



Breaker Management Using the Tango™ Reliability Management Web Service

Breaker tracking is often performed at industrial facilities using several independent databases and information storage schemes. Often, the breaker management approach is home grown and difficult to use, maintain and distribute to everyone needing access to the information.

Breaker management is performed to provide the following functions:

- Select and set-up replacement breakers.
- Manage breaker testing
- Manage breaker stores
- Manage breaker repair vendors
- Maintain breaker configuration information
- Identify repetitive and root cause failures
- Manage thermal condition testing
- Maintain breaker lifecycle history

Breaker management is information management. The Tango™ Equipment Management Web Service is designed to standardize, integrate, communicate, create accountability and analyze breaker maintenance and reliability information.

The first step in setting up or improving your breaker management capability is to identify and locate all existing breaker information. Often breaker location, design and testing information is maintained by each production area of the plant and is often not standardized across the plant.

There are three inventories which need to be completed:

a) **Inventory of breaker functional locations:**

Identify all breaker functional locations. The first place to look is the plant's CMMS. If breaker locations have been set-up in the plant CMMS, the job of building a breaker management database will be much simpler. You can export a list of functional breaker locations along with the CMMS ID number. Often this information is not available in the



CMMS. It has not been set-up to that level of detail. Instead, you will find either a master spreadsheet of locations or multiple lists for each production area.

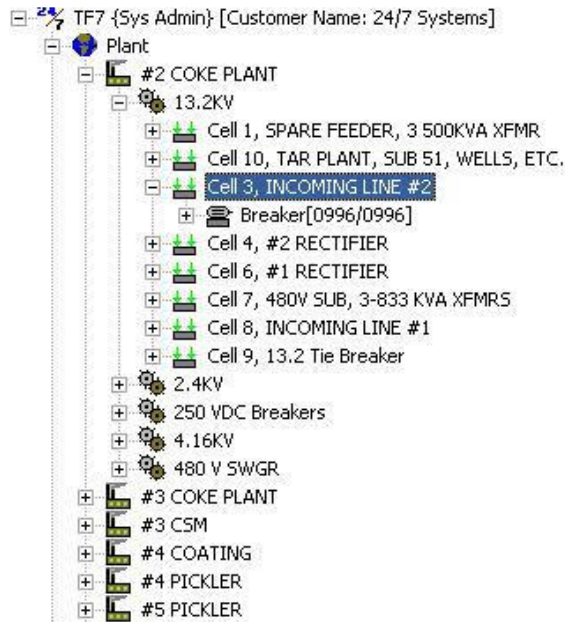


Figure1: Breaker Location Tree

b) Inventory of breaker design information:

Each breaker should be identified by serial number and often a plant specific tag number. Then the breaker name plat information should be recorded.

| Property | New Value |
|---|--------------|
| Breaker Mfg* | Westinghouse |
| Frame Size* | 1200 |
| Model Number* | B-28-B |
| Plant Tag* | 0996 |
| Serial Number* | 0996 |
| Circuit Voltage Type | |
| Close Trip Rating | 250 V |
| Close Trip Rating Type | DC |
| Comments | |
| Current Rating | 1200 A |
| Maximum Install Interval (Days) - Current | 1825 |

c)

Figure 2: Breaker Design Information



d) **Breaker configuration:**

Breakers must be configured for multiple trip settings depending on the equipment protected and the breaker type.

Once you know the breaker locations and the inventory of specific breakers, the plant must match these two inventories with a survey or if a previous survey exists, the location breaker pairing must be validated. Once this survey has been performed, it is important to begin tracking of breakers removed and installed to prevent this list from becoming out of date.

Tracking of breaker removal and installation is usually part of the breaker testing and maintenance program. When a breaker is due for testing, it is removed, cleaned and tested, then reinstalled if the breaker tests, “ok.” If the break is “defective,” it is replaced with a different breaker and the old breaker is returned to a repair shop for reconditioning and testing.

The breaker testing team or contractor needs to be provided with a list of breakers they are required to test in an area. The test group must record the test results and if a breaker is removed, its ID and the ID of the breaker installed.

Work Planners Report

Report Date: *Jun-20-2007*

Target Repair Date: *Jun-20-2007*

| Work Deadline | Work Action | Plant Tag | Equipment State | Location |
|---------------|-------------|----------------------|-----------------|---|
| Dec-31-1994 | Reinspect | 1260 | Installed | 04 SUB - OLD COLD MILL >> Upstairs >> Cell 9, 150KVA LTG TRANS >> Breaker |
| Dec-31-1994 | Reinspect | 1267 | Installed | 04 SUB - OLD COLD MILL >> Upstairs >> Cell 3, SPARE >> Breaker |
| Dec-31-1994 | Reinspect | 1458 | Installed | 27 SUB - N/S SHIPPING / ROLL GRINDER >> - #3 PICKLER >> Cell M, MAIN BREAKER >> Breaker |
| Dec-31-1994 | Reinspect | 1461 | Installed | 27 SUB - N/S SHIPPING / ROLL GRINDER >> - #3 PICKLER >> Cell 3 >> Breaker |
| Dec-31-1994 | Reinspect | 1583 | Installed | 04 SUB - OLD COLD MILL >> Upstairs >> Cell 8, 600KVA AUX PWR TRANS, >> Breaker |
| Apr-13-1997 | Reinspect | 1578 | Installed | 20 SUB - N TERM TREATMENT / E CLARIFIER >> 20 >> Cell 4, AIR BLOWERS 1 & 2 >> Breaker |
| Apr-13-1997 | Reinspect | 1576 | Installed | 20 SUB - N TERM TREATMENT / E CLARIFIER >> 20 >> Cell 1, FEEDER #1 >> Breaker |
| Apr-13-1997 | Reinspect | 1577 | Installed | 20 SUB - N TERM TREATMENT / E CLARIFIER >> 20 >> Cell 3, MCC #1 - EAST CLARIFIER >> Breaker |
| Mar-11-1998 | Reinspect | 1589 | Installed | 34 SUB - N TERM TREATMENT / PUMPHOUSE >> 34 >> Cell 2, PUMP HOUSE MCC, DOOR #8 >> Breaker |

Figure 3: Work Planners Report

The testing or replacement of a breaker are the events that resets the breaker test interval. Typically, breakers are tested on a three to five year interval, depending on characteristics of the load. One key component of the Tango™ breaker management capability is the management of test intervals and due dates. Figure 3 shows the Tango™ Work Planners Report for breakers due



for testing by a specified date. Once a test report is generated, it must be filed as a linked document to the test record.

Repair and Failure Tracking

Tango™ provides the ability for the breaker repair shop to directly enter failure and repair information. This direct entry eliminates the usual transmission of email reports to the plant that someone at the plant must re-enter into a tracking system.

Low Voltage Air Circuit Breaker Inspection & Test Report

Technical Services Division



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Customer:
Location:
Substation: GB
Special ID No.: 4-695
Feeder: NO. 9 STRETCHER PUMP MOTOR MCC
Manufacturer: FERERAL PIONEER LTD.
Breaker Type: 75H-3
Catalog No.:
Style No.:
Shop Order No.:
Serial No.: BH21036-80
Continuous Current Rating: 3000 AMPS
Momentary Current Rating: 75 KA
Interrupt Rating: 75 KA
Fuse Nameplate/Size: N/A
Nominal Voltage Rating: 480 VOLTS

Maximum Voltage Rating: 600 VAC
Trip Device NIP: SD-3
Trip Device Rating (A): 3000 AMPS
Long Delay PUIDelay: 3 = 3000A / 3 (27 - 72S @ 300%)
Short Delay PUIDelay: 1 = 12000A / 2 (0.30 - 0.5S)
Instantaneous Pick Up: 1 = 15000A
Ground Fault PUIDelay: N/A
Close Volts: 120 VAC
Trip Volts: 120 VAC
Air Temperature: °C, °F
Relative Humidity:
Manufacture Date:
Manufacture Location:

Mechanical Inspection

Result Codes: A - Condition Like New, Correct Adjustment B - Good Condition, Acceptable Adjustment C - Poor Condition, Unacceptable Adjustment - Correction Required D - Correction Made at Test Time

| Phase | As Found | | | As Left | | |
|---------------------------|----------|---|---|---------|---|---|
| | A | B | C | A | B | C |
| Primary Disconnects | B | B | B | | | |
| Main Contacts Condition | B | B | B | | | |
| Arc Chutes | B | B | B | | | |
| Arcing Contacts Condition | C | C | C | | | |
| Trip Bar | B | B | B | | | |
| Mechanism/Lubrication | B | B | B | | | |

Electrical Inspection

Test Type: PRIMARY CURRENT INJECTION

| Test Type | Tolerances | As Found | | | As Left | | |
|-------------------------------------|-------------------|----------|---------|---------|---------|-------|-------|
| | | A | B | C | A | B | C |
| Long Delay Pick Up | 3000 AMPS | -- | -- | -- | | | |
| LTD @ 300% | 27 - 72 SECONDS | 31.86S | 32.53S | 32.13S | | | |
| LTD @ % | AT 9000 AMPS | | | | | | |
| Short Delay Pick Up | 12,000 AMPS | 11,746A | 11,818A | 11,905A | | | |
| STD @ 150% | 0.3 - 0.5 SECONDS | 0.44S | 0.43S | 0.44S | | | |
| Instantaneous Pick Up | 15,000 AMPS | 14,000A | 14,876A | 14,909A | | | |
| Ground Fault Pick Up | | | | | | | |
| GFT @ % | | | | | | | |
| Contact Circuit MV Drop @ 3000 Amps | | 362 | 341 | 320 | | | |
| Contact Resistance by Ductor | | A - A | B - B | C - C | A - A | B - B | C - C |
| Values in µΩ | | 21 | 22 | 27 | | | |
| Insulation Resistance | | As Found | | | As Left | | |
| At 1000 volts for 1.0 minutes | | A - G | B - G | C - G | A - G | B - G | C - G |
| Values in GΩ | | 44.2 | 37.4 | 66.5 | | | |
| | | A - B | B - C | C - A | A - B | B - C | C - A |
| Values in GΩ | | 60 | 174 | 165 | | | |

Comments: BREAKER LAST TESTED 7/7/2002.
BREAKER TESTED AT SETTINGS AS FOUND.
BREAKER TESTED OKAY FOR SERVICE.

Date: 02/20/06
Tested by:
Report No.: 4-695, Fed. P. 75H-3 Bkr, SN BH21036-80, 010725
Job No.: ATF1A77

Equipment Used: HCTS, BM21, BM21
Manufacturer: AVO
Calibration Date: 02/05

Figure 4: Typical Breaker Test Report



Management of Breaker Thermal Condition Testing

Usually, industrial plants perform an infrared thermal scan of critical breakers and switchgears. Management of this information to insure that each breaker was evaluated under load, and that defective items are indentified and removed is a key part of breaker management. Tango™ provides the management and communication of the information.

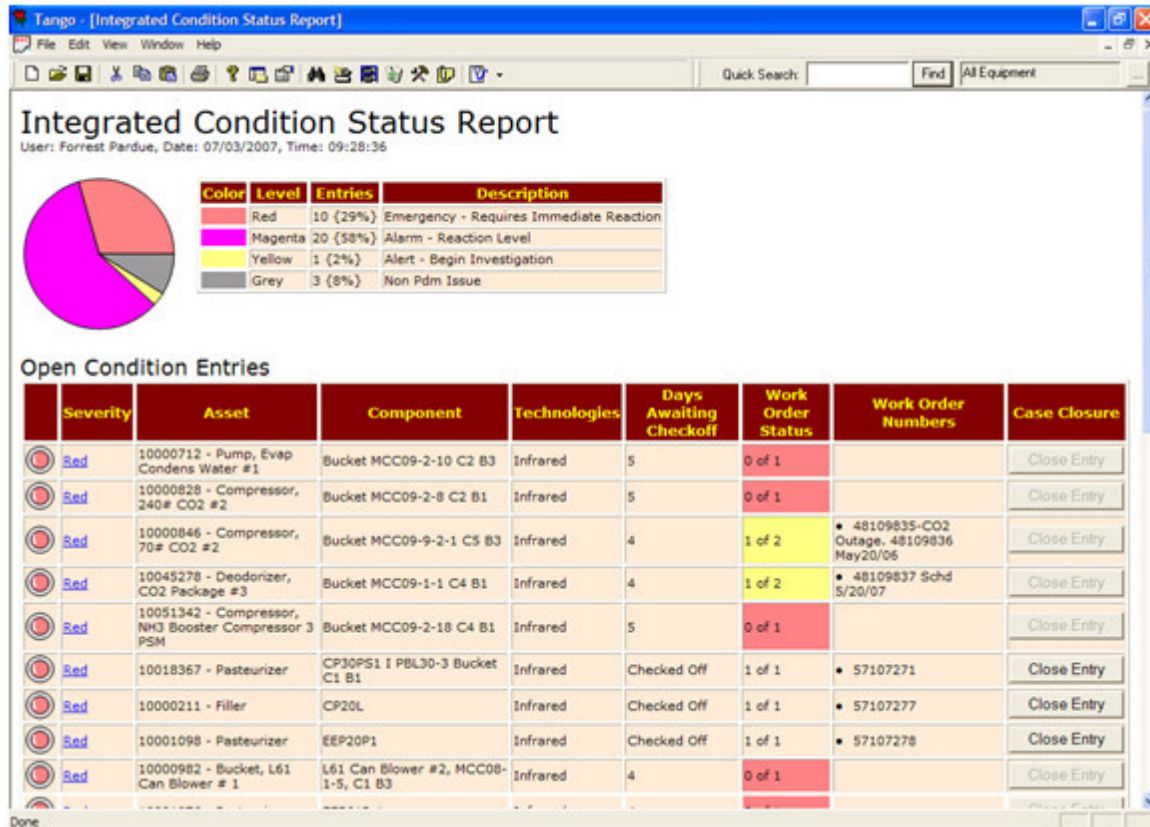


Figure 5: ICR Report with IR image in details