Industrial Production Co.
Anytown, PA

Infrared Thermography Inspection Report

Date

Normal Dry-Type Transformer Core
and Tap Connections Seen Through IR Window
Report Summary

Industrial Production Company
Anytown, PA

Date

The electrical distribution and control equipment was surveyed with an infrared imaging camera, while in operation, to identify abnormal heating. Equipment that was not running at the time of the survey was started to allow circuits to come up in temperature. Equipment that could not be run is noted as “not running”.

A summary of the report is given here.

All thermal anomalies that were found are documented on the Data Pages. These include infrared images and photographs, descriptions, and a recommendation.

A list of the equipment that was inspected is included at the beginning of the report.

Please read over the page entitled “About the Report” for information on how all IRIS Associates infrared thermography reports are arranged.

Do not hesitate to contact us if you have a question.

Thank you!

Maury Confer
IRIS Associates
ABOUT THE REPORT

EACH PAGE DOCUMENTS AN EXCEPTION

The pages of this report are formatted to document "exceptions" (abnormally warm or cool components) observed during the survey. Each page documents an exception.

The thermogram is the "heat picture" that shows the problem. Accompanying this is a photograph of the same item with an arrow or circle to identify the "hot spot".

The text of the page identifies the date, area, piece of equipment, and the problem. A recommendation is also made; however, the actual repair procedure will be the decision of the owners and maintainers of the equipment. This should be based on what is found once the problem is investigated.

A "priority" of each problem is given based on the temperature rise of the hot spot above a reference, which is usually a similar component under the same conditions. This can be useful in determining the immediacy of the needed repair. The table below is used as a GUIDE for severity. Considerations such as safety, criticality of the equipment, and availability of spares must also be taken into consideration by plant personnel when determining severity.

<table>
<thead>
<tr>
<th>Severity</th>
<th>Degrees F Above reference</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>zero to 25</td>
<td>Low Priority</td>
</tr>
<tr>
<td>2</td>
<td>25 to 100</td>
<td>Medium Priority</td>
</tr>
<tr>
<td>3</td>
<td>over 100</td>
<td>High Priority</td>
</tr>
</tbody>
</table>

At the bottom right of the page is a "Repair Comments" box to record when the problem was addressed, along with any comments.

Note: Sometimes sample images are included in the report to show equipment in normal condition. These are marked as "sample" or "informational" images and do not follow the format of documented problems.

Near the beginning of the report is an equipment list, which lists the equipment that was inspected, whether any problems were found, and on which page a problem is documented, if applicable. This is useful in knowing what was checked. It also serves as a checklist for the next survey, thus maximizing the use of time on future inspections.

ABOUT THE THERMOGRAPH

Along the right of the thermograph is a scale showing the temperature range, and the corresponding color.

The area of concern is usually outlined with a rectangle or circle. The maximum temperature within the area appears in the upper left corner of the thermograph. A reference temperature is marked with a “spot" (crosshair) and this reference temperature also appears in the upper left corner. The difference between the two temperatures is the rise of the hot spot above the reference.
Industrial Production Company
Anytown, PA

Infrared Thermography Inspection Equipment List
Date

Outdoor 138 kV Substation
The 138 kV Substation equipment inspected includes the lines, line connections, switches, bushing connections, capacitors, and any other visible connections

Station battery charger cabinet (in block building) Ok

Electrical Room No. 1
MCC A controls
MCC B controls Ok

Safety switch A Ok
Safety switch B Ok
Safety switch C Ok

Electrical Room No. 2
MCC “H” control buckets See Data Page 5
Dry-type Transformer (through IR windows) Ok

Safety switch D Ok
Safety switch E Ok
Safety switch F Ok

Utility Equipment Room
No. 1 Air Compressor – safety switch and controls Ok
No. 2 Air Compressor – safety switch and controls Ok
Air separator controls Ok

Baghouse Main Blower controls See Data Page 3
Baghouse auxiliary controls Ok
### Industrial Production Company

**Anytown, PA**

#### Infrared Thermography Inspection Equipment List

**Date**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>As Found</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrical Room No. 3</strong></td>
<td></td>
</tr>
<tr>
<td>MCC “C” controls</td>
<td>Ok</td>
</tr>
<tr>
<td>MCC “D” controls</td>
<td>Ok</td>
</tr>
<tr>
<td>Safety switch A</td>
<td>Ok</td>
</tr>
<tr>
<td>Safety switch B</td>
<td>Ok</td>
</tr>
<tr>
<td>Safety switch C</td>
<td>Ok</td>
</tr>
<tr>
<td>Dry-type transformer through IR windows</td>
<td>Ok</td>
</tr>
<tr>
<td><strong>Boiler Room</strong></td>
<td></td>
</tr>
<tr>
<td>Boiler control panel</td>
<td>Ok</td>
</tr>
<tr>
<td>Phase protection contactor cabinet</td>
<td>Ok</td>
</tr>
<tr>
<td>Water Pump controls</td>
<td>Ok</td>
</tr>
<tr>
<td>Hydraulic Unit controls and safety switch</td>
<td>Ok</td>
</tr>
<tr>
<td><strong>Admin Building Electrical Room</strong></td>
<td></td>
</tr>
<tr>
<td>Elevator controls</td>
<td>Ok</td>
</tr>
<tr>
<td>Main panelboard (cover is hinged)</td>
<td>Ok</td>
</tr>
</tbody>
</table>
Industrial Production Company
Anytown, PA

Date:

Area: Outdoor High Voltage Substation - Gas Turbine Generator No. 2

Equipment: Gas Circuit Breaker Line-Side north phase bushing connection

Problem:
The connection on the north phase (right phase facing the breaker) line-side bushing is hot. The cable connection is ok. The heat is coming from where the terminal bolts to the bushing.

Recommendation:
Disassemble the connection. Check the condition of the contacting surfaces and hardware. Clean or repair as necessary.
Make sure the connection is clean and tight.
See more pictures next page.

Severity: 3 high priority
1: Schedule action as convenient
2: Schedule action soon
3: Schedule action immediately

Temperatures:
- Ambient: 70 ºF
- Hot Spot: 225 ºF
- Reference: 122 ºF
- Minimum Degree Rise: 103 ºF

Repair Comments:

Repaired By:
Repair Date:

Data Page 1
Industrial Production Company
Anytown, PA

Outdoor High Voltage Substation
Gas Turbine Generator No. 2

This is the same circuit breaker as shown on Data Page 1

Gas Circuit Breaker Line-Side bushing connection on the north phase

This is the same breaker as shown above and on Data Page 1. The hot connection is shown with the normal connections.

This is the same breaker as shown above and on Data Page 1. The exact source of the heat can be seen by using a different color pallet.
Industrial Production Company  
Anytown, PA

Date: 

Area: Utility Equipment Room 

Equipment: Starter for the Baghouse Main Blower / internal hot connection (inside the starter)

Problem: The starter has a hot spot on the center phase coming from inside the starter. The highest temperature is not known because it's inside the case.

Recommendation: Remove the starter cover and check the center phase near the top for a high resistance connection or bad contacts.

Severity: Unknown

1: Schedule action as convenient
2: Schedule action soon
3: Schedule action immediately

Temperatures:
- Ambient: 70 °F
- Hot Spot: 158 °F
- Reference: 124 °F
- Minimum Degree Rise: >34 °F

Repair Comments: 

____________________________________________________

____________________________________________________

Repaired By: 
Repair Date: 

Data Page 3
Industrial Production Company
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Area: Electrical Room No. 1

Equipment: MCC “A” / Ventilation Fan No. 3 motor control

Problem:
The center phase hinge joint is very hot. The metal is discolored from the heat.

Recommendation:
Exercise the switch. Clean and tighten the hinge contact area and the main contact area if possible.

It may require replacing the switch

Severity: 3 high priority
1: Schedule action as convenient
2: Schedule action soon
3: Schedule action immediately

Temperatures:
- Ambient: 90 °F
- Hot Spot: 437 °F
- Reference: 253 °F
- Minimum Degree Rise: 184 °F

Repair Comments:

Data Page 4
**Industrial Production Company**  
**Anytown, PA**

**Date:**

**Area:** No. 2 Electrical Room

**Equipment:** MCC “H” – circuit breaker for Air Compressor No. 2

**Problem:**
The bottom front cable on the left phase of the main circuit breaker is very hot.

The insulation is burnt and crispy.

**Recommendation:**
Disconnect the cable and inspect the cable and breaker. Cut off the heat-damaged end of the cable and make a new connection.

**Severity:** 3 high priority

1: Schedule action as convenient  
2: Schedule action soon  
3: Schedule action immediately

**Temperatures:**
- Ambient: 55 °F  
- Hot Spot: 357 °F  
- Reference: 94 °F  

Minimum Degree Rise: 263 °F

**Repair Comments:**

Repaired By:  
Repair Date:  

Data Page 5
Industrial Production Company
Anytown, PA

Date

Informational Images

South 13.8 kV Substation

East Transformer

Transformer before and after adding oil to bring it to the correct level.

Low oil level – oil not making it into most of the radiator tubes.

Dark radiator tubes are cold therefore no oil and no cooling.

Same transformer after adding coil to the correct level.

All radiator tubes are warm, have oil moving through them, transformer is being cooled normally.

No further action is necessary.
Industrial Production Company
Anytown, PA

Date

Informational Images

Electrical Room No. 3

MCC “D”

Hot connection on circuit breaker for Auxiliary Coolant Pump as found at the time of the previous inspection.

Same circuit breaker as above with normal condition after servicing the connection.