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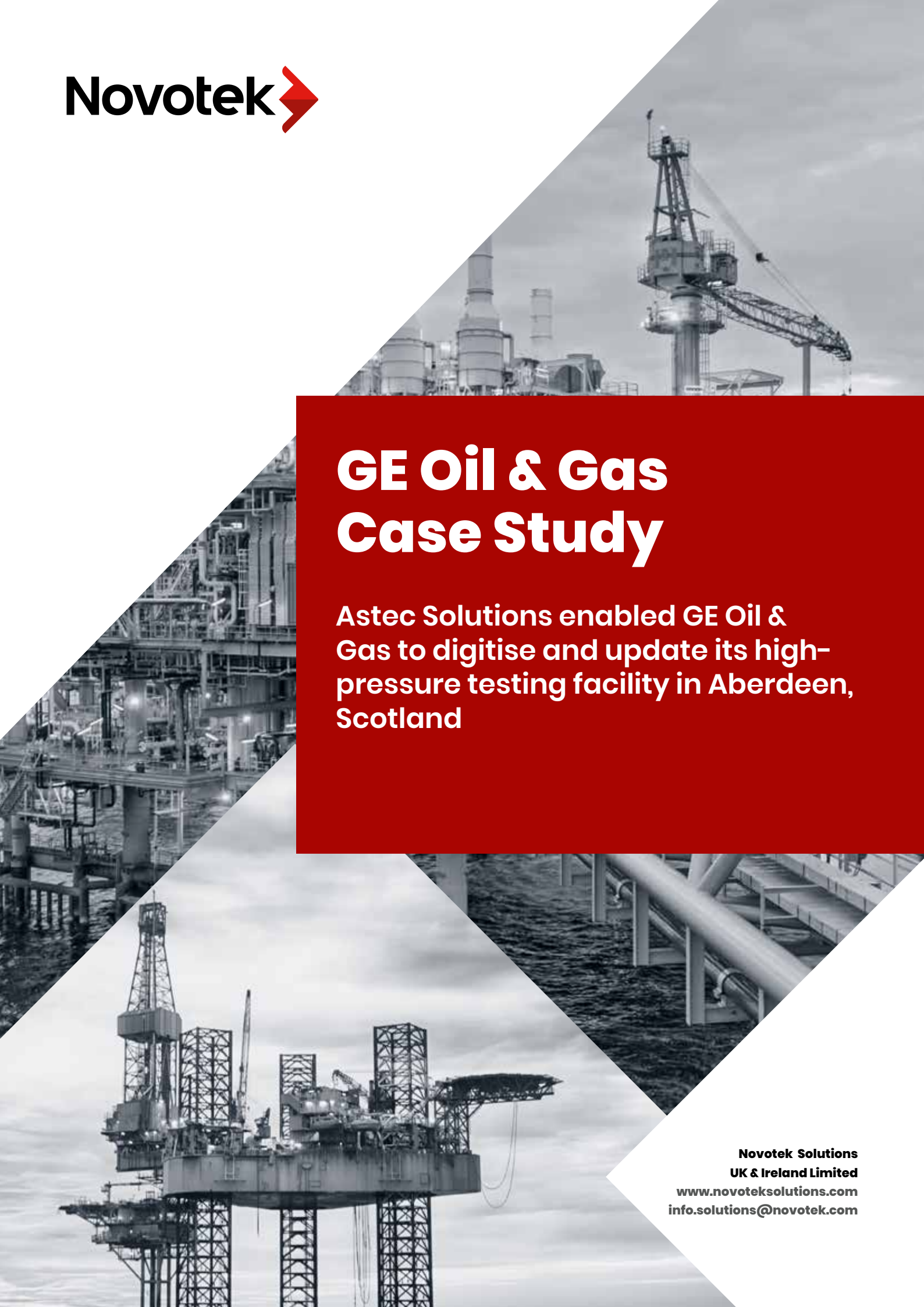

GE Oil & Gas Case Study

Astec Solutions enabled GE Oil & Gas to digitise and update its high-pressure testing facility in Aberdeen, Scotland

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Happy Christmas Trees

Background

In its 20 years of existence, GE Oil & Gas - which is headquartered in London, UK - has positioned itself as one of the world's leading equipment and service providers to the oil and gas industry. It offers services across the entire value chain, from oil and gas drilling equipment and subsea systems to turbomachinery solutions and downstream processing. The company employs more than 45,000 people worldwide, with 85% of all offshore rigs using GE drilling systems.

The company's facility in Aberdeen, Scotland, produces, tests and validates deep water, high-pressure wellheads. These installations, called 'Christmas trees', provide automated and safe control of well head flow. They have to be rugged enough to withstand extreme environments in terms of water pressure, temperatures and currents, and to control and monitor the flow of oil and gas, which can be extremely corrosive. Reliability is not an option; it is the key, mission-critical element.

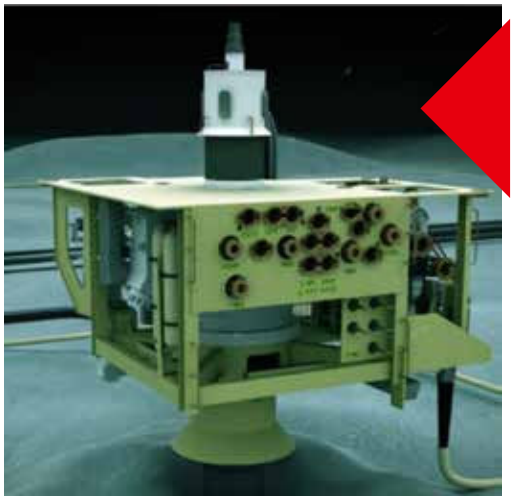
GE Intelligent Platforms called in Astec Solutions to digitise and significantly upgrade GE Oil & Gas' onshore manufacturing testing process.

"The existing process used a simple paper-and-pen system, which showed performance on an analogue basis," said Phil Butler, systems engineer with Astec Solutions.

"GE Oil & Gas wanted an electronic recording system which would automatically collect data and provide reports which could be distributed and printed anywhere and at any time, within the company or shared with partners."

The GE Oil & Gas Aberdeen facility has a number of test cells located within a single large building. The test cells can reproduce pressures of up to 30,000 psi (lbs/sq. inch) or 2068 bar, which is almost twice the pressure at the bottom of the Marianas Trench, the deepest part of the ocean floor. Those pressures are completely un-survivable by human beings and can be used to replicate 'bore pressures', which are the pressures exerted internally by oil and gas in the process of extraction. The wellheads use hydraulics to open and close the valves that control flow, and it takes a lot of power to open and close the gates. Failure at deep ocean levels simply cannot be allowed to happen.

Below: A subsea 'Christmas tree' is a stack of valves, fittings and spools used to monitor and control the production from an offshore well.



Analysis, diagnosis and planning

"Reporting is crucial," said Phil. "The company needs to be able to do something as apparently simple as produce a piece of paper that they can give to the end user, which will show the system's performance against a set of parameters."

The report could, for example, be required to show the performance of a pressure valve over a given amount of time. Parameters could include control of a pressure decline of one PSI per minute, over 24 hours. 'Breakout' tests measure actuator pressures; the trend is for a characteristic curve to be recorded as the valve opens. Actual performance on the sea bed can be compared with test records – but only if the data is available both at the testing station and on site. While the process of testing itself is not new, it was previously a pen-and-paper chart and record exercise. It was not as accurate as it now can be.

"A chart four inches high would measure pressure at 22,000 psi. Even if the valve experienced a 100 psi fall in pressure, it would not be easy to see," Phil explained. The manually recorded chart would have to be photocopied and sent out to site, which added time and inaccuracy. "A digital system is much more visible and accurate. Operators can see the data without any need to print it out, photocopy and send a hard copy to site. Trend data can be recorded every second."

Astec Solutions, which is the most experienced and longest serving GE Premier Solutions Partner in the UK, worked with GE Intelligent Platforms to develop a strategy for implementation of what would be a new system. Unit transmitters have to be calibrated in order to ensure consistency in the uploading of data. While local HMI panels collect data and manage operator workflow at each testing station, a cloud-based reporting solution was essential, in order to provide GE Oil & Gas with data and certification information accessibility anywhere in the world.

"GE Intelligent Platforms had a plan of what they wanted, which was a Digital Acquisition Unit (DAQ). They came to us with the draft architecture and tasked us to develop the software to go with it," said Phil.

The DAQs were initially developed as standalone units and went through various phases and iterations on the way to the development of a fully automatic and integrated testing system. Servers have been installed to collect data, either within the local network or in the private cloud. The system is being developed with GE Intelligent Platforms to be rolled out to sites across the world.

Status

"We have completed an increasing number of the testing units so far. They have released operators from conducting manual pressurising and depressurising of the system and delivered advantages in terms of time, accuracy and control," Phil explained. The next phase involved the roll-out of full test phase automation. "We are developing accessibility and the usefulness on an ongoing basis. We have reached proof of concept in a relatively short space of time; the original unit went into production very quickly." They now include technologies that the client company has not used before, including 'soft' PLCs.

"Soft PLCs enable logic programs to run within a PC, replacing physical PLCs. They improve flexibility and save on hardware, making use of separate, dedicated IO hardware" he continued. "The system uses SQL servers to collect test metadata and store configuration data. Time-series test results are stored within the high speed, distributed Historian system."

Outcomes

- The process is more consistent, repeatable and reliable
- The test process results have a higher degree of accuracy and resolution
- Access and availability of previous test results has been greatly improved
- Data and certification information is now available worldwide, through the private cloud
- A manual process has been replaced with an automated system, with immediate consequent efficiency savings

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