



ti thermal imaging ltd.

Thermal Imaging Report

Inspection Ref. MOTORS DEMO (MOTORS)

TI LTD / MECHANICAL DEMO

2nd Apr 2015

Client	TI LTD
Site	MECHANICAL DEMO Ti KT91BD
Contacts	Richard Wallace richard@thermalimaging.co.uk 0203 0442940

Introduction to your TI Thermal Imaging LTD risk management thermographic inspection

This mechanical and visual thermographic inspection has been carried out using a FLIR Professional thermal imaging camera with data input onto our purpose built tablet platform TICOR™ for instantaneous results and report generation. Our WEBCOR™ campaign and inspection management system houses all data that is permanently accessible over the internet allowing the user to track, monitor and adjust repair status of problems found during the inspection. This bespoke motors TICOR™ module has 11 specific inspection points all of which are trended between periodic inspections offering a true predictive maintenance platform so that components, particularly with problems, can be monitored and remedial campaigns can be created around planned downtime rather than invasive unplanned shutdowns. Ultimately this approach will keep the assets running without interruptive power outages which can prevent production and cost company revenue.

Our TICOR™ and WEBCOR™ System sync's together to ensure all data is held centrally and updated upon internet connection.

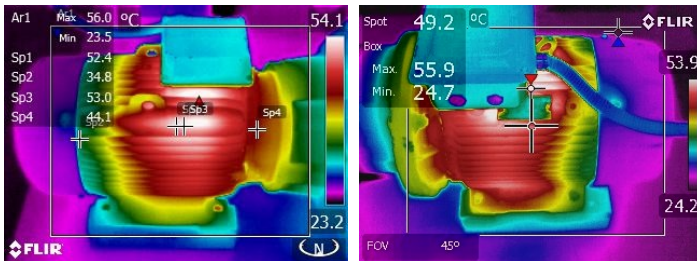
This is a guide which should help you to fully understand how the inspection was performed and how the results were achieved

- The framework to this inspection can either be generated onsite during the inspection, building the list during the survey or a list exported to MS Excel can be imported into the Android tablet to provide comprehensive information such as item locations, tag numbers, work orders etc.
- Images are captured of all online items and a record is kept of temperature data to enable a trending programme to begin. Subsequent inspections will see the addition of a new image for each inspection so that temperatures can be monitored.
- Trending images and anomalous pieces of equipment have been recorded as one of two types of inspection:
 - o Thermal – This covers temperature related anomalies
 - o Visual – This covers all visual findings only
- All component trending images are taken under normal load conditions.
- Panels have been removed where safe and possible to do so and where covered by the Permit To Work system. In addition load readings have been captured using a clamp meter only where covered by the Permit to Work system and where safe to do so. In some cases load readings have not been taken so these are left as blank intentionally and read as N/A.
- A complete inventory will be built of the equipment giving Test Status at the time of the inspection allowing transparency to the inspection and what occurred with each piece of equipment. These Test Status include:

TBT	To Be Tested	These appear in bold on the thermographers tablet to identify which items are still to be tested
T	Tested	Marked as Tested once images and faults have been documented
NTLO	Not Tested Locked Out	Selected if the item could not be opened safely
NTNL	Not Tested No Load	Selected if the item was offline at the time of inspection and could not be started
NTNA	Not Tested Not Available	Selected if the item is no longer available
NTNS	Not Tested Not Specified	Selected if an item is found to be unspecified
NTUR	Not Tested Under Repair	Selected if an item is currently under a repair procedure
NSFI	Not Scheduled For Inspection	Selected if an item is not due or needed to be tested
NTTC	Not Tested Time Constraint	Selected if the inspection has not been allocated enough time or access problems have cause it to overrun.

- Emissivity is the value in which an object emits it's infra-red radiation and is also directly proportional to it's reflectivity. For example if an item had 0.9 emissivity then it's reflectivity would be 0.1. This inspection uses an emissivity set between 0.9 and 0.96 because this is found to be suitable when assessing the temperatures of most motors and casings due to them usually being housed in various types of metal which has a similar emissivity value. Emissivity is only changed were absolutely necessary. An example of this would be copper conductor with no electrical tape/labels attached.
- Anomalous components are assessed in several ways.
 1. Elevated or abnormal temperatures either by itself or relating to a reference motor operating under similar conditions.
 2. Acoustic references around the motor.
 3. Excessive vibration felt around the motor and its mounts.
- Estimated fault component temp at full load is estimated at 55° C above ambient depending on the insulation class of the motor as there are several classes available. Using this method we can apply a temperature anomaly to the measured temperature and grade the fault accordingly as follows:

Fault Ratings	Minor	Important	Serious	Critical
55° C above ambient	0-7	8-15	16-32	33+



Summary

The Infrared Inspection was performed by T1 Thermal Imaging, by a certified infrared Thermographer. All of the items inspected are listed in this TICOR report. Any anomalies are listed in order of priority based on the component's temperature rise, as measured from a reference component of equal type and load at the time of the inspection. T1 Thermal Imaging assumes no liability directly or indirectly as a result of this inspection.

Priority	Current Inspection	Prior Inspection	Percent of Change
Thermal			
Not Specified	0	0	N/A
Minor	0	0	N/A
Important	0	0	N/A
Serious	0	0	N/A
Critical	0	0	N/A
Visual			
Not Specified	0	0	N/A
Minor	0	0	N/A
Important	0	0	N/A
Serious	0	0	N/A
Critical	0	0	N/A
Ultrasonic			
Not Specified	0	0	N/A
Minor	0	0	N/A
Important	0	0	N/A
Serious	0	0	N/A
Critical	0	0	N/A

I hereby certify the project was inspected by myself or under my direction and that the enclosed data is the result of this inspection.

TICOR

Louw, Stephan

Inventory

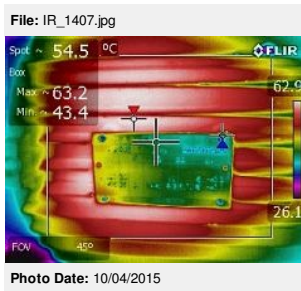
Equipment Description	Item ID	PM Work Order	Phase	kW	Number of Poles	Running Speed	Rating	Voltage	Frequency	Manufacturer	Alternating or Direct Current	Motor Efficiency	IP Rating	Duty	Problem #s	Status
BASEMENT																T
PUMP MOTOR 1	AGMIE 100 L 40	N/A	3 PHASE	3 KW	4	1400 RPM	6.9 AMPS	400 V	50 HZ	CAMAK	AC	85.5 %	55	S1 CONTINUOUS DUTY		T
PUMP MOTOR 2	1805133867	N/A	3 PHASE	15 KW	N/A	1400 RPM	30.5 AMPS	400 V	50 HZ	CAMAK	AC	N/A %	55	S1 CONTINUOUS DUTY		T
PUMP MOTOR 4	XNADH53791HTOP	N/A	3 PHASE	11 KW	4	1400 RPM	22 AMPS	400 V	50 HZ	ARMSTRONG	AC	85 %	55	N/A		T
PUMP MOTOR 5	S0074CHJ	N/A	3 PHASE	3 KW	4	1400 RPM	6.1 AMPS	400 V	50 HZ	N/A	AC	83 %	55	S1 CONTINUOUS DUTY		T
PUMP MOTOR 3	S0024CJ	N/A	3 PHASE	0.55 KW	N/A	1400 RPM	1.25 AMPS	400 V	50 HZ	N/A	AC	77 %	55	S1 CONTINUOUS DUTY		T

Trending Data

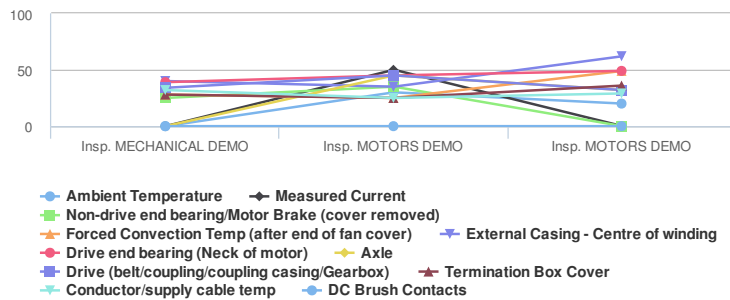
Current Inspection No	MOTORS DEMO
Report Date	1 st Sep 2015
Item No	1
Item ID	AGMIE 100 L 40
Status	T
PM Work Order	N/A
Phase	3 PHASE
kW	3 KW
Number of Poles	4
Running Speed	1400 RPM
Rating	6.9 AMPS
Voltage	400 V
Frequency	50 HZ
Manufacturer	CAMAK
Alternating or Direct Current	AC
Motor Efficiency	85.5 %
IP Rating	55
Duty	S1 CONTINUOUS DUTY



BASEMENT - PUMP MOTOR 1



Trend Data Graph



Inspection History

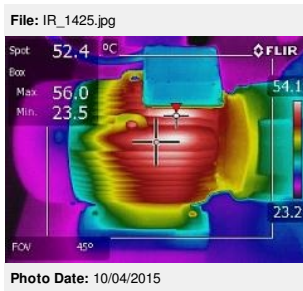
Inspection Reference	Date Inspected	Ambient Temperature	Measured Current	Non-drive end bearing/Motor Brake (cover removed)	Forced Convection Temp (after end of fan cover)	External Casing - Centre of winding	Drive end bearing (Neck of motor)	Axle	Drive (belt/coupling/coupling casing/Gearbox)	Termination Box Cover	Conductor/supply cable temp	DC Brush Contacts
MOTORS DEMO	10 th Apr 2015	20.0 °C	0 AMPS	0 °C	49.7 °C	62.4 °C	49.3 °C	32.9 °C	32.9 °C	36.0 °C	29.5 °C	0.0 °C
MOTORS DEMO	2 nd Apr 2015	30.0 °C	50.0 AMPS	35.0 °C	25.0 °C	35.0 °C	45.0 °C	45.0 °C	45.0 °C	25.0 °C	25.0 °C	0.0 °C
MECHANICAL DEMO	1 st Apr 2015	°C	NOT AVAILABLE AMPS	25.0 °C	28.0 °C	40.0 °C	39.0 °C	NOT AVAILABLE °C	34.0 °C	28.0 °C	32.0 °C	0.0 °C

Trending Data

Current Inspection No	MOTORS DEMO
Report Date	1 st Sep 2015
Item No	2
Item ID	1805133867
Status	T
PM Work Order	N/A
Phase	3 PHASE
kW	15 KW
Number of Poles	N/A
Running Speed	1400 RPM
Rating	30.5 AMPS
Voltage	400 V
Frequency	50 HZ
Manufacturer	CAMAK
Alternating or Direct Current	AC
Motor Efficiency	N/A %
IP Rating	55
Duty	S1 CONTINUOUS DUTY



BASEMENT - PUMP MOTOR 2



Inspection History

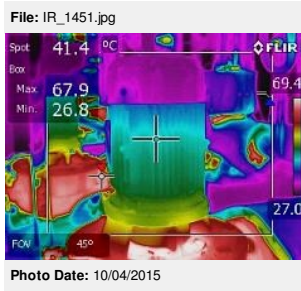
Inspection Reference	Date Inspected	Ambient Temperature	Measured Current	Non-drive end bearing/Motor Brake (cover removed)	Forced Convection Temp (after end of fan cover)	External Casing - Centre of winding	Drive end bearing (Neck of motor)	Axle	Drive (belt/coupling/coupling casing/Gearbox)	Termination Box Cover	Conductor/supply cable temp	DC Brush Contacts
MOTORS DEMO	10 th Apr 2015	20.0 °C	0 AMPS	0 °C	34.8 °C	53.0 °C	44.1 °C	0 °C	33.9 °C	31.6 °C	30.5 °C	0 °C

Trending Data

Current Inspection No	MOTORS DEMO
Report Date	1 st Sep 2015
Item No	3
Item ID	S0024CJ
Status	T
PM Work Order	N/A
Phase	3 PHASE
kW	0.55 KW
Number of Poles	N/A
Running Speed	1400 RPM
Rating	1.25 AMPS
Voltage	400 V
Frequency	50 HZ
Manufacturer	N/A
Alternating or Direct Current	AC
Motor Efficiency	77 %
IP Rating	55
Duty	S1 CONTINUOUS DUTY



BASEMENT - PUMP MOTOR 3



Inspection History

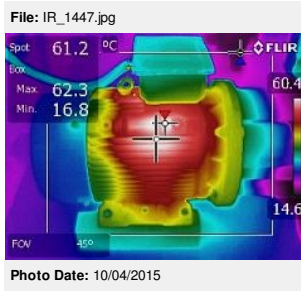
Inspection Reference	Date Inspected	Ambient Temperature	Measured Current	Non-drive end bearing/Motor Brake (cover removed)	Forced Convection Temp (after end of fan cover)	External Casing - Centre of winding	Drive end bearing (Neck of motor)	Axle	Drive (belt/coupling/coupling casing/Gearbox)	Termination Box Cover	Conductor/supply cable temp	DC Brush Contacts
MOTORS DEMO	10 th Apr 2015	20.0 °C	0 AMPS	0 °C	36.3 °C	41.7 °C	46.6 °C	0 °C	61.2 °C	35.2 °C	34.3 °C	0 °C

Trending Data

Current Inspection No	MOTORS DEMO
Report Date	1 st Sep 2015
Item No	4
Item ID	XNADH53791HTOP
Status	T
PM Work Order	N/A
Phase	3 PHASE
kW	11 KW
Number of Poles	4
Running Speed	1400 RPM
Rating	22 AMPS
Voltage	400 V
Frequency	50 HZ
Manufacturer	ARMSTRONG
Alternating or Direct Current	AC
Motor Efficiency	85 %
IP Rating	55
Duty	N/A



BASEMENT - PUMP MOTOR 4



Inspection History

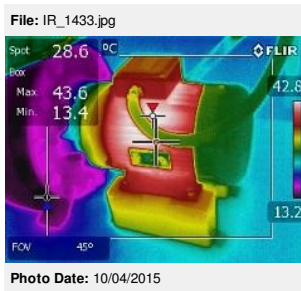
Inspection Reference	Date Inspected	Ambient Temperature	Measured Current	Non-drive end bearing/Motor Brake (cover removed)	Forced Convection Temp (after end of fan cover)	External Casing - Centre of winding	Drive end bearing (Neck of motor)	Axle	Drive (belt/coupling/coupling casing/Gearbox)	Termination Box Cover	Conductor/supply cable temp	DC Brush Contacts
MOTORS DEMO	10 th Apr 2015	20.0 °C	0 AMPS	0 °C	39.3 °C	61.0 °C	44.2 °C	0 °C	29.0 °C	31.0 °C	30.2 °C	0 °C

Trending Data

Current Inspection No	MOTORS DEMO
Report Date	1 st Sep 2015
Item No	5
Item ID	S0074CHJ
Status	T
PM Work Order	N/A
Phase	3 PHASE
kW	3 KW
Number of Poles	4
Running Speed	1400 RPM
Rating	6.1 AMPS
Voltage	400 V
Frequency	50 HZ
Manufacturer	N/A
Alternating or Direct Current	AC
Motor Efficiency	83 %
IP Rating	55
Duty	S1 CONTINUOUS DUTY



BASEMENT - PUMP MOTOR 5



Inspection History

Inspection Reference	Date Inspected	Ambient Temperature	Measured Current	Non-drive end bearing/Motor Brake (cover removed)	Forced Convection Temp (after end of fan cover)	External Casing - Centre of winding	Drive end bearing (Neck of motor)	Axle	Drive (belt/coupling/coupling casing/Gearbox)	Termination Box Cover	Conductor/supply cable temp	DC Brush Contacts
MOTORS DEMO	10 th Apr 2015	20.0 °C	0 AMPS	0 °C	36.2 °C	43.5 °C	33.6 °C	0 °C	24.7 °C	33.4 °C	26.9 °C	0 °C

Client Work Appraisal

We are continually trying to improve our service and ensure that our inspections are carried out to the highest standards. Please use the form below to add your comments, anonymously if you prefer, and send back to us at the address above or:

Email: richard@thermalmaging.co.uk

Service	Excellent	Good	Mediocre	Poor	Comments
Office					
Response time to enquiry					
Content of information sent on enquiry					
Telephone and email manner					
Price					
Value					
Engineer					
Time keeping					
Appearance					
Code of conduct					
Subject knowledge					
Method of work					
Engineer flexibility					
Inspection Specification					
Equipment and software					
Report content					
Report delivery time					
Report retrieval					
Other comments					