VERITRAX: LIVE AND INTEGRATED CHEMICAL DELIVERY, USAGE AND BILLING SYSTEM

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ABSTRACT

This paper summarizes the case history of the implementation of VeriTrax, a fully integrated chemical delivery and data management system. This is a computerized system that automates the processes involved in the provision of production chemicals, allowing for increased accuracy of chemical usage and tank levels for operators, and increased efficacy of chemical delivery and billing through a fully integrated SAP-based system. The Operator and Clariant Oil Services worked together to create VeriTrax, which optimized performance by eliminating manual input into both the Operator's and Clariant Oil Services' SAP systems.

Complete details are given in the paper on the three components of VeriTrax: a global positioning system (GPS), a computer interface and a smart meter. When a delivery is made using VeriTrax, the GPS immediately identifies the well based on the location and the smart meter records the amount of product dispensed and sends this information into SAP.

INTRODUCTION

This case history concerns a southern California oilfield which comprises several thousand wells, owned by about a dozen companies. The fields have been producing since 1916 and comprise the sixth and ninth most productive fields in the United States. The producing complexes cover an area approximately 22 miles long and 3 miles wide. Production comes from two distinct zones that produce both heavy and light crude oils. Total production from the fields is in excess of 100,000 barrels of oil equivalent per day and over 1,000,000 barrels of water per day.

Many different production chemicals are used in these fields and can be broken down into two main categories: downhole applied products and surface applied products. This paper concerns the downhole applied products and these can be further broken down into two categories: continuous injection and batch treatment products. Both continuous injection and batch treatment products can be either a single functionality corrosion inhibitor or a multifunctional combined corrosion and scale inhibitor.

There are over 5,000 wells in the fields being treated and over 90% of the producing wells receive chemical treatment. A continuously treated well has a chemical storage tank at the well site, near the pumping unit. Chemical usage typically varies from ½ to 2 gallons per day and the tanks require refilling approximately once per month. Batch treatment wells are treated every one to two weeks and several gallons of product are pumped down the backside of the well and the well allowed to recirculate. The produced fluid is used to flush the chemical treatment through the production tubing to coat all the wetted parts of the well with a protective corrosion inhibitor film.

The process, prior to the implementation of the automated system, was both time consuming and prone to human error. When making a delivery, the driver arrived at a well, connected hoses from the delivery or treater truck to the well and pumped the product into the chemical tank or batches it directly into the well. The volume of product dispensed was measured and this information, along with the well ID number was recorded manually on a paper form. The operator then disconnected from the tank or well and moved on to the next location. This procedure was performed by the drivers some 60 to 70 times a day. Figure 1 shows a typical delivery stop to a well that was on continuous injection.

After servicing each well, the driver returned to the office, handed off the 60 to 70 completed forms to an administrator, who manually input the day's records into SAP – an equally tedious process – so that invoices could be generated for the various customers. This resulted in some 5,000 transactions per week between the service company and the operating companies.

The complexity and sheer size of operation mandated some form of automation to increase efficiency and eliminate human error as much as possible. This challenge was accepted by a team created by the service company and the operating companies, and in 2008 a pilot project began to do just this.

THE TRUCK MOUNTED DEVICE (TMD) OVERVIEW

TMD was the acronym given to the truck mounted device, which aimed to reduce the previously described complexity and automate much of the manual process involved, creating a smoother and more effortless series of tasks. This could all be achieved by eliminating the manual input into SAP and manual data transfer from the field delivery and applications team to the data processing team. The TMD consisted of three basic components:

- A global positioning system (GPS) – the GPS instantly identifies each well location upon arrival based upon location.
- A laptop computer – the laptop automatically records the well location via an interface with the GPS.
- A smart meter – the field technician then connects the smart meter (docked to the laptop) which records the exact amount of product delivered.

Through this new interface there is nothing to write down and no paper trail to keep up with. When the technicians have finished with the day's routes, they return to the base dock the laptops to the network, and in seconds the day's data is loaded directly into SAP. This process saves hours of key-punching. Invoices can be generated and sent automatically to customers – and in some cases interface directly with customers' SAP systems. The unique aspect of this system is that the information is uploaded automatically to SAP and this differentiating factor means that at the end of the workday it is known exactly – and almost instantaneously – how much of each product has been delivered to any given well. Some photographs and schematics of the set-up have been given in Figures 2 through 4. The original acronym – TMD (truck mounted device) – is now referred to as 'Veritrax', a registered trademark.

THE SOFTWARE INTERFACE

The focus of this paper is mainly on the customized software interface that links the three components of the TMD and then enables the final SAP interface. It is this linkage that differentiates this system and makes it unique, as the individual hardware components are not in themselves at all novel. This paper intends to describe the basic architecture of the interface framework and the various user interfaces that are possible.

The overall objective of the software interface was to provide a complete management framework for mobile applications and data. The framework was developed specifically for SAP centric organizations in order to fully leverage the investment in SAP made by the service company and operating companies.

The interface represents a wholly cost effective way to deploy mobile applications out in the field in order to reduce operating costs, increase efficiency, and improve customer service. The interface can communicate over any TCP/IP network via fixed LAN/WAN, Wi-Fi, GSM, 3G or 4G networks. The goal of this interface is to extend functionality of a central operating system (in this case SAP) out to the point of business (in this case the well locations in the field) using mobile computers. A high level schematic of the interface software has been given in Figure 5, which shows the components of the TMD as well as the ultimate interface - the central SAP server. Figure 6 shows the SAP add-in as composed of two major components – a workbench, deployment, and synchronization function as well as a core function for processing, scheduling, execution, monitoring and statistics.

The typical business applications employed by this system include mobile sales, field service, remote payment (via EFT), inventory management, proof of delivery, in-truck scheduling, time-writing, purchase order approval and issue tracking (customer service / help desk queries). The automation of these applications brings with it business benefits. These can be categorized into cost saving benefits and improved customer relationships. The cost savings come with streamlining existing business processes using automation. Furthermore people's time is optimized so that more value is obtained as well as increased accuracy and elimination of correcting errors. Improving customer relationships comes about by the implementation of an effective and real time delivery system that gives up to date and quality information. It clearly demonstrates technical innovation and also enables multi-skilled employees to operate efficiently, effectively and professionally in the field.

A benefit analysis was performed on the chosen software framework, summarized as follows:

Simplicity
The installations were not complex and the software took only a few hours to install. All the add-ons and utilities within the new software ran in SAP, providing an integrated single user interface which enabled the business to leverage off existing SAP knowledge.

Reliability
The software had automatic network reconnect and automatic storage and forwarding of business transactions.

Return on investment (ROI)
The use of the software interface (and hardware) considerably reduced the cost to do business through automated processes, increased accuracy and better processes.

Flexibility
The system supported real-time, stand alone and backup modes of operation as well as supporting multiple user interface options.

ARCHITECTURE OF THE INTERFACE SOFTWARE
The software interface framework is made of three basic components: Java Server, SAP interface and Presentation Client. In addition to this there are two subsidiary add-ins there are specialized presentation clients and a central gateway which provide additional security and networking ability. A brief description of these components has been given below:

Gateway
This enhances network performance and at the same time provides a high level of security. It performs high speed compression and encryption of data that moves around the network.

Java Server
The Java Server is deployed on devices that support a Java Virtual Machine. The Java Server executes applications and synchronizes and stores the data as well as manages the network and peripheral device interfacing.

SAP Interface
This is written in ABAP and provides an application workbench to design, construct and deploy mobile devices centrally.

Presentation Client
These clients enable a more user friendly front end to enhance usability of the software.

Local Database
Each Java server maintains a local database to store mobile application definitions and cached data and is defaulted to using an in-built database.

The software itself was designed to have a simple (yet robust) front end for users of all ability. The basic framework has been displayed schematically in Figure 7. The application flow is composed of only a few SAP transactions that cover the bulk of the interface software functions. Of course, in the background for administrators there is a more complex series of functions but for everyday users the format of the interface software provides a user-friendly feel. This contributed to the success of the implementation of this program.

Figure 8 goes on to show a couple of example screenshots of the SAP screens that make up the front end software. These are actual screens that would be used by the field technicians (albeit with dummy data entered into the fields). It can again be seen that the delivery scheduling and route summary screens along with the individual stop screen are very straight-forward in their design and use thus enabling quick, efficient and trouble free data entry.

CONCLUSIONS

Implementation of this automated system has allowed the Service Company and Operating Company to go to a daily billing cycle such that payment is made every day for service. This has cash flow benefits for the Service Company and it has budget management benefits for the Operating Company. This fast and accurate accounting is something the primary Operating Company wanted to be provided as part of this upgraded system.

The labor savings alone is significant using this TMD system and created a large cost saving that could be passed on to the customer base in the area and had no detrimental effect to the service level given (quite the opposite in fact). The drop in errors due to automation and less data entry should also not be underestimated as a benefit – while it is difficult to quantify in terms of a dollar saving the reduction in labor hours is plain to see.

There is now the potential to have 6,000 wells serviced instead of the 4,200 wells prior to system implementation – and this is a somewhat conservative estimate of the efficiency increase from installing the new automated system.

Now that this system is installed there are other automations that can be implemented. This could include the creation of daily route sheets. Currently this is partially automated as each well takes a prescribed amount of chemical, and to create route sheets we have a crew of people who inventory chemical tanks' supplies every day. Tank readings are recorded and uploaded into SAP. Based on these readings, SAP creates a list of the wells that need servicing the next day. Moving this manual surveillance process to an automated system has obvious benefits.

Overall the TMD is a vast improvement over the previous method used to record, invoice and recommend further chemical treatment improvements. The TMD project is now an integral tool in the business because it's been proven to reduce errors, increase focus and improve response time to address the chemistry.

CONCLUSIONS

The authors wish to thank the large extended team involved in the implementation of the TMD in the field – the names are too many to list here. JJW also wishes to thank Doug Ford for providing valuable information for the explanation of the interface software. The authors also wish to thank 58th Southwestern Petroleum Short Course for accepting this paper for publication and to Clariant Oil and Mining Services for allowing us to publish the work.

Figure 1 - Typical Operation During a Chemical Delivery to a Continuous Injection Well

Figure 2 - Rugged Laptop Computer Mounted in the Cockpit of the Delivery Truck
Front View (Left) And Rear View (Right)

Figure 3 - Flow Meter Mounted onto Delivery Truck (Left) and the Hardware Interface (Right) Into the Laptop Computer

Figure 4 - Ultra Simple GPS Device Connected via USB to the Laptop Computer

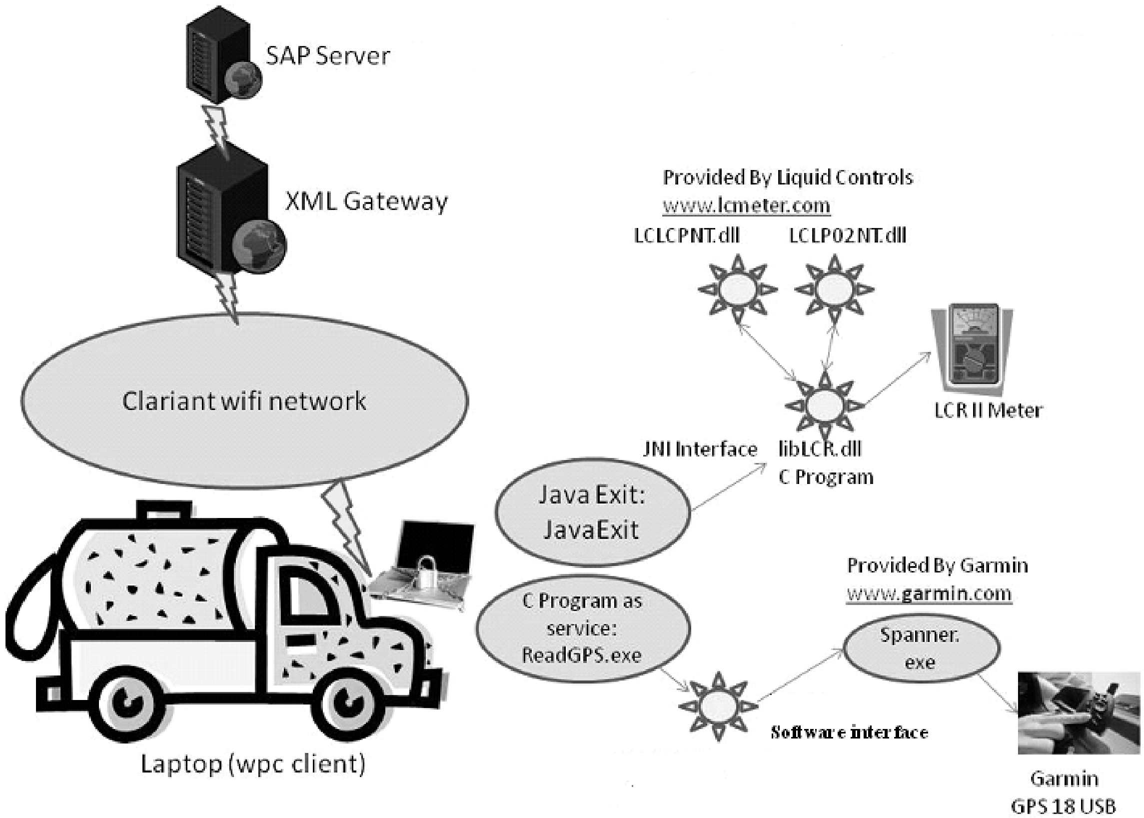

Figure 5 - High Level Overview of the Software Interface Connecting the Three Hardware Components Making up the TMD and Then the Further Connection to the SAP Server System

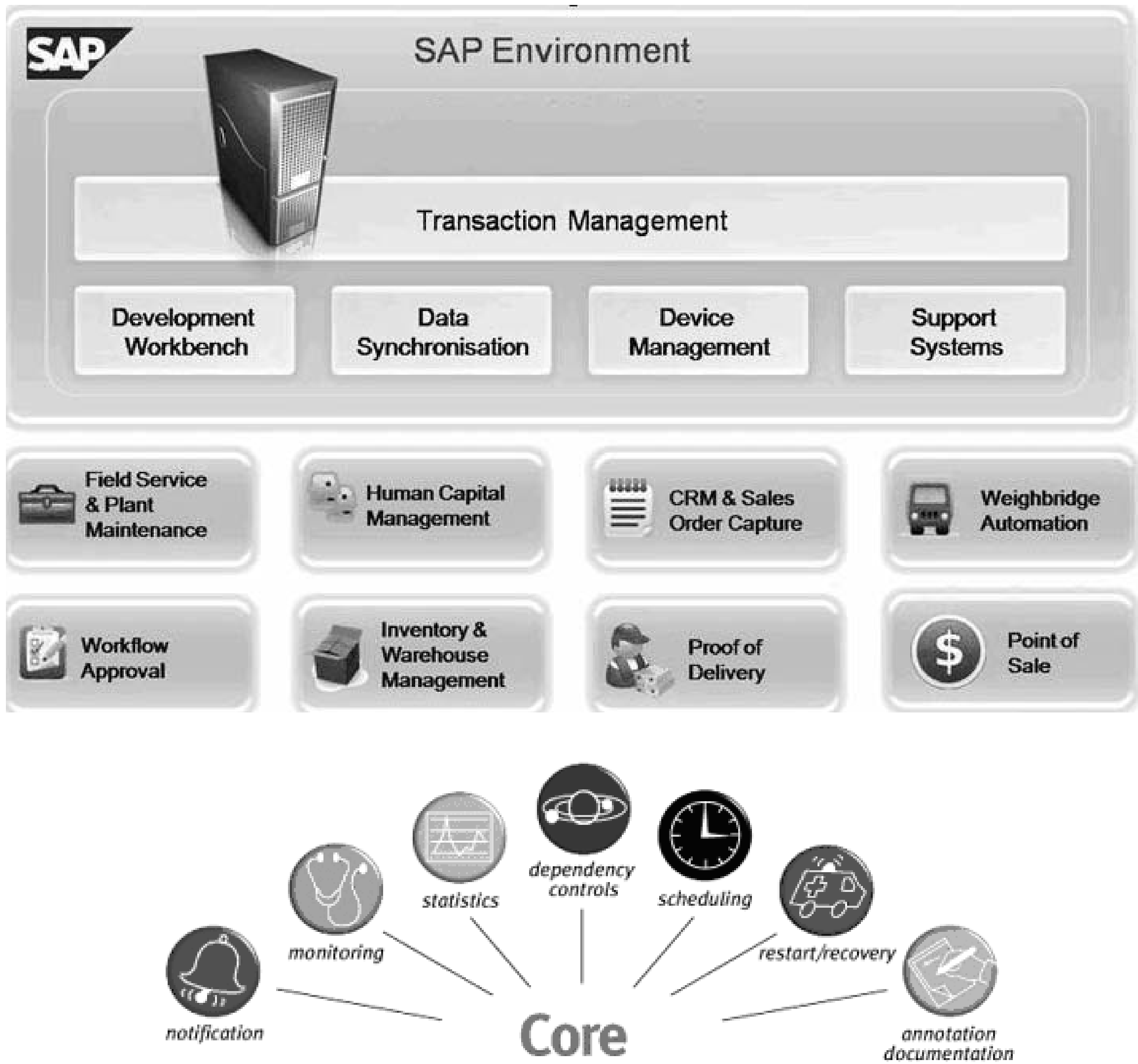

Figure 6 - SAP add-in is composed of two major components (top) workbench, deployment and synchronization functions and (bottom) core processing of scheduling, execution, monitoring and statistics.

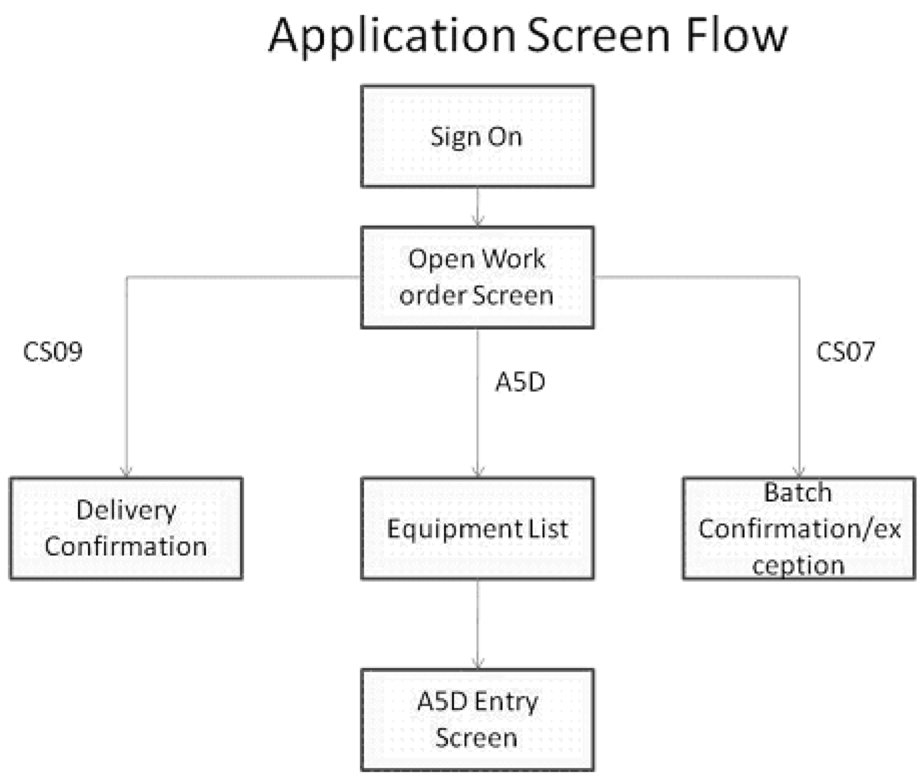

Figure 7 - Summary of the application flow of the software front-end and the simplicity of using only a few SAP transactions to access the bulk of the interface software.

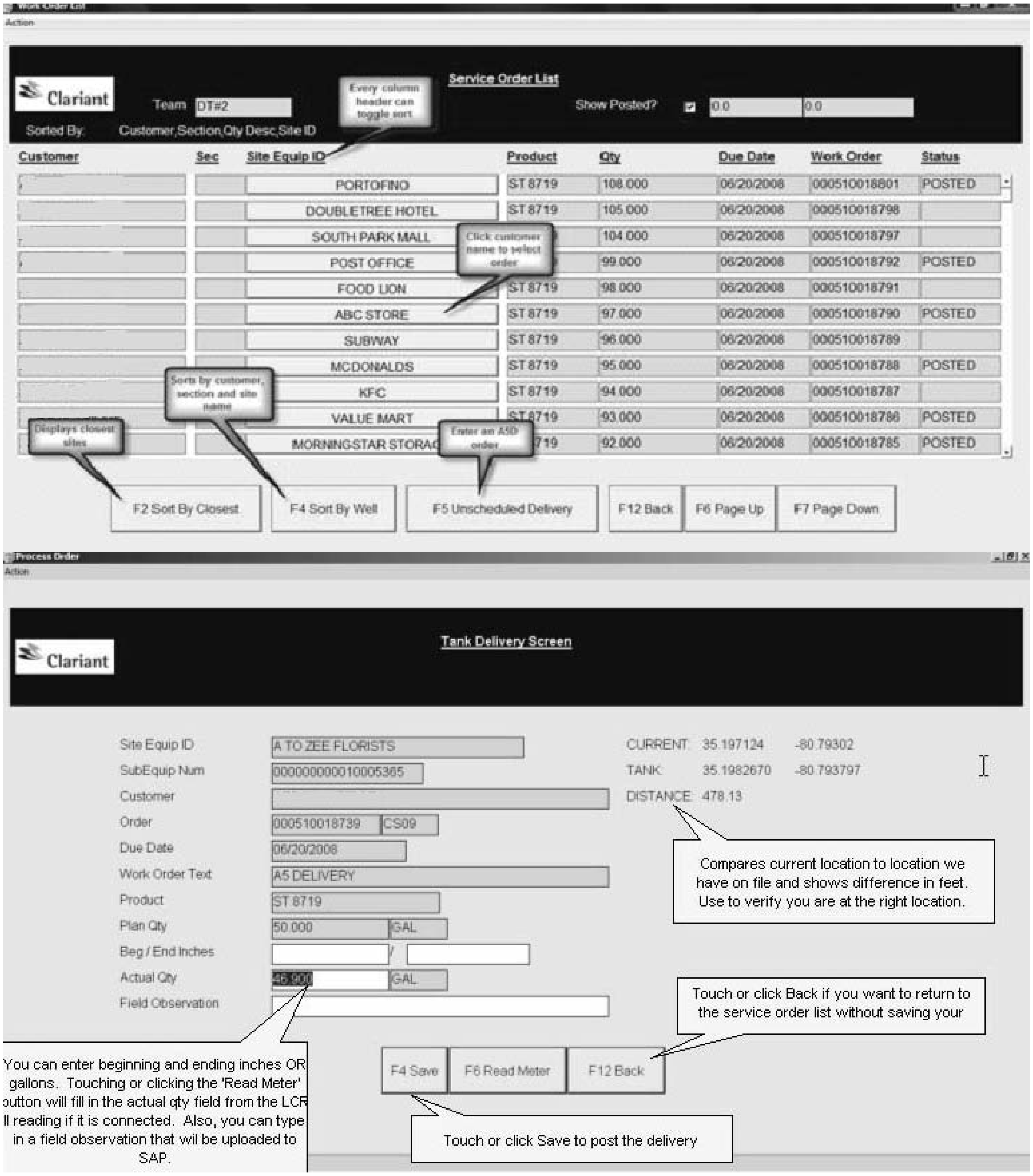

Figure 8 - Example screenshots of SAP add-in software interface. The top shows an example of scheduling delivery stops and how the data is simplistically entered. The bottom shows an individual stop and again the simplicity of the data required to complete the dataset for a delivery.