



*“The Glas Dowr Kitan project has been a tremendous success for all parties. We were impressed with the Invensys attitude throughout the project and their ‘change the game’ approach. It is one thing to have a good project plan in place, but another to actually execute and deliver.”*

*Ernest Hofstee  
Senior Project Manager, Bluewater*

## At Bluewater, the clearest path to Modernization is through Invensys

### Goals

- To replace and upgrade the existing integrated control and safety systems
- To achieve ‘First Oil’ on time in order to avoid contract penalties and lost production
- To maximize the availability/uptime of the control and safety systems and to minimize the total cost of ownership

### Challenges

- The Project teams are located in multiple locations, that is, the Netherlands, Slovakia, Germany and Singapore
- Process data from the new ICSS, including serial interfaces, safety systems and new I/Os, were available only in the very late stages before the planned FAT
- The original DCS had to be kept ‘alive’ as long as possible and the existing safety systems had to remain operational with just a few hours available to upgrade

### Solutions and Products

- Foxboro® I/A Series® Distributed Control System
- Triconex® Tricon™ Triple Redundant Safety System
- Triconex Trident™ Safety System
- Wonderware® Historian
- Foxboro Measurement & Instruments

### Results

- After replacing the Emerson ProVox and Delta V DCS systems and implementing a new integrated control and safety systems on the Glas Dowr, Bluewater was able to successfully meet ‘First Oil’ date on time
- Bluewater and its customer can now monitor the control and safety systems, both on and offshore, in real time

Foxboro® Triconex®

**Hoofddorp, The Netherlands** – Founded in 1978, Bluewater Energy Services B.V. (Bluewater) is a specialist in the design, development, leasing and operation of tanker-based production and storage systems, as well as innovative Mooring and Transfer Systems for the oil & gas industry.

Bluewater operates worldwide from offices in The Netherlands, UK, USA, Nigeria, Malaysia, China, Angola and Russia. The company currently owns and operates a number of Floating Production Storage and Offloading (FPSO) vessels, including the Glas Dowr.

The Glas Dowr is an FPSO vessel that is designed, built and operated by Bluewater. The function of an FPSO is to safely convey produced hydrocarbons from wellheads to a production vessel, and from floating storage platforms to export tankers. The Glas Dowr commenced its first operations in August 1997 on the Durward & Dauntless Field (UKCS) for Amerada Hess. After 2000, the Glas Dowr moved from the UK to South Africa where she operated on the Sable Field for Soker E&P from 2003 to 2008.

More recently, Bluewater completed the conversion of the Glas Dowr at the Sembawang shipyard in Singapore to prepare the FPSO for operations on the Kitan Field. She left Singapore in June 2011 and arrived at the Kitan Field in early July 2011. The Kitan Field is located some 500km off the Australian coast in an area of the Timor Sea. After completion of the subsea infrastructure, 'First Oil' was achieved on 14th October 2011. Glas Dowr operates on behalf of ENI JPDA.

For oil companies, operators and contractors, achieving 'First Oil' on time is absolutely critical to subsea oil drilling projects. Any delays here can result in very costly penalties and 'lost' production. Therefore any projects that involve the upgrade or replacement of existing FPSO control and safety systems are critical in terms of their scheduling and project management. As Ernest Hofstee, Senior Project Manager at Bluewater confirms: "To Bluewater, achieving First Oil on time is critical because income starts being generated for us at this time. Any delays here will have a direct effect on our income. The implementation of new control and safety systems and the role Invensys played here were absolutely critical to the overall Glas Dowr upgrade project."

"In terms of overall risks on the Glas Dowr project, we viewed the ICS [integrated control system] implementation and upgrades as a high risk element and therefore delivering this element on time was fundamental to the overall project goals," adds Hofstee.

With a deck area of 740m<sup>2</sup>, the Glas Dowr has a processing capacity (fluids) of 70,000 bpd and a crude oil storage capacity of 104,500m<sup>3</sup>. The vessel is powered by 4 x 4.7MW gas turbines and a 6.3MW diesel generator. The Glas Dowr's main functions are the receipt and control of fluids from subsea wells; processing of the incoming fluids for separation into crude, water and gas; storage of the stabilized crude oil and maintaining it at the required temperature; treatment of effluent for discharge of water to the sea; chemical injection; provision of water injection facilities; offloading of crude into 'tandem moored' shuttle tankers; and power generation for process, gas export, offloading and utilities. The vessel and its functions are therefore absolutely critical to First Oil. In fact, all systems on the Glas Dowr are designed for a minimum annual average production uptime of 95%.

From April 2010 to March 2011, Invensys Operations Management successfully completed the project that involved the upgrade and implementation of a new Integrated Control and Safety System (ICSS) for the Glas Dowr. This project was completed on time and within budget and to specification.

## Existing ICS

Prior to implementing Invensys' new ICSS solution, the Glas Dowr's existing ICS was based on Emerson's ProVox system and Delta V DCS (distributed control system). The emergency shutdown and Fire & Gas logic solvers were based on a Triconex Tricon system. As Robert Stank, Project Manager at Invensys Netherlands states: "The Emerson DCS system was nearing the end of its useful life and so could not be expanded with new controllers or I/Os. The existing installed control systems were becoming obsolete and many items of hardware were in need of repair or just hadn't been used for a long time. In addition, the existing cross-wiring and cabling was a point of



genuine concern for Bluewater. We therefore proposed a new ICSS solution that involved the complete upgrade and replacement of DCS hardware and application migration of the existing ICS. This work involved installing around 2,000 hardwired I/Os and 7,000 serial I/Os."

## Invensys "Change the Game" Approach

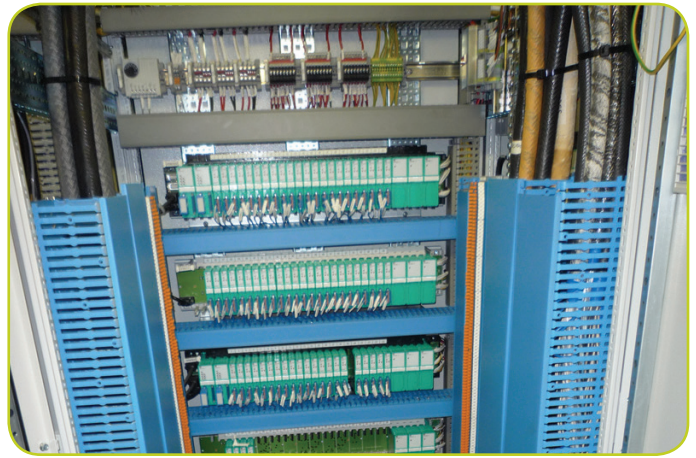
Ronald Molenbroek, Sales Account Manager at Invensys was also a key member of the project delivery team. "Bluewater was looking for an automation partner that could help it realize the critical Glas Dowl project within time and to budget, particularly with regards to achieving First Oil on schedule. They required a full replacement solution with a proven low Total Cost of Ownership but that also offered high system availability."

"We therefore took a project-based approach, which involved working very closely with Bluewater rather than with an EPC contractor. Project requirements for both parties were very open, transparent and clear. We ensured that the customer knew exactly what they were going to receive from us and when, as well as what we expected of the customer," he adds.

Or, as Robert Stank puts it: "Collaboration, cooperation and openness were absolutely critical factors to the success of this project. All parties had the same goals and objectives. Lead engineers and technicians from Invensys and Bluewater sat together in the same locations, which meant very fast responses to queries and any issues were resolved quickly. Weekly progress meetings - in which the teams took a 'no topic is taboo' approach - and detailed regular reporting throughout the course of the project, were equally important. I would say that this genuine partnership approach and positive working environment were key ingredients in the successful delivery of this project."

Invensys Lead Engineer Roel Olieman adds: "Our focus was much more about meeting the needs of the management team at Bluewater, particularly in terms of planning, budgets and risk-sharing. Invensys acted as a true partner rather than as an automation supplier. We referred to this as our 'change the game' approach."

"We used an open, common working environment during the project. Bluewater, Invensys and subvendor personnel all used Microsoft® Sharepoint technologies for data exchange and for recording and tracking any issues on the project, which further supported our collaborative



approach," adds Robert Stank. "Our project team was involved very early on in the pre-order phase, which helped to ensure buy in of the project team after the order was awarded and guaranteed a seamless transfer from Sales to the project delivery team."

## The New ICSS Solution

The new ICSS solution from Invensys involved the upgrade and replacement of all obsolete control and safety systems on the Glas Dowl, including hardware and application migration. The scope of services provided by Invensys included project management, detailed system engineering and design, supervision of installation, FAT and SAT testing, commissioning and training.

The new fully integrated solution from Invensys comprised a number of solutions from its comprehensive portfolio: Foxboro DCS, Trident Safety System, Tricon Safety System, Foxboro instrumentation (including level, pressure, flow and temperature sensors), and Wonderware historian.

The legacy DCS hardware was replaced completely, with a new Foxboro DCS. Invensys replaced a number of systems including I/O and marshalling cabinets, PLCs, multi-core cabling, control cabinets, control processors, redundant control network infrastructure (copper and fibre optic), operator workstations and consoles, application engineering servers, printers, data logging PCs and a complete revamp of the ship's central control room.

"We also improved the reliability and stability of communications by replacing the vessel's existing infrastructure with a new one based on a redundant, fault tolerant switched fibre optic network, which would help to keep system availability high at all times," explains Roel Olieman.

A Wonderware Historian is also part of the solution at Bluewater. The historian system combines the power and flexibility of a relational database with the speed and compression of a true process historian. Wonderware Historian is designed to collect a wide variety of plant or vessel data, at full resolution and very high data rates, ensuring that decision makers at all levels will have the historical information they need at all times.

"In terms of the Glas Dowlr, Wonderware Historian is being used to generate reports on a frequent basis, for example, daily or weekly, which if required can then be exported to onshore personnel for further analysis. This can include sets of data on key performance indicators such as temperatures and volumes of crude oil or other critical downhole production data," explains EEC technical lead Martin Forro.

The existing Emergency Shutdown (ESD) and Fire & Gas systems on the Glas Dowlr were upgraded with new I/O firmware in order to extend their lifetime and to comply with IEC 61508 regulations. Invensys upgraded the existing Triconex Tricon Fire & Gas system with new I/O Firmware, main processors, cards and communication modules. The existing addressable fire detection system was replaced with a new central fire system and detectors. For this, Invensys installed its Tricon range of fault tolerant safety controllers and Trident triple modular redundant safety controllers.

According to Robert Stank, Invensys Operations Management overcame a number of project execution challenges by using its 'change the game' approach. "Despite a very tight schedule, a fixed budget with little room for changes, and a constantly evolving scope of work, we successfully implemented the ICSS for Bluewater in readiness for First Oil in October 2011. This was particularly impressive when you consider that process data from the new ICSS, including serial interfaces, safety systems and new I/Os, were only available in the very late stages before FAT [Factory Acceptance Test]. We had to keep the original DCS 'alive' as long as possible and the existing safety systems had to remain operational with just a few hours' window being available for the upgrade."

Ernest Hofstee of Bluewater agrees: "In my experience, project delays often happen when work is handed over from one party to another during a project, which causes delays due to knowledge being passed on to other people such as a shipyard or third party contractor. This didn't happen on the Glas Dowlr Kitan project. We maintained a 'one-team' approach all the way through from project start to finish, with the same team in the Netherlands being moved to the shipyard in Singapore. All the work was carried out by the same people, which minimized project delays and disruption."

According to Hofstee, there were other success factors too, including the early engagement of Invensys during Bluewater's front-end design activities in which the project scope, schedule and execution plan were finalized. This also included the early engagement of eReM, a company contracted by Invensys to carry out manufacturing, demolition and installation work on the project. "The execution of demolition and installation activities in the shipyard in Singapore was carried out by Invensys and eReM personnel with no shipyard staff involved, which avoided lost time due to knowledge transfer."

Another key success factor, says Hofstee, was involving the people who would operate the new ICSS systems at the development and testing stages in the project. "If you involve the operators early on in the project, the buy-in later is much better and you don't get as much resistance to use the new systems."

"The Glas Dowlr Kitan project has been a tremendous success for all parties. We were impressed with Invensys' attitude throughout the project and their 'change the game' approach. It is one thing to have a good project plan in place, but another to actually execute and deliver. On this project, the starting points were not diluted as the project progressed, which was critical in ensuring that the project and First Oil were achieved on time."



Invensys Operations Management • 10900 Equity Drive, Houston, TX 77041 • Tel: (713) 329-1600 • Fax: (713) 329-1700 • [iom.invensys.com](http://iom.invensys.com)

Invensys, the Invensys logo, ArchestrA, Avantis, Eurotherm, Foxboro, IMServ, InFusion, SimSci-Esscor, Skelta, Triconex, and Wonderware are trademarks of Invensys plc, its subsidiaries or affiliates. All other brands and product names may be the trademarks or service marks of their representative owners.

© 2013 Invensys Systems, Inc. All rights reserved. No part of the material protected by this copyright may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording, broadcasting, or by any information storage and retrieval system, without permission in writing from Invensys Systems, Inc.