Qualitative Infrared Thermographic Survey of Electrical Switchgear

January 4, 2014

Prepared for:
Happy Client
Facilities Engineer
Acme Widget Company
January 4, 2014

Happy Client  
Facilities Engineer  
Acme Widget Company  
1234 Main Street, US  
Your Town, USA  
HappyC@AWCompany.com

Dear Mr. Client:

The electrical switchgear in Acme Widget Company, was the subject of an electrical infrared (IR) survey on January 4, 2014. Equipment designated by the client for this survey is listed in this report.

**Your ElectriSCAN™ report includes:**
- **Equipment List** – a list of all equipment surveyed
- **Thermographic Reports** – individual report pages of all equipment with thermal anomalies
- **Repair Guide** – a list of all equipment with problems with a temperature rating

**General**  
Stockton Infrared Thermographic Services, Inc. was retained for an electrical thermographic survey of the building in an effort to identify areas of thermal anomalies and to document them for further review and repair. Our inspection is designed to comply with accepted industrial standards and this report is for the exclusive use of our client and is not intended for any other purpose. This report is based on information obtained at the site at the given time and date. Should additional information become available at a later date, we reserve the right to determine the impact, if any, that the new information may have on our findings and recommendations and to revise the report if necessary and warranted.

**Analysis and Recommendations**  
We recommend that the maintenance team carefully review this report. Items listed on the Repair Guide below, should be checked by qualified personnel. We used the Delta-T temperature method for rating our findings. However, your repair action decisions should include not only temperature, but other factors such as safety, criticality of the equipment, availability of back-up equipment and other factors.

Our reports are designed to be clear, concise and useful. Please review this report carefully and if there is anything you would like us to explain, or if there is other information you would like, please feel free to call us as we would be happy to answer any questions.

Sincerely,

Rob Miller  
Rob Miller, CMRP  
Stockton Infrared Thermographic Services, Inc.  
864-637-8826  
Rob@StocktonInfrared.com
Understanding Infrared Imagery

Infrared imagery is often a grayscale picture or thermograph whose scales (or shades of gray) represent the differences in emitted energy from the surface often referred to as temperature. As a general rule, patterns in the image that are lighter in shade are warmer and darker patterns cooler. Unlike visible imagery that capture visible light in the 0.4-0.7 micrometer wavelengths, objects observed using infrared imagery capture infrared wavelengths in the 3-5 or 8-14 micrometer range. Visible lights that produce heat and other relatively hot objects are very evident, but as a result of their heat or infrared emission and not due to the visible light emissions.

Equipment List
THERMOGRAPHIC REPORT

Report No. 1

Acme Widget Company
Plant #2

AREA
AIR COMP RM/PANEL CPAL 3

LOCATION
Breaker/Circuits #40-42

Date 6/4/2002
Time 10:02:57

Ambient temp. 85.6
Reference temp. 101.2
High temp. 123.4
Temp. rise 22.2

RISE ABOVE IN DEGREES F
\[\begin{array}{c}
\text{Ambient} \\
\text{Reference} \\
\text{Adjacent phase} \\
\text{Direct measurement}
\end{array}\]

AMPERAGES
\[\begin{array}{c}
\text{#40:} \\
\text{#42:}
\end{array}\]

\[\begin{array}{c}
27.9 \\
27.6
\end{array}\]

DESCRIPTION
Breaker (30Amp) is overheating. Breaker load exceeds 80%. There is apparent internal damage.

RECOMMENDATION
Replace breaker, check ratings.

Acme Widget Company

<table>
<thead>
<tr>
<th>TEMP. RATING</th>
<th>TEMP. RISE</th>
<th>CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>1-18</td>
<td>Routine. Repair during regular maintenance, little chance of physical damage.</td>
</tr>
<tr>
<td>Alert</td>
<td>19-36</td>
<td>Repair within 30 days, watch load and inspect for physical damage.</td>
</tr>
<tr>
<td>Serious</td>
<td>37-54</td>
<td>Repair/Replace ASAP. Inspect surrounding components for physical damage.</td>
</tr>
<tr>
<td>CRITICAL</td>
<td>&gt;55</td>
<td>IMMEDIATE REPAIR/REPLACE. DANGER EXISTS!</td>
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</tbody>
</table>

QUESTIONS ABOUT THIS REPORT? Call 1-800-248-SCAN
Report No. 2

Acme Widget Company  
Plant #2

AREA  
SS1/480V MAIN #1/DIST PANEL

LOCATION  
Breaker 45 (NE Lights)

Date 6/4/2002  
Time 10:02:57

Ambient temp. 82.0
Reference temp. 89.9
High temp. 111.2
Temp. rise 21.3

RISE ABOVE IN DEGREES F  
Ambient
Reference
Adjacent phase
Direct measurement

AMPERAGES  
Phase A: 89  
Phase B: 113  
Phase C: 143

DESCRIPTION  
Circuit imbalanced.

RECOMMENDATION  
Balance loads.

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THERMOGRAPHIC REPORT

Report No. 3

Acme Widget Company
Plant #2

AREA
AIR COMP SHED/A.C. #1

LOCATION
Disc/Air Compressor #1

Date 6/4/2002
Time 10:02:57

Ambient temp. 80.8
Reference temp. 138.0
High temp. 265.0
Temp. rise 127.0

RISE ABOVE IN DEGREES F
Ambient
Reference
Adjacent phase
Direct measurement

AMPERAGES
Phase A: 45
Phase B: 46
Phase C: 45

DESCRIPTION
SWITCH (blade connector), phase A overheating.

RECOMMENDATION
Check switch connections.
Report No. 4
Acme Widget Company
Plant #2

AREA
CHILLER PAD/CHILLER CH-2

LOCATION
Starter Pnl/Contactor #2

Date 6/4/2002
Time 10:02:57

Ambient temp. 95.2
Reference temp. 108.0
High temp. 138.0
Temp. rise 30.0

RISE ABOVE IN DEGREES F
- Ambient
- Reference
- Adjacent phase
- Direct measurement

AMPERAGES
Phase A: 99
Phase B: 96
Phase C: 99

DESCRIPTION
Contactor connector overheating.

RECOMMENDATION
Reinstall wire, check connection.

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QUESTIONS ABOUT THIS REPORT? Call 1-800-248-SCAN
**THERMOGRAPHIC REPORT**

Report No. 5

Acme Widget Company
Plant #2

**AREA**
VACUUM FAN ROOM/MCC-A

**LOCATION**
Cubicle A1/Vacuum Fan #1

Date 6/4/2002
Time 10:02:57

| Ambient temp. | 77.7 |
| Reference temp. | 104.0 |
| High temp. | 156.0 |
| Temp. rise | 52.0 |

**RISE ABOVE IN DEGREES F**
- Ambient
- Reference
- Adjacent phase
- Direct measurement

**AMPERAGES**
- Phase A: 170
- Phase B: 170
- Phase C: 170

**DESCRIPTION**
Breaker lug/phase A, line side.

**RECOMMENDATION**
Check breaker lug and connections.

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**TEMP. RATING** | **TEMP. RISE** | **CLASSIFICATION**
--- | --- | ---
Minor | 1-18 F degrees | Routine. Repair during regular maintenance, little chance of physical damage.
Alert | 19-36 | Repair within 30 days, watch load and inspect for physical damage.
*** Serious | 37-54 | Repair/Replace ASAP. Inspect surrounding components for physical damage.
CRITICAL | >55 | IMMEDIATE REPAIR/REPLACE. DANGER EXISTS!

**QUESTIONS ABOUT THIS REPORT?**
Call 1-800-248-SCAN
Report No. 6
Acme Widget Company
Plant #2

AREA
MAINMCR #3 MCC #3-2

LOCATION
Cubicle D2/Pump 3B

Date 6/4/2002
Time 10:02:57

Ambient temp. 86.0
Reference temp. 104.8
High temp. 224.2
Temp. rise 119.4

RISE ABOVE IN DEGREES F
- Ambient
- Reference
- Adjacent phase
- Direct measurement

AMPERAGES
- Phase A: 30
- Phase B: 28
- Phase C: 29

DESCRIPTION
Fuse and fuse clip/phase A, load side.

RECOMMENDATION
Replace fuse and fuse clip.

<table>
<thead>
<tr>
<th>TEMP. RATING</th>
<th>TEMP. RISE F degrees</th>
<th>CLASSIFICATION</th>
</tr>
</thead>
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<tr>
<td>Minor</td>
<td>1-18</td>
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*** CRITICAL >55 IMMEDIATE REPAIR/REPLACE. DANGER EXISTS!

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<table>
<thead>
<tr>
<th>#</th>
<th>PLANT AREA</th>
<th>AREA</th>
<th>LOCATION</th>
<th>CLASS</th>
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<tr>
<td>1</td>
<td>FLOCKING AREA</td>
<td>FLOCK LINE #2 CNTRL RM</td>
<td>Control Pnl FL2-3/Main Brkr</td>
<td>S</td>
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<tr>
<td>2</td>
<td>FINISHING AREA</td>
<td>FINISHING/FM #1</td>
<td>Cntrl FM1.3/Predryer Main</td>
<td>A</td>
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<td>3</td>
<td>FINISHING AREA</td>
<td>FINISHING/FM #1</td>
<td>Cntrl Pnl FM1.1MS-0610</td>
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<td>4</td>
<td>FINISHING AREA</td>
<td>FINISHING/FM #1</td>
<td>Cntrl Pnl FM1.1Brrr MS0610</td>
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<td>5</td>
<td>PRINTING AREA</td>
<td>PRINTING/BATTERY CHGRS</td>
<td>Panel LP-2/Circuits 14 &amp; 16</td>
<td>M</td>
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<tr>
<td>6</td>
<td>MAINTENANCE OFFICES</td>
<td>MAINT. OFFICES/PLNLS</td>
<td>Panel RP-15/Circuit #21</td>
<td>A</td>
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<td>7</td>
<td>FINISHING AREA</td>
<td>FINISHING/PLN LP-8</td>
<td>Panel/Circuit #9</td>
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<td>8</td>
<td>PRINTING AREA</td>
<td>PRINTING/PNL PDP2-G</td>
<td>Panel/Breaker #1</td>
<td>C</td>
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<tr>
<td>9</td>
<td>FAN ROOM</td>
<td>FAN ROOM/FAN #1</td>
<td>Comb Strtr/Fan #1</td>
<td>C</td>
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<tr>
<td>10</td>
<td>FAN ROOM</td>
<td>FAN ROOM/FAN #2</td>
<td>Comb Strtr/Fan #2</td>
<td>A</td>
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<td>11</td>
<td>SUBSTATION #2</td>
<td>SUBSTN #2/PNL LP-7</td>
<td>Panel/Circuit #13</td>
<td>A</td>
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<td>12</td>
<td>PRINTING AREA</td>
<td>PRINTING/PM #4/CTRLS</td>
<td>Main Control Pnl/Main Brkr</td>
<td>C</td>
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<tr>
<td>13</td>
<td>SUBSTATION #1</td>
<td>SUBSTN #1/13.2V</td>
<td>Main 13.2V Switch/Overview</td>
<td>S</td>
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<tr>
<td>14</td>
<td>CUTTING AREA</td>
<td>CUTTING/CTRLS</td>
<td>Control Pnl CT3-2/Main Disc</td>
<td>A</td>
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<tr>
<td>15</td>
<td>EMBOSSE</td>
<td>EMBOSSE/ HOT OIL</td>
<td>Control Pnl Relay-Heaters</td>
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<td>16</td>
<td>WASTEWATER AREA</td>
<td>WASTEWATER PUMPS</td>
<td>Pump Control Pnl/FU 36 &amp; 38</td>
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<tr>
<td>17</td>
<td>3803 WAREHOUSE</td>
<td>3803 WR/HE/PNL PP-4B</td>
<td>Panel/Overview</td>
<td>S</td>
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<tr>
<td>18</td>
<td>3803 WAREHOUSE</td>
<td>3803 WR/HE/PNL PP3-B</td>
<td>Panel/Overview</td>
<td>A</td>
</tr>
<tr>
<td>19</td>
<td>PRINTING AREA</td>
<td>PRINTING/PM #3/PDP2-D</td>
<td>Panel/Breaker-PM-3 Ctrls</td>
<td>A</td>
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<tr>
<td>20</td>
<td>DYE HOUSE</td>
<td>DYE HSE/ ETS 1-4</td>
<td>Control Pnl1-4-Main Brkr</td>
<td>S</td>
</tr>
<tr>
<td>21</td>
<td>DYE HOUSE</td>
<td>DYE HSE/ OVEN TENTER</td>
<td>Main Breaker/Overview</td>
<td>M</td>
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<tr>
<td>22</td>
<td>DYE HOUSE</td>
<td>DYE HSE/ AIR CMR/SSR #1</td>
<td>Starter Pnl/Overview</td>
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<tr>
<td>23</td>
<td>DYE HOUSE</td>
<td>DYE HSE/ BOILER</td>
<td>Control Pnl1HR Blwr Fuses</td>
<td>C</td>
</tr>
<tr>
<td>24</td>
<td>PRINTING AREA</td>
<td>PRINTING/PNL #3/CTRLS</td>
<td>Control Pnl 3-5/Main Switch</td>
<td>A</td>
</tr>
<tr>
<td>25</td>
<td>FLOCKING AREA</td>
<td>FLOCK #1 CNTRL RM</td>
<td>Cntrl Pnl-Ex. Fans/Fan M7E</td>
<td>C</td>
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<tr>
<td>26</td>
<td>FLOCKING AREA</td>
<td>FLOCK RANGE #1/DISCS</td>
<td>Main Disc #52/Overview</td>
<td>S</td>
</tr>
</tbody>
</table>

(NR) Not Rated = 2
(M) Minor = 12
(A) Alert = 15
(S) Serious = 13
(C) Critical = 10
TOTAL = 52