Compact Control System for Offshore Marginal Oilfield Platform

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ABSTRACT

In order to reduce the cost in developing small and marginal oil and gas field, the unmanned platforms are designed and fabricated with compact process control system. However, it is economically inefficient when the platform installed with traditional whole set of control system. This article introduces a new control system designed for small and marginal oilfield platform which enables the pressure control and logic shutdown for the platform during production process. Instead of using electronic meters and compressor control system, it uses gas form a nitrogen package as the drive of control system for pneumatic instrument and fusible circuit. At the same time, it utilizes the hydraulic pressure from a hydraulic pump to drive the whole control system. With a simple structure and easy operation procedure, this control system is proved to be practically feasible and economically efficient for the production platforms of small and marginal oilfield.

KEY WORD: Simplified platform; Marginal field; Compact Control System; BZ34-3 and BZ 34-5

INTRODUCTION

In order to reduce the cost in developing small and marginal oil and gas field, the unmanned platforms are designed and fabricated with compact control system. However, it is economically inefficient when the platform installed with traditional whole set of control system. BZ34-3 and BZ34-5 (Liu, Sun, et al., 2008) can be defined as small marginal oilfield. So in order to solve the technological problem and make BZ34-3 and BZ34-5 economically profitable, several new technologies have been studied and applied.

This article introduces a new control system designed for small and marginal oilfield platform which can execute the process control and logic shutdown for the platform during platform production. Instead of using electronic meters and complicated control system, it uses a nitrogen package as the control source for pneumatic instrument and fusible circuit. At the same time, it utilizes the hydraulic from a hydraulic pump to drive the valve to execute the shutdown and control logic.

The compact control system has been successfully applied in exploitation of small marginal oilfield BZ34-3 and BZ 34-5 in 2006 and 2007, respectively. The compact control system has been successfully operated for 2 years without technical or safety problems. With a simple construction and easy operation procedure, this control system is proved to be practically feasible and economically efficient for the production platforms of small and marginal oilfield.

SYSTEM CONTROL FUNCTION

The compact control system includes single well control, shutdown logic control and fire detection logic control function for the platform. The nitrogen package is the control air supply source for the pneumatic pressure switch and fire detection fusible plug, the hydraulic pump was driven by 220VAC power supply from power distribution panel, it will supply the hydraulic power for the wing and main surface valve and subsurface valve of charisms–tree.

The single well flow line pneumatic pressure switch and main flow line pneumatic pressure switch will realize the control and shutdown of each well and total process platform. When the pressure of any single well flow line reaches the high-high or low-low set point, the pneumatic pressure switch will be turned on, the control gas will be released and the single well surface valve will be closed by well control module logic control, while another well can still keep normal production.

When all the well flow line pressures reach the high-high or low-low set point, or all the valve surface valve closed, the shutdown valve on the main flow line will be shutdown, at same time, the displace valve will be open. In this way, diesel oil from central process platform will be transmitted to the subsea pipeline, to prevent the coagulating of the subsea pipeline between the platform and central process platform cause by the shutdown of platform for certain time.

The fusible plug was designed for the fire detection for the wellhead area and production equipment area, the control gas is from nitrogen package, it will have charge function, the pneumatic pipeline will connect to the logic control module. When there is any fire in the protected area, the control gas will be released, and whole platform will be shutdown through logic control module. Refer to Fig. 1 for details.