digital energy journal

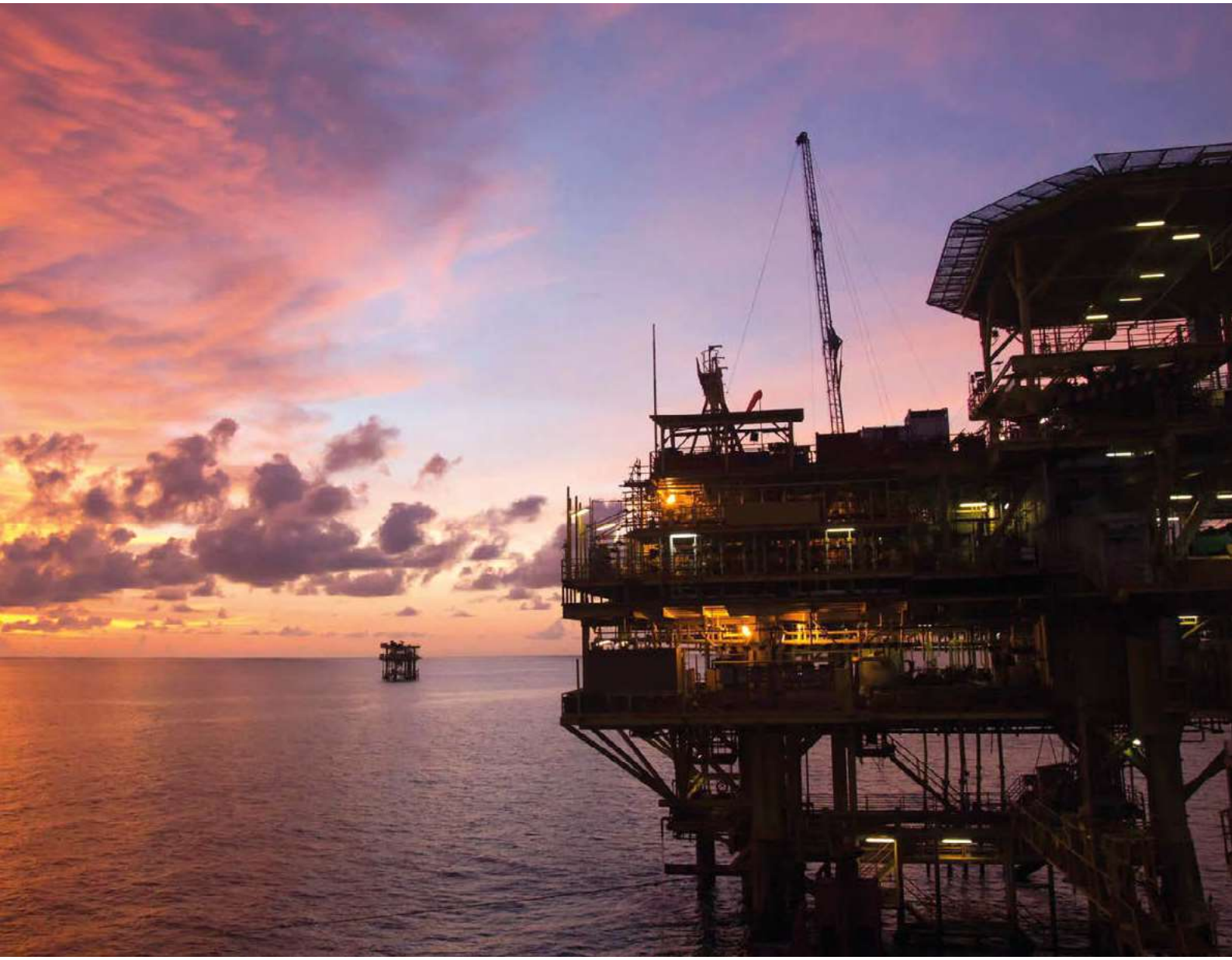
Customisable, asset specific AI models

Integrating operations and engineering data

Machine learning for your safety systems

Making software integrations easier

July - August 2021



How to make geothermal businesses work

Finding Petroleum

Official publication of Finding Petroleum

digital energy journal

Issue 91 July - August 2021

Digital Energy Journal
United House, North Road,
London, N7 9DP, UK
www.d-e-j.com
Tel +44 (0)208 150 5292

Editor and Publisher
Karl Jeffery
jeffery@d-e-j.com
Tel +44 208 150 5292

Advertising sales:
David Jeffries, Only Media Ltd
djeffries@onlymedia.co.uk
Tel +44 208 150 5293

Production
Very Vermilion Ltd.
www.veryvermilion.co.uk

Subscriptions:
£250 for personal subscription, £795 for corporate subscription.
E-mail: subs@d-e-j.com

Cover photo: TotalEnergies (formerly Total) is developing a satellite imaging methodology to monitor potential methane leaks at offshore facilities. The technology, known as "Glint Mode," is based on observing sunlight reflected by the ocean surface, and interference effects from methane in the air.

Opening

Lone Star – AI and predictive analytics for production assets

Lone Star Analysis of Texas provides software and consulting services which oil and gas companies can customise themselves into asset-specific AI models for their equipment – as an alternative to an outside company doing everything

A common way for oil and gas companies to engage with AI is to work with outside consultancies and software houses, who come in and build AI models for their specific equipment.

Lone Star Analysis of Addison, Texas, has a different customer offering – it provides a foundational AI model on a piece of equipment, such as an electrical submersible pump (ESP), which oil and gas companies can then customise for their specific equipment.

This gives operators the best of all worlds, in that they retain control over the developed AI models, they can develop them to meet their asset, business and operational needs, and can do so much quicker than building a traditional AI model.

Having models already partly built with known physics properties of the asset means that you do not need as much data to train the algorithm as you do in traditional AI engagements. To build an equipment algorithm and to allow the model to learn may take years of data, says Davey Brooks, vice president of automated intelligent analytics solutions with Lone Star.

Also, when companies implement Lone Star analytics models, it is much easier to understand how the AI is working, compared to many 'black box' solutions that don't provide transparency in the computations and results,he says.

"There needs to be auditability of the results, an ability to prove that the results are reasonable and that the predictions make sense, so decision makers are confident that when they apply the results to their business they are going to drive business value."

Lone Star's aim is to develop models and platforms which can be used with a wide range of equipment and customer requirements, as well as a wide range of data qualities and data structures, he says.

Results based

Lone Star builds its business based on customers seeing for themselves that they can achieve good results using the system.

"Our motto is [we help you make] smarter decisions faster," he says.

When organisations take an active role in implementing analytics, it should make it easier to expand their use of analytics throughout the company. "You would be much more trusting of someone who works with your company, than just me and my results," he says. "We're a firm believer of the organization taking ownership in that process."

Davey Brooks, vice president of automated intelligent analytics solutions with Lone Star

This compares with how many other AI providers promote their technologies, often over-promising what the solutions can deliver, leading to expectations being too high, Mr Brooks says.

As a result of this, many companies have spent more money on AI projects than the results justify, he says.

One reason for results not meeting expectations is a lack of flexibility and extensibility in the solutions they implemented, he says.

ESP analytics

Lone Star's focus is on Electrical Submersible Pumps (ESPs). These sit at the bottom of wells, pumping oil and gas from reservoirs into the well and up to the surface.

ESPs can be much more effective than traditional "sucker rod pumps" (nodding donkeys) at the well head, because they apply their force directly at the reservoir depth.

But ESPs are expensive and difficult to fix if they go wrong. They need to operate in a certain range, including in the mix of oil and gas going through them. If there is too much gas, the motors can spin too fast and burn out.

An analytics system which can give an operator advance warning of an emerging problem, such as having too much gas in the production flow, or a motor being in a critical state, would be extremely useful.

Many analytics companies have tried to develop such a system over the past decade. But oil and gas companies are still trying to make better AI models for ESPs.

Perhaps one of the reasons for the lack of success in the past is the amount of effort and data needed to build AI models for an individual pump, Mr Brooks says.

ESPs are very diverse. "There can be hundreds of different types of ESPs within an organizations' production operations."

Also, ESPs can fail in about 60 different ways, and provide a number of data streams from their sensors. There is a lot of work involved building models about how all of those failure modes can be identified from the data.

Lone Star provides a physics-based analytics model of ESPs, which customers have the ability to configure to work with their specific pump.

Customers can add specific information and parameters of the ESP, conditions at the production site, and other variables to tailor the model to the particular production site.

The models are designed to work with the dirty / noisy data, and unstructured data, which ESPs often provide.

It means customers can develop a model for their specific ESP much faster, and with less data, than if they were starting with nothing.

The ESP model has been developed building on customer expertise. "We don't profess to know everything there is to know about ESPs, we're not an ESP company. We've leveraged the knowledge of [customer] ESP experts and subject matter experts to build this model and identify the value points."

Other equipment

The same approach can be applied to many other types of assets common in the oil and gas industry.

For example, Lone Star has analytics models for rotary screw compressors, which are typically used in manufacturing operations, to power air-driven tools.

With these compressors, the Lone Star models can be used to determine the best time to put a compressor into 'idle' mode or switch it off, taking into consideration the time to start it up again, and the additional wear on the equipment while it is idling.

"You can apply the methodology and model [the method] to virtually any asset. If there's sensor data available, you can get the data off, and there's value associated with the asset, you can create a predictive model and prescribe actions" Mr Brooks says.

"You could apply it to anything that spins, creates heat, has liquid flowing through it."

The analytics capabilities can also be applied to financial and economic problems, but typically not with real-time data.

Combining physics based models

To make it faster to build models for specific equipment, Lone Star combines physics based models, which are based on how we know parameters will relate for reasons of physics, with data based models, which are based purely on patterns seen in the data.

The physics principles "you can't really argue with. They are principles and calculations which are tried and true," Mr Brooks says.

With a physics-based model, "you don't have to train the model to learn things that are already known about the operating properties of the asset."

Lone Star calls the approach of combining physics-based and data-based models "Evolved AI."

Mr Brooks believes that oil and gas AI will increasingly be combining physics models with data models in this way.

This is also another way of getting away from the "black box" approach adopted by many providers, where "there seems to be some magic associated with these AI, ML and really complex analytics. The data comes in, goes behind the dark curtain the lights come up and the results are there."

"You're unable to audit it, or prove that the results are what you expect."

"With 'evolved AI' because you're using mathematical and physics equations and principles, we can confidently say "we know this is going to be accurate within some range".

About Lone Star

Lone Star has over 110 full time personnel. It does not employ traditional data scientists, but employs many mathematicians, physics professionals, and engineers of different disciplines – mechanical, petroleum, systems, electrical.

It also has a roster of around 1400 external subject matter experts. "The problems that we typically are asked to solve are so specific we can't possibly have all of that knowledge in our organisation and leverage personnel with deep, specific knowledge to help us drive solutions for our cusotmers," Mr Brooks says.

It claims that its clients get a minimum of 20x return on investment in the solutions, and sometimes as much as 100 x return.

Its analytics models can be run either in the cloud, on the edge or at the wellsite, on local PCs.

"I'm not going to tell you we can solve every problem in the world, but there is a ton of flexibility for us to solve a broad range of business problems within an organisations," Mr Brooks says.

Challenges integrating operations and engineering data

AVEVA put together a panel of customers to discuss the benefits and challenges of integrating operations data with engineering data, with representatives from Enbridge, General Mills and Nutrien

AVEVA, a UK engineering software company active in the oil and gas sector, put together a panel discussion of customers to discuss benefits and challenges integrating operations data with engineering data. The panel had representatives from Canadian pipeline operator Enbridge, food manufacturer General Mills and Canadian fertiliser company Nutrien.

The panel discussion was held as part of the "AVEVA World Digital" event on June 17.

It follows AVEVA acquiring OSISoft, an operations data company, in August 2020. OSISoft makes the well-known "PI System" data historian, used by many oil and gas companies.

AVEVA is exploring ways it can help customers get value from combining the PI System data with its engineering data. For example, it should be possible to make better plans about maintenance, minimise energy use, and optimise operations. Everybody should have access to the data they need at any time.

Enbridge

"A big focus for [us] is access to data," said Ray Philipenko, director, Pipeline Control Systems and Leak Detection with Enbridge Pipelines, based in Edmonton, Canada.

"Coming up with a reference architecture in terms of how the data flows is fundamental to