



PEMBINA PIPELINE USES e9 TREATMENTS' NANOTECHNOLOGY-BASED SURFACE TREATMENT

PEMBINA PIPELINE REDUCES DOWNTIME AND RESOURCE DEMAND

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Paraffin wax is a naturally occurring byproduct found in various hydrocarbons. If not managed properly, it can cause significant impacts to oil and gas operations. It has the potential to drop out of solution and deposit on pipe walls, processing equipment and the surfaces of measurement devices.

Pembina Pipeline Corporation is a leading energy transportation and midstream service provider serving North America's energy industry for more than 65 years.

In a few of its locations, Pembina observed a unique paraffin wax forming with extremely hard properties when crude oils were blended with butane resulting in a shutdown of the pipeline. These shutdowns cause potential revenue loss to the producer, as well as a considerable draw on Pembina resources to clean, re-install, prove or validate the measurement equipment.

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Abstract

Paraffin wax is a naturally occurring byproduct found in various hydrocarbons. If not managed properly, paraffin wax can cause significant impacts to oil and gas operations. Paraffin has the potential to drop-out of solution and deposit on pipe walls, processing equipment and the surfaces of measurement devices.

Pembina Pipeline Corporation is a leading energy transportation and midstream service provider serving North America's energy industry for more than 65 years. In a few of its locations, where crude oils were blended with butane, Pembina observed a unique paraffin wax forming with extremely hard properties. These hard wax formations deposited on measurement equipment and required operations to shut down the pipeline. These shutdowns cause potential revenue loss to the producer, as well as a considerable draw on Pembina resources to clean, re-install, prove or validate the measurement equipment.

Recently, e9 Treatments introduced Pembina to its Pro Series products as a potential solution to mitigate issues with this paraffin wax. e9 Treatments offers a nanotechnology-based surface treatment which coats the surfaces of measurement equipment to help stop wax from adhering to the measuring components.

e9 Treatments' Product

When applied to a clean and dry metal surface, e9 Treatments' Pro Series products lower the surface energy of the metal, making the surface repel water and oil. Under normal operating conditions, contaminants carried in the oil (such as paraffin, asphaltene, scale, iron sulfide, and others) can stick and bond to any untreated metal surface because of the metal's naturally high surface energy. This is particularly noticeable as the flow line loses pressure or temperature. Similarly, paraffin tends to precipitate out of the fluid as ambient temperatures get cooler. All of this leads to a slow buildup of oil and water-based contaminants on equipment surfaces. e9 Pro Series treatments lower the surface energy of the treated metal, preventing water or oil molecules to "wet" or bond to the surface. The molecules and the contaminants they carry tend to drift along in the flow line, not precipitating out of the fluid, "sticking" or bonding to the surface. When they do stop on the treated surface, there is not enough surface energy to form a strong, permanent bond. This makes the surface much easier to clean. e9 Treatments' Pro Series products achieve this dynamic without affecting the physical properties of the device, nor its designed performance.

Case Study

At one location near Drayton Valley Alberta, Canada, Pembina observed paraffin wax build-up on a 2" Coriolis meter where blending of crude oils and butane occurred. Pembina systems remotely monitor measurement equipment and pipeline balances enabling operations to shut-in sites when accuracy requirements are not met. Within days of the producer initiating butane blending, Pembina's leak detection system identified that the line balance was moving towards a shortage.

With leak detection tolerances set to 0.2%, operations shut in the site to investigate. Technicians identified wax build-up on the meter and the site remained shut-in until technicians could remove, clean and re-install the meter. This cycle occurred 1-3 times per week for over a year.



Figure 2. Coriolis being removed from a pipeline.

The pipeline downtime resulted in a significant resource draw for Pembina operations with each occurrence. Each shut-in required two operators to drive 2 hours to the site, then spend 2-3 hours removing the meter, steaming the meter to clean it, and re-installing the meter. Additionally, for every occurrence another operator had to drive to the site to prove the meter after it was returned to service. The downtime also caused potential revenue losses for the producer when monthly nominations weren't achieved due to the outages.

Pembina decided to treat one of the Coriolis meters at the site to help reduce downtime and maintenance costs. To ensure accuracy wasn't compromised by applying e9 Treatments to the meter, a prover tested the meter before and after treatment the day it was put into service. The meter factor change was negligible.

One year after applying e9 Treatments' Pro Series product to the Coriolis meter and installing the meter in the pipeline, the meter continues to run without interruption. Pembina has not shut down the site due to paraffin wax build-up.

By lowering the surface energy of the treated metal, e9 Treatments prevents precipitating wax to develop a strong bond with the surface. In many applications, the normal flow of material or gravity itself, self-cleans the device. Pembina witnessed the self-cleaning scenario on this meter. Through Pembina’s remote monitoring system operations could see when the meter would show signs of wax starting to build-up, but then self-clean once enough build-up occurred. Since e9 Treatments’ Pro Series products do not allow the wax to make a strong bond with the metal surface, the wax breaks away from the surface re-entering the flow prior to the meter or balances going outside the allowable tolerances. The meter factor has remained within specifications for the entire year, even showing signs of this self-cleaning effect.

The Cost of Shut-Ins Due to Contaminant Deposition

The financial impacts of paraffin wax and other contaminants depositing on meters include down-time for the producer. This downtime jeopardizes the ability of the producer to meet monthly volume nominations.

For Pembina, major costs include resources to support cleaning, replacing measurement equipment and proving. From an environmental perspective, prior to treating the Coriolis meter, this site required operations to drive up to 24 hours per week to provide service. Reducing the need for frequent onsite service contributes significantly to greenhouse gas reductions.

“We are very pleased with the performance of e9 Treatments. Our pipeline operation went from having to shut down for meter maintenance 1-3 times per week to running for over one year without interruption. We plan to use e9 Treatments in other aspects of our operation.”

—James Smithinsky, Pembina Pipeline

Summary

The application of e9 Treatments’ Pro Series products to the Coriolis meter resulted in a significant reduction of downtime, increased resource efficiency for Pembina Pipeline and reduced financial risk to the producer for missing monthly nominations.

With the success of e9 Treatments on this site, Pembina introduced the product to a number of other locations where paraffin wax has been observed. Pembina applied e9 Treatments to BS&W meters, as well with great success. The company is now evaluating e9 Treatments on thermowells, tubing and other process equipment and instrumentation where paraffin wax is contributing to shutdowns and other operational issues.

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