FREQUENCY RESONANCE BUMP TEST

On

GENERATOR STATOR END-WINDING

TECHNICAL BACKGROUND

Generator stator end-winding vibration is caused by forces that can be electrical or mechanical in origin. Generally, forces can be divided in steady state, load change, drive (turbine) problem and system fault or short circuit forces.

Based on frequency, end-windings can vibrate in two critical ranges, line frequency, usually produced by mechanical forces and twice line frequency, produced by electromagnetic forces from current carrying on stator bar/coil.

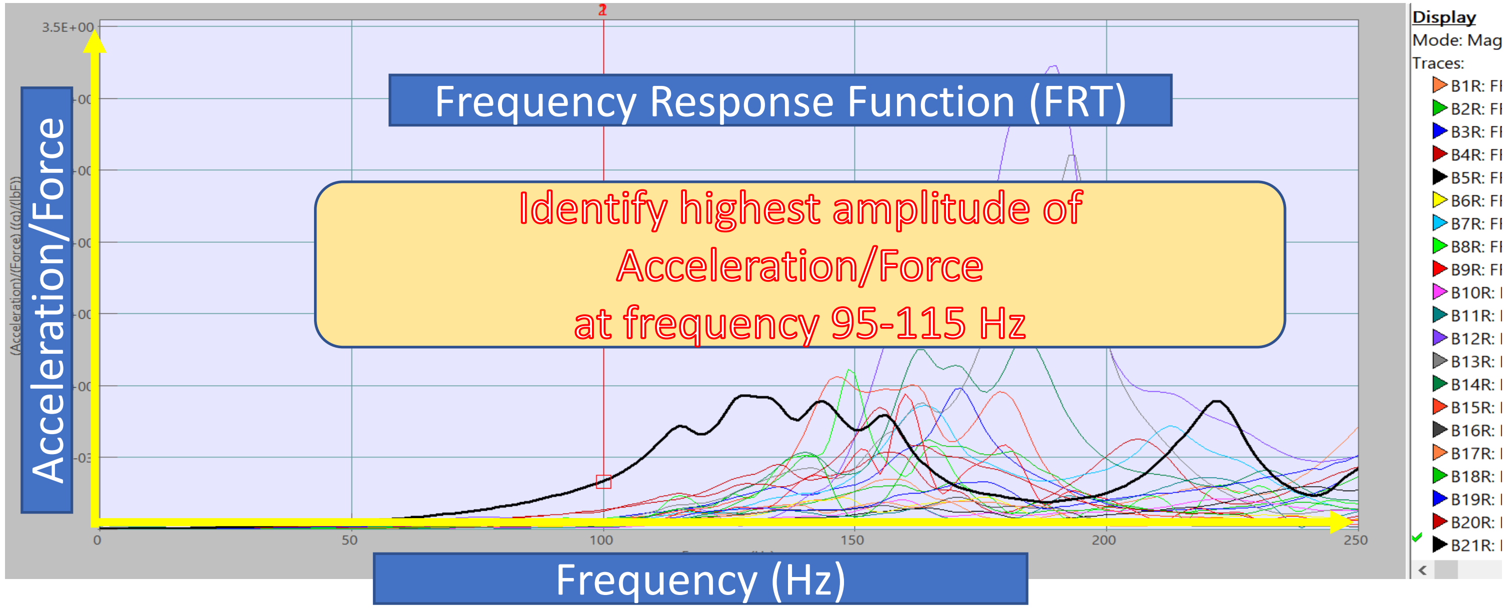
Mechanical vibration is the result of rotor rotation: unbalance or misalignment, damaged bearings, and electrical problems on rotor field.

Electromagnetic forces excited by the stator current which **is twice the electrical synchronous frequency** of the generator (100 Hz for 50Hz System)

FREQUENCY RESONANCE BUMP MEASUREMENT

An end-winding bump test uses accelerometers placed on the stator winding, special computer software and computer, and a calibrated impact hammer. The hammer is used to bump the end-winding, causing it to vibrate. The vibrations are then measured and analyzed. The purpose of performing impact or bump testing on generator end-winding baskets, phase leads, and circuit rings is to identify resonances that would be readily excitable by the electromagnetic forcing frequency (100 Hz in Thailand (50Hz system))

Bump test was carried out on end winding caps of NDE (Exciter End) and DE (Turbine End) which is the location of highest vibration in order to determine the dynamic flexibility, and to identify local resonances of the bars in the critical frequency range of 95 – 115 Hz. Response was captured in frequency response function (FRF) format.



KEY CONCEPT

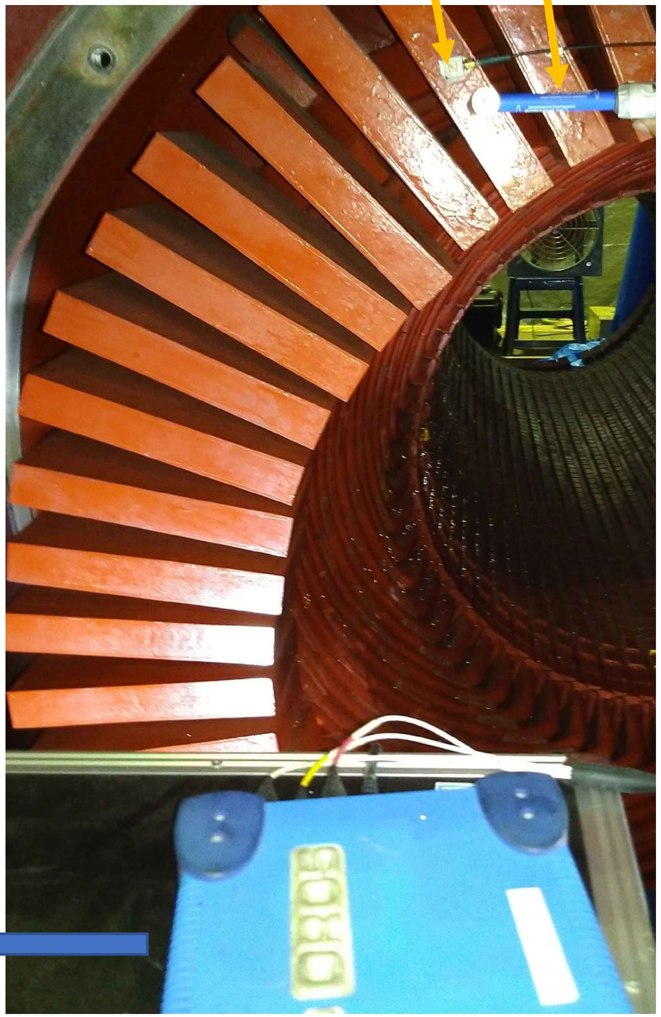
1. A bump test is the measured response of an impact to an stator winding.

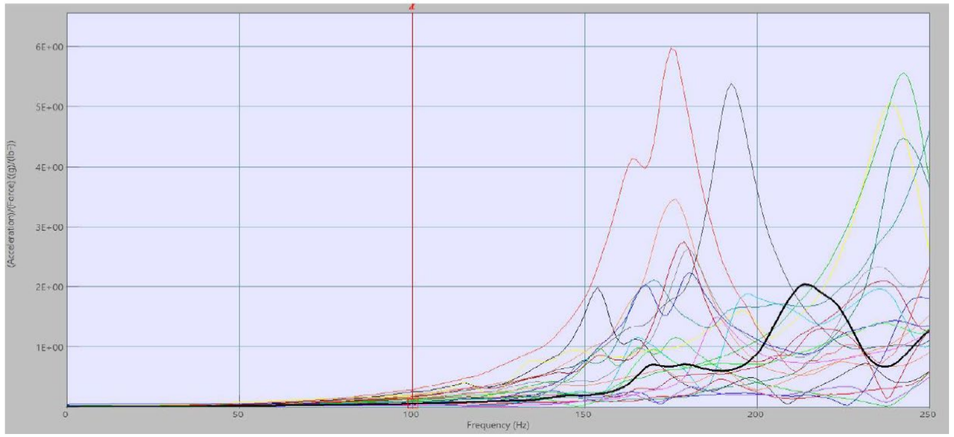
2. The force of the impact is to energize.

3. The response of the stator winding **IS MEASURED**.

Sensor

Impact





Analyzer

TYPICAL ACCEPTANCE CRITERIA

The resonant peak value in critical frequency region 95Hz to 115 Hz shall be less than 4.4 (m/s^2)/N or 2.0 g/lbf

Summary Highest Amplitude @ 95-115Hz at each Slot at DE

Impact Location (Slot) on DE	Radial Direction Measurement Max 2.0 g/lbf @ 95-=115 Hz	Axial Direction Measurement Max 2.0 g/lbf @ 95-=115 Hz	Criteria	Test Evaluation
1	0.450	0.338	< 2 g/lbf	Satisfied
2	0.991	0.159	< 2 g/lbf	Satisfied
3	0.976	0.204	< 2 g/lbf	Satisfied
4	0.221	0.326	< 2 g/lbf	Satisfied
5	1.397	1.820	< 2 g/lbf	Satisfied
6	0.155	0.291	< 2 g/lbf	Satisfied
7	0.196	0.107	< 2 g/lbf	Satisfied
8	0.770	0.234	< 2 g/lbf	Satisfied
9	1.213	0.695	< 2 g/lbf	Satisfied
10	0.082	0.449	< 2 g/lbf	Satisfied
11	0.724	0.237	< 2 g/lbf	Satisfied
12	1.389	0.771	< 2 g/lbf	Satisfied
13	1.566	0.606	< 2 g/lbf	Satisfied
14	0.145	0.176	< 2 g/lbf	Satisfied
15	1.124	0.564	< 2 g/lbf	Satisfied
16	0.548	0.396	< 2 g/lbf	Satisfied
17	0.749	0.130	< 2 g/lbf	Satisfied
18	0.255	0.766	< 2 g/lbf	Satisfied
19	0.580	0.315	< 2 g/lbf	Satisfied
20	0.315	0.097	< 2 g/lbf	Satisfied

WHEN TO PERFORM

1. During Major overhaul.
2. Anytime that found sign of vibration/broken of blocking, tie, serial loop or structure on generator stator end-winding.

Improvement after found vibration higher than criteria

JOB REFERENCE LIST

- Glow Energy GT1A, GEC ALSTHOM, 45.529 MVA, Thailand
- Glow Energy GT1B, GEC ALSTHOM, 45.529 MVA, Thailand
- Glow Energy GT1C, GEC ALSTHOM, 45.529 MVA, Thailand
- Glow Energy GT2A, GEC ALSTHOM, 45.529 MVA, Thailand
- Glow Energy GT2B, GEC ALSTHOM, 45.529 MVA, Thailand
- Glow Energy GT2C, GEC ALSTHOM, 45.529 MVA, Thailand
- Glow Phase5 STG, SIEMENS, 160 MVA, Thailand
- LPS Power Station GT12, BRUSH, 30.4MW, Brunei
- LPS Power Station GT13, BRUSH, 30.4MW, Brunei
- LPS Power Station GT15, BRUSH, 30.4MW, Brunei

GEN

WWW. genrayong.com

Tel. 089-549-3277