

Terra Nova FPSO... An Integrated Systems Approach



ABB Automation



The Field

The Terra Nova oilfield is located offshore, 350 kilometres east-southeast of St. John's, Newfoundland in the most explored basin on the Grand Banks - the Jeanne d'Arc basin. The Terra Nova field will be developed using a Floating Production Storage and Offloading (FPSO) facility. The facility is a ship with integrated oil production and storage from which oil will be offloaded into shuttle tankers. The FPSO hull is 292.2 metres long and 45.5 metres wide, and has an oil storage capacity of 960,000 barrels.

Working interests in the entire field are shared primarily between Petro-Canada, Mobil Oil Canada, Husky Oil Operations, Norsk Hydro Canada and Murphy Oil.

Oil will be produced for the first six years at an average rate of 115,000 barrels of oil per day starting in late 2000 with cumulative production of 370 million barrels of crude oil by 2014. A total of twenty-four wells will be developed consisting of fourteen producers, seven water injectors and three gas injectors. These wells will be located in four glory holes (16 metres wide at the bottom x 36 metres wide at the top x 10 metres deep) to protect them from iceberg scour. Trenched flowlines connected to flexible risers will link the subsea installations to the FPSO.

Symphony - A Common Platform

ABB was chosen as the Automation supplier because of our experience in providing fully integrated control systems in the offshore industry including our previous integrated control systems for Hibernia and the Petrobras P-36 platforms.

All of these diverse systems are controlled by a common control system - ABB's Symphony Distributed Control System. The main backbone is provided by ABB's high speed redundant control network - Cnet. The Cnet provides a secure deterministic means of connecting the Process Control cabinets which are dis-

tributed throughout the ship. The ability of Cnet to bring together widely distributed control equipment reduces central system space requirements and eliminates extended cable runs.

Intrinsic Safety

As most of the field transmitter signals are from Class I Division 1 and 2 areas, Intrinsic Safety (IS) barriers were required for the control I/O modules. In order to reduce the required footprint for this equipment, special termination units were provided that allowed the IS barriers to simply plug into the termination units.

The added benefit to this approach was the reduction of wiring effort and simplification of system maintenance. Field wiring is connected to the IS barrier with a plug. Replacement of barriers involves unplugging of the field wiring and barrier with no possibility of wiring mix-ups during replacement.

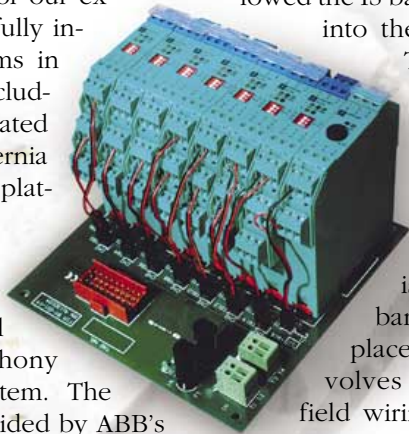
Additionally, in order to save space on the ship, ABB cabinets were located

directly in Class I Division 1 and 2 areas. In these cases, purged cabinets were designed and provided to meet this special need.

PSD/Fire & Gas

Both the Process Shutdown (PSD) and the Fire and Gas systems were supplied using the ABB Symphony platform configured in a fully redundant architecture. Use of common hardware through the FPSO has simplified control system maintenance and has reduced costs associated with personnel training and stocking of spare parts. Additionally, use of a common system eliminates the need for interfaces thereby simplifying system configuration and maintenance. ABB also supplied a Fire and Gas mimic panel that provides the operators with an overview of the FPSO Fire and Gas systems. This mimic is fully interactive with the ABB Symphony Distributed Control System allowing both monitoring and control.

ABB supplied the addressable Fire and Gas system for the accommodation area. This system was integrated into the Symphony control system through a serial link and an ABB General Purpose Interface.



Heating/Ventilation

Integration of the Heating, Ventilating and Air Conditioning (HVAC) signals into the control system allows the operator to start / stop motors and open / close dampers from their consoles instead of having to move to a stand alone panel and manually turn switches. HVAC integration provides a much safer way to conduct certain procedures and allows the operator greater control from his consoles. Additionally, having the HVAC control signals with the control system allow automation of operator actions such as closing dampers and turning on/off air blowers when the Fire and Gas system detects problems.

Power Management

The Electrical Power Management System (EPMS) on the ship is controlled by a custom C program which runs directly within the ABB Symphony Multi-Function Processor. Running the program at the processor level provides a number of advantages including redundancy and the elimination of external system interfaces. The EPMS system monitors power generation capacity of the ship and provides prioritized load shedding and power load re-acceleration after power restoration. Integration of the EPMS system with the other control systems allows the operator to monitor power generating capacity and trip or reset loads from the operator console. Complete information and speed of response are critical to the safe operation of the platform electrical system.

Subsea Control

Monitoring and control of the KOS subsea equipment is by the ABB Symphony system via redundant serial communications links. These links bring in over 2000 data values from the subsea well monitoring equipment. With this integrated approach, all subsea information is readily available to the operator as well as for use in advanced control strategies.

Ballast Control

The vessel ballast system consists of 20 wing tanks and 8 double bottom tanks that provide direct compensation for all crude oil movements. The ABB Symphony system monitors the tank levels using hydrostatic level transmitters and calculates the true tank levels using tank pressure compensation algorithms. The vessel Fire and Gas system interfaces with the ballast application to alert the operator and isolate any tanks contaminated by hydrocarbons. Additionally, the ABB Symphony vessel shutdown system prevents overfilling or over pressurization of the ballast tanks by automatically closing the ballast tank inlet valve on detection of high level or high pressure.

Additional systems controlled by the ABB Symphony system include the crude oil offloading and the desalination units.

Turret Control

ABB Symphony equipment required for process control, process shutdown and fire and gas protection of the turret is contained within the turret structure. This equipment is connected onto the Symphony Cnet communications backbone through use of Fiber Optic swivels that allow the turret to move 360 degrees while still being connected to the ships Cnet backbone.



A Common Operator Interface

In order to pull together all of the information contained within these systems, ABB's high performance 30,000 tag OIS43 operator consoles were used to provide the operators with a single window. Advanced display and alarming features of this console allow control of all vessel and production facilities with only six console screens and two operators.

Dynamic Simulation

As part of the project, a high fidelity dynamic model of the topsides portion of the project was developed and integrated into an operator training system utilizing ABB Symphony's direct connect simulation technology. This technology allows the direct use of actual controller configurations within the simulator. This allows the end user to keep the trainer up to date themselves and provides an excellent test facility for control configuration changes, there by improving safety and reliability of the FPSO operation.

The result of the integration of all production and ship-board systems is a system that provides complete, accurate and real time information allowing the operator to make the right decisions in a timely manner. This system is a reflection of ABB's dedication to providing systems that fully meet the needs of our customers.



3BCA012006R0001

ABB Automation

860 Harrington Court
Burlington, Ontario L7N 3N4
Phone: (905) 639-8840
Fax: (905) 639-8639
Toll Free: 1-800-263-9110
<http://www.abb.com>