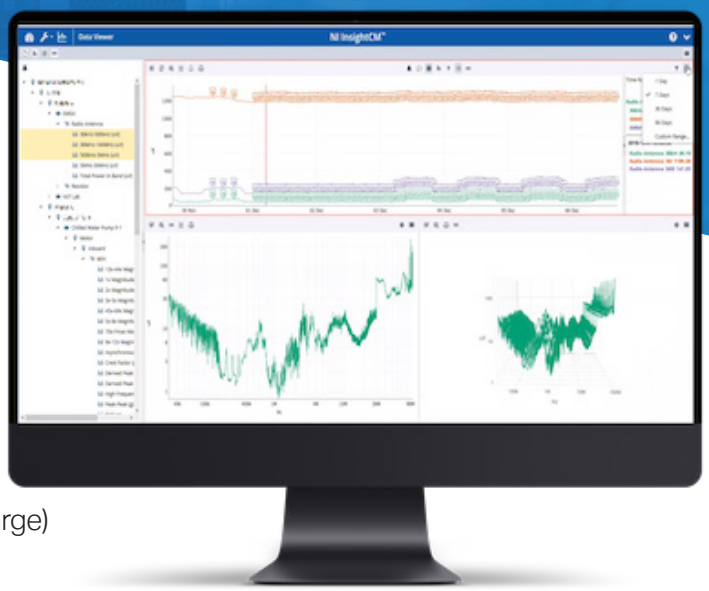
CUTSFORTH
ENHANCED ELECTRO-MAGNETIC INTERFERENCE MONITORING

INTRODUCTION



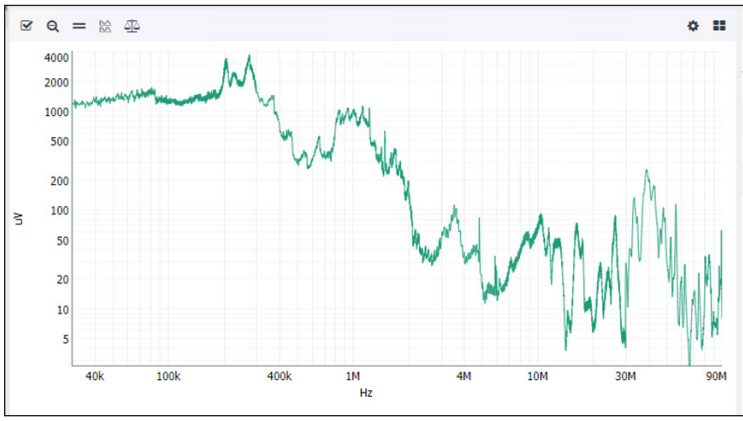
Is EMI magic?

Electro - Magnetic Interference (EMI) Monitoring may seem like a magic trick. However, the system simply detects conditions associated with EM emissions within the GSU, Isophase Bus, and Transformers. Subject matter experts have been extensively gathering data over the last 40 years. Through their research and testing, they have been able to detect patterns to determine which data sets and waveforms correspond to which failure modes:

- Arcing
- Partial Discharge
- Gap Discharge
- Corona
- Random Noise
- Micro - Sparking (rapid gap discharge)

EMI ASSESSMENT ALGORITHM

Cutsforth™ has created an automated assessment classification algorithm. The tool automatically categorizes time domain waveforms. Each frequency range is associated with certain failure modes. For example, if there is arcing within a 30 MHz - 100 MHz range, plant personnel should look into the Isophase Bus. The system can alert key personnel when EMI increases. Tables are trendable and these features are available in the EMSA platform. This computerized system means that analysis no longer needs to be done manually.



Range	Noise	Corona	Tone	Discharge	Arcing	RMS
30kHz-500kHz	0.6428	0.6377	0.3018	0.6826	0.3475	1095.7615
500kHz-5MHz	0.9352	0.6084	0.1161	0.8347	0.3945	253.9154
5MHz-30MHz	0.9252	0.0257	0.1300	0.8631	0.1388	11.4877
30MHz-100MHz	0.9898	0.0107	0.0082	0.3058	0.0118	7.3244

REAL - WORLD EXAMPLE

A plant in Ohio was monitoring and trending a crack in a winding. They were able to repair the damage during an upcoming planned outage rather than waiting until failure forced a major outage. The riskier approach is to wait until a failure occurs, which can be incredibly expensive. Merely stopping an Isophase Bus failure more than pays for the EMI Monitoring system.

CUTSFORTH
THE POWER OF INNOVATION™

See More @ Cutsforth.com/EMI

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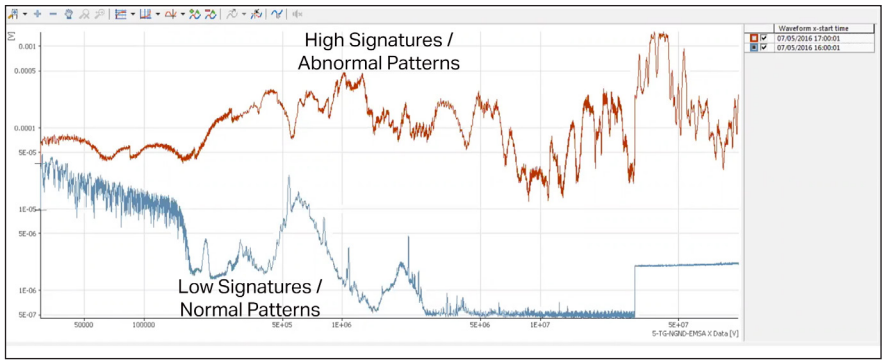
WHAT DOES EMI MONITORING DETECT?

Potential Failures to Detect:
EMI monitoring detects insulation failure when current flows from conductor to ground, which creates a discharge and emits an electro-magnetic signal that the Cutsforth™ system detects and measures. This failure usually manifests itself in some form of arcing. Below are some other defects easily detected by EMI:

Generator Defects:
- Slot discharge
- Loose end-windings (broken ties)
- Loose stator bars (loose wedging)
- Loose phase rings (circuit rings)
- Contamination on windings

Iso-phase/Aux Bus/Substation Defects:
- Insulation breakdown and water intrusion
- Broken support insulators
- Loose isolated phase bus hardware
- Contaminated insulators
- Defective isolated phase bus enclosure insulation

CASE STUDY



A Tale of 2 Generators: The Red Line Generator has Isophase Bus issues (specifically relay actuation); the Grey Line Generator is normal. With EMI, plants can track generators side by side as another method to determine when a fault is occuring, and take appropriate action.

FINANCIAL IMPACTS

Converting one Major Outage to Minor Outage over five years:

Factor	Assumption
Net Savings:	$767,527
Installed Cost:	$90,000 total cost of ownership (Includes estimated contracting costs)
Return Multiple:	8.5x
Rate of Return:	70% over 5 years

** Note: The results are illustrative only. Specific risks, costs, and prices will vary. This is not a guarantee of savings nor a guarantee of eliminating risk. Proper maintenance must be performed*

CONCLUSION

EMI Monitoring gives plants the capability to measure and trend components from the generator to the GSU over time. Specific failure modes correlate defects into specific frequency ranges. This system provides a long-term planning tool, which optimizes maintenance and capital budgets.

For information on Electro-Magnetic Interference Monitoring or any of our other systems visit **Cutsforth.com**.