THE WALL STREET JOURNAL.

https://www.wsj.com/articles/oils-new-technology-spells-end-of-boom-for-roughnecks-1531233085

Oil's New Technology Spells End of Boom for Roughnecks

One of the last industries where blue-collar laborers can earn high salaries is being transformed as artificial intelligence and automation replace workers

By Christopher M. Matthews
July 10, 2018 10:31 a.m. ET

After 20 years in the oil-and-gas industry, Eric Neece was used to its booms and busts. He wasn't surprised when he was laid off by GE Oil & Gas in Conroe, Texas, in 2015 after oil prices plummeted. He figured his job would come back when prices crept back up.

He was almost right. The work came back. But Mr. Neece's former job as a well logger—measuring well conditions thousands of feet underground—was gone. Those duties are increasingly being overseen remotely and handled by automation.

Technology has already transformed labor needs in most of the world's manufacturing. It's now upending the energy business, foretelling the end for one of the last sectors in America where blue-collar workers could depend on jobs paying six-figure salaries.

"Our industry has had a lot of people making $150,000 out in the field," said Kathryn Humphrey, who spent two decades at BP PLC before retiring from the company's digital oil field program in 2013. Those days are going away, she said.

For Mr. Neece, the changes could reduce the number of jobs he used to do by more than 25%, analysts said. Automated control systems can send commands to underground tools that capture data on a well's geologic formations, flow rate and other variables. Smaller teams of technical specialists located in remote operations centers are replacing laborers on the ground, who in the past made adjustments manually.

The energy sector had been shielded from pressure to innovate by high oil prices. When prices fell 75% over 20 months beginning in 2014, oil and gas companies were finally forced to modernize to squeeze out profits. Many found they could use new technologies to do the work better and cheaper, with fewer people. They have invested billions of dollars on what the

industry dubs "digital oil fields," embracing artificial intelligence, automation and other technologies.

Oil prices are back up to their highest levels in more than three years. U.S. production has topped record levels, hitting 10.9 million barrels a day in the last week of June, according to the U.S. Energy Information Administration, compared with its high of 9.6 million in 2015. But as of May, nationwide oil and gas employment is down 21% since 2014, according to state and federal data compiled by Karr Ingham, an economist for the Texas Alliance of Energy Producers, an industry group.

For decades, high school graduates could jump into a job on a drilling rig with few technical skills and expect a well-paid career. The allure of the often dangerous life of a roughneck attracted generations of workers from Oklahoma to Wyoming. A few highly active pockets with labor shortages, such as the Permian Basin in West Texas and New Mexico, retain this boom feel. Truckers, for example, are so in-demand there they can command bidding wars.

Mr. Neece followed his father, who spent more than 20 years working in oil fields, into the industry in 1997. He joined Halliburton Co. after graduating from a vocational school and serving in the U.S. Air National Guard, eventually moving to GE Oil & Gas. He worked in fields from Wyoming to Oklahoma.

The work paid well, and Mr. Neece, 54 years old, indulged in boats, cars and motorcycles. "You get used to a certain lifestyle," he said. Things changed after he was laid off in 2015, and he looked for a new position for months. "It seems like they're doing more with less people," he said.

With diminished prospects, he left the business. He now repairs wind turbines for GE Renewable Energy. He took a pay cut from his oil job, but he likes the stability of his new career and the way it gives him more time at home. He said he would encourage his children to study technology and become specialists. "My dad was a roughneck on the rig and then moved up the ladder," he said. "You can't just start out swinging and hauling iron anymore."

Baker Hughes , a GE company that is the successor to GE Oil & Gas, said it is focusing on recruiting high-tech workers, increasingly from Silicon Valley. "You need to combine talent from the tech industry with oil and gas expertise," said Binu Mathew, who was hired from Oracle Corp. in 2013 and heads the company's newly created digital products division. "[Everyone] understands this is going to change the industry."

Major oil companies and smaller shale producers including Chevron Corp. , Devon Energy Corp. , Baker Hughes and EOG Resources Inc. are recruiting computer scientists, who develop algorithms and other tech tools.

At Devon's WellCon center—short for well construction—in Oklahoma City, a small team of

Eric Neece's job measuring well conditions underground was overtaken by technology. Above, with his daughter Grace at home in Perryton, Texas. **PHOTO:** DAVID BOWSER FOR THE WALL STREET JOURNAL

engineers and scientists monitor every well the company is drilling and fracking across the U.S.

From several screens, Kyle Haustveit, a 28-year-old completions engineer—he has a bachelor's in petroleum engineering—watches the company's "Showboat" development, where five rigs are drilling 24 wells in a complex project in Kingfisher County, Okla., that will tap multiple layers of rock simultaneously.

One screen displays the progress as a 2-mile-long horizontal well is drilled 10,000 feet underground. A graph tracks the budgetary impacts in real time using customized software. If the drill bit goes outside the sweet spot where the company believes oil and gas to be—an area sometimes no more than 10 feet across—dollar signs tick up and a call is made to workers in the field to adjust equipment.

Another screen tracks four fracking crews working within a square mile. Mr. Haustveit is collecting data on how the sand, water and chemicals the crews pump to release oil and gas from the rock affect the pressure on the other wells. He will feed it, along with microseismic and acoustic data captured by fiber-optic cables, into a program that will use machine learning to determine the best way to frack to produce the most oil as quickly as possible.

"I grew up in a small town in North Dakota, so I thought all oil and gas happened in the field," Mr. Haustveit said. "I didn't have a clue that this is what it would be like."

The center was manned by about 80 people monitoring 40 rigs before the 2014 oil bust. Today, roughly a dozen people monitor the company's 21 active rigs. Tony Vaughn, Devon's chief operating officer, said the transition was difficult but has improved the company's operational efficiency. "It required a lot of people with an old-school mind-set to leave the company, frankly," he said.

Devon has around 3,100 employees, down from 5,500 in December 2014. The company laid off 300 workers in April.

Devon estimates its drilling and construction costs per well are down 40% since 2014, and it has improved its initial production rates, a key metric in determining how much oil a well will produce, by 450% since 2012.

The company has invested more than $100 million in technologies ranging from fiber-optic cables to augmented reality. Some of the most significant returns have come from centralizing and organizing data. The company had to scan millions of pieces of paper just to get a handle on what it had. Now, everyone has access to real-time drilling software companywide.

Trevor Wise, left, and Tim Kaptur set up a drone at a BP oil pump near Wamsutter. The devices use infrared imaging to determine which oil holding tanks are full instead of having workers check the levels manually. PHOTO: NICK COTE FOR THE WALL STREET JOURNAL

About 80 miles south, in Duncan, Okla., Halliburton had 3,000 workers at the end of 2014 but laid off around 2,000 when oil prices dropped, according to Chris Deal, president of Duncan's chamber of commerce.

The town of about 23,000 people, known as "the buckle of the oil belt," has had an economy centered on oil and gas since 1919, when Erle P. Halliburton invented a revolutionary method of oil well cementing here and established the oil field service company, which over the years moved its headquarters to Houston but maintained significant operations here.

The company's biggest business in Duncan—manufacturing and repairing fracking equipment—has come back, but employment has crept up to only 1,300, said Mr. Deal. Instead, Halliburton is using new automation and artificial intelligence tools to design and build, said James West, an analyst at investment bank Evercore ISI.

A Halliburton spokeswoman declined to comment.

Mr. Ingham, the economist for the Texas Alliance of Energy Producers, said he believes technological changes will create new jobs in the oil industry to replace the ones it renders obsolete. But analysts say the process is disruptive for workers, because those who lose work due to automation are seldom the same people employed in newly created jobs.

The changes may also have more of an impact on rural communities, which are less likely to have workers with skills needed for tech-driven jobs, according to a study funded by the Massachusetts Institute of Technology.

In Duncan, about 1,500 laid-off workers left town permanently, Mr. Deal said. The hospital now employs almost as many people as Halliburton, and the town is converting an abandoned Halliburton office into its new city hall. School officials say they are adding a computer science program to position students for the new economy.

Pete Calhoun, 44, started at Halliburton painting the company's well-known red fracking trucks in 2006 and was working on the factory floor assembling high-pressure valves when he was laid off in 2016. With new technology coming in, it "seemed like there were a lot of people who didn't need to be there," he said.

He left the business and now works as a nurse in a long-term-care facility in the Duncan area, where he makes $24 an hour, more than the $18 an hour he made at Halliburton. He didn't have a college degree before working at Halliburton, and he did 14 months of course work to earn his nursing degree. He said the security of his new career was worth the time and money he spent to go back to school.

Steve Burt, a machinist by trade, was laid off in 2015 off by Mowdy Machine Inc., a contractor for Halliburton in Duncan, where he made specialized mechanical parts. He became a laboratory assistant at a Duncan-based startup that tests chemicals and other materials used in fracking.

"If you'd told me I'd be starting over in my 60s, man," Mr. Burt said with a wry smile. "You've got to be flexible in this business."

In Wamsutter, Wyo., BP has about 2,000 wells. Site manager Henry Hopkins used to drive to a group of wells every morning, prioritized by instinct, and check if pump jacks and other equipment were working.

These days, Mr. Hopkins gets his marching orders from a computer algorithm that maps his route every morning, telling him which wells need maintenance or repairs based on sensors installed in the wells. He pops on augmented-reality glasses when he arrives at a wellhead and sends a real-time feed of what he sees to BP technicians at an office in Denver, who can transmit instructions and data into his field of vision to show him how to perform complicated tasks.

BP has more than 2,000 oil and gas wells around Wamsutter, in south central Wyoming. **PHOTO:** NICK COTE FOR THE WALL STREET JOURNAL

The more virtual way of working has allowed BP to reduce its head count in the Wyoming field to around 100. A 47,000-square-foot command hub it built a decade ago, envisioned to house 300 workers monitoring wells, is up for sale.

"We've gotten very lean in our business," said Shawn Holzhauser, a vice president in the company's U.S. operations, saying it is more likely to use temporary workers for some tasks. "We need resources that aren't permanent to the company."

The company's production unit for the contiguous U.S. has reduced its noncontractor workforce by 40%, largely through technology updates, and has cut lease operating expenses 48% since 2014, the company estimates.

In Wamsutter, with a population of about 500 people that fluctuates depending on drilling activity, BP built the town's park, health clinic and day-care center. The cafeteria in the command hub used to be the town's best dining option. It is now closed, and funding has dried up for other civic projects, residents said.

"It was going to be the greatest thing on earth," said Bobbie Amos, who works in the town library. "Everything was going to run in Wamsutter, but now here we are."

Few BP workers live in Wamsutter anymore, instead commuting from larger towns nearby, residents said. Emma Waldner, 74, who has lived in Wamsutter since she was 10, said many of the rental units she owns around town are empty. She said she is concerned that further pullbacks will lead the middle school to close. "If we don't have a school, we don't have a town," she said.

Brian Pugh, BP's chief operating officer for U.S. onshore production, said he and his team are digital evangelists—convincing skeptical employees with decades of experience that the new

way, dubbed "intelligent operations," is better.

The executive led town halls to hear concerns and quell fears from employees in the field. "Obviously when you start talking technology and analytics, people get nervous," Mr. Pugh said.

Employee Ian Gallagher said morale suffered at BP when the layoffs began, but that those who have remained have embraced the changes.

He started in a Colorado oil field nine years ago for BP, climbing radio towers for repairs. He had attended a few semesters of college but didn't graduate. In 2014, he saw the company starting to change around him and decided to teach himself Python and other common programming languages. Now, he works out of a BP office in Durango, Colo., designing wireless monitoring prototypes for BP compressors. "The way I've dealt with it is to learn as much as I can and adapt," he said.

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Appeared in the July 11, 2018, print edition as 'Technology Spells End Of Roughneck Boom.'