

ULTRA-SOUND APPLIED TO ELECTRICAL EQUIPMENTS

PURPOSE

The purpose of this newsletter is to show this important predictive maintenance tool known as “Ultra-sound”, well known in mechanical applications and now applied to electrical power systems, used to identify insulation fails by scanning to detect noise level (ultra-sound).

MONITORED EQUIPMENT

- ✓ Transformers
- ✓ Panels, SWGs, MCCs
- ✓ Motors
- ✓ Generators
- ✓ Cables & Potheads
- ✓ Insulators
- ✓ Busbars
- ✓ Busways
- ✓ Relays
- ✓ Circuit Breakers
- ✓ Man Holes
- ✓ Substations
- ✓ Control & Command Circuits
- ✓ Others electrical equipments



Three types of problems can be detected by EngePower Ultra-sound equipment:

- ✓ Electric Arcing
- ✓ Corona
- ✓ “Babies” electrical discharge.

Electric Arcing

Electrical arcing occurs every time there is a disruption of air or insulating fail, followed by current leakage. Most of the faults in industrial electrical power systems occurs through the failure of insulation, ie, through the arc.

Corona

The corona occurs when the voltage in an electrical conductor exceeds the potential gradient of the air that surrounds it and begins to ionize it generating a blue or purple cloud around.

“Babies” Electrical Discharge (Partial Discharge)

Also known as “baby arcing”, it occurs when insulation starts to fail establishing a low intensity current discharge which cannot be identified by conventional protective devices.

EngePower´s Ultra-sound equipment is allowed to inspect in three voltages ranges as follow:

- (a) Between 120V to 15 kV
- (b) From 15kV to 115 kV
- (c) Over 115 kV

Phenomenon

After having a dielectric breakdown of the molecules that make up the elements of air surrounding the equipment are to generate a sound (ultrasound) usually imperceptible to the human ear, but using the equipment known as ultrasound, it can be identified as a noise resemble a “break”; or “frying” just like when water is sprinkled in hot oil or even a “buzz”.

Inspection

Ultrasound Inspection does not require shutdowns and even opening panels to be detected. Once detected the presence of leaks, then yes, it is necessary to open to identify the exact location of it. The procedure is similar to that used in infrared inspection. However, one complements the other in terms of predictive maintenance.

Ultrasonic tests are used in closed panels. Since the ultrasonic emissions can be detected by scanning the doors and ventilation shutters, can detect serious problems such as electrical arcing, corona, and initial insulation fails "baby arcings" (partial discharge) without having to shut down electrical equipment.



The method for detecting the electrical arc and corona is similar (are similar) the procedure for leak detection. Instead of trying to listen to a escaping sound the user will seek to identify the sounds of break, frying or buzz. In some cases, as if you had to find a source of radio or TV interference, in electrical substations, the general area of disturbance can be located through a detector more “thick” (higher amplitude and lower sensitivity) in the case of a radio transistor or a interference locator with broadband access. Once you have located the area, the scanning module can be used. The sensitivity is reduced if the signal is too strong to follow. When this occurs reduce the sensitivity to improve the mid-line reading of the meter and continue to trace the sound to the strongest point to identify it.

Thus, to determine whether a problem exists or not, is relatively easy. Comparing the quality and sound levels found in similar equipment the problem sound will tend to be quite different.

In low voltage systems, a quick busbar scanning often detects arc or some kind of discharge if a unfastened connection is present. You can scan also junction box to identify the presence of arcs. As in the same case of leak detection, the closer the emission source the stronger is the signal.

When the signal appears to be not strong enough to be detected, the accessory Ultrasonic Waveform Concentrator can be used, which is nothing more than a parabolic reflector which will double the detection distance and promote a more accurate detection point. This module is recommended for situations in which the safety distance becomes an important point. This module (UWC-10) is highly directional and will locate the exact area of electrical discharge.

Another available module is the LRM Module (Long Range Module) which increases the detection distance. The detection range UWC module is 5° and in the LRM module is 10°.

Some types of problems already identified by EngePower in customers:

- ✓ Imminent failures in transformers
- ✓ Partial discharges inside equipments
- ✓ Insulation fail in potheads (without having to use destructive methods, such as HIPOT)
- ✓ Insulators fails
- ✓ HV Disconnect Switches insulation fails
- ✓ Busbars insulation fails

ULTRASOUND EQUIPMENT AND ITS ACCESSORIES

