Acu-Trac® Automated Fuel Optimization

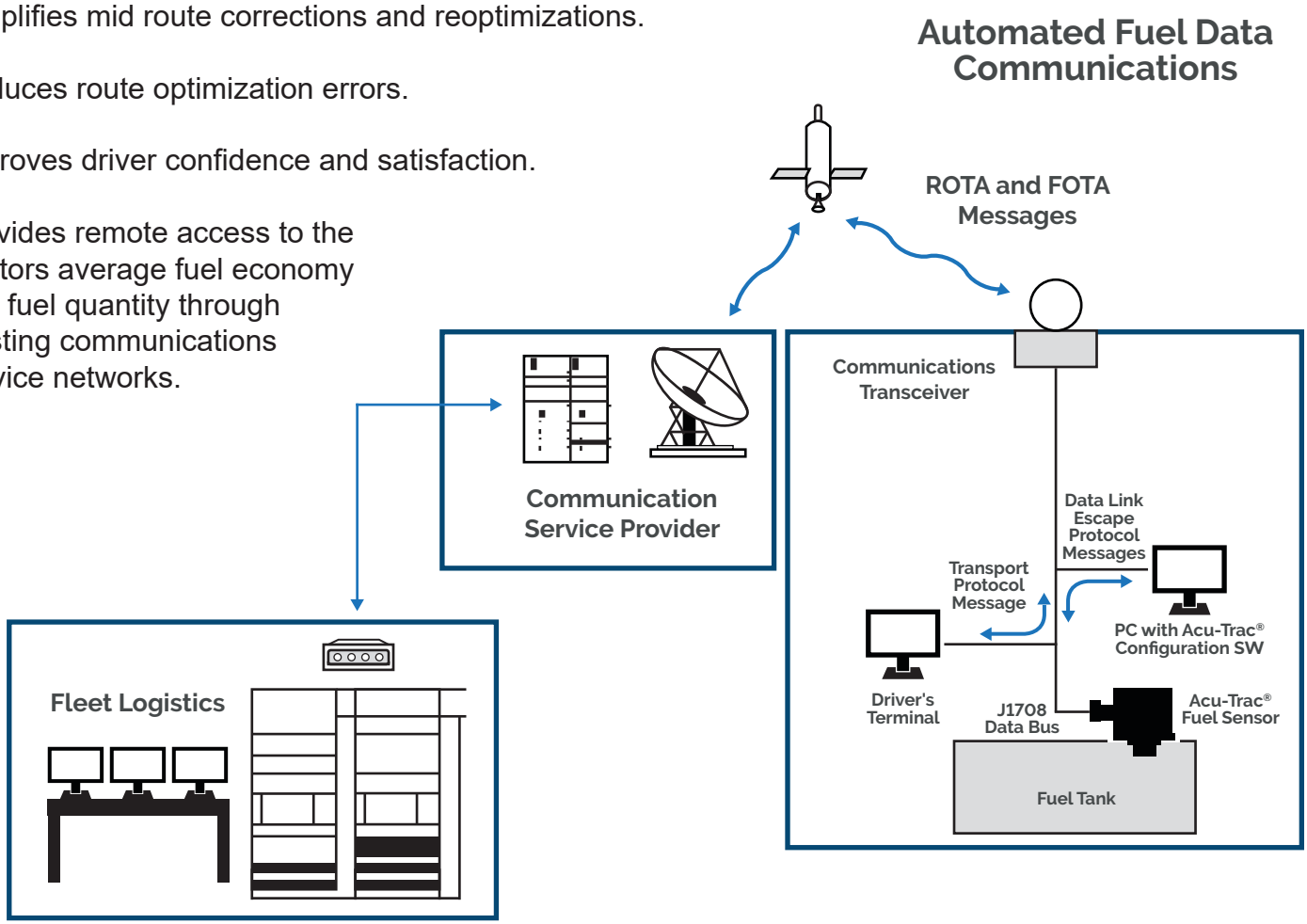
Improved Fuel Optimized Routings with the Acu-Trac® Sensors Family

Fuel optimized routings provide significant savings by taking advantage of small, localized, differences in fuel costs and the taxes associated with a particular route selection. Nevertheless, driver biases and mechanical fuel sender inaccuracies dictate an excessive minimum fuel guard band which reduces the tractor's range for optimized route consideration. The net result is a suboptimal route that may not provide the expected savings.

SSI's Acu-Trac® family of fuel sensors solves the sub optimal routing problem by automating the fuel data reporting process.

And, in so doing Acu-Trac®...

- Significantly expands the range from which routes may be selected by eliminating driver biases and fuel sender inaccuracies.
- Simplifies mid route corrections and reoptimizations.
- Reduces route optimization errors.
- Improves driver confidence and satisfaction.
- Provides remote access to the tractors average fuel economy and fuel quantity through existing communications service networks.



Introduction and Background

Fuel Optimization is the process used by the on highway trucking industry to route tractors so as to take advantage of local and regional differences in fuel price, taxes and user fees.

The process begins by polling the driver for their input as to the fuel on hand as well as the tractor's current fuel economy. The driver's responses in conjunction with the truck's location are used as inputs to a fuel optimization software package. The fuel optimization software in turn projects and evaluates potential routings using local fuel and tax data ultimately arriving at a routing that minimizes the total cost for executing the particular dispatch.

Inherit in the system is a necessary form of guard banding to assure that the fuel gauge inaccuracies and driver biases do not result in a downtime or an extra stop due to a lack of fuel. Guard banding and the driver biases are almost always to the plus fuel side of the equation producing less than optimal results.

For example with a typical software guard band of 15%, fuel sender accuracy of ± 10% coupled with a nominal driver bias of 20% results in a reported fuel quantity that could be off by as little as 10% or as much as 30%. Adding the variation to the 15% guard band means that a significant portion of the tractors range, 30% to 45%, may never be used.

The optimization process is impaired by this loss of range. Dropping 600 plus miles out of the tractors range results removes a considerable number of route options resulting in a route selection that contains more frequent fuel stops and less savings than otherwise could be achieved.

SSI's ultrasonic Acu-Trac® fuel sensor family solves the fuel optimization problem by delivering improved accuracy and by allowing the fuel optimization software to remotely access current fuel data automatically without dispatch or driver intervention.

Automating the Fuel Data Acquisition Process with the Acu-Trac® Family

The remote acquisition of data is facilitated by the fuel sensor's ability to communicate over the J1708 data bus and link through existing communications services. A query sent to the fuel sensor from the fuel optimization software is relayed over the communication network and then onto the J1708 data link.

In response, the fuel sensor replies by broadcasting a free form packet message or a PID 254 fuel data response over the J1708 data bus, linking through the communications service network back to the host computer. The message provides the following data to the fuel optimization software:

- Current fuel quantity in gallons
- Average MPG over the last 16 hours in MPG
- Fuel tank capacity in gallons

This automated process eliminates the driver bias and coupled with the fuel sensor's improved accuracy, provides an opportunity to reduce the level of fuel optimization software guard banding required.

Even with a 15% guard band SSI's Acu-Trac® family of fuel sensors extends the optimization consideration range by upwards of 30% or approximately 400 miles which dramatically increases the number of route selections from which to choose.

Benefits and Features

Acu-Trac® Increases the Available Range for Route Optimization: A tractor with twin 120 gallon tanks averaging 6.0 mpg has a total range of 1440 miles. SSI's Acu-Trac™ fuel sensor requires minimal guard banding enabling the optimization software to use virtually the tractor's entire practical range, upwards of 1200 miles, when considering route options.

Acu-Trac® Simplifies Mid Route Corrections and Re-optimizations: The ability to poll the fuel sensor remotely affords the opportunity to run a second and even a third optimization while the tractor is in route. The interim optimization increases dispatcher and driver confidence by providing a mid route confirmation and can also, compensate for short-term variances that otherwise may have gone unnoticed.

Acu-Trac® Reduces Route Optimization Errors: Incorrect fuel data entries results in a sub optimal route or in the worst case a route that doesn't make sense, frustrating the driver. The SSI Acu-Trac® fuel sensor automatically provides fuel data in an electronic form thereby eliminating the entry errors associated with manual driver or dispatch entry.

Acu-Trac® Improves Driver Satisfaction: The fuel sensor automatically acquires the fuel data eliminating the need for the driver to stop, bring up the display and key in the fuel capacity and MPG data.

Acu-Trac® provides remote access to the tractors average fuel economy, fuel quantity: The fuel sensor can be polled at any time for any reason to provide real time fuel data.

Operation and Messaging

The Acu-Trac® fuel sensor constantly monitors the fuel quantity within the tank and the vehicle mileage broadcasts over the J1708 data bus. The fuel sensor uses these variables to calculate a running average for MPG over the last 16 hours of operation.

The fuel quantity data is filtered to remove the effects of vehicle motion, hills and etceteras on fuel quantity. The MPG calculation excludes lengthy stops, idling, abnormal vehicle speeds and is further averaged via a rolling average to provide a readily accessible accounting of the fuel economy achieved over the preceding 16 hours.

The fuel sensor responds to fuel data requests either using a standard J1587 PID 254 message or will transfer the data over the vehicle data network through an off vehicle data link such as Qualcomm. Both formats are outlined in the Acu-Trac® Application Notes AT-AN6 and AT-AN7.

In the case of a PID 254 fuel data command, the fuel sensor broadcasts a PID 254 Fuel Optimization Data response which includes the current fuel quantity, average MPG and fuel tank capacity.

If the fuel sensor receives an off vehicle free-form fuel optimization data command, the fuel sensor responds first by setting up the data link and then follows up by broadcasting a free form packet version of the message over the off vehicle J1708 data link. The free form packet message contains the fuel data and the vehicle's VIN number to simplify the message's origin identification process.

The specific command and response formats for the fuel sensor's free-form data messaging capabilities are outlined in the Acu-Trac® Application Note AT-AN6.

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