



Electrical Thermographic Survey

Sample Report

January 2011

By

Pixel Thermographics Ltd

Pixel Thermographics Ltd

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Report Details

Customer

Inspection Site

Contact Person

Contact Person Address

Phone Number

Email Address

Thermographer

Thermographer Certification

ITC Level 2 Certified Thermographer

Survey Equipment

Flir Thermacam SC640 Infrared Camera
Reporter 8.5 Software

Inspection Date

January 2011

INFORMATION

This sample report has been produced to provide potential clients with evidence of the types of fault we are able to detect using infrared thermographic equipment.

The type of equipment which can be surveyed includes:

- Switchgear and Switchboards
- Busbar Systems
- Distribution Boards and Fuse Boards
- Transformers
- High Voltage Systems
- Overhead Power Lines & Substations
- Control Panels
- UPS Systems
- Batteries

The benefits of using Pixel Thermographics Ltd to conduct an electrical thermographic survey include:

- Power is not interrupted during a survey.
- This is a predictive maintenance technique which will make your business more reliable and lessen the risk of fire.
- We are able to detect faults which if left unattended would lead to breakdown or risk of fire.
- We provide a clear report which details the suspected cause of the fault, the severity of the problem and the remedial action required to repair.
- All our surveyors are certified professional electrical thermographers.
- We only use high resolution thermal imaging equipment (resolution of 640 x 480 pixels) which allows us to detect faults on smaller components and allows us to keep a safe distance from potential faults.
- We are able to cover a lot of ground during a survey
- Insurance companies provide positive feedback on our service and follow up activities.
- You should be able to get a reduction in your business insurance by having a thermographic survey conducted.

A FLIR Thermacam SC640 was used to capture the thermal data which is recorded within this report. Report has been produced using Flir System Reporter Professional 8.5 Software.

Following completion of a survey we produce a report which will be issued to the client within five working days.

Contact us for a detailed quotation.

Mark Pedersen CEng MIET

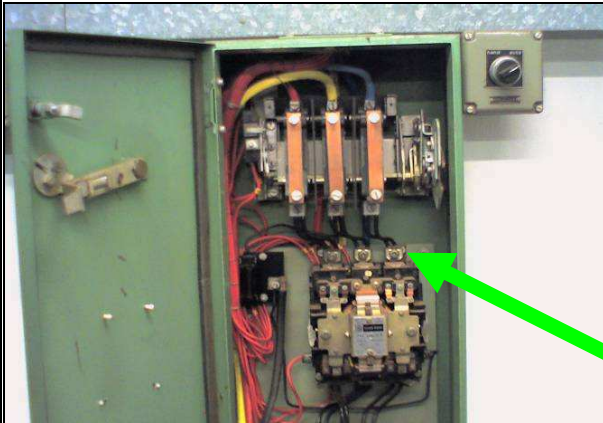
Chartered Electrical Engineer and *Certified Level 2 Thermographer*
Director - Pixel Thermographics Ltd

Summary of Issues Found

Location	Equipment	Type	Priority	Page Number
Block 157 Pump House	157 Pump Set 3	Contactors	1	5
Old Wing - Main UPS Room	UPS Input / Output Panel	Connection From Breaker	2	6
Main Switchroom 2	Fuseboard A-1-4-6	Fuse Blue 6	2	7
Main Control Room	Main Switchboard (Central)	Panel 5 - Main Breaker - Phase 2 & 3	1	8
Line 7 PLC Section	AB PLC Digital Output Rack	Terminal No. 7	1	9
Sanitex Roller Machine	Main Control Panel	Overload Incoming Phase 3	1	10
Main Control Room	Main Switchboard (Aft)	Panel 15 - Bottle Fuse - Lighting Board L11 Phase 3	1	11
Main Control Room	Main Switchboard (Central)	24V Simos Alarms Negative Battery Connection	2	12
Main Switchroom	Power Factor Control Cubicle 1	Capacitor Bank No. 6	3	13
Machine Room	Sewing Machine F6 Control Panel	PCB Mounted Fuse Carrier	2	14
Main 33kV Switchyard	Incoming 33kV Supply Line 2	Phase 1 Connection	2	15

High risk of equipment failure, loss of production and safety of personnel	Priority 1	Urgent attention required
Medium risk of equipment failure, loss of production and safety of personnel	Priority 2	Investigation or corrective action is necessary at the earliest opportunity
Low risk of equipment failure, loss of production and safety of personnel	Priority 3	Plan repair at next natural outage. Non urgent.
No risk of equipment failure, loss of production and safety of personnel	Priority 0	Image included for information only

VISUAL IMAGE



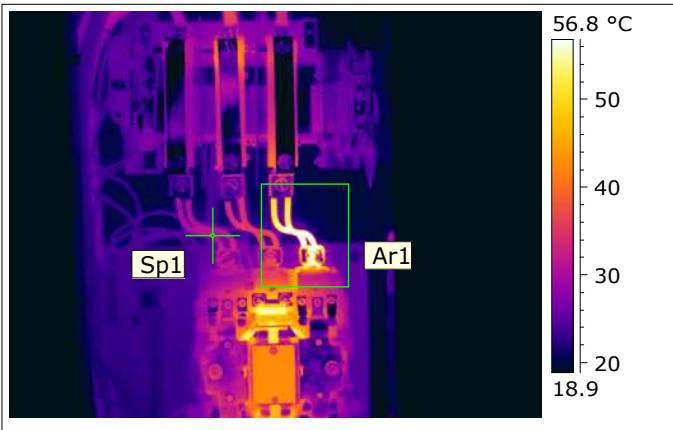
EQUIPMENT INFORMATION

Location	Block 157 Pump House
Equipment	157 Pump Set 3
Type	Contactator

RATING OF EQUIPMENT

Phase	Measured Current (Amps)
Red	43
Yellow	42
Blue	43

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	11.7 °C
Emissivity	0.94
Object Distance	1.5 m
Reflected Apparent Temperature	12.9 °C
Image File name	Contactator.jpg
Sp1 Temperature	31.0 °C
Ar1 Max. Temperature	67.0 °C
Difference Ar1 - Sp1	36.0 °C
Fault Rating	Priority 1

ANALYSIS & OBSERVATIONS

Elevated temperature noted on incoming feed to contactor from isolator.

Current measurements were taken and 43 Amps was measured across each phase indicating that load is not the cause of the temperature rise.

Likely cause of the rise is a poor or high resistance connection.

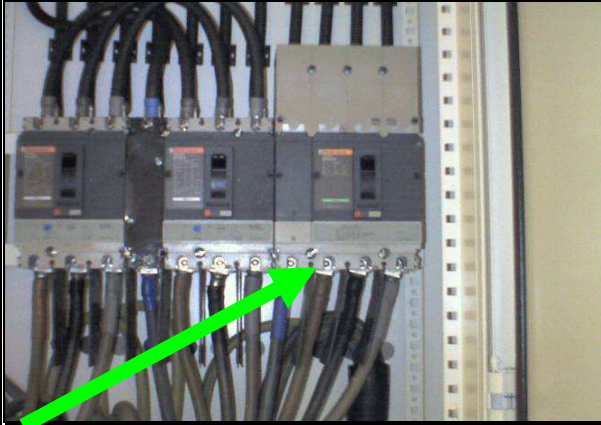
Recommendation is to inspect, clean and remake off this connection

Repaired by:

Date:

Comment:.....

VISUAL IMAGE



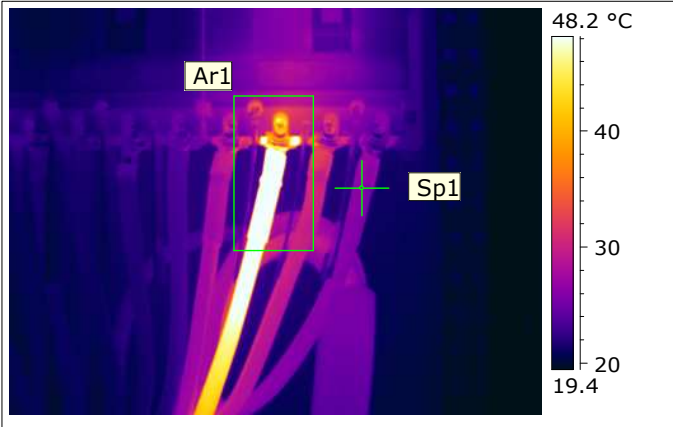
EQUIPMENT INFORMATION

Location	Old Wing - Main UPS Room
Equipment	UPS Input / Output Panel
Type	Connection From Breaker

RATING OF EQUIPMENT

Phase	Measured Current (Amps)
Phase 1	40 A
Phase 2	41 A
Phase 3	41 A

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	21.0 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	21.0 °C
Image File name	IR_10238.jpg
Sp1 Temperature	25.8 °C
Ar1 Max. Temperature	58.4 °C
Difference Ar1 - Sp1	32.6 °C
Fault Rating	Priority 2

ANALYSIS & OBSERVATIONS

Elevated temperature noted on phase 1 (brown) outgoing connection from the breaker. The temperature varied considerably during the course of the survey and the Thermographer witnessed temperatures up to 70°C shortly before this image was recorded.

The likely cause of this rise in temperature is a poor or loose connection to the breaker.

It is recommended that the lug is cut off and replaced with new. Also replace the breaker as internal temperatures may well have exceeded the manufacturers recommendations.

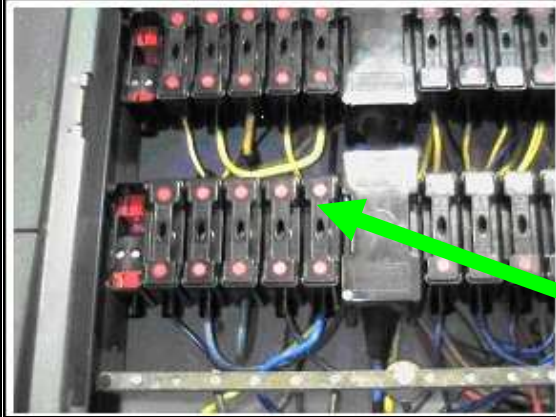
The breaker is a **Merlin Gerin Compact NS160NA**

Repaired by:

Date:

Comment:.....

VISUAL IMAGE



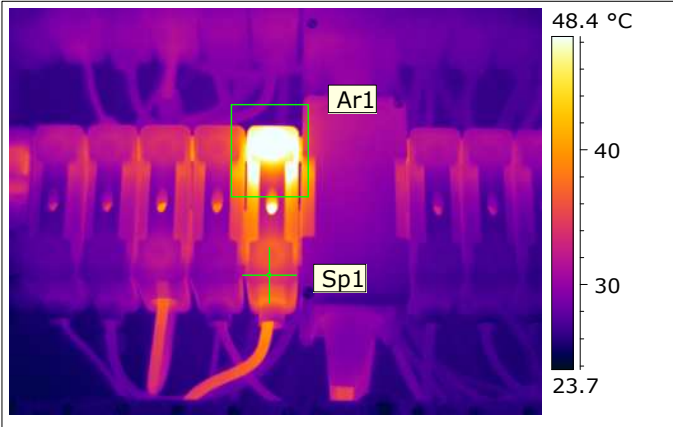
EQUIPMENT INFORMATION

Location	Main Switchroom 2
Equipment	Fuseboard A-1-4-6
Type	Fuse Blue 6

RATING OF EQUIPMENT

Phase	Measured Current (Amps)
Red	23
Yellow	16
Blue	31

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	23.2 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	25.0 °C
Image File name	IR_0033.jpg
Sp1 Temperature	34.7 °C
Ar1 Max. Temperature	56.7 °C
Difference Ar1 - Sp1	22.0 °C
Fault Rating	Priority 2

ANALYSIS & OBSERVATIONS

Raised temperature noted on in-feed side of fuse carrier.

Temperature imbalance such as this would not be expected across a fuse and indicates an internal problem.

Possible source of temperature rise includes poor connection, loose fuse fixing, or high resistance blade connections.

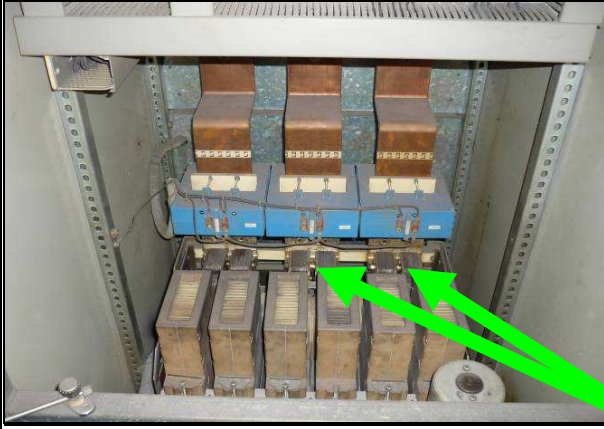
Recommendation is to inspect, check fuse carrier blades for signs of pitting or heat damage, re-tighten the fuse fixings and re-tighten all connections.

Repaired by:

Date:

Comment:.....

VISUAL IMAGE



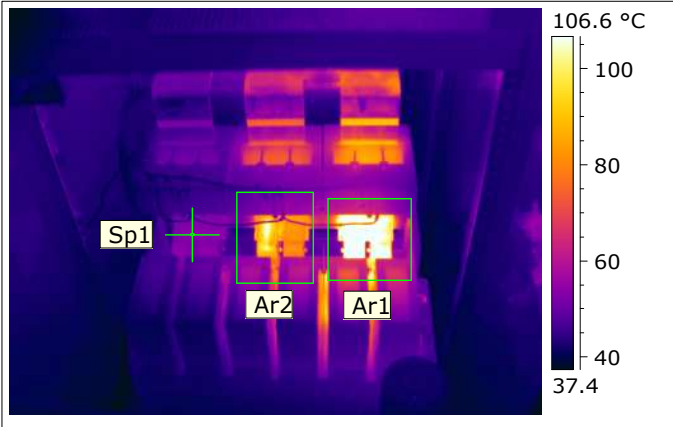
EQUIPMENT INFORMATION

Location	Main Control Room
Equipment	Main Switchboard (Central)
Type	Panel 5 - Main Breaker - Phase 2 & 3

RATING OF EQUIPMENT

Phase	Measured Current (Amps)
Red	550 Amps
Yellow	550 Amps
Blue	550 Amps

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	25.0 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	25.0 °C
Image File name	IR_6731.jpg
Sp1 Temperature	53.4 °C
Ar1 Max. Temperature	163.9 °C
Ar2 Max. Temperature	111.6 °C
Difference Ar1 - Sp1	110.5 °C
Fault Rating	Priority 1

ANALYSIS & OBSERVATIONS

Significantly elevated temperatures noted on the contacts of Phases 3 and 2 of the circuit breaker.

Likely cause of this heat rise is poor or dirty connections between the breaker and the contact.

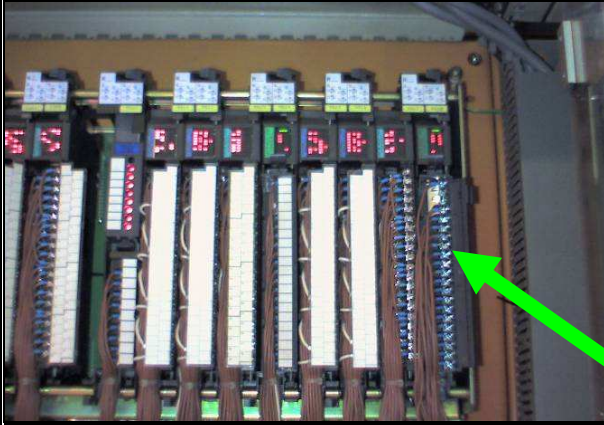
Recommendation is to remove the breaker and completely clean the connections and contacts of phases 2 and 3.

Repaired by:

Date:

Comment:.....

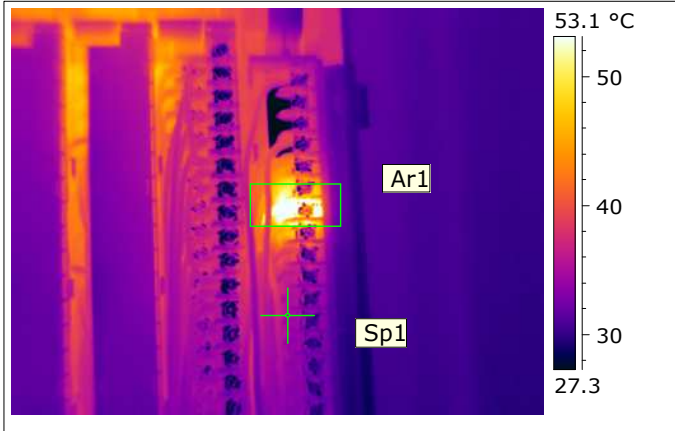
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	Line 7 PLC Section
Equipment	AB PLC Digital Output Rack
Type	Terminal No. 7

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	21.5 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	21.5 °C
Image File name	IR_2007-08-07_0026.jpg
Sp1 Temperature	34.3 °C
Ar1 Max. Temperature	71.8 °C

Difference Ar1 - Sp1	37.5 °C
Fault Rating	Priority 1

ANALYSIS & OBSERVATIONS

Temperature increase on terminal No.7.

No information was available at the time of survey to indicate the downstream device but significant temperature rise indicates an issue worth investigating.

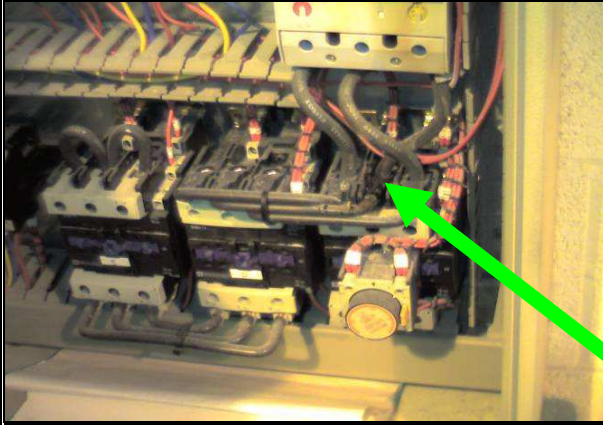
Recommendation is to inspect and identify downstream connected device. Check expected operating currents.

Repaired by:

Date:

Comment:.....

VISUAL IMAGE



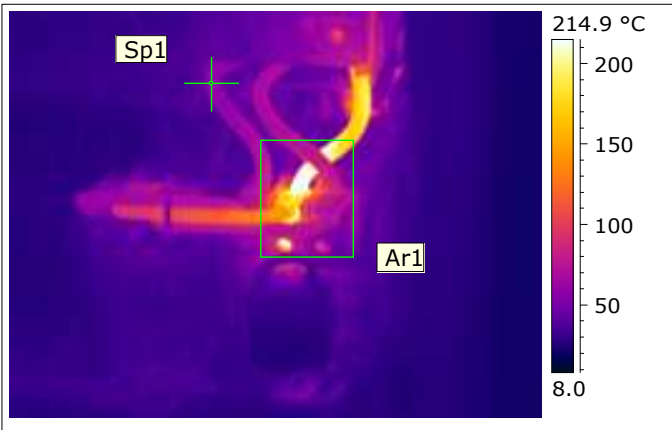
EQUIPMENT INFORMATION

Location	Sanitex Roller Machine
Equipment	Main Control Panel
Type	Overload Incoming Phase 3

RATING OF EQUIPMENT

Phase	Measured Current (Amps)
Red	67
Yellow	73
Blue	79

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	21.0 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	21.0 °C
Image File name	IR_2630.jpg
Sp1 Temperature	60.9 °C
Ar1 Max. Temperature	273.6 °C
Difference Ar1 - Sp1	212.7 °C
Fault Rating	Priority 1

ANALYSIS & OBSERVATIONS

Dangerously high temperatures noted on incoming phase 2 connection to main overload unit.

Visible heat damage also noted at the time of the survey.

The unit manager and operator were both made aware of this fault immediately and the decision was made to isolate this equipment until a repair could be carried out.

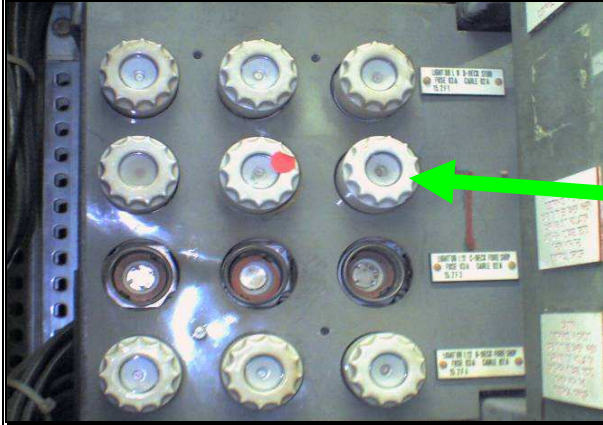
Recommendation is to replace the overload, the contactor and the 3 feed cables which have all suffered heat damage as a result of this fault.

Repaired by:

Date:

Comment:.....

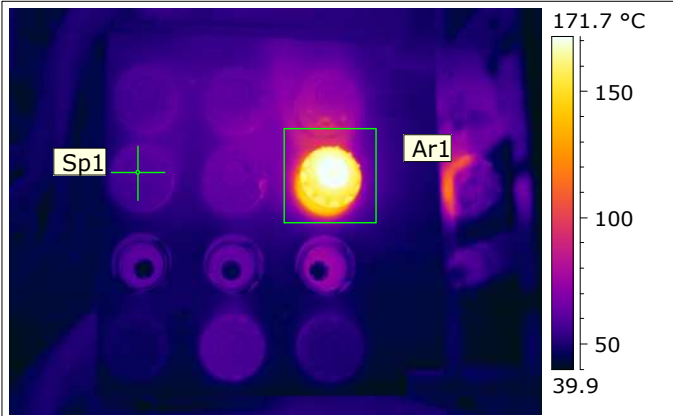
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	Main Control Room
Equipment	Main Switchboard (Aft)
Type	Panel 15 - Bottle Fuse - Lighting Board L11 Phase 3

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	25.0 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	25.0 °C
Image File name	IR_6727.jpg
Sp1 Temperature	58.9 °C
Ar1 Max. Temperature	193.8 °C
Difference Ar1 - Sp1	134.9 °C
Fault Rating	Priority 1

ANALYSIS & OBSERVATIONS

Significantly elevated surface temperatures noted on bottle fuse carrier.

Likely causes of heat rise include dirty or pitted conductive surface, loose or poorly fitted fuse carrier or poor outgoing connection at rear.

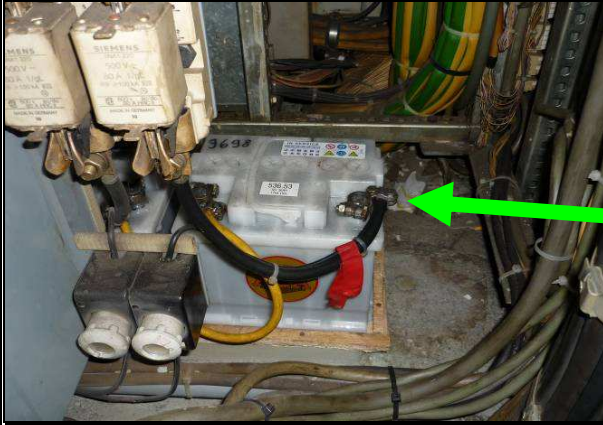
Recommendation is to remove the carrier, replace the fuse, check all surfaces are clean and re-install the carrier ensuring it is tight.

Repaired by:

Date:

Comment:.....

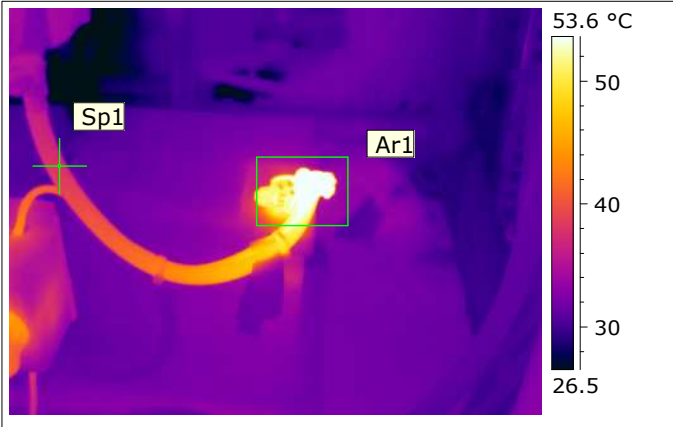
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	Main Control Room
Equipment	Main Switchboard (Central)
Type	24V Simos Alarms Negative Battery Connection

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	25.0 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	25.0 °C
Image File name	IR_6733.jpg
Sp1 Temperature	37.9 °C
Ar1 Max. Temperature	61.3 °C
Difference Ar1 - Sp1	23.5 °C
Fault Rating	Priority 2

ANALYSIS & OBSERVATIONS

Elevated temperature noted on battery negative connection.
Likely cause of heat rise is a poor or loose connection.
Recommendation is to inspect, clean and re-tighten this connection.

Repaired by:

Date:

Comment:.....

VISUAL IMAGE



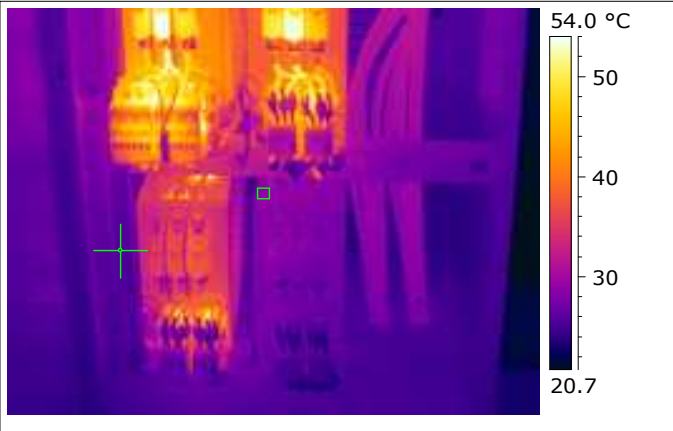
EQUIPMENT INFORMATION

Location	Main Switchroom
Equipment	Power Factor Control Cubicle 1
Type	Capacitor Bank No. 6

RATING OF EQUIPMENT

Phase	Measured Current (Amps)
Red	N/A
Yellow	N/A
Blue	N/A

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	20.0 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	20.0 °C
Image File name	IR_8067.jpg
Sp1 Temperature	25.7 °C
Ar1 Max. Temperature	30.2 °C
Difference Ar1 - Sp1	4.4 °C
Fault Rating	Priority 3

ANALYSIS & OBSERVATIONS

Capacitor bank 6 noted as not being under load at time of survey.

Inspection of PFC controls indicated that the bank should be energized and therefore highlights a possible control issue.

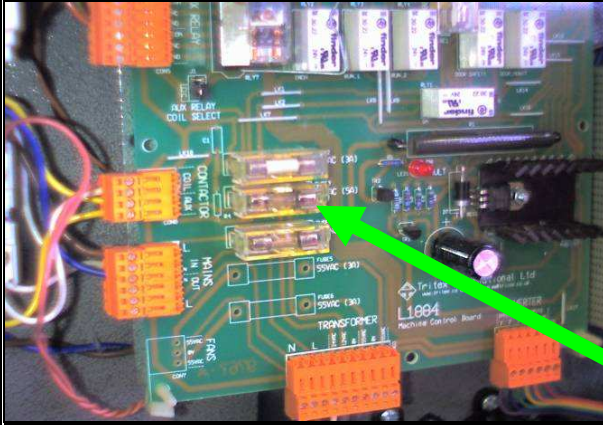
Recommendation is to test, inspect, and re-instate this capacitor bank.

Repaired by:

Date:

Comment:.....

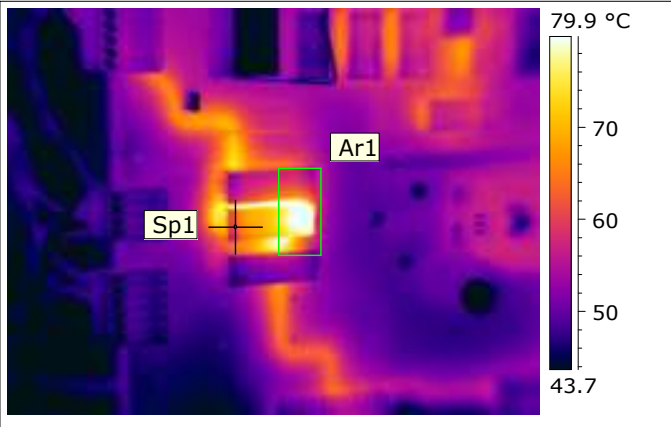
VISUAL IMAGE



EQUIPMENT INFORMATION

Location	Machine Room
Equipment	Sewing Machine F6 Control Panel
Type	PCB Mounted Fuse Carrier

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	21.0 °C
Emissivity	0.95
Object Distance	1.5 m
Reflected Apparent Temperature	21.0 °C
Image File name	IR_1400.jpg
Sp1 Temperature	61.9 °C
Ar1 Max. Temperature	94.3 °C
Difference Ar1 - Sp1	32.4 °C
Fault Rating	Priority 2

ANALYSIS & OBSERVATIONS

Elevated temperature noted on end of fuse carrier on machine PCB unit.

Temperature differential across a fuse carrier would not be expected and indicates an internal issue.

Discussion with machine operator highlighted that the machine stops intermittently and this fault could well be the cause of this.

Recommendation is to replace the fuse carrier and fuse.

Repaired by:

Date:

Comment:.....

VISUAL IMAGE



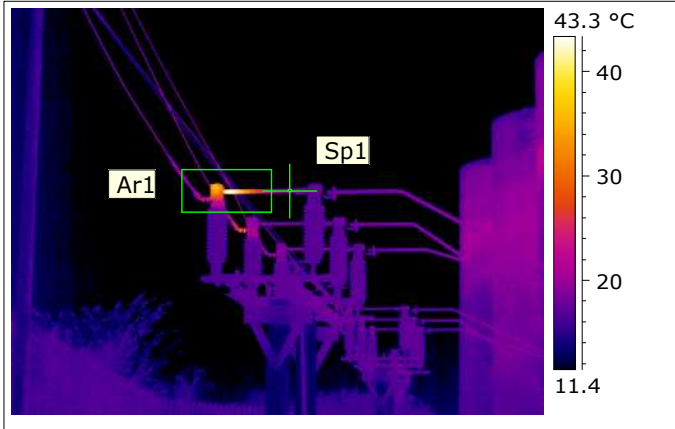
EQUIPMENT INFORMATION

Location	Main 33kV Switchyard
Equipment	Incoming 33kV Supply Line 2
Type	Phase 1 Connection

RATING OF EQUIPMENT

Phase	Measured Current (Amps)
Red	N/A
Yellow	N/A
Blue	N/A

THERMAL IMAGE



RADIOMETRIC DATA

Object Parameters	Value
Atmospheric Temperature	16.0 °C
Emissivity	0.40
Object Distance	7.0 m
Reflected Apparent Temperature	16.0 °C
Image File name	Pole 1L1 Substation 1.jpg
Sp1 Temperature	19.9 °C
Ar1 Max. Temperature	57.2 °C

Difference Ar1 - Sp1	37.3 °C
Fault Rating	Priority 2

ANALYSIS & OBSERVATIONS

Elevated temperature noted on 33kV feed line within the switchyard compound.

No current data was available at the time of this survey.

Further investigation and monitoring required of this connection. If degradation is observed then the supply authority should be informed.

Repaired by:

Date:

Comment:.....

The following plant and panels were inspected during the survey:

A full inventory of inspected panels, systems or items would appear on this and subsequent pages.