Proactive Monitoring of Friction Management Systems Reduces Costs and Downtime

By: Nicholas Dryer and David Mintskovsky

Abstract

The latest research shows that friction management systems reduce friction and thus reduce the cost of fuel for railroads, and increase rail as well as OTM Life. Unfortunately, these systems are placed in remote locations and have minimal communication capability, and in many cases end up non-operational, which eliminates their benefit. A major railroad found a solution that utilizes the latest cellular and satellite technology along with a custom web interface that provides easy access and real-time monitoring of field equipment. The oil and gas pipeline companies have been taking advantage of a similar solution globally over the past ten plus years.

The product, defined as a remote monitor (often marketed as an M2M solution), and the user interface allows for fast information transfer and regular status updates of equipment in the field. It also allows for on-demand polling by individuals or companies responsible for maintaining that sector of the rail and equipment. Using report-by-exception, the remote monitor notifies an operator instantaneously when a problem occurs. Some of the common field related problems included power outage, low material level, non-operational pumps, trigger system malfunctions and potential vandalism. Additionally, remote monitoring will be able to generate consumption reports, which will allow for a more predictive approach for maintenance and service versus a reactive and delayed approach that greatly reduces the benefits of the systems.

This paper will discuss the ease of installation, simplicity in use, and other benefits of a remote monitor and how it helps reduce maintenance and services costs, improve production and know when equipment is non-operational for the railroads.

Introduction

Before any type of remote monitoring was available on the friction management systems, very little was known about the performance of the assets in the field. Many areas of railroad systems had significant amounts of non-operational time; it is not unheard of to have over eighty percent of friction management assets down at any given time. For example, a subdivision in Texas had an audit performed on ten systems that discovered that only two of them were actually working. Another subdivision in Alabama that has twelve systems, four were found to be non-operational.

The first generation remote monitors provided the ability to monitor material levels, while this was the first attempt, this system did not provide railways an indication on whether the system was even operational. The second generations of remote monitoring systems began to give railways a more in depth look at how the systems were operating, the additional functions of monitoring wheel counts, pump time, and system power became available, however, at a higher cost. The systems were not reliable as they consumed the site batteries with their high power communication radios. Additionally, these systems constantly sent out messages that overwhelmed field engineers and created constant information that ended up being ignored. If the power at the site was lost, the radios would stop responding requiring one to notice that the radios were no longer communicating, and would eventually require a field visit to verify if the battery was bad or if the solar panel had problems.

The new solutions for Rail Friction Management (RFM) available today provide proven field reliability and robust features not available with the previous generations. Manufactured by an M2M electronics and communications company, the systems can be installed on all friction management platforms available today and are not manufacturer specific. Using cellular and satellite networks these systems work throughout North America as well as all over the world. Some of the key features include the ability to shut off the friction modifier pump remotely, access the latest site data, receive instant notifications if problems occur in the field, and the ability to determine specific site problems such as a low battery voltage or low tank level.

Additional features include exception based reporting, over-the-air reprogramming of key parameters, ability to transmit alarm messages to specific operators and crews, and connectivity using any Internet enabled device. Most importantly, the new RFM remote monitors help reduce the overall cost of maintenance by ensuring that equipment is operational, reduce and possibly eliminate some of the travel time and visits to remote locations, as well as increase efficiency and fuel savings of maintenance crews.

For example, a maintainer currently covers a territory of roughly 285 miles and visits 48 units over the course of a five day work week performing a visual inspection. The visual inspection would not provide information on whether or not the wheel sensor is working properly. The travel time to each site could be as long as five hours depending on weather and road conditions. The time to inspect each site may only be ten minutes, which accounts for roughly 20% of value added work. The rest of the time is spent commuting from site to site.

Application of Technology

The RFM remote monitor is specifically designed to help maintain friction management systems with key features requested by several Class I railroads. These features are discussed in detail below, in no particular order.

- User defined parameters – the user can log into a secure website and set up specific parameters that they want monitored. These parameters can be door alarms, battery voltage, tank level, wheel/axle counter, AC power presence, solar panel voltage, and pump operation. A parameter such as battery voltage would have a high and low alarm level, a user can set 10V as the low level and 15V as the high level. If the voltage is found to be out of this set range, an alarm is generated and a message is sent to the user(s). The user can reprogram these parameters at any time from any internet connected device. Figure 1 shows configuration parameters for some of the channels.

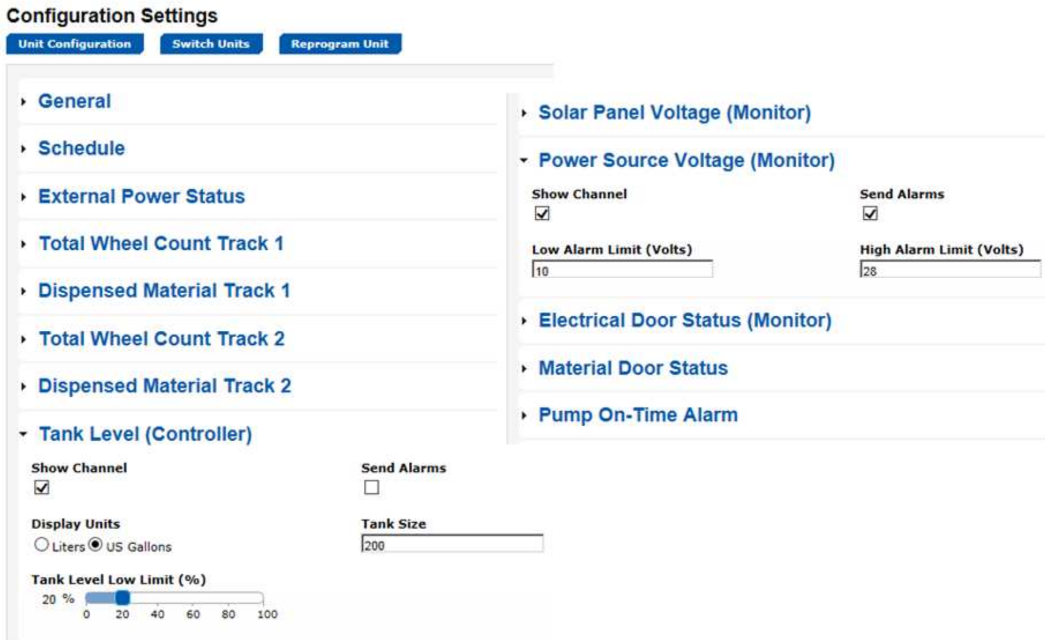

Figure 1: Configure Channels

- Exception based reporting – the user set parameters are checked after every train event or at set time intervals (ex. Every 4 hours). If a parameter is found to be out of the pre-set range (ex. Tank level is too low), an alarm message is generated and sent out via email or SMS to a specified user or group of users. If all the parameters are within the pre-set range, the RFM remote monitor goes back into idle mode, which preserves battery life. Once a parameter returns to within pre-set range (ex. tank refilled), a return to normal message is sent out to the users and the remote monitor goes back into idle mode. Figures 2 and 3 show the alarm messages sent out via email and the same message can be seen on the secure website.

	09 Jul 2013 07:22	Alarm Notification

Sent To: [redacted] (Nicholas Dryer), [redacted] (Charlie Rudeen), [redacted] (David Mintskovsky)

Message:
The MP [redacted] Marceline Single Track site has received an alarm report. The following values were reported by the site:

Monitor Battery Voltage: 8.4 V
Total Wheel Count Track 1: 454,711
Dispensed Material Track 1: [redacted] US gal
Total Wheel Count Track 2: 0
Dispensed Material Track 2: 0.0 US gal
Tank Level (Controller): 177 US gal
Last Train Direction Track 1: West
Track Last Event: Track 1
Wheel Count Last Event: 296
Dispensed Material Last Event: [redacted] ml
Solar Panel Voltage: 8.7 V
Power Source Voltage: 12.8 V

To view the details of this alarm, visit https://secure.pipelinewatchdog.com.

Figure 2: Alarm Message Sent by Email

	09 Jul 2013 08:03	RTN Notification

Sent To: [redacted] (Nicholas Dryer), [redacted] (Charlie Rudeen), [redacted] (David Mintskovsky)

Message:
The MP [redacted] Marceline Single Track site has returned to normal status. The following values were reported by the site:

Monitor Battery Voltage: 8.3 V
Total Wheel Count Track 1: 454,711
Dispensed Material Track 1: [redacted] US gal
Total Wheel Count Track 2: 0
Dispensed Material Track 2: 0.0 US gal
Tank Level (Controller): 178 US gal
Last Train Direction Track 1: West
Last Train Direction Track 2: C
Track Last Event: Track 1
Wheel Count Last Event: 296
Dispensed Material Last Event: [redacted] ml
Solar Panel Voltage: 12.9 V
Power Source Voltage: 12.9 V

To view site details, visit https://secure.pipelinewatchdog.com.

Figure 3: Return to Normal Message Sent by Email

- Daily reports – a daily summary report is generated and stored on a cloud server that can be viewed using the secure website. The report is automatically generated at a user defined time of day and a summary of the last week, month, or year report can be sent directly to an email address of specified users. Figure 4 shows a channel history view that can be accessed through a link on the website.

Channel History

Time	Monitor Battery Voltage	External Power Status	Total Wheel Count Track 1	Total Wheel Count Track 2	Dispensed Material Track 2	Tank Level (Controller)	Pump Status	Last Train Direction Track 1	Last Train Direction Track 2	Track Last Event	Wheel Count Last Event	Dispensed Material Last Event	Rain Sensor Status	Solar Panel Voltage	Power Source Voltage
03 Jul 2013 09:52	8.2 V	Good	419,419	292,507	[redacted] US gal	166 US gal	Enabled	B	C	Track 1	512	[redacted] US gal	Dispensing	13.5 V	13.5 V
02 Jul 2013 19:00	8.2 V	Good	411,727	291,074	[redacted] US gal	166 US gal	Enabled	B	D	Track 2	0	[redacted] US gal	Dispensing	14.6 V	13.4 V
01 Jul 2013 19:00	8.2 V	Good	404,918	283,652	[redacted] US gal	167 US gal	Enabled	A	C	Track 2	558	[redacted] US gal	Dispensing	16.4 V	13.4 V
30 Jun 2013 19:00	8.3 V	Good	397,390	278,230	[redacted] US gal	168 US gal	Enabled	A	C	Track 2	558	[redacted] US gal	Dispensing	17.1 V	13.4 V
29 Jun 2013 19:00	8.3 V	Good	388,541	269,463	[redacted] US gal	168 US gal	Enabled	B	C	Track 2	245	[redacted] US gal	Dispensing	15.2 V	13.4 V
28 Jun 2013 19:00	8.1 V	Good	382,813	261,348	[redacted] US gal	169 US gal	Enabled	B	C	Track 1	514	[redacted] US gal	Dispensing	13.2 V	13.3 V
27 Jun 2013 19:00	8.3 V	Good	372,746	255,084	[redacted] US gal	170 US gal	Enabled	B	C	Track 1	520	[redacted] US gal	Dispensing	13.0 V	13.1 V
27 Jun 2013 03:09	8.3 V	Good	365,023	254,551	[redacted] US gal	170 US gal	Enabled	A	C	Track 2	308	[redacted] US gal	Dispensing	0.4 V	12.7 V
26 Jun 2013 19:00	8.1 V	Good	359,753	254,551	[redacted] US gal	171 US gal	Enabled	A	C	Track 1	3	[redacted] US gal	Dispensing	13.1 V	13.1 V
26 Jun 2013 15:16	8.0 V	Good	359,196	254,551	[redacted] US gal	171 US gal	Enabled	B	C	Track 1	3	[redacted] US gal	Dispensing	19.0 V	13.0 V
25 Jun 2013 19:00	8.3 V	Good	351,457	254,551	[redacted] US gal	171 US gal	Enabled	B	C	Track 1	514	[redacted] US gal	Dispensing	15.5 V	13.4 V

Figure 4: Ability to View History

- Real-time data – a user can log into the secure website and "poll" the specific site or a group of sites to receive the latest site data. This feature is especially useful if maintenance is required and helps in troubleshooting issues such as site battery problem, a solar panel issue, or low fluid level.

- Levels of users – each site can have multiple users assigned to it. The users can have varying degrees of access ranging from Company Manager that can control all site information to Read Only Technician that can only read the data, but not change any parameters. The sites themselves can be assigned to specific subdivisions. A Company Manager can have access to all sites within an organization and can assign the Technicians to have access to only specific sites within a company or subdivision. Alarm messages can be sent to specific users who are responsible for that site or that subdivision or to an entire group of users. Figure 5 shows what a company manager sees when logging into the website. Figure 6 shows the view of what a technician who is assigned to specific subdivisions would see when logging into the website.

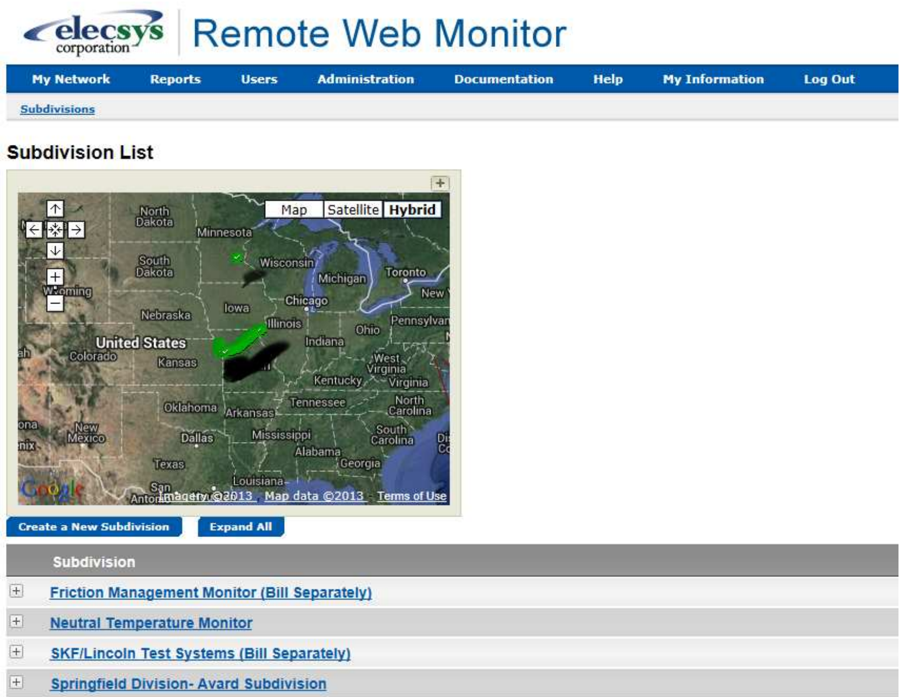

Figure 5: Company Manager Sees All Subdivisions

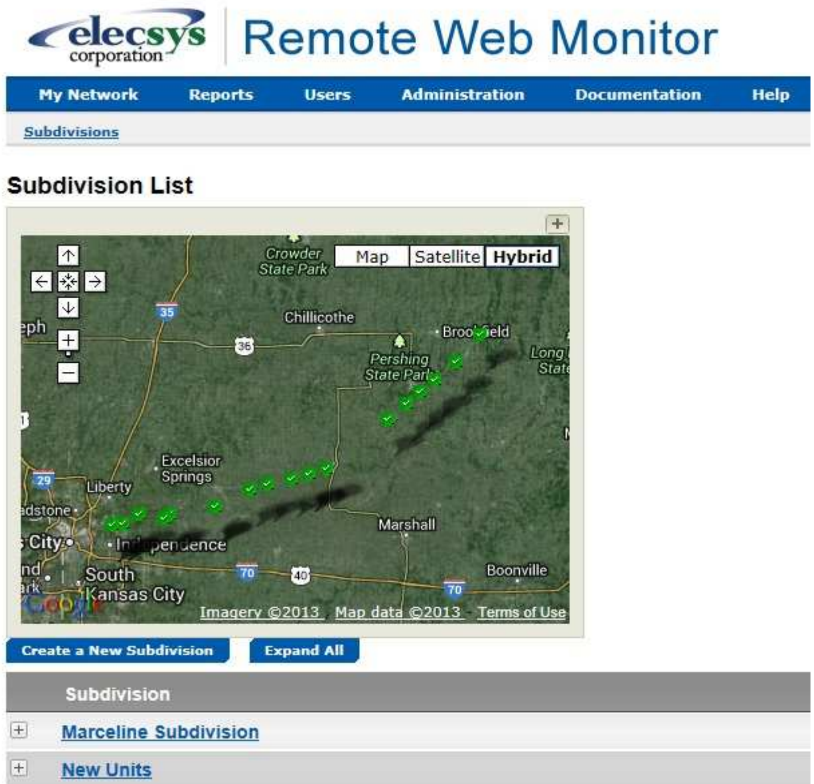

Figure 6: A Technician Sees a Specific Subdivision

- Backup battery – the RFM remote monitor has its own battery that ensures continuous operation even if site batteries are depleted. The internal battery allows the RFM remote monitor to continue transmitting alarm messages of parameters that are out of the pre-set range, such as low battery level at the site, door open, low tank level, etc... This internal battery is trickle charged off the main batteries and allows the remote monitor to operate more than six months on its own power.

- Remote interrupt – a user can set specific times and dates to turn OFF and then back ON the pump inside the lubrication system as well as turn it ON/OFF on demand. One of the key benefits is the savings of lubricant when performing maintenance on the rail, such as rail grinding, or performing ultrasonic inspections when a system may need to be off for three days before the inspection. Additional cost savings are achieved when comparing remote interrupt to manually turning off every single unit before an inspection or maintenance activity.   With remote interrupt, the controller is still operating and the remote monitor continues transmitting daily reports such as wheel/axle counts, door open/closed, battery voltage, tank level, power presence, etc… Figure 7 shows the user interface for instant and scheduled remote pump interrupt.

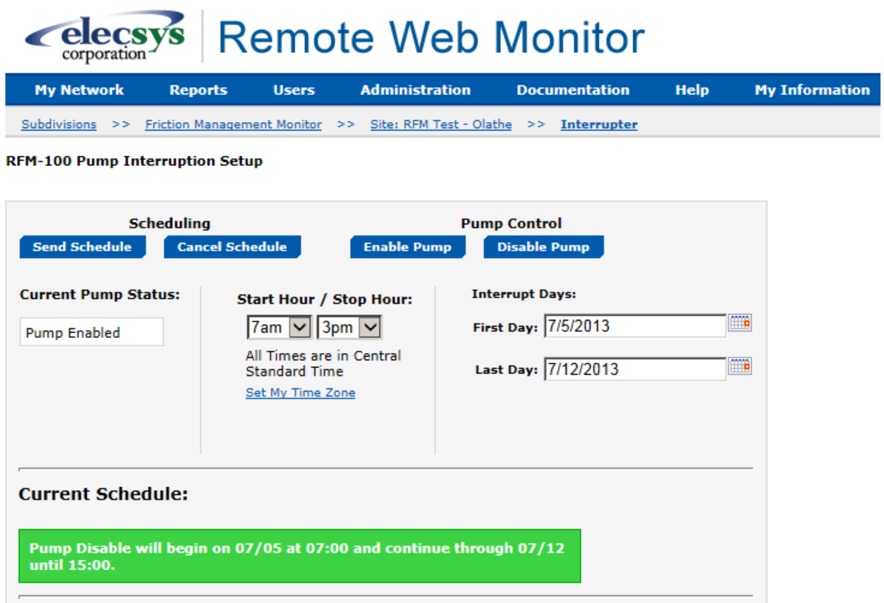

Figure 7: Schedule Pump Interruption

- RS232 Serial – each RFM remote monitor is equipped with an RS232 serial port that can communicate with specific digital controllers that are provided with friction management systems today. The remote monitor reads the data and interprets the information which is then displayed on the secure website. New controllers are being added to the portfolio of controllers with which the remote monitor communicates upon request.

- Data Storage – the RFM remote monitor is equipped with a memory card that can store site information for the last twenty (20) years. The data can be retrieved over-the-air if the unit has a cellular connection or by downloading the data to a computer using a USB cable. This is particularly helpful if performing specific tests on a section of rail.

- Digital channels – four digital channels are available for use with magnetic door alarms, to count wheels/axles of a passing train or to detect the presence of AC power. Digital channels can help in troubleshooting site issues, such as the loss of AC power. When used with magnetic door alarms, they can help determine if a door is being opened for regular maintenance or if there could be another problem such as theft.

- Analog channels – four analog channels are available for measuring items such as battery voltage, solar panel voltage, pump operation, and fluid level sensor (can be either a 0-10V or 4-20mA). All of these channels can have alarm thresholds configured remotely, using any internet connected device and can be programmed at any time.

The digital and analog channels provide instantaneous as well as periodic input checking. Instantaneous inputs monitor continuously and send out alarms when they occur. Periodic inputs have high and low level limits and report at the regularly scheduled intervals, such as after every train event. Should an out of limits alarm condition occur, a message is sent via email or SMS to the specified users. If the condition returns to within the pre-set limits, a new message is sent to the users. Table 1 below describes the different alarms and their configurable alarm conditions.

Periodic Input	Configurable Alarm Conditions
Battery/Power Supply Voltage	Outside Alarm Threshold (High or Low Limits)
Solar Panel Voltage	Outside Alarm Threshold (High or Low Limits)
AC Power Detect Probe	Does Not Alarm, Only to aid in troubleshooting
Grease Tank Level Sensor	Below Alarm Threshold (in percentage)

Instantaneous Input	Configurable Alarm Conditions
Pump On Time	Pump staying on longer than time threshold
Pump Current Sense	No current sensed or high current sensed
Wheel/Axle Count	No Counts for configurable amount of time
Tank Door Sensor	Door opened
Electrical Door Sensor	Door opened
Power Loss	Power was lost at site/AC Detect aids in determination of failure

Table 1: Alarms and their conditions

These new remote monitors offer easy field installation to work with existing friction management systems. They can be mounted inside or outside an existing system and connect with two wiring harnesses. A trained installer can complete the field installation of one remote monitor in less than one hour. The goal for future implementation is to have the monitors installed in the factory of the major friction modification system providers and thus eliminating the need for field-retrofit. A few pictures of the remote monitor installed in existing friction modification system manufactured by Loram-MOW and Lincoln.

Figure 8: Remote Monitor Actual Size 5.4x7.8x2.8 inches (135x200x72 mm)

Figure 9: Monitor Inside TOR unit

Figure 10: Monitor Inside TOR Unit

Figure 11: Close Up of Remote Monitor Connected

Figure 12: Monitor Inside GF Unit

Figure 13: Close Up of Monitor Inside GF Unit

Analysis

The first fifty (50) units were installed on existing friction management systems. The field retrofit installation required approximately one hour per system. Upon completion of the field installation, the remote monitor became operational and started transmitting messages.

The following is a sampling of the screens that can be viewed by logging into the secure website from any internet enabled device: Figure 14 shows a view of the entire subdivision with information about the main parameters such as operational status, site power, tank level and electrical door status.

Subdivision

BNSF - Marceline Subdivision

Assigned Users: Nicholas Dryer, Jon Behrens, Kevin Vogts, Brad Willems, Allen Peyton, Brian Barthel

Sites

Status	Int	Site	Last Contact	Monitor Battery Voltage	Tank Level (Controller)	Solar Panel Voltage	Power Source Voltage	Electrical Door Status (Controller)	Internal Use	Unit Type
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	7.8 V	138 US gal	13.0 V	13.0 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.2 V	138 US gal	14.0 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	31 Jul 2013 19:00	8.3 V	138 US gal	13.0 V	13.0 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.3 V	141 US gal	15.5 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	31 Jul 2013 19:00	8.3 V	156 US gal	14.3 V	13.5 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.2 V	143 US gal	13.1 V	13.0 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.3 V	137 US gal	15.8 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.3 V	159 US gal	12.8 V	12.9 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.3 V	158 US gal	13.4 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.3 V	180 US gal	14.6 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	7.8 V	160 US gal	15.2 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	7.8 V	170 US gal	14.5 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.3 V	133 US gal	13.3 V	13.3 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.2 V	132 US gal	16.5 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.2 V	131 US gal	14.9 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.2 V	62 US gal	14.2 V	13.2 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.3 V	134 US gal	15.2 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.2 V	134 US gal	16.2 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.2 V	161 US gal	16.5 V	13.4 V	Closed	PumpEnabled	RFM
OK		MP [redacted] Marceline Double Track	01 Aug 2013 19:00	8.3 V	132 US gal	14.3 V	13.4 V	Closed	PumpEnabled	RFM

Figure 14: Entire Subdivision View

Clicking on any of the sites shown in Figure 14, leads to the specific site and more detailed information such as wheel counts, graphs for tank levels, specific location of the unit, amount of dispensed material, pump status, and several others.

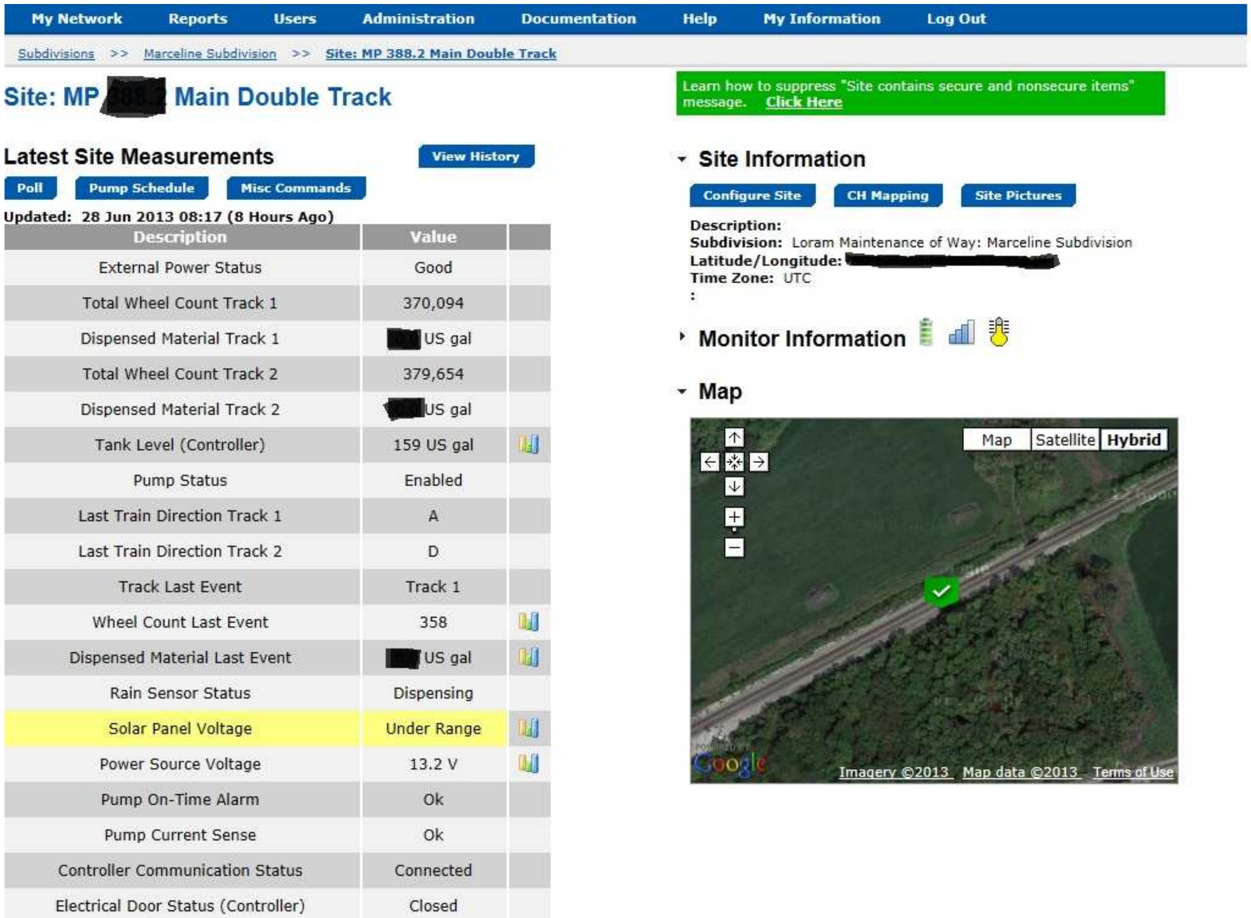

Figure 15: Site Specific View

In the site specific view as shown in Figure 15, a user can select to view a graph for the values reported to the site for tank level, solar panel power, site power, dispensed material during the last track event as well as wheel counts. Graph of the tank level is shown in Figure 16 and can be modified to show several months, a year, or a custom date range.

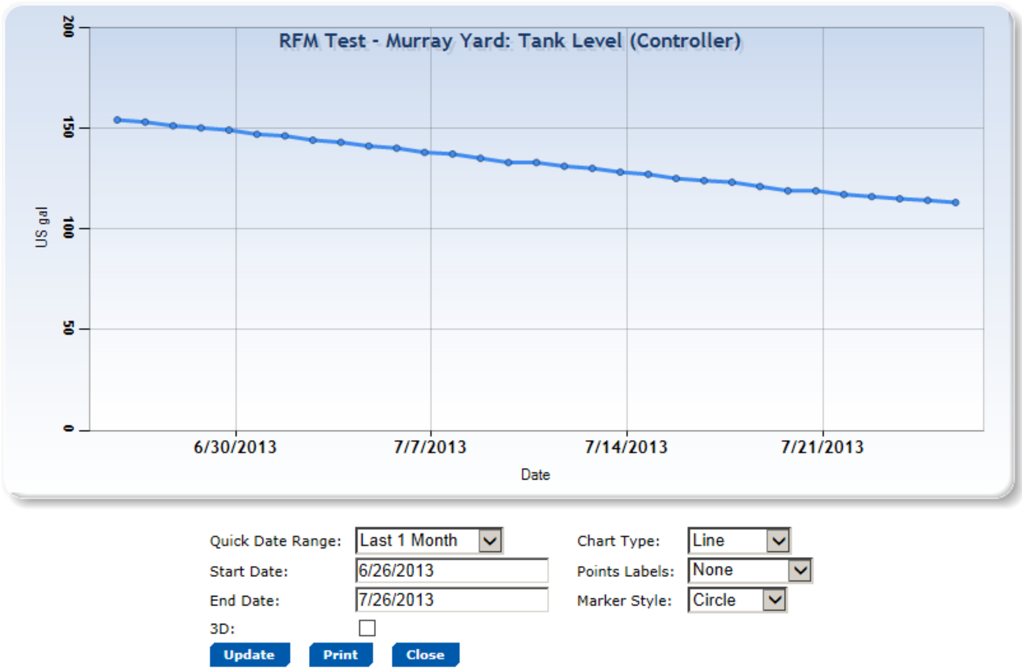

Figure 16: Instant Graphing Capability

Quality control of service for filling and maintaining material level is now clearly visible and information is available with graphs and numbers. Figure 17 shows the graph of a when a tank was filled and returned to 100% full.

Figure 17: Tank Filling Graph

Ability to see the history of all the channels under the “View History” provides information about the state of the units and when alarms were reported as well as cleared, as shown in Figure 18.

Channel History

Time	Monitor Battery Voltage	Total Wheel Count - Main 1	Dispensed Material - Main 1	Tank Level (Controller)	Last Train Direction - Main 1	Track Last Event - Main 1	Wheel Count Last Event	Dispensed Material Last Event	Solar Panel Voltage	Power Source Voltage	Electrical Door Status (Controller)	Unit Temperature	Lo D
01 Aug 2013 19:00	8.2 V	681,831	[redacted] US gal	166 US gal	West	Track 1	412	[redacted] ml	13.0 V	13.0 V	Closed	127.4 °F	
31 Jul 2013 19:00	8.2 V	669,876	[redacted] US gal	167 US gal	West	Track 1	291	[redacted] ml	13.0 V	13.0 V	Closed	122.0 °F	
30 Jul 2013 19:00	7.8 V	661,972	[redacted] US gal	167 US gal	West	Track 1	306	[redacted] ml	13.0 V	13.0 V	Closed	105.8 °F	
30 Jul 2013 10:15	7.9 V	657,903	[redacted] US gal	167 US gal	East	Track 1	47	[redacted] ml	13.1 V	13.1 V	Closed	96.8 °F	
29 Jul 2013 19:00	8.0 V	653,218	[redacted] US gal	168 US gal	East	Track 1	294	[redacted] ml	12.7 V	12.7 V	Closed	91.4 °F	
29 Jul 2013 15:44	8.4 V	652,680	[redacted] US gal	168 US gal	West	Track 1	438	[redacted] ml	12.8 V	12.7 V	Open	78.8 °F	
29 Jul 2013 14:25	8.0 V	652,680	[redacted] US gal	167 US gal	West	Track 1	438	[redacted] ml	12.8 V	12.7 V	Closed	91.4 °F	
29 Jul 2013 12:46	7.8 V	652,004	[redacted] US gal	168 US gal	East	Track 1	238	[redacted] ml	12.9 V	12.9 V	Closed	96.8 °F	
29 Jul 2013 12:26	7.6 V	652,004	[redacted] US gal	167 US gal	West	Track 1	3	[redacted] ml	0.0 V	0.0 V	Open	87.8 °F	
29 Jul 2013 12:16	7.1 V	652,001	[redacted] US gal	237 US gal	East	Track 1	3	[redacted] ml	0.0 V	0.0 V	Open	82.4 °F	
29 Jul 2013 12:14	7.2 V	652,001	[redacted] US gal	237 US gal	East	Track 1	3	[redacted] ml	0.0 V	0.0 V	Open	82.4 °F	
29 Jul 2013 12:09	7.2 V	652,001	[redacted] US gal	167 US gal	East	Track 1	3	[redacted] ml	22.3 V	16.5 V	Open	82.4 °F	
29 Jul 2013 11:02	8.4 V	652,001	[redacted] US gal	167 US gal	East	Track 1	3	[redacted] ml	13.1 V	13.1 V	Open	98.6 °F	
28 Jul 2013 19:00	7.8 V	645,601	[redacted] US gal	168 US gal	West	Track 1	322	[redacted] ml	13.3 V	13.3 V	Closed	104.0 °F	
27 Jul	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Track	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

Figure 18: Ability to View History

<u>Discussion of Advancements in Technology and Benefits</u>

Before reliable remote monitoring became available, maintainers could spend as much as 80% of their time commuting from site to site. If a problem is noticed during one of the visits, the maintainer may not have all the right tools or equipment to correct the problem and would need to come back to the site the next day or another week. Additionally, before remote monitors, sites may be down and non-operational until a maintainer can come by and see the site not working. After a problem is noticed, it could take several more days to make the systems operational, reducing the benefits of having a friction management system on the rails.

With the first generation of remote monitors, the systems provided ability to see the tank levels, battery voltage, train events, wheel counts and pump time. Some of these legacy systems required high amounts of power and thus draining the site batteries and forcing the system to shut down. Additionally, the first generation included radios that are becoming obsolete and being phased out by the Class I railroads. These radios require a significant amount of maintenance of their infrastructure and this increases the cost of the entire system, although that cost may not always be associated with the friction management systems.

The new generation of remote monitors makes the maintainers much more efficient in planning site visits and knowing which materials and tools to bring with them to the specific sites. Using a previous example of a maintainer covering roughly 280 miles of track per week, with an average salary of $1000 per week, only $200 or roughly 20% is being used for actual maintenance work. The rest is being used for non-maintenance related work. The added benefit of having a monitor in the field is the ability for a maintainer to now cover their territory more efficiently. Additionally, the remote monitor is constantly checking the system compared to a maintainer that could only check it once a week and sometimes less frequently.

The monitors also provide instant notification if a problem occurs in the field and create an opportunity for faster service to be performed on the malfunctioning unit. This helps reduce the downtime and decreases other rail maintenance activities. Working units also improve overall performance and fuel efficiencies and reduce costs.

Conclusions

Having an effective remote monitoring solution could potentially pay for itself in less than six months and many times having faster return on investments (ROI).

During the initial launch of 50 units, we measured 94 percent of the systems being up and running and reporting every day. One of the 50 systems was shut down due to a derailment, which leads us to conclude that 96 percent of the systems were operational and visible. This is significantly better when compared to systems with no remote monitoring or poor monitors that are not fully functional. Additionally, having working remote monitors allows the maintainers to focus on problem areas/units and provides them with knowledge of what supplies to bring with them.

Proactive remote monitoring, using field proven equipment, saves time, reduces costs and makes the railroads more efficient. These remote monitors can and should be required for all future wayside equipment and may be useful in other applications.

Acknowledgments

BNSF

Elecsys Corporation

Lincoln, a SKF Group brand

Loram – MOW

List of Tables

List of Figures

For Additional Information Contact

David Mintskovsky
M2M Rep
913-558-6413
Davidm@m2mrep.com