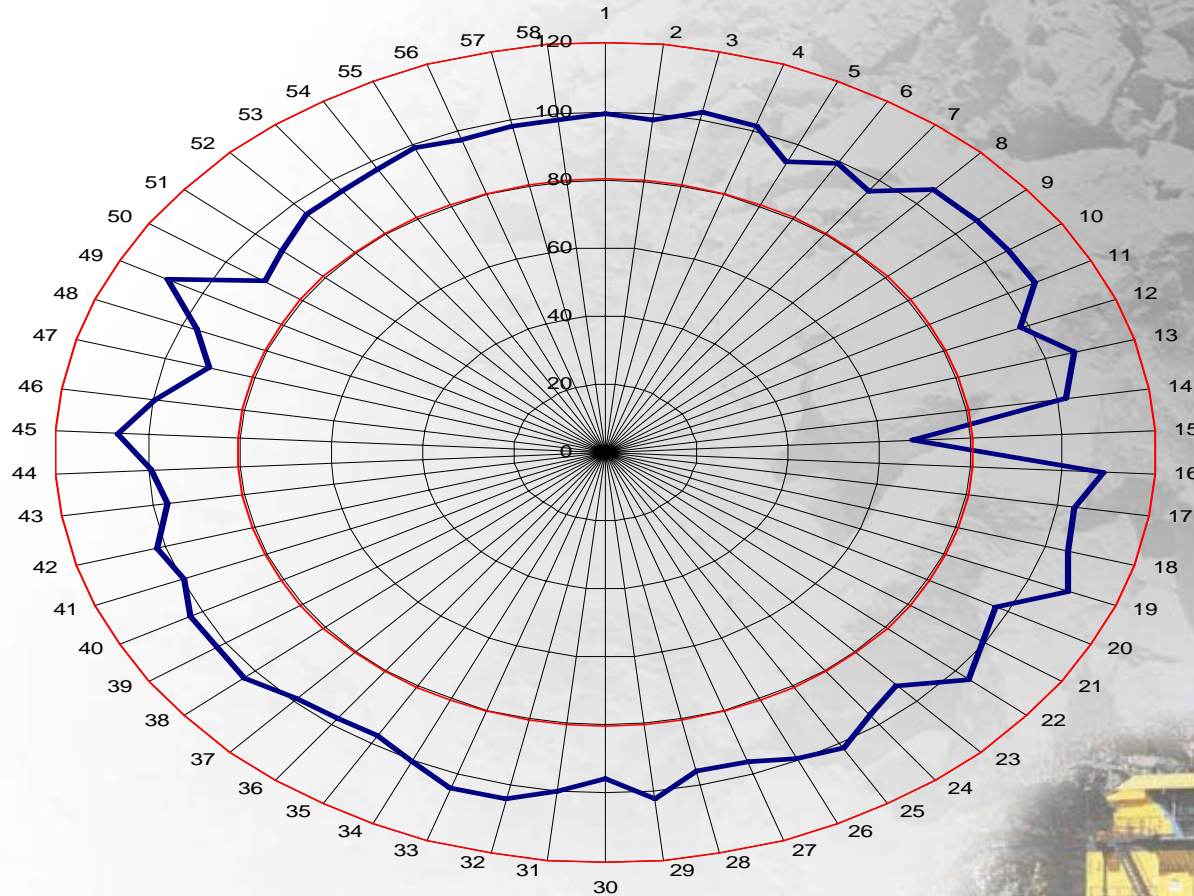
TB - Central, 250hp, 1785rpm, GE
W/O 10669 -CA current analysis



Label: analysis with full load current



SAME MOTOR, THE ROTOR BAR TEST CONFIRMS BAR #15 BROKEN



AIRGAP CHECK

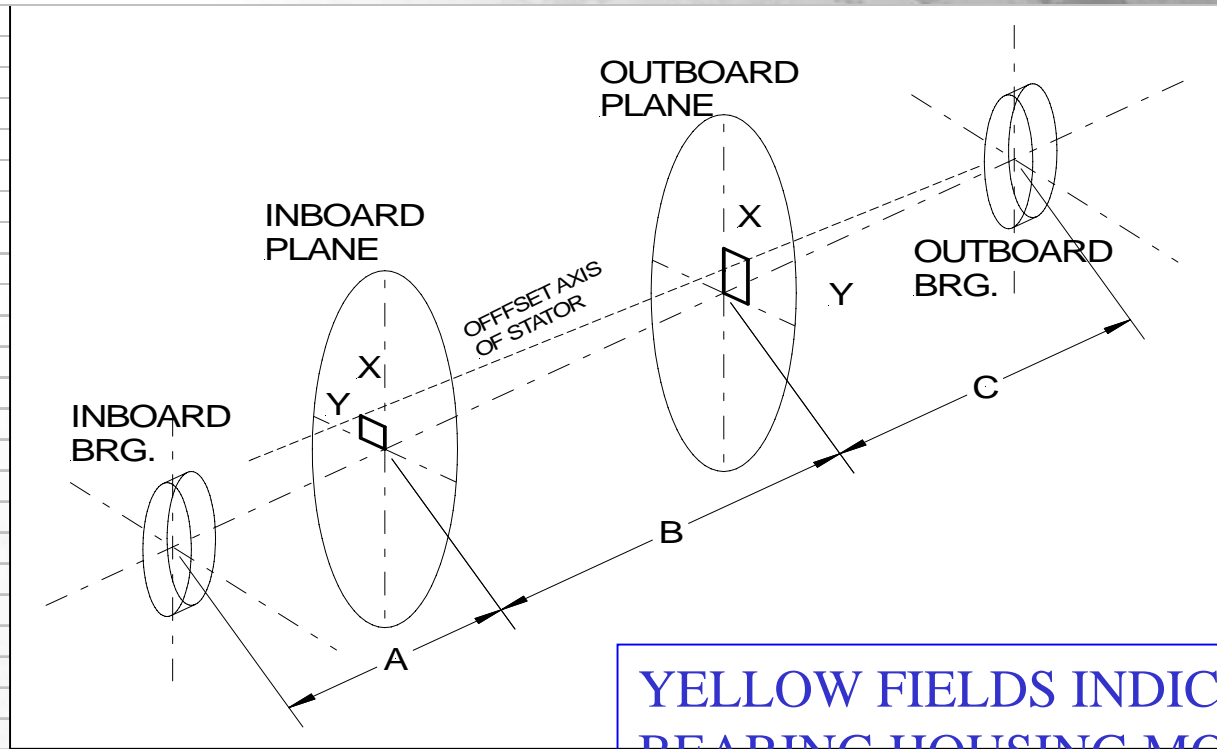
The eccentric airgap can cause excessive vibration at 120 Hz. The airgap eccentricity should be less than 10%, for the 2 pole motors it is recommended less than 5%. There are analyzers on the market claiming to recognize airgap eccentricity from current signature.

P&H can check the airgap eccentricity with unparallel accuracy approaching 0.001". Unlike other methods it checks the airgap in as many places as the number of slots/teeth. The position of the rotor is calculated to give it the best fit possible no matter how complicated the shape of the airgap is.



CENTERING THE ROTOR IN THE AIRGAP

ENTER DATA FOR CORRECTIONS INTO YELLOW FIELDS:	
A=	8
B=	12
C=	8
CALCULATED VALUES:	
INBOARD X=	-1.32548
INBOARD Y=	-2.66384
OUTBOARD X=	0.600071
OUTBOARD Y=	1.058514



CORRECTED X (HORIZONTAL) FOR INBOARD BEARING:	X _{bi} =	-1.81
CORRECTED Y (VERTICAL) FOR INBOARD BEARING:	Y _{bi} =	-5.15
CORRECTED X (HORIZONTAL) FOR OUTBOARD BEARING:	X _{bo} =	0.116
CORRECTED Y (VERTICAL) FOR OUTBOARD BEARING:	Y _{bo} =	-8.87

YELLOW FIELDS INDICATE BEARING HOUSING MOVES TO CENTER THE ROTOR IN THE AIRGAP

