



PREDICTIVE ANALYTICS TO DRIVE REAL TIME PRODUCTION OPTIMIZATION

Why ConocoPhillips is taking the next step toward digital transformation



**Mark Hutcherson,
Director,
Operations
Excellence,
ConocoPhillips.**

Mark began his career with Exxon-Mobil in 2001 in facilities and project engineering roles. He joined Burlington Resources in 2005 and after the acquisition by ConocoPhillips in 2006, he transitioned to roles in production and completions engineering, supporting conventional oil and gas assets.

Mark assumed his current role in mid-2017. He also holds a B.S. in Civil Engineering from Kansas State University.

Mark, tell us about your background and current role at ConocoPhillips.

I've been in the oil industry since 2001 and joined ConocoPhillips in 2006. I've worked my way through various roles in facilities and production engineering and project management. I also have experience managing teams and most recently became the Director of Operations Excellence.

Since 2015, our Operational Excellence (OE) program has changed vastly. We went from a large centralized group of subject matter experts to only a few in our corporate center. OE remains in our global production organization, but where it used to be an organization of corporate oversight and operational governance, we've evolved to a supporting role that assists business units in continuing their OE journey in their own fit-for-purpose way.

OE has helped us push our independent business units and overall organization to a much higher standard, and that continues today.

Your OE function decreased significantly in 2015. Was that prompted by the oil price downturn?

There were lots of changes taking place in the industry at that time – we needed to adapt to the lower commodity price, so the timing was necessary but convenient. I think the timing was very appropriate for us because the OE concept and what we were trying to push in our framework had already been embedded.

Subject matter experts in OE were embedded back into the business units to directly contribute to the work, but our central OE group can pull on those resources as needed when business units

ask for assessments or for us to assist them with operational challenges.

Where is the operational excellence function today and where are you spending the majority of your time?

Our group is still small, but we're very active in our work with operations on continuous improvement and operational safety performance. An important part of what we do is continue to influence and align our global business units, which is very important to the company. We also look at encouraging active knowledge sharing and identifying initiatives and innovations from a bigger picture point of view.

We still do everything that we did in the past, just as a leaner organization and more efficiently, letting the business units drive a lot of it. What we're really working on today is innovation, technology and data analytics.

Tell us about some of the technology projects you've been working on?

I have meetings and direct conversations with our operations managers around the globe to pick their brains and see what opportunities they see in the operations world to innovate. I get a lot of ideas from them, and it's my role to sift through those and figure which of these will stick and be beneficial to the organization. This means that a big part of my role is looking

into data analytics and working with IT groups, as well working with people in our business units to push any ideas and innovations that we see fit.

Unconventional is a big part of where our capital goes and where our future is – data is the number one enabler. We've therefore been organizing our data into data warehouses so that our engineers can have fast access to that data and conduct real-time analysis. We're doing work to incorporate digital twins in our procedures, supply chain and inventory management.

In terms of our offshore assets, we employ data analytics and remote monitoring and inspection technologies. One thing we've done in Norway and the UK is move workers from the platforms to onshore to save on cost as well as make our operations safer. We have done a lot to change our approach to logistics, operational efficiency and maintenance offshore.

Another technology project we're working on is advancements in unmanned aerial systems. In our operations, we drive millions of miles a year. In West Texas there are lots of remote facilities and not many people, but heavy machinery on the road and fatigue make it more dangerous to drive. When we've looked at the statistics of fatalities on the road in the State of Texas versus the relative population in

West Texas, it is disproportionate.

We've been using drones for pipeline inspection, surveillance, flare tip inspection etc., but how can we take it to the next level – to get operators off of the road and survey our remote facilities with drones? We have to be very innovative about the sensors we can employ and how we utilize them to do all the things that an operator would be doing to save that trip.

How has the company been fostering a culture of technology adoption?

There has been a big push from our leadership on the benefits and uses of new technologies. Technology has enabled us to increase our value to the shareholders. While it's still early days, I think we're doing a good job of building a framework and strategy to disseminate across all of our business units and functions. A key element to foster technology adoption is communicating the right message to our workforce. Our folks work hard and want to be successful, but this can cause them to be risk-averse. We want to encourage them to take the right kinds of risks and are trying to push a culture of 'dare to try', to allow workers to take on more risk. We're not going to jeopardize safety or the environment. We don't want high-risk, low-reward opportunities, but are looking for low to high-risk, high-reward opportunities while keeping our people safe and protecting the environment.

One of the challenges when exploring new innovations is that the benefit is not always obvious. Sometimes you have to try things out and know that you may not succeed on some but with others you might hit a home run.

How is ConocoPhillips using technology for equipment condition monitoring and predictive analytics?

We've employed data scientists to work directly with operations to incorporate machine learning algorithms for our



condition monitoring and our asset performance management initiatives. The idea is to let data determine our preventative maintenance (PM) frequency versus experience or conservative industry standards.

Take a simple example like electric submersible pumps (ESPs), which we use to artificially lift our steam-assisted gravity drainage (SAGD) wells. ESP optimization is a big part of what our production engineer's do day-to-day. However, it is one thing to have a clean, informative dashboard built with software and sensor-trending data to make fast decisions and improve efficiency, but it's another to have a program that analyzes those data points and makes decisions for them.

With that computing power, we can monitor data points 24/7 and compare them to manufacturing specifications

and industry data. This will enable us to predict failures before they occur and roll that into a preventative maintenance program that is not overly conservative. Using machine learning for that is going to have a huge impact on our organizational efficiencies as we have tended to design our PMs based on overly conservative assumptions. The most important aspect of this is to continually have accurate data coming in. In newer facilities that's easier, but it is a little bit harder to address in some of our legacy assets.

Do you have metrics on what the bottom line benefit would be?

In one asset, we're pulling ESPs from wells about every 2 years. In general, for every month that we add to the mean time to failure, it's about \$1 million a year in cost savings. One-million may not sound like a huge sum, but

if we could double that time between pulls or even increase it by 50 percent, that then becomes a much bigger number and that's something that repeats annually throughout the life of a project.

Advances in technology will mean workers spend less time at their desks looking for anomalies and opportunities, and more time looking at things by exception. At the first stage, we can use these algorithms and machine learning to bring it to their attention for further analysis and a decision. As we get further down the road, these activities will be automated so that the system will be able to act independently without manual intervention, thus allowing engineers to work more efficiently and have more time to think ahead and apply the next innovation.

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