PUMP MONITORING

In the Pursuit of **100% Availability**

Learn how SNF leverages IIoT sensors and analytics software from Siemens to remotely monitor its pumping equipment and detect problems before they occur, making operations safer, more productive and more transparent.

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SIEMENS

THE CUSTOMER

SNF Water Science

SNF is a specialty chemical company and a water chemistry expert.

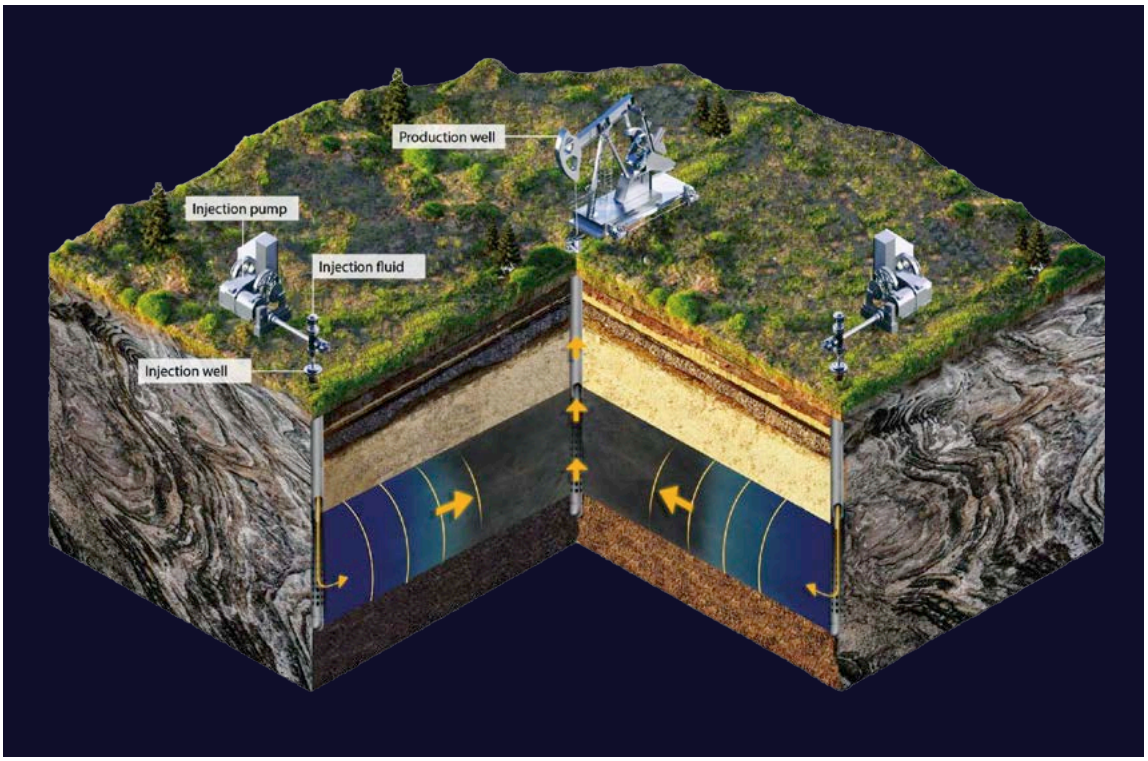
With 21 production facilities and subsidiaries in more than 50 countries, SNF is the world's leader when it comes to designing and manufacturing water-soluble polymers. SNF is continuously innovating its range of more than 1000 products, which helps preserve natural resources, encourages recycling and improves the efficiency of industrial processes.

Different oil recovery phases

The oil & gas industry is just one of the markets that SNF addresses with its chemicals. Especially when extracting oil from the ground, chemicals are needed, which SNF produces and supplies to its customers.

In the primary oil recovery phase, the pressure in the oil reservoir is high enough so that no additional equipment is required to bring the oil to the surface. The recovery factor of this first phase, which is the percentage of oil that can be extracted from a reservoir, is typically in the range of 5 to 15 percent. The pressure decreases over the lifetime of a reservoir, which means that measures have to be applied to extract the oil out of the ground.

Headquartered in Andrézieux, France, SNF is the world's largest producer of polyacrylamide.



To extract more oil from the reservoir, long-chain water-soluble polymers are pumped into the ground using injection pumps.

This is where secondary oil recovery comes into play. Water or gas is injected into the reservoir to restore the pressure. By combining the first and secondary oil recovery phases, 35 to 45 percent of the oil in a reservoir can be extracted.

Chemicals to boost output while reducing the waste of resources

Water-soluble polymers are chemical substances that dissolve in water and change its physical properties through gelation, thickening or stabilization.
Expertise relating to water-soluble polymers is especially needed in the third oil recovery phase. Enhanced oil recovery (EOR), also known as tertiary oil recovery, is a process to increase the mobility of oil in a reservoir to boost the amount of oil extracted. In enhanced oil recovery, polymer flooding is a cost-effective approach to maximize the productivity of existing assets while minimizing resource use.

A polymer flood project can reduce water usage by 50 to 90 percent per barrel of oil produced. The CO_2 required to produce a barrel is also reduced by two-thirds.

More than 60 percent of the oil in a reservoir can be extracted when using EOR.

Here, SNF offers modular plug-and-pump installations that can be easily delivered and deployed on site to use polymer flooding. SNF designs, implements and operates these installations for their customers to maximize the amount of oil extracted out of a reservoir.

With in-depth polymer expertise and their modular plug-and-pump installations, SNF offers an end-to-end solution to their customers so that they can increase reservoir yield.

THE CHALLENGE

Dealing with high vibrations

The equipment used in plug-and-pump installations mixes the polymers with water and then pumps the mixture into the reservoirs.

The equipment within the plug-and-pump station is subject to high vibration levels that can cause malfunctions and result in unplanned downtimes.

SNF was aware of unusually high vibration levels of their pumps and motors, but was unable to identify the precise location and the root cause. This meant that the equipment could suddenly fail without any prior warning, requiring maintenance personnel to travel to the remote oil reservoir to resolve the problem. This resulted in inefficient operations and high costs.

SNF invested a lot of time in identifying Industrial Internet of Things (IIoT) solutions that provide an easy-to-use interface to optimize maintenance activities and increase service efficiency for the large number of pump stations distributed all across the world.

"Due to the remoteness of the oil fields and therefore of our equipment, unplanned downtimes must be avoided at all costs. A small problem with one pump can have cascading effects on several other processes, and can even bring the entire oil extraction operation to a standstill. This is why we need to aim for 100% availability of our plug-and-pump installations."

Fabrice Diana
Digital Transformation Manager at SNF

THE SOLUTION

IIoT pump monitoring

SNF finally selected the Drivetrain Analyzer Cloud – a motor and pump condition monitoring solution from Siemens.

Plug & play condition monitoring for SNF's plug-and-pump installations

The raw data from SIMOTICS CONNECT 400 sensor modules is analyzed in the Industrial Cloud application Drivetrain Analyzer Cloud. These modules were quickly and easily mounted on the pumps and motors in SNF's installations. Once the sensor modules were mounted onto the third-party motors, they were ready for commissioning using an easy-to-use mobile application. The sensors are now automatically collecting raw vibration, temperature and magnetic field data from the pump motor. And it is irrelevant whether the motor is driven directly online (DOL) or using a variable frequency drive (VFD).

The SIMOTICS CONNECT 400 sensor module mounted on a third-party motor in a plug-and-pump installation from SNF.

Analytics in the Industrial Cloud

The data captured at the oil reservoirs is transferred to the Industrial Cloud via Siemens SCALANCE communication technology. This is where the Drivetrain Analyzer Cloud comes in. The application captures sensor module data. It provides powerful analytics and a transparent, customizable dashboard showing the actual condition of the equipment at a glance.

"With SIMOTICS CONNECT 400 and Drivetrain Analyzer Cloud, we are combining our unique domain expertise in motion control and drive technology with digital skill sets such as data science, artificial intelligence and digital twins to provide an extremely powerful yet easy-to-use monitoring solution for SNF and their plug-and-pump installations."

Louis Mahlau
Product & Portfolio Manager – IoT & Analytics at Siemens

Drivetrain Analyzer Cloud calculates various KPIs for the health and energy usage of the equipment within the plug-and-pump installations. Statistics regarding CO_2 emissions and energy costs are calculated based on data from the sensor modules. When inefficient motors are detected, Drivetrain Analyzer Cloud goes a step further and even suggests alternative, more efficient motors. This also includes information on the savings in terms of energy, operational costs and CO_2 emissions that can be achieved by switching to a more efficient motor.

Drivetrain Analyzer Cloud comes with dedicated pump analysis features based on pump characteristic curves, in addition to a traffic light that visualizes the mechanical condition of the connected asset (bearing wear, imbalance, misalignment).

In addition to detailed energy efficiency KPIs, Drivetrain Analyzer Cloud has built-in AI capabilities to determine the state of the equipment, providing SNF with transparency about its remote equipment. An easy-to-understand traffic light system, based on in-depth FFT analysis and machine learning, indicates upcoming failures due to imbalance, misalignment or bearing damage. When an anomaly is detected, SNF's maintenance personnel are automatically notified so that the appropriate action can be taken to avoid unplanned equipment downtime.

The SIMOTICS CONNECT 400 sensor module can also be used for generic vibration monitoring. This means that other drivetrain equipment, such as transmissions or clutches, can be connected to the cloud and their health monitored. SINAMICS drives can also be connected to the application. Equipment that belongs together, such as a drivetrain comprising a pump, motor, gearbox and drive, can be grouped together, allowing SNF to mimic the real topology of their plug-and-pump installations and monitor the status of the installations in separate views. This makes Drivetrain Analyzer Cloud the application of choice for fleet management, monitoring and optimizing the entire drivetrain – not just motors and pumps.

Dedicated pump analytics

One of the regular updates to Drivetrain Analyzer Cloud has added new pump monitoring and analytic capabilities, enabling SNF to gain even more insight from the data provided by the SIMOTICS CONNECT 400 sensor modules. The pump analysis feature helps to optimize energy consumption in pump and motor combinations with realtime KPIs and efficiency metrics such as pump efficiency and flow rate – all visualized on a streamlined user interface to make decision-making even easier. Additional analytical functions focusing on pump clogging indicate, in the form of a traffic light, whether or not there is a problem.

THE BENEFITS

Achieving more with less

With the health indicators and alarm thresholds embedded in Drivetrain Analyzer Cloud, SNF is now able to remotely monitor its entire plug-and-pump fleet and make smarter maintenance decisions. This reduces costs and increases availability and transparency. Based on these benefits, SNF plans to equip all new plug-and-pump installations with SIMOTICS CONNECT 400 sensor modules together with the Drivetrain Analyzer Cloud application for monitoring and optimizing their operations. This will also allow them to offer additional services to their customers.

"With the plug & play connectivity of SIMOTICS CONNECT 400 and the easy-to-use analytical capabilities of Drivetrain Analyzer Cloud, we made the perfect choice to monitor the conditions of our plug-and-pump installations. Siemens has paved the way for us to achieve our goal of 100% availability, while at the same time, reducing costs and increasing transparency."

Fabrice Diana
Digital Transformation Manager at SNF

Higher availability

With the analytical capabilities of Drivetrain Analyzer Cloud, SNF is able to make much smarter maintenance decisions. By knowing the exact status of all their equipment, they are able to increase their pump uptime from an already good level of 95 to 98 percent, closer towards their goal of 100 percent.

Lower costs

With the data presented in an easy-to-understand manner, the teams at SNF are now able to better schedule their maintenance, resulting in a 20 percent reduction in the manpower required to operate their equipment.
In addition, the need for on-site support has been reduced by 30 percent, resulting in significant cost savings for SNF.

More transparency

Drivetrain Analyzer Cloud allows a clear correlation to be made between motor vibration levels and other issues in the production process. In addition, SNF can now automatically generate field operation reports that provide transparency not only to the equipment operators, but also to all other stakeholders.

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