

# The Technology Consortium, Ltd.

Ron Hoffman

864-277-1645

4ttc@charter.net

422 Lake Eljema Drive Piedmont, South Carolina 29673, USA

## Arc-Flash and Thermography...

### **Why it makes sense to integrate Thermography with Arc-Flash Studies:**

- *Arc-Flash certifies electrical (Physical system) issues...*
- *Thermography validates component performance and predicts failure...*
- *Thermography is done concurrent to Arc-Flash inspection...*
- *Thermography gives you a graphic representation of efficiency...*
- *Thermography "Sees" objects in a completely new "Light"...*



### **What is an Arc-Flash???**

This 4kV starter cell Explosion (Arc-Blast) was due to a failure of the leads feeding the motor. This panel is not arc-resistant and as can be seen, the rear panel was blown completely off.

*Arc-Flashes are caused when an employee or equipment comes in close proximity to, or in contact with, a conductor or an energized circuit. Arc fault (Flash) occurs due to reduction of dielectric clearances between conductors. Once the path is established, short circuit current flows through air until the upstream protection device clears the fault.*

- ✓ *Phase-to-ground or phase-to-phase incidents result in an Arc-Flash fault.*
- ✓ *The resulting Arc produces "Plasma", which has a much higher degree of conductivity than air.*
- ✓ *The "Plasma-Arc" provides the conductivity path for the current source and consumes all materials within close proximity.*
- ✓ *Arc-Flashes may produce temperatures in excess of 5,000 Degrees Fahrenheit and generate high-pressure waves (Arc-Blasts).*
- ✓ *Arc-Flash incidents are instantaneous and extremely violent.*
- ✓ *Worn, corroded or failing equipment may also cause the Arc-Flash event.*
- ✓ *Arc-Flash is a dangerous condition that will continue until upstream circuit protection devices react.*

*There are Arc-Flash incidents waiting to happen Every Day...*

*Prevention is the best way to avoid them...*

# The Technology Consortium, Ltd.

Ron Hoffman

864-277-1645

4ttc@charter.net

422 Lake Eljema Drive Piedmont, South Carolina 29673, USA

## Why Thermography is a Smart Addition to Arc-Flash...

Consider how Thermography has identified the following problems that were not visually apparent. This technology will significantly increase the value of your Arc-Flash study...

## What is Thermography???

Everything, including ice cubes, emits heat! Thermography uses this physical characteristic to determine, identify, and quantify thermal inconsistencies and variations.

Thermography is a real-time, non-contact visual testing process capable of determining less than one tenth of a degree ( $0.07^{\circ}$  C.) temperature variation. Because Thermography is a non-contact, non-destructive test, there is no need to reduce, or cease your normal manufacturing operations. This also allows the Thermographer to work in concert with the Arc-Flash Team to identify and record thermal data that is not visually apparent. This data will then generate a report listing specific findings and anomalies. This information will allow you to predict failures and plan for shutdowns, repairs, replacements, or other corrective actions.

Note: The Highest Temperature differential (Heat) is represented by the Brighter (Whiter) color shown...

This is what the Arc-Flash Technician "Sees"...



This is what Thermography "Sees"...

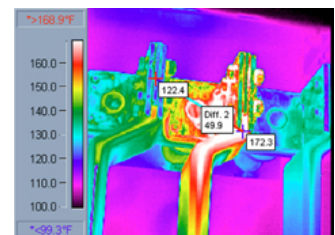


Overheating contacts inside this load tap changer on a main power transformer has caused a dramatic increase in the temperature of the oil inside, posing a potentially dangerous situation. A normal load tap changer is usually cooler than the main tank.

This is what the Arc-Flash Technician "Sees"...



This is what Thermography "Sees"...



Thermography easily detects the thermal inconsistencies of this faulty disconnect switch.

# The Technology Consortium, Ltd.

Ron Hoffman

864-277-1645

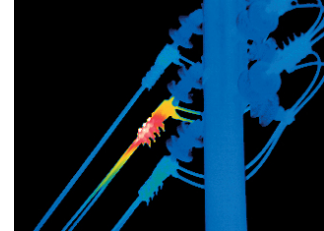
4ttc@charter.net

422 Lake Eljema Drive Piedmont, South Carolina 29673, USA

*This is what the Arc-Flash Technician "Sees"...*



*This is what Thermography "Sees"...*

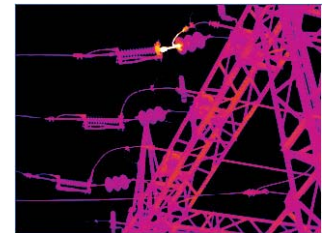


This demonstrates a "Thermal Anomaly" at bolted connection that would not be apparent without Thermography.

*This is what the Arc-Flash Technician "Sees"...*



*This is what Thermography "Sees"...*



The thermal image shows a hot connection (437°F) in a substation. The infrared camera pinpointed the problem immediately. An electrical connection had "blown-off" during a lightning storm and had re-welded itself to the support bracket of the insulator.

*This is what the Arc-Flash Technician "Sees"...*

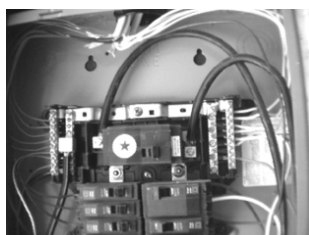


*This is what Thermography "Sees"...*

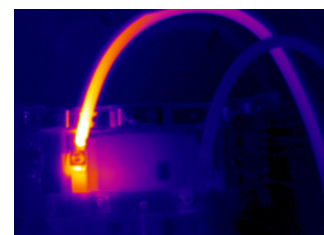


Excess heat on this distribution transformer was attributed to internal damage plus low oil level.

*This is what the Arc-Flash Technician "Sees"...*



*This is what Thermography "Sees"...*



This hot lug connection is easily found with Thermography.

# The Technology Consortium, Ltd.

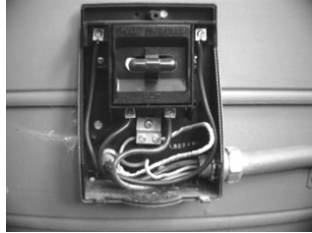
Ron Hoffman

864-277-1645

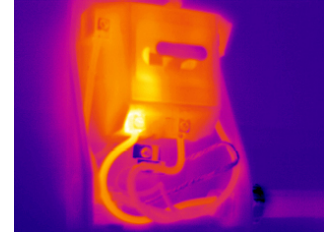
4ttc@charter.net

422 Lake Eljema Drive Piedmont, South Carolina 29673, USA

*This is what the Arc-Flash Technician "Sees"...*



*This is what Thermography "Sees"...*

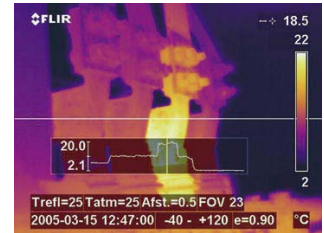


Thermography easily identifies this internal breaker connection problem.

*This is what the Arc-Flash Technician "Sees"...*



*This is what Thermography "Sees"...*



Excessive heating of this low-voltage bus bar connection on a transformer is obvious with the use of Thermography.

*This is what the Arc-Flash Technician "Sees"...*



*This is what Thermography "Sees"...*



This faulty disconnect switch is easily recognized with Thermographic inspection.

## **Summary...**

*While adding value to your Arc-Flash electrical survey is a great use for Thermography, it is by no means the only use of this technology. Most mechanical system failures will be predicted using Thermography. Heat due to age, improper lubrication, misalignment, corrosion, or overloading is readily observed.*

*Since typical electrical and mechanical failures occur when there is temperature rise of over 50°C, Thermography will detect these problems well in advance of a failure. Temperature measurements of these components allow you to determine an objective prioritization of, and plan for, future repairs.*

*An unexpected failure of even a minor piece of equipment can cripple your production. Shutdowns are unnecessary since there is a predictive solution... Thermography!!!*