Talking Motors Offer Maintenance Help in Age of Virus: BNEF Q&A

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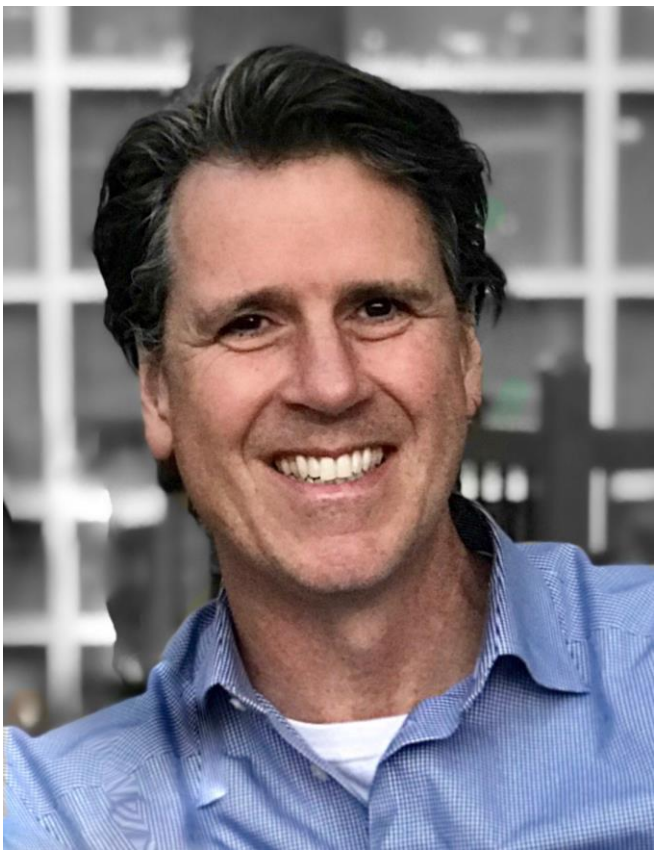
Unplanned equipment outages can mean lost production and cost companies billions of dollars. What do you do, then, during a global pandemic when you can't get people into the field to check on the status of equipment? What if you had a machine-learning tool that could predict when a motor is about to break and whether it's using electricity efficiently?

Veros System Inc. is an Austin-based startup with backing from Royal Dutch Shell PLC and Chevron Corp. that says it has the answers to the above questions. Veros offers a service backed by machine learning and cloud computing that reads the electrical waveforms from equipment such as the motors that drive pumps and compressors.

Using the data, Veros has built up a massive dataset with readings that show how a motor performs over time. Should the waveform readings deviate from the accumulated dataset, Veros and its customer will get advanced warning that something is not as it should be.

``Industry is straining to keep operations running, even with the complexity of Covid. They definitely don't want to have equipment breaking without any notice and they have limited personnel to inspect their operations,'' Jim Dechman, Veros's chief executive officer, told BloombergNEF in an interview. ``Planned shutdowns become even more important because it's difficult to get parts in and crews out to do the repair. The more warning you get that a pump is about to break, the better.''



Jim Dechman, president and CEO, Veros Systems Inc.

Oil and gas companies invest $13 billion annually in conventional enterprise software, BNEF estimated in a recent note (terminal | web), adding that by 2030 the sector will spend almost as much on cloud computing and advanced analytics. Advanced analytics could provide at least $18 billion in cost savings for the oil sector in the next few years, in applications like well production optimization and oil refinery energy efficiency, BNEF analysts wrote.

Veros was founded in 2001 by Alex Parlos, a professor at Texas A&M University at the time.

Shell Technology Ventures, the venture-capital arm of Shell, invested in Veros six years ago. Shell says that Veros could deliver several million dollars a year of production that would have been lost by unplanned shutdowns.

Veros's Dechman spoke to BNEF in mid April. An edited Q&A transcript follows:

Q: What does Veros Systems do?

A: We're focused on making power distribution systems more intelligent and asset aware. There are over 50 million large motors in factories around the world and they consume about half the world's power – half of the world's electricity. Motors do everything from running conveyors to running pumps, compressors. They're the movers of industry. All motors are cabled because they need electricity. We are tapping into the electrical lines and providing a way those motors can talk back. They can say that they're having an issue or they aren't running quite right or the compressor they're driving is starting to fail. The motors have quite a bit of information and they're willing to talk, but you just have to know how to listen.

Q: And this is achieved how?

A: It starts with capturing the electrical waveform signals in the electrical cabinet and then sending the data to the cloud for machine-learning processing. We have a non-intrusive device that users install to sample the current and the voltage signals that feed the motors. Those same signals are already in the power distribution equipment sold in the market, so long-term we see [original equipment manufacturers] like ABB, Danfoss, GE, Rockwell, Schneider, Siemens, Toshiba, TMEIC etc. using their own equipment and our math to make their power distribution hardware more intelligent. We have licensing/distribution relationships in place with Fluke and Siemens currently and have two more we hope to announce later this year.

Q: How much of your approach is predicated around energy savings versus predictive maintenance?

A: The health monitoring is what gets the most attention. Being able to tap into an electrical conductor and provide a month's worth of warning before a motor or a compressor fails; that warning is worth a ton in industry. As an operator it gives you a month to schedule downtime to go in and repair or replace the compressor.

Q: But what about energy savings?

A: Engineers get paid to select equipment to do a certain job in a factory so you have to pick out a motor, you have to size it, and it has to be correctly sized. You don't want it to be too big, too powerful, to run a pump because then it runs very inefficiently and there's a lot of electrical waste. At the same time, you don't want to pick out a motor that's too small because then it won't work. It won't have enough power to drive the pump.

It's important to have a device that shows you how efficiently the motor is working to understand the cost of operation. Veros has innovative technology that uses only electrical signals to analyze the motion of the motor's rotor. Using this and our proprietary algorithms, we're able to produce an efficiency measurement to show how effectively a motor is actually working. That translates to potential energy savings.

Q: How do you take your dataset and turn it into information that you can apply in the field?

A: We sample at just under 400,000 times each second per motor. That means we're continuously gathering 400,000 data points each second of every day for every motor. When you start looking at scale with thousands or tens of thousands of motors, it is a tremendous amount of data. To handle this massive inflow of data, we perform some processing at the edge and some in the cloud. The edge processing takes the data down to a feature set, which is basically a way to compress the data. Then the compressed feature set data flows up to the cloud and that's where the machine-learning processing is done. It's done continuously and any alarms or issues are highlighted and emailed out to the customer and to us.

Q: So over time you're developing a model of what a particular motor's performance should look like and then any anomaly sets off alarm bells?

A: Our methods combine physics and machine learning, but they are not anomaly based. The models are for a particular motor's health, not performance. We're actually looking at the motion of the motor rotor to see mechanical issues developing. There's a rotor that spins inside of every motor. The rotor is connected to a shaft and that shaft is connected to a pump or a compressor. The motor rotor spins because its windings create a rotating magnetic field that drives the rotor's rotation. Flutters in the rotor's movement are transmitted through the air gap and imprint into the electrical waveforms. We're looking at the motion of that rotor very carefully in the software. As I said, our models are physics based – they're based on how a motor rotor normally rotates and how a bearing issue in a compressor would exchange its energy when it starts to deteriorate and how that energy would look in a flutter of the rotor.

The machine learning piece up in the cloud really is filtering out the process variations, the electrical line variations and all the other noise that makes it hard to see that energy from when the bearing starts to deteriorate. For our alarms, it's a mechanical issue on a compressor or it's an electrical issue on the motor, not just some anomaly.

Q: Are there performance insights in looking through the data that have surprised you?

A: What we've discovered over the last decade is that by continuously recording all that electrical data, we actually have a huge library of historical waveforms to support our industrial customers.

One incident that happened recently involved monitoring some subsea pumps for Shell. These pumps are over 7,000 feet below the surface of the ocean and they're performing a function called artificial lift where they're lifting the oil from the seabed through a pipe to the surface. The pumps help to increase the flow rate of the oil. We were able to show that, under certain conditions, they were spinning backward, and how fast and for how long. This information importantly gave Shell hints at equipment and process design improvements that would resolve the issue and measurements to show their effectiveness after implementation.

Q: You must have the biggest dataset of its kind in the world.

A: Yes and that is one of the key values of the company – extensive data, coupled with PhDs who know how to make sense of the electrical waveforms. We have petabytes of electrical waveform data and event data from when pumps and compressors fail. That data allows us to continuously improve our models and technology.

Q: What kind of an impact are you seeing right now because of the coronavirus?

A: People are more interested in the capabilities of remote monitoring. We were troubleshooting an electrical issue with a customer who couldn't get a service person to visit the site because of the coronavirus. So they had us look in remotely and give analysis just by looking at the electrical waveform. I think Covid will drive a jump in remote monitoring.

Q: What are your short-term concerns and your long-term concerns?

A: They're somewhat the same for us. We're a venture-capital-backed company so we're running hard, looking to grow and either go public or be acquired by an OEM that would utilize our technology in their power distribution equipment. The virus slows everything down. It's like getting in your car to do a 4-hour drive with all your kids and halfway through the drive you realize it's going to be a 16-hour drive. You have to make adjustments.

For us, we have to keep bringing the data in. Thankfully we have systems in place that automatically collect the data and store it in the cloud. Financially, we have Chevron, Shell and two local venture capital firms – Austin Ventures

and LiveOak Venture Partners. They've been very supportive and are a key part of our success.

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