Glance - FuelIT

Fuel Management Solution

Overview

FuelIT™ Executive Overview

With fuel prices rising worldwide, every large scale diesel fleet user needs the ability to oversee and control fuel usage via a monitoring system which will provide the following benefits:

1. Enable continual monitoring of inventory levels of diesel in all the tanks, and enable alerts to be issued when it is time to re-order diesel.
2. Provide consumption reports on who is using how much diesel when, including trending graphs of how much diesel is used by the different machines, over time.
3. Enable an alert to be issued when seepage (leaks) are detected in a tank.
4. Enable alerts to be issued when fuel theft (unauthorized dispensing) occurs.
5. Provide real time status on the position and status of all machines on site.

The FuelIT™ system from Applied Information

The advent of inexpensive, reliable wireless data communication has made it possible to develop the FuelIT™ fuel management system. This system allows a mine to completely manage the flow of diesel through the distribution and consumption network, as follows:

1. As each transaction of diesel is measured, and each transaction is tied to an operator, the mine management knows who dispensed diesel to whom.
2. As the level in each diesel tank is monitored (from the largest tank to the smallest vehicle), the mine management know the status of all the diesel reservoirs in the system.
3. By continually monitoring the levels in each tank, alarms can be set to help management eliminate seepage. If the tank level is dropping over time, without a dispensing transaction, then the tank has a leak and the appropriate alarm can be sent to the correct maintenance person.
4. By knowing the geo-location (the position on the map) of each vehicle and tank in the distribution pipeline, it is easy to determine where material is dispensed and to which vehicle. In the case of abnormal dispensing of diesel (e.g. where there is no vehicle to consume the diesel), an alarm can be raised and sent to the correct person to investigate a potential diesel theft.

Equipment that is monitored

Main storage tanks

On the main storage tanks, both the fuel level in the tank (tank status) as well as the fuel dispensed (transactions) are monitored. Each transaction can only occur once an iButton is swiped and the transaction is therefore allocated to a specific contractor, operator etc.
If the fuel level (status) drops by a significant amount without a transaction having been registered, then either seepage is occurring or fuel is being siphoned off. These parameters can be alarmed and notifications sent out according to a set of predefined business rules.

Vehicles

With FuelIT™ one can track when fuel was dispensed to a vehicle, how far that vehcile travelled with the avaialble fuel, and what the average fuel consumption was. As with a main tank, the fuel usage may be alarmed according to a number of parameters such as excessive fuel usage over a distance, fuel in the tank dropping without the vehicle actually being switched on and driving, etc. Because the vehicle operator is required to swipe a valid iButton at the beginning of the shift in order to start the vehicle, all the parameters previously mentioned are time date stamped and linked back to the operator of the vehicle.

Diesel bouser

A diesel bouser is a combination of the above applications as it has both its own fuel tank as well as carrying fuel for dispensing to other equipment. The status of all parameters is continually monitored and each transaction is recorded with a location, time date stamp, and an operator ID. All abnornmal parameters or operations are highlighted, alarmed, or highlighted in reports along with the pertinent information.

Towed tanks

A towed mini tank such as the one shown, need to be fitted with a power pack that is solar charged and also has the option whilst in the vehicle yard to be plugged into a charging unit, as this will extended the operating periods during periods of bad weather when solar charging is adversely affected. Monitoring is similar to the diesel bowser.

Principle of operation

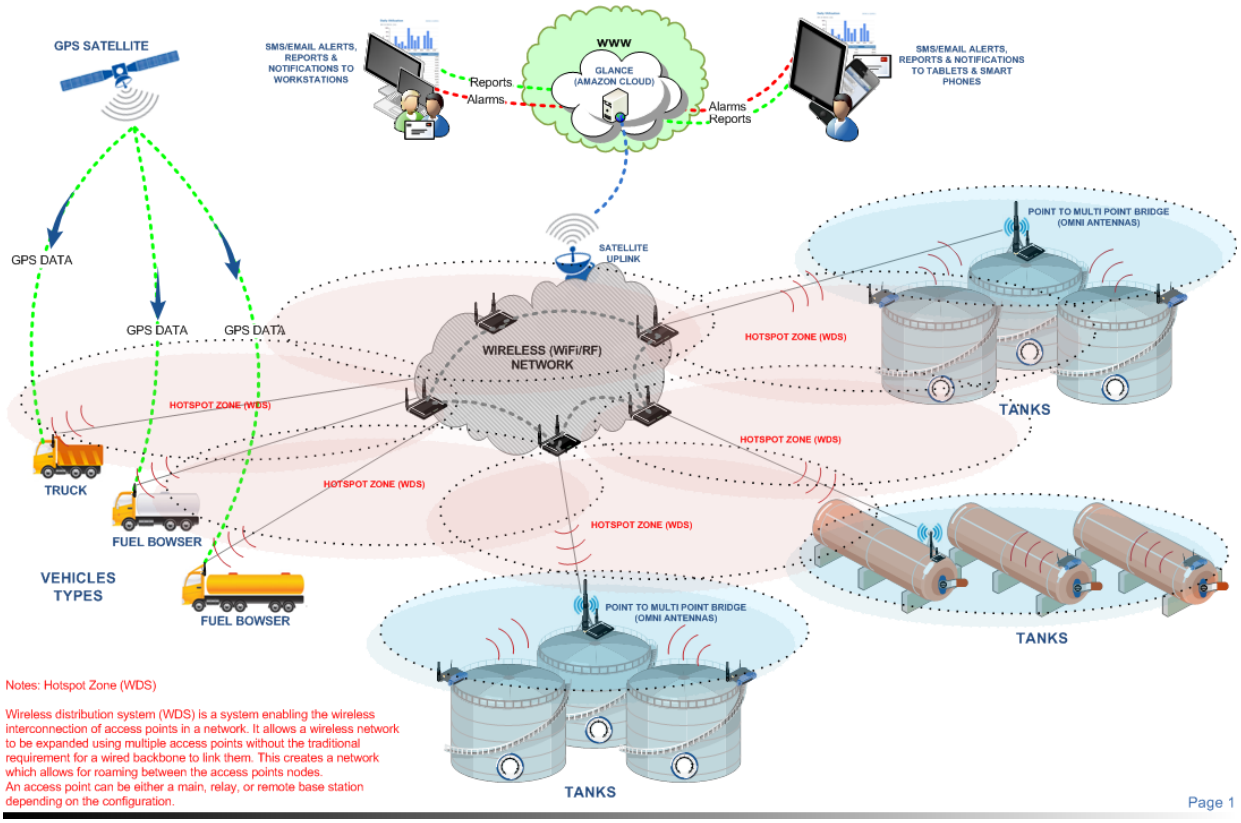
FuelIT™ is based on a few simple principles and subsystems, which enable total fuel management.

1. **Instrumentation.** Each fuel tank is fitted with the following instrumentation.
    a. Level measurement. An industrial sensor will be fitted to each tank in order to measure the fuel level. Some tanks, as in vehicles, are already fitted with fuel level measurement devices and wherever possible, these will be used to provide input into FuelIT™ without further instrumentation being required.
    b. Transaction measurement. An industrial flow meter will be fitted to the dispensing point of each tank and tied to an industrial electronic iButton swipe. This means that the time, place, volume and operator of each dispensing transaction will be known, without the operator having to manually enter any data.

2. **Telematics (Communication).** Each tank location (including the fixed tanks and all the mobile tanks) will be fitted with a small telematics device. This telematics device connects to the instrumentation and locally stores the data. Periodically, and when in wireless range, the telematics unit wirelessly uploads all the data to the Central Server. During the site investigation, the capability of the mine wireless system will be evaluated and confirmed as suitable for the real time monitoring of vehicles and machines.
3. **Central Server**. The cloud based server hosts the database, the business rules engine, the alarm engine, the reporting engine and the other services to allow the system to work as designed. There is no computing hardware or software to install. Interfaces are provided for the mine's IT department to retrieve data if they so require, but this is not required for the system to function.
4. **Web User Interface**. The Glance - *Applied Data Visualization* interface allows the user to access the data over the Internet. These screens provide a rich visual overview of the system and key performance indicators. Drilling down of each point on the network, with two level of increasing details, provide full system visibility. Trending of key performance indicators is provided (e.g. daily diesel use) so that the user can visually turn the data presented into actionable business information. Comprehensive alarms are provided for abnormal situation management, with the business rules and alarms engines providing alerts (such as tank seepage) via SMS and email.
5. **Reports.** Any number of reports can be generated based on the business rules engine. The reports provide the right information to the right person at the right time. Daily operational reports, alarm based reports, usage by operator or contractor reports, can be pushed to the correct person or pulled by the correct person with the proper credentials at any time.
6. **Additional features**. FuelIT™ comes with a standard MaintainIT™ interface. This means that full historical "bread crumbing" (a trail of the vehicle's recent track) and tracking of a vehicle's current position is available on the system. Additional to this, vehicle service intervals and engine parameters are monitored. Thresholds are set and abnormal parameters generate email's and SMS's to the correct person or department.

Systems architecture

A typical systems architecture for the FuelIT™ system is shown below.



Monitoring and control of the various parameters is accomplished as shown in the matrix table below.

Project implementation

Projects of this nature are broken down into phases with an associated cost, the phases being as follows.

1. **Site investigation**. A detailed site investigation would need to take place once the project is approved. Amongst other things, locations of fixed equipment, type of fixed equipment, type of mobile dispensers needs to be confirmed, so we ensure we are supplying the correct monitoring equipment. A detailed investigation of the terrain and environment also needs to take place.
2. **Detailed design**. Once the site investigation is complete, a detailed design based on the findings is then conducted and submitted for approval. Amongst other things, the placement and type of equipment is decided. This includes planning and designing the communication architecture and placing of equipment.
3. **Functional design and specification**. Submission of functional design and implementation cost for clients approval.
4. **Installation**. There are several phases to the installation. This includes the physical installation of all the equipment onsite, as well as collaborating with the customer to define the business rules which will visualize how the information is presented on the WEB interface as well as the look and feel of reports, alarms and SMS's and who these need to be distributed too, what the Alarm escalation path will be if not attended to, an all other actions required of the system.
5. **Commissioning**. This is bringing the system "live" and going through a handover to the client by means of an acceptance test procedure. This ensures the system we delivered meets the client's expectations exactly, and complied with the requirements of the Functional Specification.
6. **Training and setting-to-work**. This entails the training of the client's staff to use the system both from an infield operations point of view, as well as from a software/back office aspect. We work closely with the client through a 4 to 6 week period, operating the system in tandem with their appointed operators. During this setting to work phase business rules and operations can be adjusted based on feedback from the live system.
7. **Operation and maintenance**. Due to the nature of these systems, they will require operational and maintenance support. The system comes with a 12 month warrantee after which a service level agreement based maintenance contract can be implemented. The service level agreement could include an onsite technician to support the system during the life of the mine.