Technology Summary

Mobile Asset Condition Assessment

Founded:	2007
Poles Surveyed:	2 Million
U.S. Patents:	US 7,577,535 B2
	US 7,912,660
Utility Customers:	130
Non-Utility Customers:	5

Description

Exacter's predictive process provides information that accurately identifies specific points of weakness across a utility's power grid. Exacter's patented technology identifies and locates RF failure-signature emissions on overhead equipment. A powerful data-analysis engine processes field data and presents results in map, spreadsheet, satellite photo, or GIS-compatible formats. Exacter's unique process allows for surveying large geographic areas efficiently. EXACTER® is a strategic information tool for managing multiple aspects of overhead distribution reliability and asset management.

Applications

- Asset Management/Asset Health
  - GIS Data
  - Web Portal Data Management
- Reliability/System Hardening
  - Failed Lighting Arrester Location & ID
  - Weakened Equipment Location & ID
  - Pre/Post-Storm Forensics
  - Worst-Performing Circuit Assessment
  - Pole Fire Prevention
- CMI / SAIDI / SAIFI Management
- Smart Grid Preparation/AMR Maintenance
- Targeted Feeder Programs
- Strategic Targeting for Line Rebuilds

System & Process Accuracy

97.8%

Deliverables

- Field ID & Location Confirmation
  - GPS Location of Problem
  - GIS-Compatible File
  - Pole # (if available)
    - Specific Component on Pole
    - Photograph of Component
    - Map of Locations
    - Database of Problem Locations
- Availability of Additional Analytics
- Presentation of Findings with Recommendations

Research

"Arc sources are the primary characteristic of electrical equipment failure."

— Dr. Stephen Sebo
The Ohio State University High Voltage Laboratory

White papers available upon request.

Articles

T&D Magazine, August 2009
"Predictive Maintenance Pre-empts Outages"
http://tdworld.com/overhead_distribution/predictive-maintenance-20090801/index.html

International Licensees

- Genics Inc. – Canada
- Forestal La Reforma – Mexico
- Pole Foundations – Australia
- PoleScan – New Zealand

Partners and Advisors

- PAR Electrical Contractors, Inc.
- Quanta Technology – Dr. Richard E. Brown
- Midwest ISO – Paul J. Feldman

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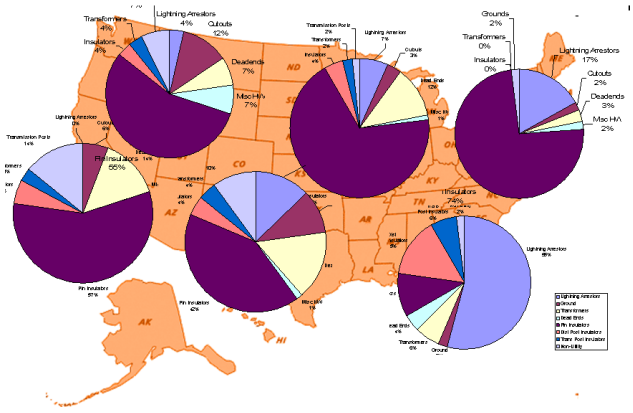
EXACTER Complements Infrared Inspection

Infrared cameras will pick up heated components. Thus, these are only components exhibiting high-impedance in series with the circuit load current. This would include devices like failing or loose clamps and connectors, some lightning arrester failures that have faulted to ground (failure of the activator to isolate the ground wire), and in-line splices. These findings represent important issues and immediately actionable information.

EXACTER also finds many heat related problems. The most probable are splices and faulted arresters. Most of these devices show up in the southeastern US as shown by the regional database display, below.



The findings that infrared provide are augmented by EXACTER as insulator failures are not detectable using heat signatures. Leakage currents across failed insulators and insulating materials of all types, cutouts, and non-current carrying elements are low, typically in the milliamp range.

The significant attribute of EXACTER is that it finds the devices that cannot be located by infrared, but that cause fuse, recloser and breaker operations.

Insulators as a Reliability Target

There is a growing awareness of the impact of insulator and insulation material flashover as a significant cause of outages due to fuse, breaker and recloser operation. In fact, many utilities deal with unknown outages (outages that appear to "heal" after a recloser operation or when a fuse is replaced) by installing reclosers to eliminate the SAIDI impact. Of course, this creates a MAIFI issue and CAIFI/CAIDI indices absorb the impact as well. Because there is not visible evidence these types of outages/operations are often classified as Unknown, Tree Touch, or Animal Contact.

There is a process by which insulators flashover from contamination and environmental conditions known as scintillation. The process begins with dry-band arcing on the surface of insulators. EXACTER accurately discriminates and locates those insulators that are demonstrating dry-band arcing. Left alone, the insulator will eventually flashover and cause a protective device operation. Typically, when a new fuse is closed in or the recloser times out and reenergizes the circuit, the circuit remains energized. The flashover eliminates the causal condition until the process begins again.

The interesting thing about scintillation flashovers is that they seldom leave any indication of arcing or flashover.

Other flashovers are caused by system transients like lightning and switching surges. Cracked insulators, tracked devices, and leaking insulating materials are included in the group that does not present a heat signature, but can result in a flashover or pole fire.

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Lightning Arresters a Root Cause Device

When a lightning arrester is damaged by line transients one of two things occur. The arrester becomes resistive and high ground currents cause the activator to "blow-off" the ground connection. This leaves a visual indication of operation. Or, the arrester begins to conduct a resistive current which does not reach the level of activator operation. Therefore, there is no visual indication of failure and there is probably not enough current to create a heat signature for infrared location.

EXACTER has been demonstrated to locate damaged, non-protective arresters. In the southeastern US, more than 50% of findings are damaged arresters.

Damaged arresters do not protect the surrounding equipment and are responsible for underground cable faults as there is a great rise in surge impedance at the riser pole transferring damaging energy levels directly into the underground cable.

Scalability for Predictive Maintenance

EXACTER is designed to allow precise deployment along specific feeder routes, but the most cost effective use is the wide deployment across the entire system. Assessment of an entire network can be accomplished in 6 weeks regardless of the number of miles surveyed. By subsequently importing the survey results into a GIS system or by using the EXACTER Web Information Portal, intelligent decisions can be made to harden the grid at specific vulnerable or important locations. No other technology can be deployed in this widespread, strategic, and cost-effective manner.

Hardening vs. Preventive Maintenance

Several EXACTER customers have demonstrated dramatic reliability indices improvement by establishing a Grid Hardening Process. In most cases, EXACTER was not the only initiative undertaken. Double digit percentage reduction of equipment related SAIDI and SAIFI is common.

An international utility engaged Exacter in a six-month EXACTER-only trial. In February 2010, EXACTER was deployed on known trouble circuits. In March, following the intelligence gathering, all equipment on the trouble circuits that was indicated as weakened by EXACTER was replaced, regardless of visual condition. The circuit performance was then studied for 6-months and compared to previous years of historic data. In November 2010, a final report was presented to the executive management stating that the circuit's performance improved dramatically.

This utility is now designing a more comprehensive program with EXACTER.

Conclusions

1) EXACTER patented discrimination algorithms only report the emissions from arcing, leakage, and tracking that occur on energized equipment on the electric grid. All of these conditions are abnormal and lead to flashovers, collateral damage, and safety risks

2) EXACTER finds different things than infrared and visual inspections and augments these techniques for the purpose of grid performance enhancement

3) EXACTER is scalable and can survey hundreds or thousands of OVHD miles in a period of about 6-weeks

4) Hardening the grid is different then replacing broken parts. It is a process of locating equipment that will degrade performance of the grid and eliminating those targeted weakened components

5) EXACTER can locate equipment which can flashover, cause an outage, and leave no telltale indication of the failure. These flashovers are often recorded as unknown-cause events.