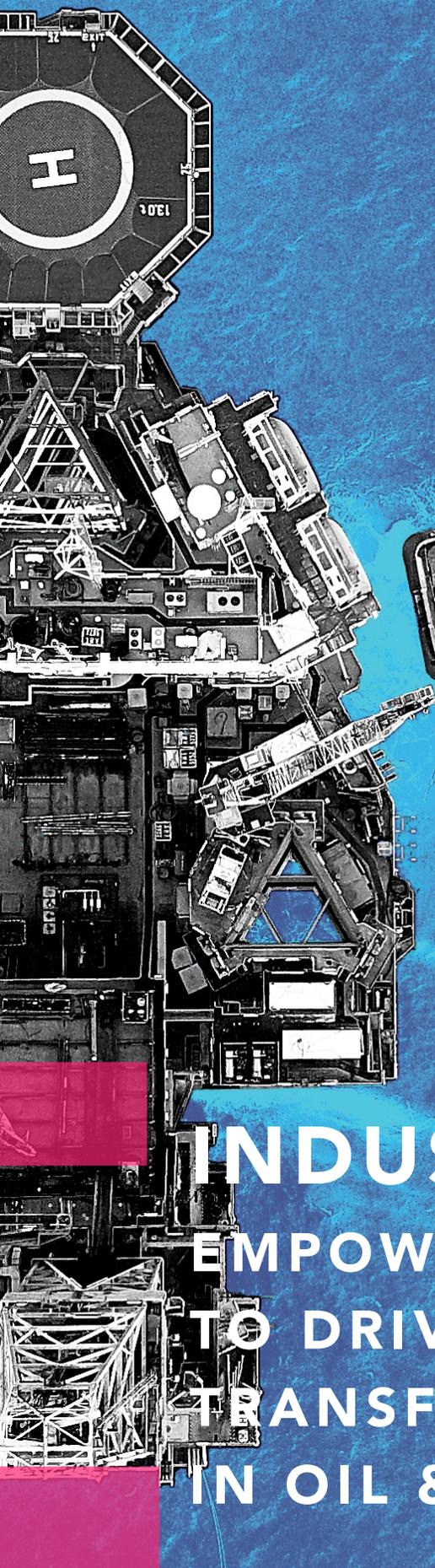




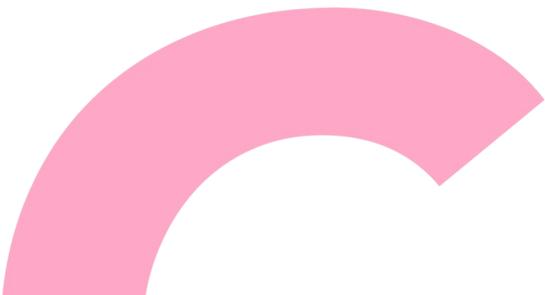
COGNITE



**INDUSTRIAL AI:
EMPOWERING HUMANS
TO DRIVE DIGITAL
TRANSFORMATION
IN OIL & GAS**

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EMPOWERING HUMANS TO DRIVE DIGITAL TRANSFORMATION IN OIL & GAS



01

The industrial future will be shaped by those who digitalize first and best.

Our customers are digital leaders in the world of Oil & Gas. Companies like OMV, Aker BP, Wintershall dea, and others have deployed Cognite Data Fusion to accelerate their own paths to digital value.

02

Dynamic data handling will become a competitive advantage across the value chain.

Benefits range from improved production efficiency using ML to reduced maintenance costs with predictive maintenance. Innovations in this field will impact everyone from EPC to Operators to Oilfield Services to Original Equipment Manufacturers (OEMs)..

03

Hybrid thinking and modeling are necessary to digitalize industry in a scalable way.

The hype behind pure black-boxed Artificial Intelligence (AI) solutions to optimize production is premature. Revolutionizing industrial operations with technology requires a hybrid of machine learning models and physics-based models. In process industries, physics is the best companion to math. High tech is nothing without a sound operational foundation.

04

Machine-as-a-Service (MaaS) is the new Software-as-a-Service (SaaS).

What cloud computing did to the software industry in the 2010s, digital twins are doing to processing and machine operating industries in the 2020s.

This paper reflects Cognite’s annual assessment of the status of digitalization in the Oil & Gas industry. Our customers are seeing big results from their operationalized use cases. We’re privileged to share some with you here.

Thank you to our select Oil & Gas customers for joining us to create a safer, more sustainable, and more efficient industrial world.



STATE OF THE INDUSTRY: DIGITALIZATION IN OIL & GAS



The major players are doubling down on digital investments because their ambitions go beyond the basics. Extracting the most possible value from data requires putting it in context and making it available to the right people at the right time.

Many Oil & Gas companies have recognized the immediate value of making their existing data accessible to their personnel, but they still have a long way to go. The sheer volume of data generated by pervasive, low-cost sensors makes it challenging to control and put to work in a useful and reliable way. At the same time, the advent of relatively affordable cloud-computing capabilities, as well as the meteoric rise of data science as a discipline, has made it more possible than ever to solve maintenance, production, and HSE problems with digital solutions that scale.

So, why is it so difficult to operationalize groundbreaking digital POCs and pilot projects?

Drowning in data. Starving for context.

Industrial companies have so far invested in aggregating their data and making it available to their personnel utilizing a cloud data warehousing set-up. Unfortunately, active metadata management has remained an afterthought, thereby limiting the value of the data.

Lacking well-documented, well-communicated contextual meaning, raw data is like a set of coordinates in the absence of a mapping service. Those lucky few who intuitively understand the coordinates without a map may benefit. For all the rest, it's the map that provides the meaning. Without a map, coordinates alone are useless to the majority.

The main bottleneck to digitalization efforts in Oil & Gas is the failure to push beyond the standard cloud data lake. These vast amounts of expensively extracted and stored data are rendered unusable to anyone outside the data lake project team itself. (And too often remain useful in only a very limited way to that team, as well.)

Industrial applications exist today that can make a major operational impact. But these require data that has undergone some additional layer of contextual processing. This includes enriched data and synthetic data resulting from machine learning processes.

From there, the contextualized data must be made truly useful to developers via APIs and SDKs. These tools are critical to extracting application value from the data stored in a data lake, yet remain largely absent from today's enterprise data architecture.

What's the urgency?

In a recent report, Forrester warned industrial companies not to fall into the “easy (lazy) trap” of assuming digital disruption isn’t underway, or that digital disrupters that enter established verticals will be hobbled by regulation. Why? Because the impetus behind the digital industrial revolution is not the advent of new enabling technology. Like everything else in the free market, this revolution is coming because of people. Customers.

The consumer industry has a two-decade head start on discovering the demand for digital context, making it a reality, and deploying it in ways that benefit users. From Google to Amazon to Facebook to Uber, the prevalence and convenience of digital in our consumer lives is increasing the pressure on the industrial space to follow suit. People know what smooth, data-driven processes look like and can achieve. Now they expect to see enterprise do business that way.

The industrial players who invest in the contextualization and developer-friendly accessibility of their data will have a major competitive advantage in the increasingly digital landscape of the future.



Your customer is digital. familiar with low-friction and joined-up digital experiences in their personal lives, your customers increasingly expect — and demand — the same in their business dealings.

Your ecosystem is digital. Participants constantly share or sell data to improve processes, strengthen relationships, build better products, and deliver richer services.

Your future is digital. Digital must be core to everything you do. it can't be an add-on or an afterthought.

“From Grease To Code: Industrial Giants Must Bet Their Futures On Software”
Forrester (April 2019)



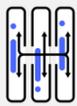
COGNITE DATA FUSION

We partner with our Oil & Gas customers to maximize the value of their data, equipping them for the digitalized future by making the right data available to the right users at the right time.

Data is only as valuable as it is accessible, readable, and open for connections to other relevant data. Cognite Data Fusion (CDF) delivers contextualized data as a service through a combination of machine learning, rules engine functionality, and subject matter expert enablement.

CDF integrates seamlessly with existing IT and OT infrastructures to liberate a wide variety of industrial data from separate, siloed source systems, collecting it all as a comprehensive set in the cloud, securely and without space limitations. It then automatically structures the sensor data in relation to other relevant data (e.g., process diagrams, 3D models, event data, and more). The contextualized data is then easily shareable through a secure Application Programming Interface (API).

With CDF, data scientists are empowered to deliver portfolio-level economic impact in asset-intensive industries.



LIBERATE DATA

Break OT data free from siloed source systems



CONTEXTUALIZE DATA

Connect OT data with IT data in a way that mirrors the physical world



EMPOWER PEOPLE

Make it securely accessible to developers based on their use cases

Data Liberation

Today, data science efforts with available O&G data are restricted to static, one-off projects that are tedious, risky, and expensive to perform. We have seen that data collection alone may require a data scientist to connect to up to seven different systems. Sometimes this includes jumping through hoops to get access to specific systems onshore.

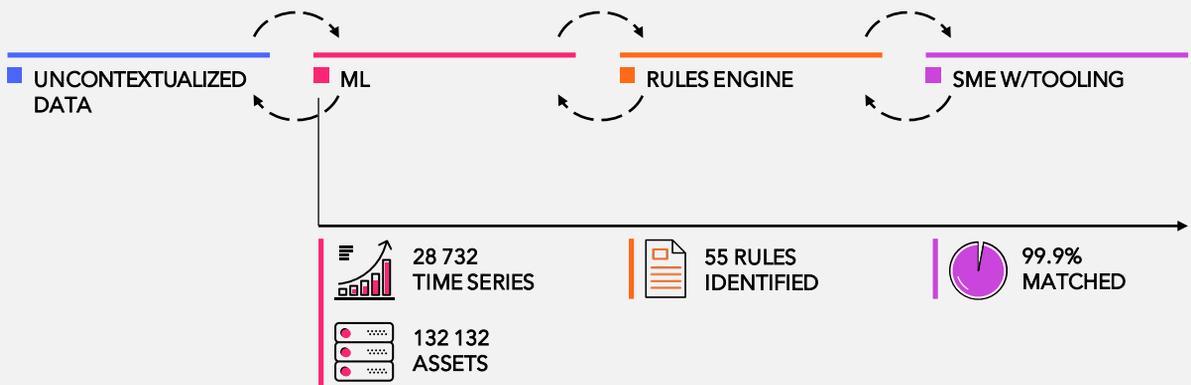
CDF liberates data from existing OT systems using automated data extractors.

Rather than collating all master data and transactional capabilities within a central system, CDF contextualizes it with IT data and structures it in a data model that is intuitive and understandable to both humans and machines. This makes all data accessible to authorized users across your organization and dramatically reduces the cost of integration and maintenance. CDF enables the scalability and speed of application development, without the risk of turning the adoption of a new application into a lengthy and risky multi-stakeholder development project.

Contextualization Pipeline

CDF makes the liberated data meaningful for humans and machines by putting it through a contextualization pipeline to create a connected data model of an asset or system. By structuring the data alongside other relevant data sources, CDF provides users with a digital representation of industrial reality that relates specifically to the use case that matters most to them.

CDF's contextualization pipeline is accurate, scalable, and empowers companies to leverage their data as a strategic asset. With contextualized data, Oil & Gas companies find it easier to examine their assets across multiple levels, from individual sensors to complex models. Armed with virtual representations of real-world assets reflecting real-time data, operators can identify and prevent problems that have been present but invisible for decades.



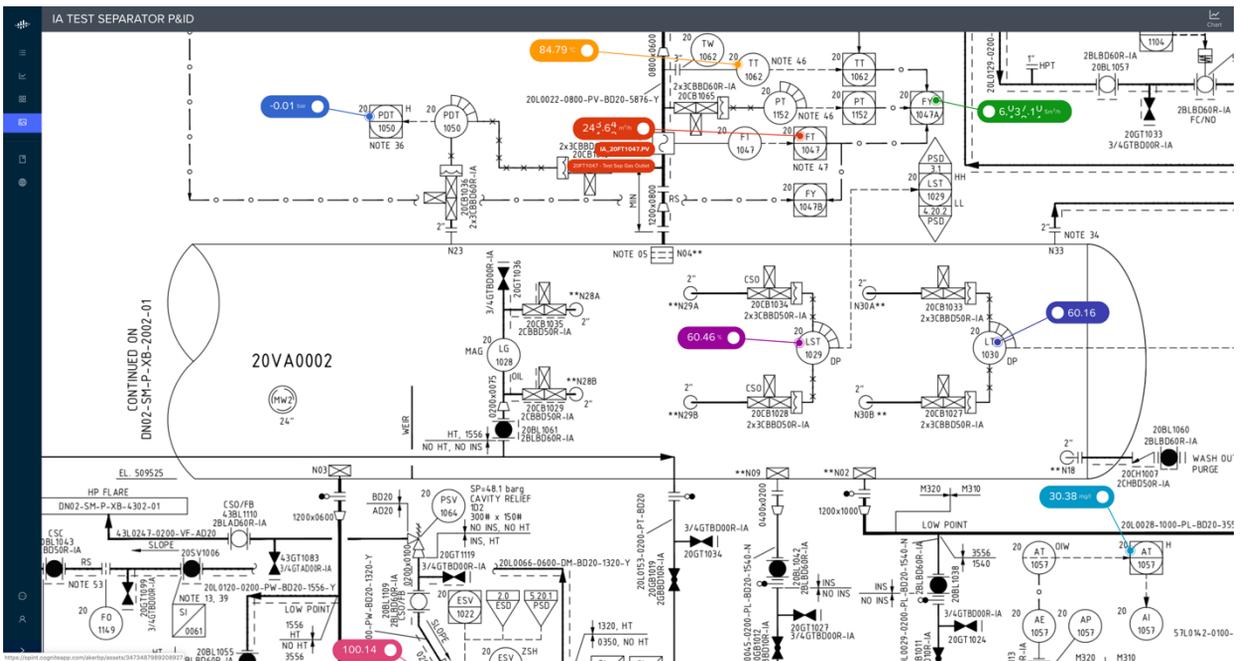
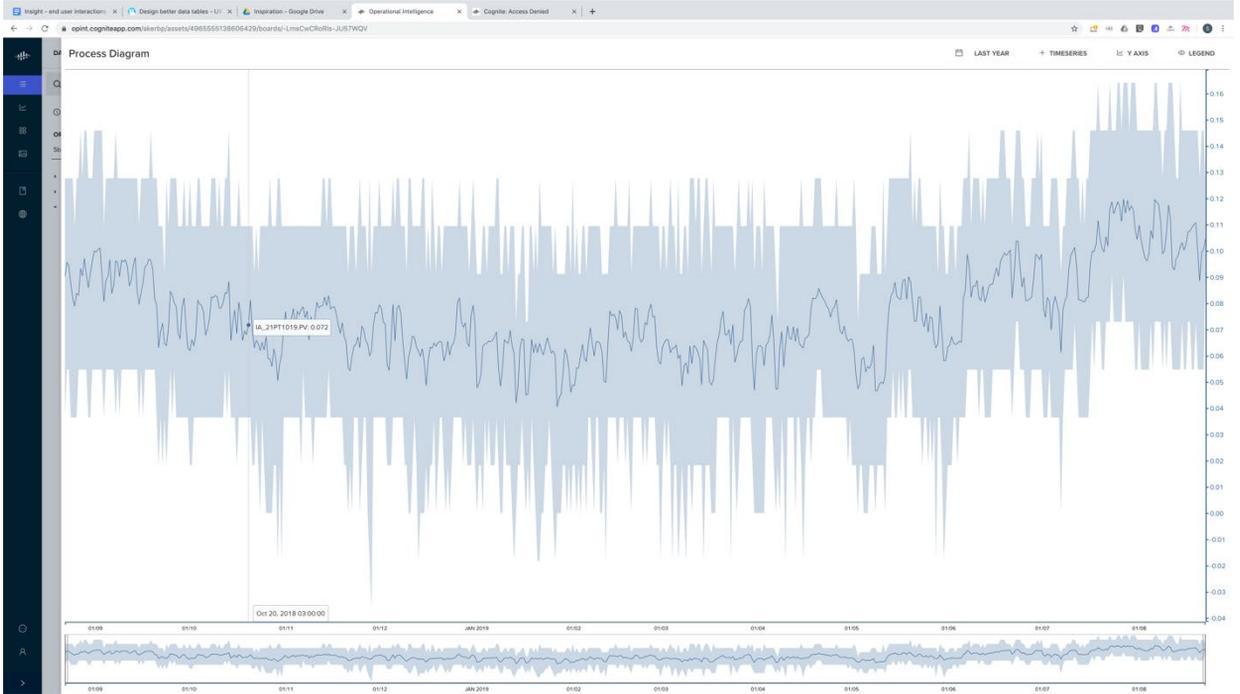
Industrial Applications

Once data has been liberated and contextualized within CDF, you can choose to make it openly and securely accessible to approved third parties, granting permission to strategic partners and vendors via user-friendly Application Program Interfaces (APIs).

Cognite's philosophy centers on the importance of data sharing to successful digitalization. By sharing data within their own ecosystems, Oil & Gas companies can inspire their partners to innovate and improve. With more clean, contextualized data, third-party companies can quickly build applications and develop services to meet real-world needs.



Asset Data Insight



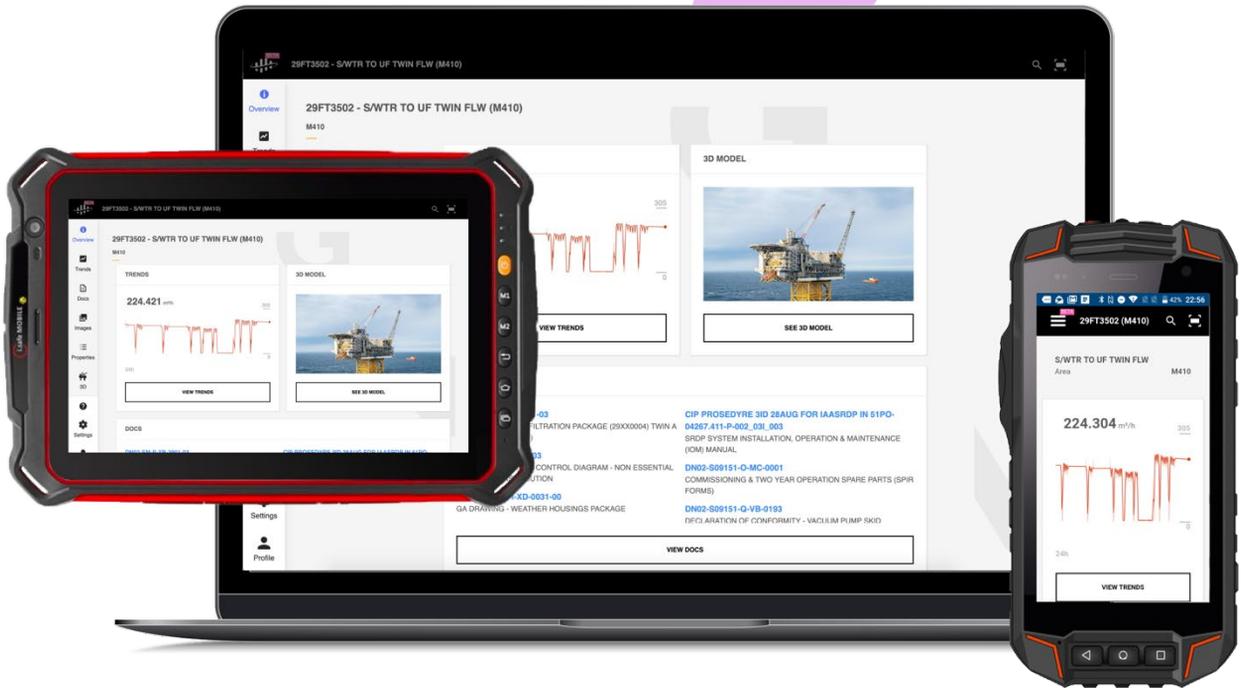
Asset Data Insight (ADI) is a Cognite application that enables real-time health monitoring and investigation. Users can perform quick, thorough data exploration to create detailed analyses and make informed, effective maintenance and production optimization decisions at every level of an organization.

ADI transforms the cleaned and contextualized data within Cognite Data Fusion into actionable insights via asset-centric dashboards that intuitively visualize links between different data sources.

By enabling users to create a model for one component and then roll it out to an entire installation, ADI minimizes the manual effort required from users, freeing up time for higher-level analyses and effective decision-making.

For problems that require deeper investigation, users can efficiently navigate from ADI into specialized applications or dashboards such as Grafana and Power BI, among others.

Operation Support



Operation Support is Cognite’s flagship Digital Worker application, giving field workers instant access to the data they need about the equipment at hand.

Accessible on computers and handheld devices, Operation Support presents contextual information in an asset-centric structure, allowing field technicians to efficiently plan and execute their tasks.

Operation Support allows Digital Workers to scan or look up an equipment tag to quickly pull up all associated documentation and other information stored in Cognite Data Fusion (CDF).

This data can be viewed in context with 3D models, making it simple to navigate complex installations.

The app also includes dynamic checklist functionality, so that workers can keep track of corrective and preventive maintenance work with shared checklists. This field experts can also document equipment status in the field with image and video sharing, enriching the existing data set and heightening overall understanding of the asset at the team level.

Customized Digital Microservices

CDF is an integrated microservices studio, designed to handle the unique enterprise architectures and application development frameworks of its customers.

The most important thing is to help teams use data to make themselves more productive, giving them the freedom to create and innovate with data science and application development in the frameworks they already know.

ADDITIONAL KEY FEATURES OF CDF



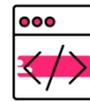
OPTIMIZED TIME SERIES

Beyond instant raw data access, CDF automatically calculates key statistical features of incoming data at all levels of granularity.



DATA TYPE, DATA SET, DATA KIT

A use-case-centric approach to accessing, managing, and monitoring collections of rich, live industrial data in CDF.



WRITE-BACK MANAGEMENT

A platform approach to application write-back management, enabling a scalable, enterprise-grade industrial application strategy.



COGNITE'S INDUSTRY SOLUTIONS

In our work with Oil & Gas companies, we've learned that the best way to deliver digital value is to begin with the use cases. These are scenarios and problems that are important to human users.

Once you've prioritized your use cases, the next step is to identify which data is relevant to each and to liberate that data from its source systems.

This "stone by stone" approach allows you to solve some use cases quickly, delivering immediate value, while simultaneously building a firm-but-flexible data foundation to streamline this process for future digital success. It also allows you to address metadata management with the kind of calculated intention necessary to drastically increase the quality (i.e., usefulness and reliability) of your data.

Cognite Data Fusion is already making an impact on the Oil & Gas sector. We've proven that true data openness can enable **Data-Driven Production Optimization**, extend the life of machinery through **Smart Maintenance**, and increase worker efficiency by powering **Digital Worker** applications.



SMART MAINTENANCE

Data-driven equipment monitoring and maintenance operations.



PRODUCTION OPTIMIZATION

Data- and physics-driven decision-making for max production.



DIGITAL WORKER

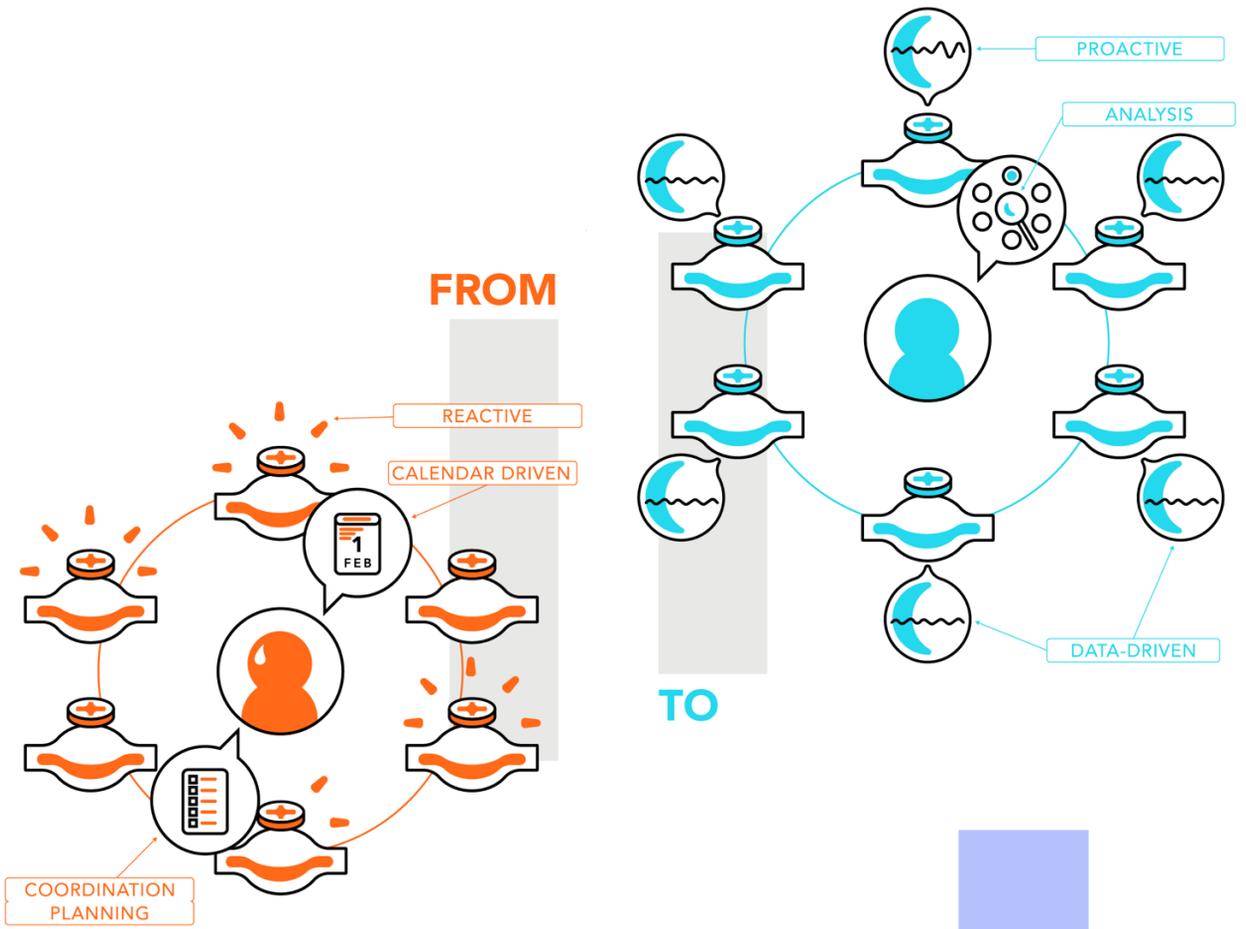
Data-empowered and tech-enabled workforce in the field.

In most cases, companies have enough data to identify and solve some use cases within one or more of these domains almost immediately after the crucial contextualization step.

To accelerate the time to digital value, Cognite developed Industry Solutions, a package of services designed to complement your company's digital program.

Our interdisciplinary team of software developers, data scientists, designers, and industry professionals will help you identify the right use cases, connect you with expert resources, and shift your maintenance philosophy from reactive to proactive. Together, we streamline the use case process – from identification through delivery – so you can create end-to-end digital value in your operations as quickly as possible.

With the dedication of our Subject Matter Experts, and with access to our library of proven use cases available for selection, you'll quickly get up and running with our 3D Pipeline, Physics-Guided Machine Learning, and a variety of applications, including our own [Operation Support](#) and [Asset Data Insight](#), to increase safety and efficiency and drive revenue.



FROM THE FIELD: 8 CDF USE CASES

Cognite Data Fusion is already making an impact in the Oil & Gas sector. We've proven that true data openness can enable **Data-Driven Production Optimization**, extend the life of machinery through **Smart Maintenance**, and increase worker efficiency by powering **Digital Worker** applications.

Our customers are global market leaders. With contextualized data, companies like OMV, Wintershall dea, Aker BP, and many others they have found it easier to examine and understand their assets across multiple levels, from individual sensors to complex models. Now operators can identify and prevent problems that have been present but invisible for decades. And with the advent of **Performance-Based Contracts**, legacy business models are poised for metamorphosis.

Automating Maintenance to Save Time & Costs

Cognite worked with Aker BP to liberate control system data, helping the exploration and production company slash maintenance expenses, increase worker safety, and redirect resources toward production-critical equipment at the Valhall oil field.

IN SHORT

Calendar-based maintenance is an inefficient method of checking the status of equipment, as engineers spend much of their time checking equipment in good working condition.

Aker BP used Cognite Data Fusion to optimize the process shutdown (PSD) valve maintenance process, creating a system that automatically logs when the valves were last operated and whether they fulfilled travel time demands.

-50%

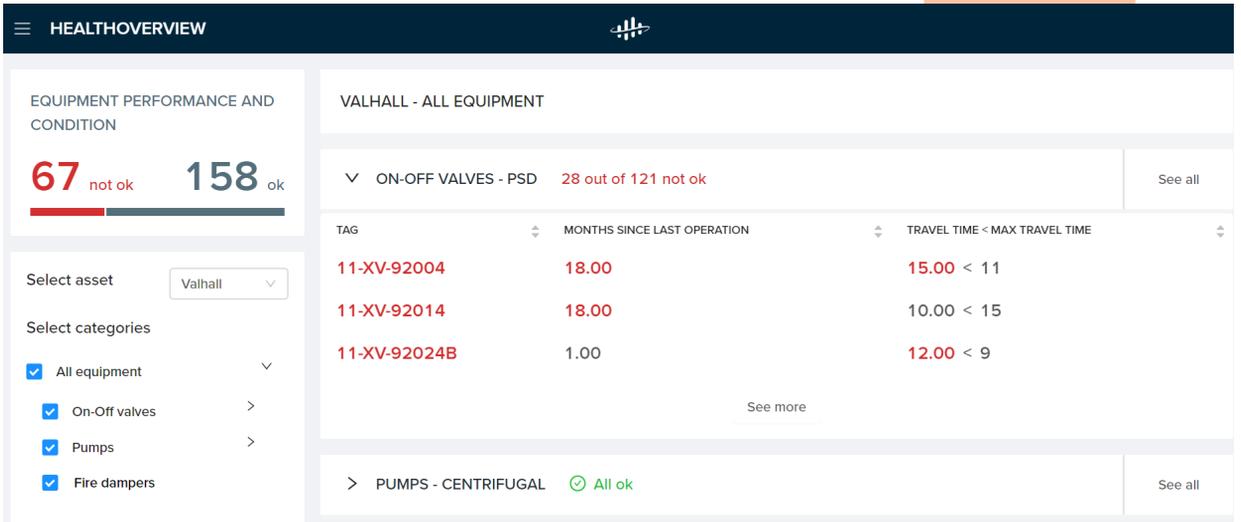
Time reduction for an average maintenance session

-80%

Reduction in hours engineers spend on testing

-66%

Reduction in annual maintenance checks



Making Data Accessible to Operators to Improve Onsite Efficiency

Most Oil & Gas companies don't suffer from a lack of data. They suffer from a lack of data accessibility. Operational inefficiency is one of the most painful byproducts of this problem. Aker BP wanted to optimize their on-site operations on the Ivar Aasen offshore installation to reduce wasted time, resources, and manpower.

IN SHORT

Cognite Data Fusion ingested and organized all maintenance information from Ivar Aasen. Cognite's Operation Support application made the data available for field technicians on mobile devices.

On a mobile and tablet app interface, engineers and technicians on the Ivar Aasen can instantly access all live sensor data and historic equipment performance data to make their work more efficient.



Increased number of monthly maintenance jobs



Reduced time spent on routine inspections



Deploying a Virtual Flowmeter to Advance Well-Monitoring

Harnessing the combined power of physical modeling and data analytics (physical analytics) for production optimization, Aker BP deployed Turbulent Flux’s virtual flowmeter on their challenging Valhall reservoir to mitigate chalk influx. Cognite Data Fusion powers the solution and visualizes the live data.

IN SHORT

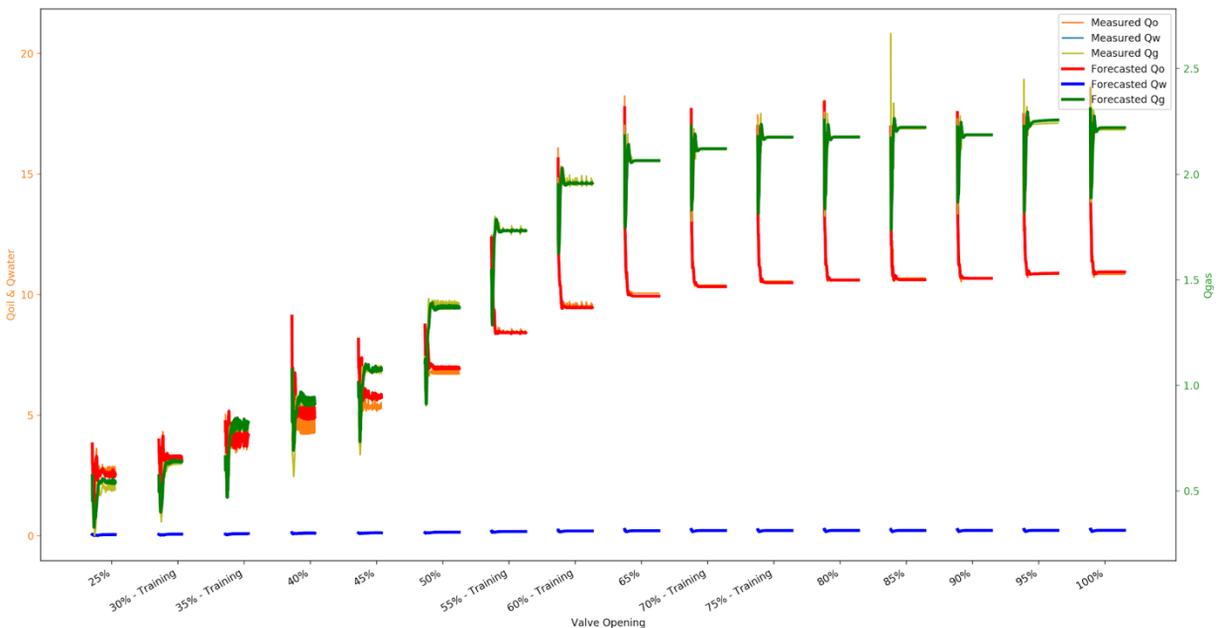
Non-intrusive and quick to install, TurbulentFlux’s virtual flowmeter:

- 01 Reduces the number of costly well-interventions to remove chalk obstructions
- 02 Reduces non-productive time and increase overall well-productivity as chalk influx is better prevented
- 03 Monitors production and optimize operations through always valid well rates for oil, gas and water

**547K -
1.1M \$**

Expected Annual Savings

FLOW RATES DATA – KERAS NN



Visualizing Risk Factors to Boost Worker Safety

By combining data on work permits, leaks, barrier impairments, well integrity status, noise levels, and more in one visualization tool, Aker BP increased efficiency and worker safety at the Ivar Aasen field.

IN SHORT

Aker BP used Cognite Data Fusion (CDF) and Cognite's 3D viewer to build a tool that visualizes how conflicts and hazardous conditions may affect upcoming maintenance tasks at the Ivar Aasen oil field.

The visualization tool boosts worker safety by giving offshore management team a clear overview of factors that affect safe execution of upcoming maintenance tasks, helps Aker BP fulfill its responsibilities under the health, safety and the environment (HSE) regulations enforced by the Petroleum Safety Authority Norway, and expedites risk assessment during work permit meetings.



Increased worker safety
by visualizing risk factors



Reduced time spent preparing
for work permit meetings



Providing Seamless Vendor Integration to Enable Fast, Accurate Condition Monitoring

The interoperation of Cognite Data Fusion with the Siemens IMS and dashboards enables real-time Condition Monitoring for Aker BP's Ivar Aasen onshore team and pushes the industry toward the lucrative possibility of Predictive Maintenance.

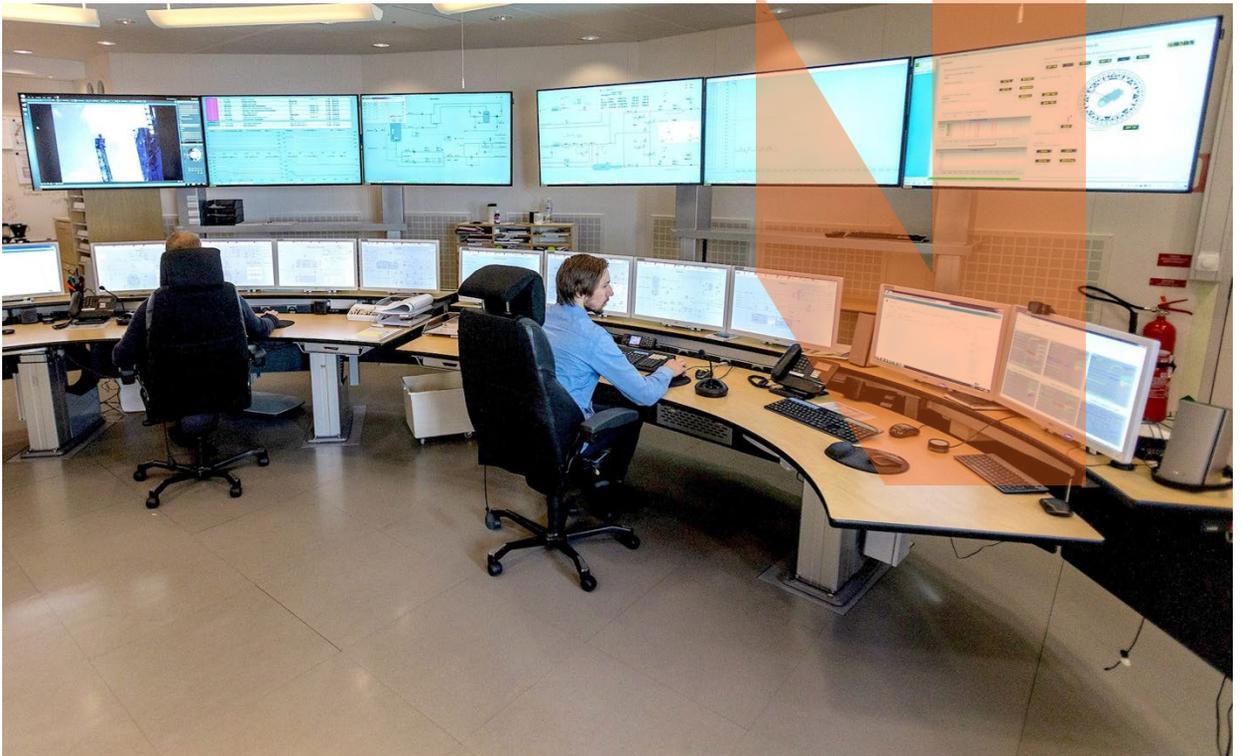
IN SHORT

Siemens turned to Cognite, whose cloud-native industrial data platform was already in operation across Aker BP's assets on the NCS. Cognite Data Fusion offered the capability to collect, clean and contextualize more various kinds of data automatically and without space limitations.

The interoperation of Cognite Data Fusion with the Siemens IMS and dashboards enables real-time Condition Monitoring for Aker BP's Ivar Aasen onshore team and pushes the industry toward the lucrative possibility of Predictive Maintenance.

**1,300
HOURS**

Time saved by Siemens due to smooth integration directly with Cognite Data Fusion.



Enabling Strategic Data Sharing to Power New Smart Service Contracts

Pump supplier Framo used Cognite Data Fusion to access their operational data for the first time. Armed with this knowledge, Framo has entered into the first performance-based contract on the Norwegian Continental Shelf with operator Aker BP.

IN SHORT

Traditional industrial infrastructure has limited supplier relationships to a transactional format.

Working closely with Aker BP, Framo utilized Cognite Data Fusion to access Aker BP's industrial data. With API access to the Cognite Data Fusion, Framo was able to inform their product development. Integrating with Aker BP's ERM system, they could set work orders and enable a feedback loop with design and engineering.

Using Cognite Data Fusion, Framo was able to develop and launch more effective, service-based models informed by real-time data.



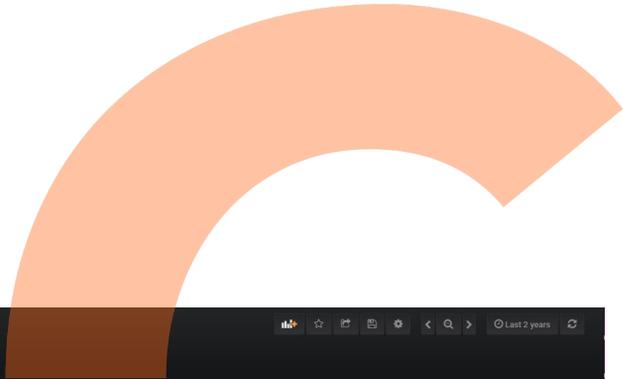
Reduced maintenance



Reduced shutdowns



Increased pump availability



Using 3D to Make Maintenance Work More Efficient & Effective

Cognite's REVEAL 3D viewer enabled Aker BP to combine equipment tags and 3D models of their installations to significantly reduce the time workers spend searching for equipment out in the field.

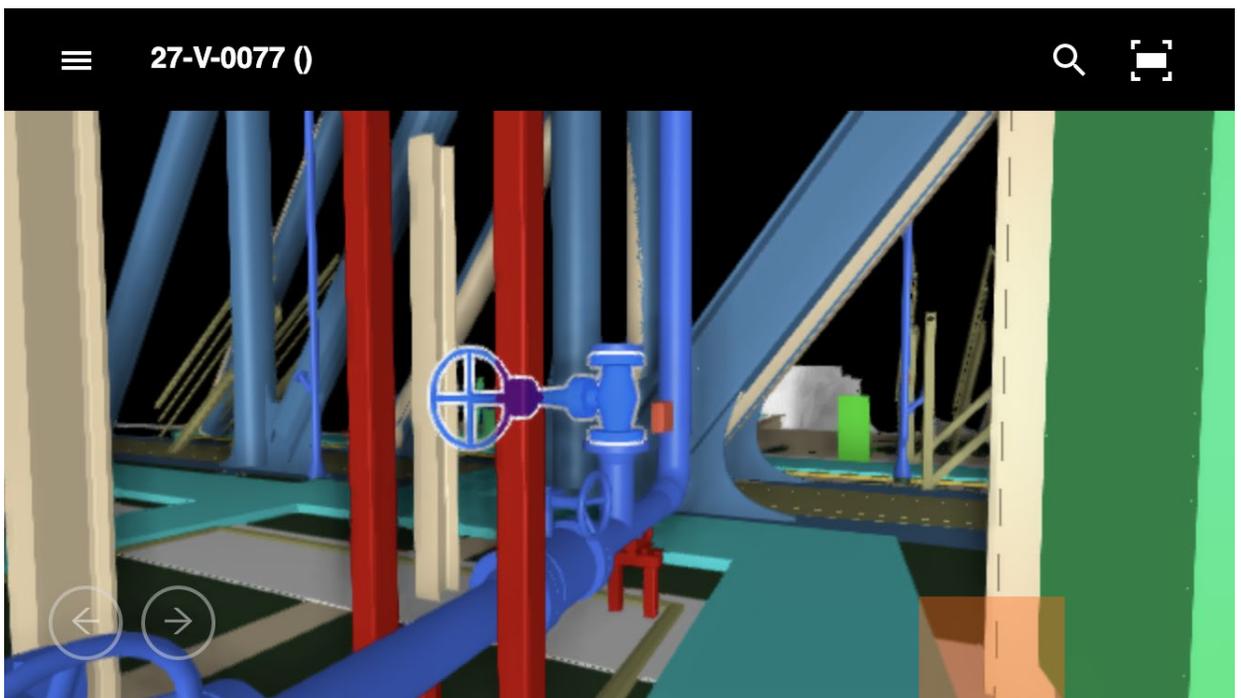
IN SHORT

Aker BP fed information about the installation Ivar Aasen, Skarv, and Valhall into Cognite Data Fusion (CDF). Cognite connected data from sensors and other sources to equipment tags, and the equipment tags to 3D models of the installations.

The 3D models are viewable on any computer and handheld device, enabling field workers to quickly locate equipment, reducing the time needed to perform scheduled maintenance on multiple valves.



Reduced time spent
on routine inspections



Generating Instant Value Via Quick Maintenance Overviews of Critical Equipment

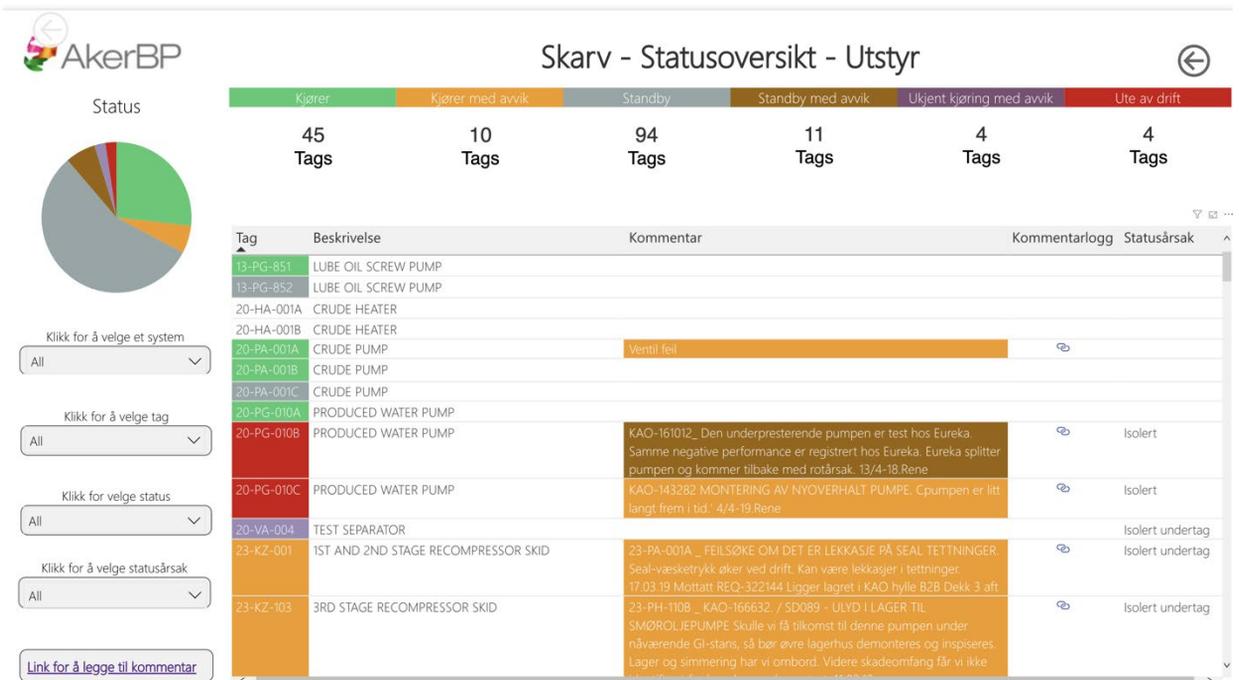
By automating data collection and streaming data in real time, Cognite Data Fusion (CDF) helped Aker BP cut administrative work and improve its maintenance planning process.

IN SHORT

Cognite combined contextualized data from four different source systems in one dashboard, giving Aker BP's offshore and onshore maintenance organization a simple but powerful tool for reviewing the maintenance status of critical equipment.

-15 HOURS

Time saved from automating data collection



ALL ABOUT COGNITE

Our Vision



An industrial world powered by data and algorithms, freeing human creativity to shape a productive and sustainable future

Together, we have built Cognite Data Fusion (CDF), a software package that empowers companies in industries like Oil & Gas, Energy, Shipping, and Manufacturing to extract value from their wealth of existing data by transforming it into useful information. CDF supplies data contextualization as a service, delivering reliable, meaningful data to industrial applications that increase safety and efficiency and drive revenue.

Our Team



Cognite is a global software company supporting the full-scale digital transformation of heavy-asset industries around the world, from the U.S. to Japan to Austria to New Zealand. Our impressive interdisciplinary team includes more than 250 of the best software developers, data scientists, designers, 3D specialists, and industry professionals.

Curious about Cognite? Call on us!



These are just a few of our 250+ industry and tech specialists, all proud to be shaping the future of Oil & Gas.



Paula Doyle SVP of Sales and Marketing

Dr. Paula Doyle holds a PhD in Industrial Automation from the University of Limerick, Ireland. She has spent the last 15 years working in a variety of roles within the Oil & Gas industry, for ABB and Siemens, both in Norway and the Middle East.

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Before joining Cognite, Petter worked with O&G Exploration in Schlumberger and developed machine learning models in his own startup. Petter holds an MA of Science and Technology in Electronics from NTNU, as well as a degree from the NTNU school of entrepreneurship.

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Carlo has spent 10+ years in oil & gas, geothermal energy, and software, with experience spanning exploration and field development solutions in diverse settings and environments worldwide. He holds a PhD in geology and an executive MBA, with expertise in digital transformation and value creation in subsurface and drilling-related topics.

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Jarle Skrebergene VP of Customer Success // EPC

Before joining Cognite, Jarle worked in Management Consulting in Arkwright and Deloitte and Business Development in Kongsberg Gruppen. He also specialized in EPC projects in Kongsberg Oil & Gas. Jarle holds an M. Sc. in Industrial Economics from NTNU.

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Gunnar Staff Senior Principal Data Scientist & Head of Production Optimization // Industry Solutions

Before joining Cognite, Gunnar served 12 years as a Principle R&D Software engineer at Schlumberger where he worked on the core numerics and physics of the OLGA flow simulator, as well as publishing numerous papers on multiphase flow modeling.

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Anna Olsson Director of Partners and Alliances

Anna has held a diverse set of solution sales, product marketing management, business development, and leadership roles over her 20+ years in the software industry. She has a degree in Information Technology and started out her career as a developer. Today, Anna and her team focus on enabling a thriving partner ecosystem.

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Tatiana Moguchaya Vice President of R&D

Before joining Cognite, Tatiana worked with Schlumberger, managing the world's leading E&P software development, and with Microsoft – managing Norway's largest business areas to accelerate digital transformation with cloud, analytics, and big data. Tatiana holds MSc in Computer Science, Mathematics and Physics.

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COGNITE



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