

Automotive Diagnostics and Infrared Inspection



Cars and other vehicles are made up of hundreds of different components and working parts. Like a mini-factory on wheels. It makes sense that infrared inspection has a place in automotive diagnostics and maintenance. This is even truer when applied to high performance racing machines and multi-passenger vehicles such as aircraft.

At a recent job at Mosport Speedway, north of Toronto I had the exciting opportunity to spend a day “in the pits” and mesh thermography with racing to see what advantages infrared inspection might provide to a racing team. A complete infrared inspection of car # 38 driven by Jamie Hale, Late Model Stock Division was performed before, during and after each heat. It was found that infrared inspection was very beneficial in the following applications:

Braking systems- Brake effectiveness and condition is of great interest to both the driver and the pit crew. Infrared images are taken of the wheel hub and the brakes themselves if accessible. Temperatures are compared, recorded and logged. A dragging brake translates to warmer brake temperatures when all four infrared brake and wheel images are compared. Cooler brake and wheel temperatures indicate improper set-up and a braking system not operating at optimum performance.

Engine: With infrared inspection engine and exhaust temperatures are easily and quickly obtained. Engine components are inspected and the real-time infrared image can be used to make adjustments as the race day progresses. Cooling and ignition systems were also inspected for proper operation. Operating temperatures of engine components can be monitored. Temperatures of water pump, alternator, radiator etc. were all recorded quickly. Temperature rise of each component gives indication of required adjustments or repair. Results are logged and reviewed to monitor for abnormal operating conditions. If results indicate a component operating at other than normal temperatures, the component is replaced and researched to prevent breakdown during important operating times.



Image: Infrared image of late model stock car performance engine exhaust

Wheels and Tires: In most automotive racing and especially stock car competition, tire and wheel set-up is crucial to achieve maximum racing performance. Improper suspension or tire balancing leads to poor performance and slower lap times. Tire profile (road surface) temperatures were obtained after each heat to give insight into tire balancing and tire set-up to match road condition concerns. An infrared image of the tire surface can reveal how each tire is gripping the road surface. A warmer temperature band around the tire indicates that a section of the tire is working harder to drive the car than a cooler tire section. Infrared images helped to assess bearing condition. Wheel hub temperatures can be monitored and bearing temperatures compared to give indication of bearing condition. As with brakes, a wheel bearing operating at a higher temperature when compared to the other three gives early warning of a problem. Elevated temperatures can mean a lubrication, wear or misalignment anomaly exists. It is worth mentioning that brake operating temperatures can often make wheel bearing temperatures difficult to obtain. High brake temperatures can mask proper bearing readings. If practical, remove the tires from the car to obtain wheel bearing and precise brake images.

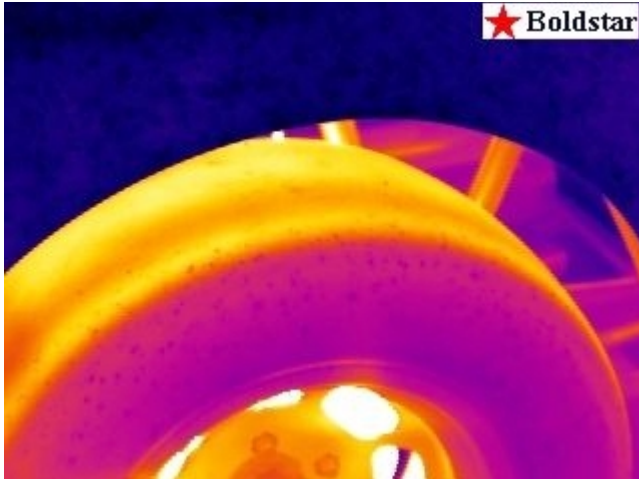


Image: Infrared image of tire after trial laps.
Cold band indicates incorrect suspension setup.
Air gap under tire when turning.

Electrical System: As in industrial electrical maintenance, thermography can locate fault conditions in automotive wiring and ignition systems. Periodic checks of fuse panels and other electrical connection points will help to locate problems. An electrical fire during the race will stop a car just as fast as a thrown piston. Thermography can identify overheating connections so repairs can be made before they get worse. Inspection of the ignition system can also indicate equipment deficiencies. Remember that some components normally run hot. A cold temperature measurement could indicate a faulty part or condition.

By maintaining a complete and thorough infrared inspection, thermography can offer important information to improve operating performance. Information is available almost immediately to help mechanics make proper adjustments to achieve optimal set-up. Logging and comparing infrared images and temperatures is key to applying thermography to any high performance racing maintenance program. Temperatures must be compared, understood and obtained regularly to achieve maximum benefits and improve overall performance.

By working with the driving team and understanding their concerns thermography just might add that extra advantage required to grab the checkered flag.

Article by
Jeff Lebold- Boldstar Infrared Services
453 Crerar Avenue
Oshawa, Ontario
Canada
L1H 2W6
www.boldstarinfrared.com
905-579-9264