

New Trailer Metering System Helps Oilfield Transportation Company Save Time. Improve Safety and Increase Revenue

Quicker, more accurate and safer solution for custody transfer metering

By: Jerry Thompson, President of Connected Energy Inc.

North Dakota-based oilfield hauling company Prairie Field Services (PFS) was looking for a quicker, more accurate, and safer solution for custody transfer metering of crude oil loading and unloading of tanker trailers. After investigating several possible solutions, they selected a system developed by Connected Energy Inc (CEI), which uses Coriolis mass flowmeter technology with large internals and a small footprint that makes it easily truck-mountable. The 4-inch meter was integrated into an overall metering system that reduces the time needed to load/unload a truck, resulting in an estimated 10-15 percent increase in revenue. Not only did the system improve the safety of PFS's workers, but the system's capabilities catapulted them into the Internet of Things (IoT).

The next generation of oilfield hauling

PFS, a member of the Prairie Companies, is the leader in oilfield hauling and logistics throughout the Bakken and Powder River Basins. Located in Watford City, North Dakota, PFS hauls crude oil from individual well sites to midstream distribution facilities. Jeff Wright, PFS's Director of Operations, was instrumental in the success of this project.

During the crude oil loading and unloading process, the tanker trailer/semi-trailer pulls up to the well site, where crude oil is normally stored in large tanks. The driver connects the hose to the tank, and then loads the oil into the tanker trailer.

The company typically used positive displacement (PD) meters for loading the truck from the well sites but tended not to measure the oil again when they offloaded at the distribution facility. They would typically use a TANK-TEL tank monitoring system with telemetry capability to measure the volume of oil, or might possibly use weigh scales. Both these alternatives can be inaccurate, and do not provide information on densities or other characteristics.

After loading, the oil must be tested to determine if it is "merchantable" – containing under the prescribed limits of basic sediment and water (BS&W). Using a centrifuge, tank truck operators take a sample from the top, middle, and bottom of the tank and two temperature samples from the middle. They then read out the results to determine if it meets the requirements.

The entire manual process takes about 30 minutes per load, and PFS was looking for a more automated truck metering solution that would reduce the amount of hands-on "tank work" on the well site. In addition to improving efficiency, they were also interested in the safety benefits of not having drivers climb up on tanks. Reducing exposure to slips, trips and falls, and volatile organic compounds (VOCs) was also desirable.

Meter solutions

Working with CEI, a system integration company with ten years of experience solving problems in the Bakken, PFS evaluated several available options. They began by conducting trials with three different meters, including two Coriolis meters and one completely different differential pressure (DP) meter technology.

The requirements of the sanctioning bodies (Bureau of Land Management (BLM) and the State of North Dakota) stipulate that there can only be one way on and off the trailer. This meant that flowrate could be a potential problem, due to the low head pressure when unloading. It wasn't until CEI reached out to KROHNE and discussed its line of Coriolis meters that they found a good solution.

After discussions with KROHNE's engineering staff, CEI decided to try an OPTIMASS 6400 Coriolis mass flowmeter with an optional remote meter head. This 4-inch meter not only has the flow rate capacity to meet the requirements, but also has a patented Entrained Gas Management (EGM™) technology that detects and signals gas entrainment. The meter maintains the active measurement in all measuring conditions with gas content from zero to one hundred percent by volume. It can report the two-phase status and output a preconfigured alarm, in accordance with NAMUR NE 107 requirements. The meter has a signal converter with digital signal processing that provides dynamic density measurement, as well as enhanced diagnostic and status indications.

The minute oil was pushed through the KROHNE OPTIMASS 6400, CEI knew they had found exactly what they were looking for. The footprint was good, the accuracy was fantastic, and the flow rate far exceeded expectations.



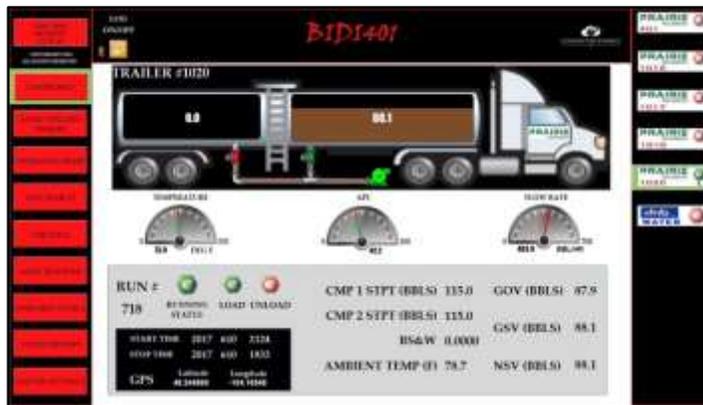
Complete installation of truck-mounted crude oil transfer metering solution

Connecting the data

In conjunction with finding the best Coriolis meter, CEI developed an integration package that is easy to operate and follows the IoT concept by storing data in the cloud and offering real time mobile applications. The patent pending system offers an auto-load feature that allows the operator to load by volume or mass. Once the preset limits chosen by the operator are met, the system turns off, reducing the number of spills from

overloading. If desired, a dispatcher can enter the desired volume/mass of each load for a trailer, even further reducing human error.

In terms of load accuracy, the system calculates average temperature, average American Petroleum Institute gravity (API gravity), gross observed volume (GOV), gross standard volume (GSV), net standard volume (NSV), and basic sediment and water (BS&W). This wealth of information is delivered on a printed ticket from the user interface or an e-ticket.



IoT integration

Meeting the requirements

During the system development, CEI, KROHNE, and PFS's Jeff Wright had to solve a variety of truck configuration challenges, including placement and footprint. Also, the system had to meet the separate requirements of both the BLM and the state of North Dakota. The system was approved by North Dakota and meets all current BLM requirements.

Based on the results of a successful pilot program, PFS purchased five systems, which are currently in operation. They are looking to outfit more trailers in the near future. To date, there have been zero failures or issues with any of the installed systems.

Safety, time and increased revenue

With the new system, the metered trucks simply pull up, hook up the hose and start pumping. The meter tells the driver if the oil is merchantable. In addition, there may be potential savings on insurance and workers compensation once PFS can show they are using metering trucks, and workers are not being exposed to hydrogen sulfide.

From a fleet perspective, if all trucks use the metering system, the 30-minute time savings gained from not having to conduct the manual tank work would be equivalent to an increase of .33 loads per shift. This equates

to a 10-15 percent increase in revenue generation per shift, thus creating a return on investment (ROI) of six months.

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