# SGS ON-ROAD VEHICLE TESTING ANALYTICS

While on-road testing is critical to quality, it is also becoming an increasingly complex and costly endeavor. SGS's team of data science and engineering experts have deep transportation industry knowledge and can provide analytics to improve the effectiveness of vehicle test campaigns. You will be able to extract more value from your test data while maximizing your return on investment.

### ON-ROAD TESTING CHALLENGES

On-road testing lacks the repeatability of dynamometer lab testing. The drive route, road grade, weather, traffic and driver tendencies can all have a profound impact on test results. SGS uses statistical methods to quantify on-road test variation, account for confounding factors, isolate dependencies and make statistically valid conclusions to support the development process.

### UTILIZE DATA ANALYTICS TO NAVIGATE THE CHANGING TRANSPORTATION LANDSCAPE

Research and development for advanced vehicle technologies is accelerating as automakers contemplate a new wave of fuel economy, emissions and safety requirements. Light-duty vehicles will increasingly employ downsized and turbo charged engines, advanced combustion and after-treatment controls with more sensors, sophisticated transmissions, electrification features, and V2x connectivity. The complexity of these systems and the pace of their introduction will radically change the vehicle testing paradigm. The design of test programs warrants more scrutiny to ensure these new technologies and their countless system interactions are thoroughly evaluated.

- Our data scientists are collaborating with test engineers to develop new transportation analytics software and services to support the testing and development of these next generation vehicles
- Focus areas include drive route analytics, test plan design, detection of hidden defects and malfunctions, and integration with customer enterprise processes
- Our applications ingest data from loggers, telematics devices and other instruments
- Batch, live-connection and stream analytics processing are available
- SGS provides a hierarchy of analytics solutions ranging from ad hoc data exploration to big data computing on a production scale

### CONTACT US

For more information on our transportation data analytics services, email us.transportation@sgs.com.

### DEEPER DATA DISCOVERY

- Event-based analysis of powertrain subsystems such as stop-start, canister purge, catalyst light-off, DPF regeneration, charge depletion, OBD monitors and more
- Clustering and association algorithms using time domain data to explore low temperature operation, engine and catalyst control behavior
- Causation analysis for malfunctions and anomalies
- Machine learning to isolate control system differences in situations where good and poor performance have been observed
- Inferential statistics to design test plans with the right amount of coverage within the operational space, enabling the discovery of quality problems and the prediction of outcomes for larger vehicle populations

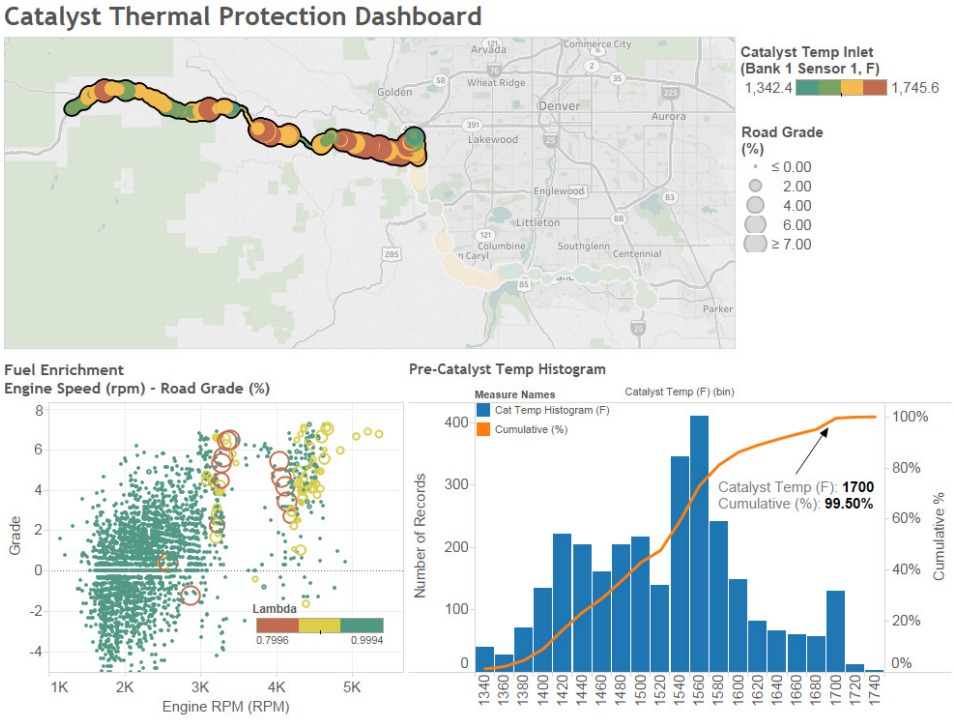
# SGS DATA ANALYTICS CASE STUDIES

## CATALYST THERMAL PROTECTION

SGS analytics and interactive visualization tools are designed for specific vehicle subsystems, enabling engineers to evaluate performance quickly.

In this example, a 2016 vehicle was tested while ascending the Rocky Mountains on a drive route up I-70 westbound from Golden to Georgetown, Colorado. The drive route included extreme road grade and speed combinations suitable for validating the catalyst thermal protection strategy.

At a glance, engineers have evidence that the catalyst briefly reached a very high temperature, 950°C (1740°F). The analysis verified that fuel enrichment was used on multiple occasions, typically on high road grades. It was also effective at limiting catalyst temperatures below 1000°C.

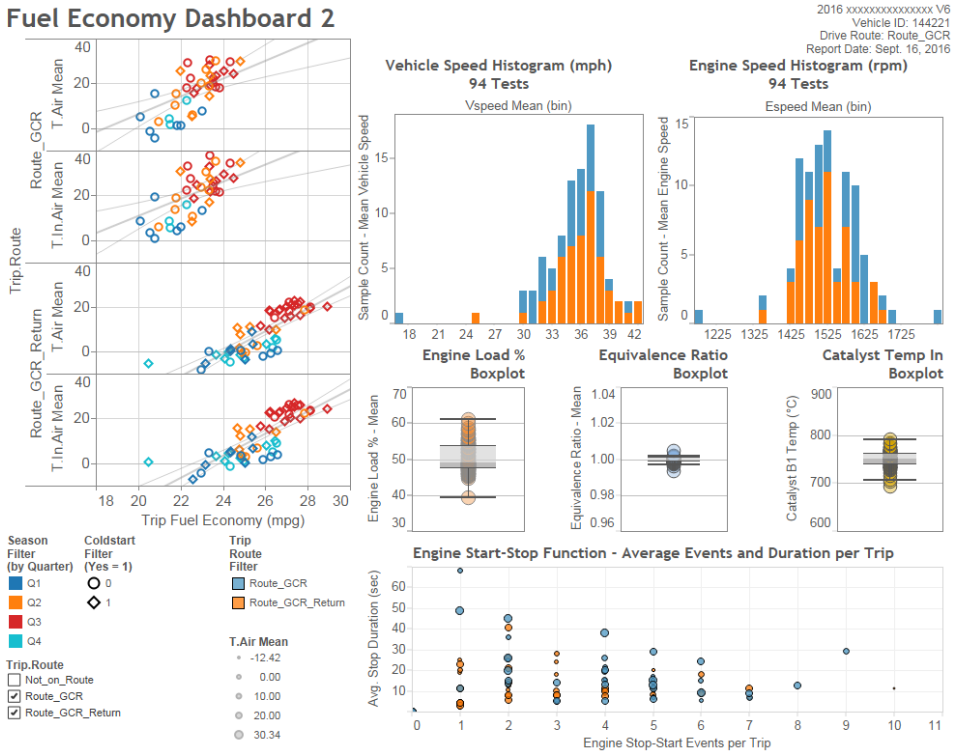



## SEASONAL EFFECTS ON FUEL ECONOMY

Data logs are easily aggregated for temporal analysis and test fleet studies. Variation in fuel economy was of interest for this long term test vehicle that was primarily driven along two different routes for a year.

The intake air temperature was found to be the primary variable impacting fuel economy, accounting for about 8% lower fuel economy (about 2 mpg difference) in cold seasons with ≥95% confidence.

Whereas vehicle fuel economy is known to be impacted by cold temperatures, the dependency was also observed between moderate and hot ambient temperatures.






WHEN YOU NEED TO BE SURE