

Fluke Ti25 Thermal Imager Gives Cagnazzi Racing a view to victory

Application Note

Testing Functions Case Study



For Roy Simmons, Crew Chief for Cagnazzi Racing, winning in National Hot Rod Association (NHRA) Pro Stock racing is not about the statistics. It's all about the data.

The stats are impressive enough: on the starting line two 2350-pound cars, each shaking with 1400 horsepower from a highly tuned, 500-cubic inch V-8 engine, inch forward. The starter's "Christmas tree" lights up, there's a ground shaking blast of sound and the cars dart toward the horizon. Less than seven seconds and a quarter mile down the track, moving more than 200 miles per hour and spinning those huge motors at more than 10,000 rpm, the racers flash across the finish line. The margin of victory: often, just inches.

But the stats don't keep Cagnazzi in the winner's circle. The key to victory is the data they collect before, during and after that seven-second run.

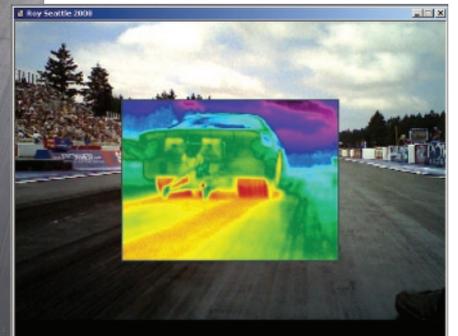
From a distance, the cars Cagnazzi builds in their Mooresville, N.C. shop look like low-slung but standard Chevy Cobalt and Pontiac G6 compacts. Look closer, though, and you see the tubular frame and roll cage and the immense drag slicks hidden within the rear fenders. Then there's the trademark Pro Stock hood scoop, designed to make room for two huge 1350 cfm carburetors and a trade secret tunnel ram intake manifold.

For Simmons and the crew, what you don't see is even more important. Placed throughout the car are 64 sensors that gather data on everything from coolant temperature, manifold pressure and fuel flow to clutch action, wheel speed, engine rpm acceleration and suspension movement. Together this wealth of data helps the Cagnazzi team analyze exactly what takes place in every second of every run. And there's always a need for more. That's what first drew Simmons to the Fluke Ti25 thermal imager.

Tools: Fluke Ti25 Thermal Imager

Operator: Roy Simmons, Crew Chief, Cagnazzi Racing

Measurements: Track and tire temperatures



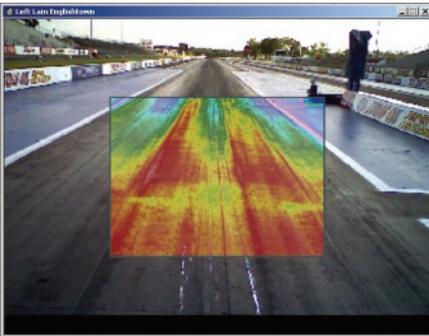


Figure 1. On the starting line at Englishtown, N.J., the hot streaks left by the Cagnazzi team's pre-start burnout show clearly in this Fluke Ti25 image. The hot rubber left during the burnout provides optimal traction, so the driver's goal is to start the race exactly in line with his burnout.

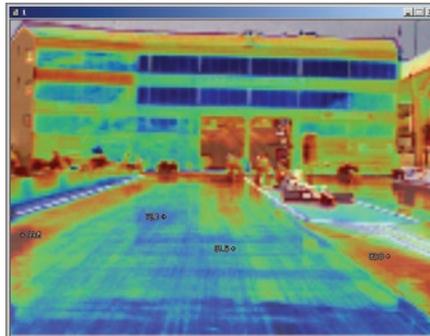


Figure 2. Nearly 20 degrees colder than elsewhere on the track, the liquid-cooled starting area at Bandimere Speedway near Denver shows clearly in this combined visual/thermal image captured by Cagnazzi Racing's Fluke Ti25.

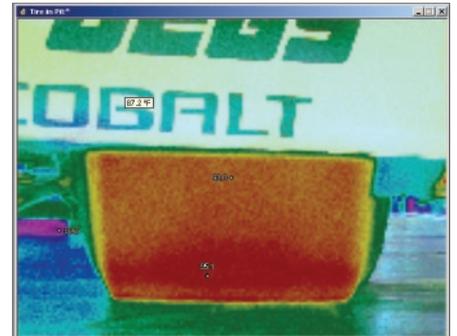


Figure 3. Merely towing the JEGS.com racer car from the pits to the inspection area and back heated this drag slick by 15 °F

A career built on data

Team owner Victor Cagnazzi, a drag racer since he was a teenager on Long Island, is comfortable building his success on data. Before he started Cagnazzi Racing he helped grow his family's company, ISG, into a successful computer infrastructure, software design and supply distribution company with revenues of more than \$70 million. The family sold ISG in 2001.

Two years later, Cagnazzi opened his state-of-the-art shop and headquarters in Mooresville, home to more than 20 NASCAR race teams. Its combination of talent, technical resources and location has earned the town the nickname 'Race City USA.'

Many Pro Stock teams buy a ready-made chassis and set it up their way, but Cagnazzi builds from the ground up. Starting with a GM engine block, a bundle of steel tubes, a five-

speed clutchless transmission, wires and sensors, the team creates cars that perform at the sport's elite level: the JEGS.com Chevy Cobalt driven by four-time champion Jeg Coughlin, and the Charter Communications/LifeLock Chevy Cobalt driven by Dave Connolly. On November 4, 2007, Coughlin clinched the 2007 POWERade Drag Racing Series World Championship in Pro Stock.





Cagnazzi takes a high tech approach to winning. According to the Cagnazzi Racing website, "the team is breaking ground every day in the application of knowledge from the wind tunnel, CAD-CAM suspension and body design, and advanced data acquisition systems developed at Northrup Grumman. No other NHRA team—in any category—exploits and applies technology to the same extent as Cagnazzi Racing."

So it's really no surprise that when Crew Chief Simmons heard of a new instrument that could turn the unknown into data he could use to gain a competitive advantage, he gave it a try. That tool is the Fluke Ti25 thermal imager.

'What we thought we were seeing, we could see'

Every NHRA strip is different, and so is each race. The Cagnazzi team initially sets up the cars based on both past experience at the strip and day-of-race conditions, such as temperature, humidity and track surface. The list of possible adjustments is long, including fuel mixture, clutch settings, transmission ratios, shift points, suspension tuning and many others. "There's not a vehicle in drag racing that

has as many components you can adjust as a Pro Stock car," said Simmons. "There's not a car that needs more data than a Pro Stock."

In addition to weather, the team must adjust for the way the NHRA crew has prepared the track. If the crew changes traction compounds, it's up to the race teams to adjust. Even a passing cloud can cool part of the track and change conditions from one race to another.

Simmons first tried the Fluke Ti25 at the NHRA Supernationals at Englishtown, N.J., searching the track for hot spots. "I didn't use it to change my routine," he said, "but I started finding out that it did verify what we were experiencing on the race track. With the Ti25, what we thought we were seeing, we could see."

Track temperatures can hit 140 °F on a hot day, Simmons said, and tires lose traction. Temperatures too cool can also cause problems. The strip at Denver features a starting area chilled by coolant piped under the surface. Simmons used the Fluke Ti25 to spot the borders of the cooler area, so he could set the cars up to avoid making the critical shift to second as they crossed the transition zone.

He also used the thermal imager on the car itself. When he checked the tires after a run, the Ti25 showed that the big drag slicks heat up not at the center, where you might expect, but at the outside corners. Even towing the car a mile to an inspection area warmed the tires by 15 °F. You could learn as much using a temperature probe, he said, but an actual picture is a lot better than a list of readings.

Simmons said he anticipates using thermography to check exhaust manifolds for hot spots caused by restricted flow, to check for weak valve springs (Pro Stock engines last for 30 runs, but valve gear is inspected after every run) and more.

So many more applications

"We've got a lot more technology where we can hone in," he said. "There are so many more applications that are going to come that have to do with the car. Checking brakes and transmissions and manifolds and all kinds of stuff, and just seeing what things are doing.

"In the past you'd kind of rub your foot on the ground and say 'This is what I think is happening, so this is what I'll do,'" Simmons said. "Nobody before has been able to say 'I know for a fact that this is what it looks like, this is where the hot spots are in the tire, in the race track and the other components on the car.'"

"At this point I can't say 'This is what it solved,'" Simmons added. "What it has done is exactly what you want to do in racing. We work and work and work to be as fast as we can, and all of a sudden we start hitting barriers of unknowns. What this does is start the conversation, and the process moves into going faster and developing your procedures and everything you do to race."

"The thermal imager is saying 'This is what it is,'" Simmons said. "Is that good or bad? That's for you to decide. Anything that gives you information and makes your brain work is a great tool."

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