FLIR APPLICATION STORY

FLIR SYSTEMS

Infrared Thermography at largest offshore Intel plant: Intel Malaysia

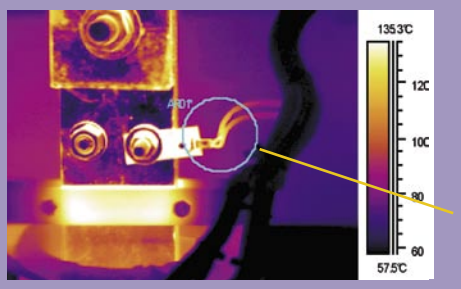
Intel Malaysia, with a workforce of 8,000 employees the largest offshore Intel manufacturing plant, is a high volume semiconductor manufacturing plant that utilizes state-of-the-art technology to produce advanced microprocessor chips for computers. The highly sophisticated assembly & testing process for microprocessor chips has little tolerance to facility and power supply interruptions. It is crucial for the Intel Facility Department to keep its manufacturing equipment working at all times.

Infrared Thermography at Intel Malaysia

Infrared thermography activities started at the Intel Facility Department in 1996 with the engagement of an external infrared service provider.

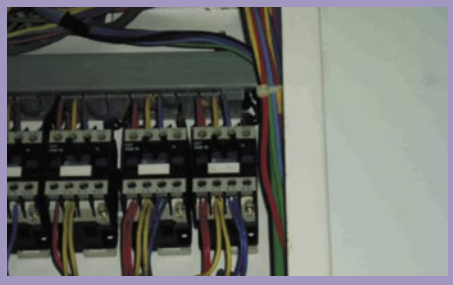
Year 2000 was a turning point for infrared activities at Intel with the establishment & formation of the "Internal Infrared Thermography Team", whose members are mainly engineers or certified electrical experts. The need for the internal infrared thermography team was triggered due to frequent electrical breaker tripping and flashovers of starter boards. These breakdowns caused interruptions to the delivery of facility services (such as electrical systems, process chilled water, compressed dry air, vacuum etc.) avoiding the production to run 24 hours a day, 7 days a week.

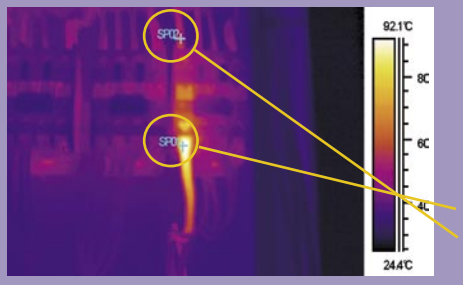
Burnt wire for power meter and voltage & Amp meter



Emissivity	0.60
Object Distance	0.5m
Ambient Temperature	22.8°C
Label	Value
AR01*	**max 163.6°C**

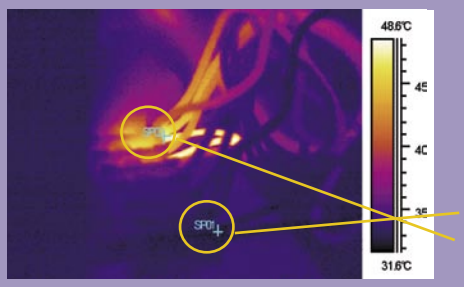
Loose connection caused heat build up in lighting contactor





Emissivity	0.97
Object Distance	0.7m
Ambient Temperature	22.8°C
Label	Value
SP01	**97.7°C**
SP02	**55.0°C**

Loose connection at 11kV switchgear charger



Emissivity	0.98
Object Distance	0.5m
Ambient Temperature	22.8°C
Label	**Value**
SP01	**32.5°C**
SP02	**47.3°C**

Predictive Maintenance Requirements

In 1999, there were five "Interruptions to Production (ITP)" and two near misses which caused a large amount of losses due to unexpected equipment breakdowns. Hence in 2000 alone, Intel Malaysia spent hundreds of thousands of US$ on premature repair and parts replacement to reduce facility equipment breakdowns. However, the payback for such repairs was not as positive, as unexpected equipment breakdowns (such as motor winding failure, damaged motor contactors, loose wire connections) still occurred. Intel Malaysia decided to implement a structured predictive maintenance program, in early 2000, to reduce unpredictable, premature equipment repair and replacement costs.

Apart from vibration analysis, oil analysis and ultrasonic detection, infrared thermography is one of the four key-elements in the predictive maintenance program.

Infrared Thermography is used to perform inspections on all electrical systems such as 11kV switchgear, transformers, medium voltage & low voltage motors, main switchboards, distribution boards and all motor starter boards.

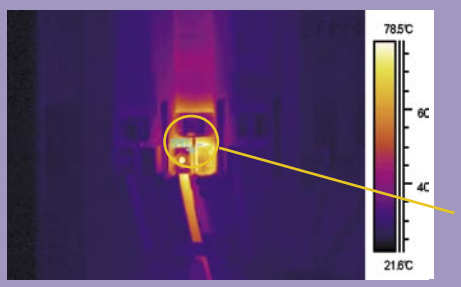
Infrared Thermography Implementation Strategy

The implementation of Infrared thermography started off in early 2000 with the purchase of a FLIR infrared camera. But, only limited knowledge and little practical hands-on experience were available.

This was overcome by attending a FLIR Systems Infrared Training Center (ITC) Level I course, which not only provided Intel with detailed and comprehensive knowledge and technical know-how, but also certified the infrared camera users as Level 1 Infrared Thermographers. The practical case studies at the end of each training session helped to enhance understanding regarding the various applications of infrared thermography.

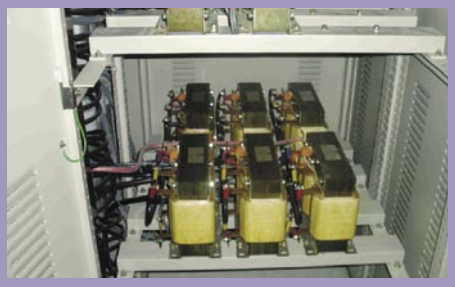
Today, with the commitment and support from management, there are a total of 10 certified Level 1 Infrared Thermographers supporting the infrared activities at Intel Malaysia.

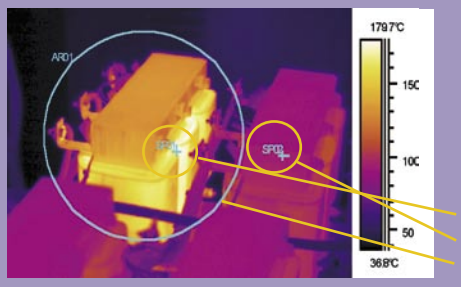
Overheating caused by loose fuse block connection



Emissivity	0.80
Object Distance	0.8m
Ambient Temperature	25.0°C
Label	**Value**
SP01	**76.0°C**
SP02	**31.4°C**

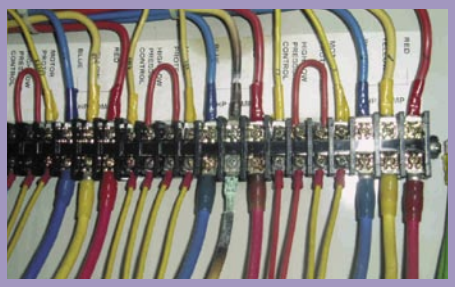
Humming sounds at reactor for capacitor bank due to unmatched of capacitor voltage rating 525V vs 440V

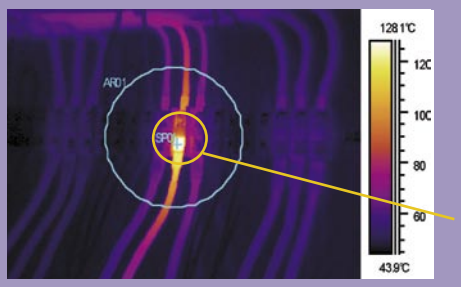




Emissivity	0.95
Object Distance	1.0m
Ambient Temperature	22.8°C
Label	**Value**
SP01	**180.0°C**
SP02	**94.7°C**
AR01 :	**max 183.2°C**

Loose wire connection for control circuit in air conditioning unit





Emissivity	0.95
Object Distance	1.0m
Ambient Temperature	22.8°C

Label	Value
SP01	**129.3°C**
SP02	**64.9°C**

Return on Investment

With just a few rounds of infrared scanning inspections, a total of more than 100 hotspots were detected. By identifying and rectifying these potential problems, a total cost avoidance of over half a million US$ and huge-actual cost saving was achieved.

Extremely satisfied with the outcome contributed by the team's effort in reducing ITP incidents, the management awarded the Infrared Thermography Team with the "Intel Malaysia Site Recognition Award" as a token of appreciation and in recognition of a job well done.

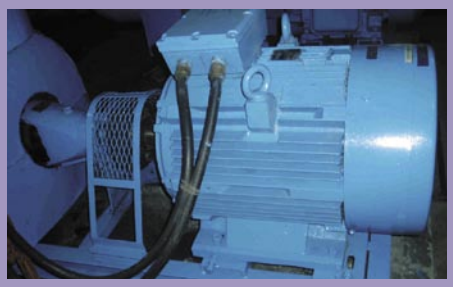
Advantages and benefits of predictive maintenance and infrared

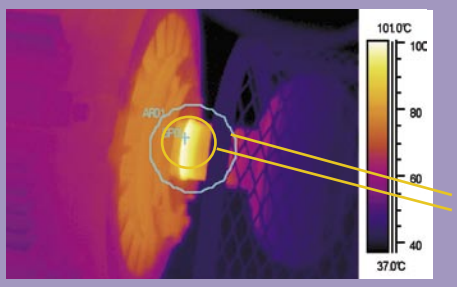
Intel Malaysia has benefited from predictive maintenance activities in identifying & rectifying over 150 ITPs between 2000 and 2003. The implementation of an in-house Predictive Maintenance Program in Intel Malaysia, resulted in a direct yearly cost saving of hundreds of thousands of US$ through the elimination of using external service providers.

The predictive maintenance program has allowed for early detection of premature failure of equipments. It enables the facility department ample time and resources to react and rectify the problem as opposed to resolving a breakdown.

As infrared thermography is non-contact, it is definitely safer and more convenient and comprehensive when it comes to determining the temperature of components and hotspots.

Periodic electrical Motor checking





Emissivity	0.59
Object Distance	0.5m
Ambient Temperature	22.8°C

Label	Value
SP01	**100.7°C**
AR01*	**max 100.7°C**

By Lim Seng Eng
Electrical System Owner
Corporate Services Department
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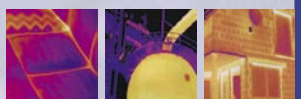

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