Success Story

Radiography
Doing more with less is finally a reality!

Background
Call Henry Inc. is the high voltage on-site support service contractor at the NASA Glenn Research Center in Cleveland, Ohio. In February 2006, they contacted ABB on behalf of the research facility regarding the health of their twenty-six (26) ABB type 38PM40-20 SF₆ gas power circuit breakers. The Center leads NASA’s research and development in the area of Aeropropulsion and specializes in turbomachinery, power, propulsion and communications, while also leading research in the microgravity science disciplines of fluid physics, combustion science and the field of microgravity acceleration measurement. You can imagine how large of a role reliability plays!

Upon NASA Glenn’s & Call Henry’s review of the maintenance data, it was noted that many of the Research Center’s circuit breakers were from 10-14 years old, with one breaker having completed over 2,700 operations during its lifetime. It was apparent that these breakers were working hard and were due for an internal inspection.

A site visit was coordinated between NASA Glenn, Call Henry, and ABB High Voltage Service in order to perform the inspection. The workscope consisted of external diagnostics testing, highlighting the use of radiography. The driver for such a program was a desire for cost and outage time reduction, while certifying the long-term integrity of each breaker and more importantly, their power supply.

The Outcome
Of the twenty-six (26) circuit breakers radiographed:
– One (1) required entry to remediate a hardware problem
– Seven (7) required reduction of the SF₆ gas moisture content
– Nineteen (19) were spared entry and intrusive maintenance
– Over three hundred and eighty (380) man-hours of intensive, internal inspections were saved, plus a crane with operator and gas cart rental were not needed

As a result of performing the external diagnostic testing and resulting maintenance, Center’s fleet was assured of continued reliable operating status.

For more information on this and other valuable services, contact your local ABB representative at 724-696-1300.
An Old Technology Applied in a New Way

ABB Mt. Pleasant, High Voltage Service has taken huge strides to dramatically lower the cost of traditional circuit breaker maintenance. The use of radiographic technology has successfully been added to our “Diagnostic Toolbox” for the maintenance of SF₆ gas power circuit breakers. When coupled with traditional external diagnostic testing, radiography can eliminate unnecessary or invasive internal inspections and maintenance, thus significantly decreasing maintenance costs and improving the reliability of the breaker. The use of Radiography for the diagnostic testing of SF₆ circuit breakers allows ABB to economically deploy a well-proven technology in a completely new way!

What is Radiography?
Radiography is the latest x-ray imaging technology, employed in an external environment, to capture detailed digital images of a circuit breaker’s critical internal components. These images are then reviewed by the OEM experts, who check dimensions and tolerances against original component and assembly drawings. Radiography eliminates the need to breech the sealing system of the equipment being diagnosed, increasing equipment reliability, making infiltration of external contaminants a non-issue. This technology can be deployed for half of the maintenance costs associated with more conventional and invasive maintenance practices.

Cost/Time Reduction

Radiography allows our utility, commercial and industrial customers to reduce operating and maintenance costs while increasing circuit breaker reliability by:

- Reducing the number of unplanned outages and maximizing uptime
- Reducing outage windows
- Allocating precious financial resources more effectively
- Extending maintenance cycles

O&M costs associated with using Radiography when compared to traditional invasive maintenance procedures are proved to be reduced by at least 50%, while the outage time is reduced from 2 days to 2 hours. (See Table 1)

<table>
<thead>
<tr>
<th>Circuit Breaker Type</th>
<th>Traditional Invasive Internal Inspection</th>
<th>Radiography</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 - 145kV</td>
<td>2 days</td>
<td>2 hours</td>
</tr>
<tr>
<td>242kV</td>
<td>3 days</td>
<td>3 hours</td>
</tr>
<tr>
<td>362kV</td>
<td>4 days</td>
<td>3 hours</td>
</tr>
<tr>
<td>550kV</td>
<td>5 days</td>
<td>4 hours</td>
</tr>
</tbody>
</table>

What is the “Diagnostic Toolbox”?

The toolbox is comprised of several stand-alone diagnostic tests. The addition of Radiography strengthens the toolbox by pulling the results of these tests together or providing the overall “visual” of the condition of the circuit breaker’s internal components. Radiography further increases the value of the individual tests.

The HV Service “Diagnostic Toolbox” includes:

Radiography Imaging
- SF₆ Decomposition Analysis (SF₆ purity & test for presence and level of up to six additional gases)
- Contact Resistance Measurements
- Timing and Travel Tests
- SF₆ Leak Detection

For more information please contact:

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