Alaska Pipe Line



Background

The Kuparuk pipeline is approximately 37 miles in length. The system originates at the Kuparuk Oil Field on the North Slope and connects into Pump Station #1 of the Trans Alaska Pipeline System. The Kuparuk portion of the pipeline has two pump stations within the first 10 miles. Conoco Phillips uses a heat trace system to keep the oil warm and uses a 500kva delta to wye isolation transformer with a filter to isolate the communication system.

Power line communication technology allows facilities to transmit data over existing low voltage power lines. This technology requires the data to be sent at different frequencies than the voltage frequency. This means facilities do not need to run separate wire throughout the facility, greatly reducing costs and significantly improving the production process.

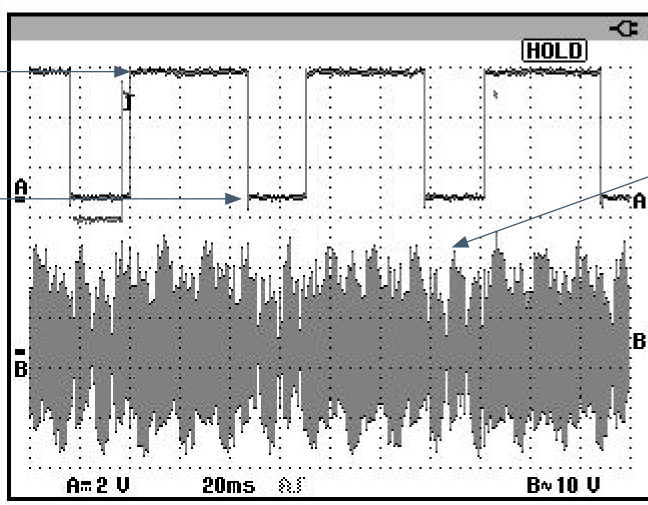
The Situation

The Kuparuk portion of the Alaska pipeline transports hundreds of thousands of barrels each year. The oil is kept warm with a heat trace system and there are a multitude of variable frequency drives powering the motors. Conoco Phillips manages the pipeline output via data sent over the existing low voltage power lines, this is known as power line communication technology.

Data such as the rate of flow and temperature of oil are immediately available. Transmitting this data quickly is critical to the operation of the Kuparuk pipeline's viability. However, something was corrupting the transmission of data. Conoco Phillips had Environmental Potentials perform a full power quality analysis of its electrical system.

"The analysis was clear, the low voltage power lines were polluted with high frequency noise," said Darrin LeRoy field technician for Environmental Potentials. "When the drives were powered up, the noise was amplified and the data became corrupted."

The top of readings shows what the signal should look like, while the bottom half of the chart shows the actual signal. The top arrow points to the positive half cycle while the bottom arrow points to negative half cycle.

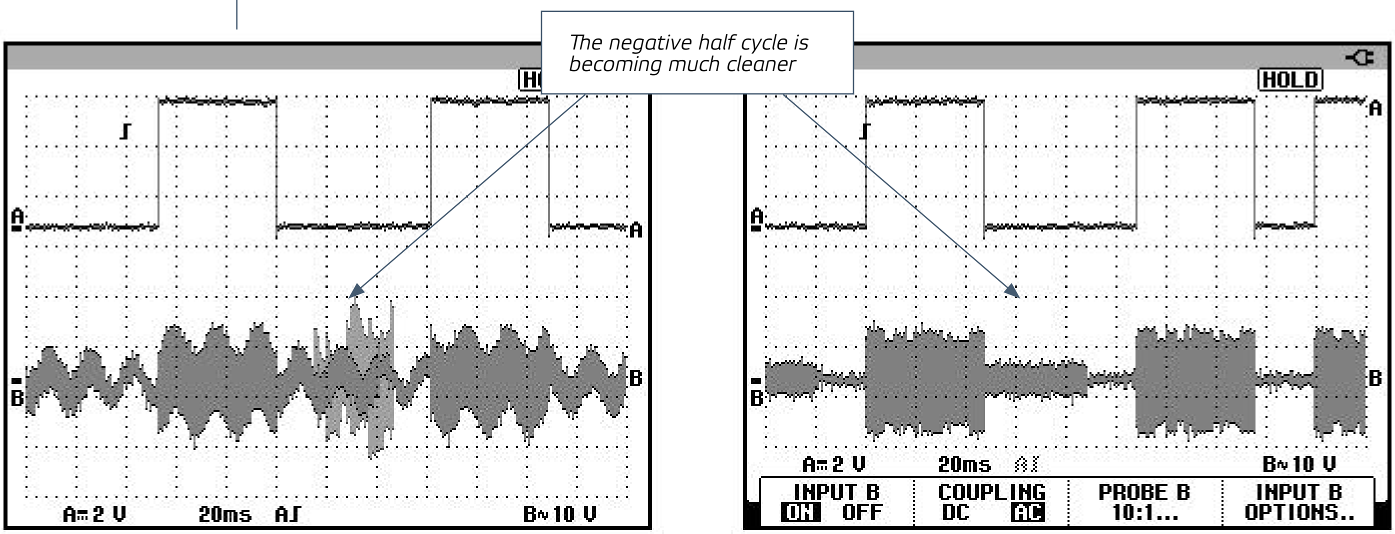


The negative half cycle is almost indistinguishable from the positive half cycle. The noise on the waveform completely corrupted the communication channel.

The Solution

"As soon as I saw all of the VFD's and isolation transformers in the facility, I knew there was going to be an abundance of noise," said LeRoy. "This facility needed a lot of filtration."

The power quality analysis revealed the facility was saturated with high frequency noise. This is a perfect application for Environmental Potentials' waveform correction technology.



While these readings clearly show a strengthening of the signal, the negative half cycle is still polluted with high frequency noise.

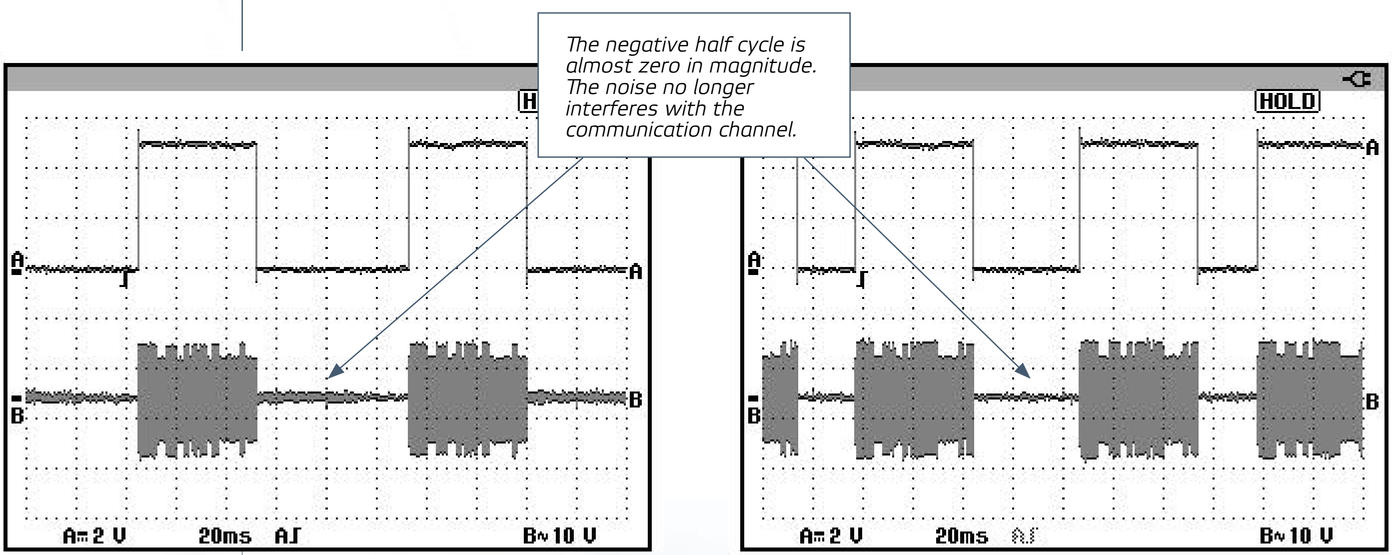
"The presence of so many drives in the facility meant that waveform correctors needed to be distributed throughout the facility," said LeRoy. "After installing five waveform correctors the signal had significantly improved."

The Result

The results are clearly visible after installing seven EP filters. The data signal in communication channel B is free from high frequency noise and is in a readable format. The level of high frequency noise is not sufficient to interfere with the communication channel.

Power line communication technology has revolutionized the modern facility. It dramatically lowers infrastructure costs because it allows data and power to be transmitted over the same wire. Power is transmitted at 50/60 Hz while the communication channel is transmitted at 47-51kHz.

However, due to high frequency noise generated by non-linear loads such as VFD's, the data can become corrupted and information sent over the line is not useable. Environmental Potentials' waveform correction technology eliminates high frequency noise ensuring that data sent over low voltage power lines is not corrupted.



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