Full Solution Deep-water PRM Project in the Jubarte Field in Brazil for Petrobras by PGS

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SUMMARY

PGS has recently completed deployment of the world's first, and to this date only, full-solution deep-water PRM project in the Jubarte field in Brazil for Petrobras. The project includes a fully fiber-optic system, topside installation on the FPSO, marine installation of the system in deep-water, the acquisition of active data using a shooting vessel, the acquisition of passive seismic data as well as data-processing of both active and passive data. In addition to describing the final solution and showing what was done, the paper shall also describe some of the steps done prior to implementation. This includes initial efforts to design, certify and build the system, followed by or in parallel preparations to deploy the system offshore. The presentation shall also briefly describe how the unique optical system works and its components. The system itself includes a wide range of different items – from top-side Opto-electronics to a riser, lead-in cables, a sub-sea hub with optical wet-mates, as well as the actual seismic array cables with optical 4C sensor stations over the field. This presentation may also cover some of the hurdles to introduce 4D PRM and permanent monitoring, as well as opportunities to overcome the same, if time permits

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Title

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Main objectives

Reservoir management teams are aware of the need to recover more than the present ratio 1 out of every 3 barrels of oil that is found, and that reservoir management, optimization and control are key tools to achieve the same. 4D4C seismic data can help production optimization teams improve their models and make them more accurate, and to improve decision making and reduce risk.

PRM, permanent reservoir monitoring, enables low-cost high-quality 4D4C seismic reservoir surveillance as well as providing better imaging where alternate techniques are not good enough.

New aspects covered

PGS has recently completed deployment of the world's first, and to this date only, full-solution PRM project in deep-water depths between 1200 and 1300m, in the Jubarte field in Brazil for Petrobras.

Introducing and implementing new technology has traditionally been a challenge in the oil industry. In projects such as this one, the successful implementation of a full solution required a multi-disciplinary team from the operator as well as the service company.

Abstract

PGS has recently completed deployment of the world's first, and to this date only, full-solution deep-water PRM project in the Jubarte field in Brazil for Petrobras.

The project includes a fully fiber-optic system, topside installation on the FPSO, marine installation of the system in deep-water, the acquisition of active data using a shooting vessel, the acquisition of passive seismic data as well as data-processing of both active and passive data.

In addition to describing the final solution and showing what was done, the paper shall also describe some of the steps done prior to implementation. This includes initial efforts to design, certify and build the system, followed by or in parallel preparations to deploy the system offshore.

The presentation shall also briefly describe how the unique optical system works and its components. The system itself includes a wide range of different items – from top-side Opto-electronics to a riser and lead-in cables, a sub-sea hub with optical wet-mates, as well as the actual seismic array cables with optical 4C sensor stations over the field.

This presentation may also cover some of the hurdles to introduce 4D PRM and permanent monitoring, as well as opportunities to overcome the same, if time permits.

200 words

PRM, permanent reservoir monitoring, enables low-cost high-quality 4D4C seismic reservoir surveillance as well as providing better imaging where alternate techniques are not good enough and better imaging is needed. 4D Seismic, complemented in future by techniques like multi-transient EM, is considered by many to be the only direct wide-scale reservoir monitoring tool we have to get information make such decisions, given the need for information far from the well-bore.

High-quality 4D4C seismic can be very useful in complex reservoirs. This includes fields where there are production zones below sections that are difficult to image through, such as gas clouds and salt. This seismic data can help production optimization teams improve their models and make them more accurate, for example to understand connectivity and compartmentalization. One can see which faults are permeable and which ones are baffles or impermeable by using 4D seismic before and after a reservoir has flowed, information that can then be input into a model. Similarly, although one can run a PLT, production logging tool, to see how flow is taking place at the time the PLT is run, in some cases 4D4C systems can show how these zones perform over longer periods of time – information that is extremely valuable.

The Jubarte pilot project

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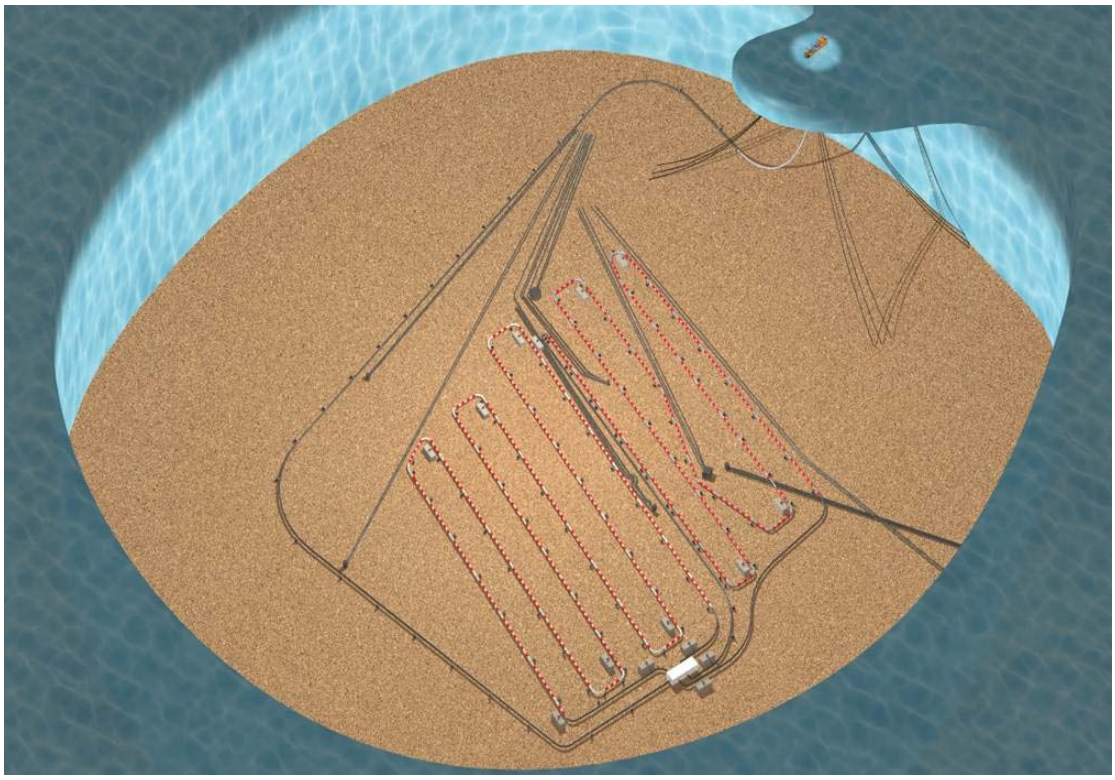

Jubarte Field PRM Array schematic.

In addition to describing the final solution and showing what was done, the paper shall also describe some of the steps done prior to implementation. This includes initial efforts to design, certify and build the system, followed by or in parallel preparations to deploy the system offshore.

This presentation also describes, briefly, the fiber-optic system and optical technology that provides high quality 4D4C seismic that overcomes some limitations of existing techniques of reliability and cost. In addition to excellent data quality, advantages expected from optical systems include no in-sea electronics, improved reliability, lighter weight, significantly reduced deployed system cost and improved operational safety. The unique system is based on a Michelson interferometer and DWDM/FDM telemetry which offer performance and reliability advantages over alternative systems. It is also the basis for a 1m channel land seismic system in development for exploration or PRM.

Conclusion

Given that the information will help operators see bypassed oil, water-flood fronts, see production driven natural fractures from passive reservoir monitoring, the authors believes that in a short time O&G companies will accept that more and improved 4D, made economical with PRM systems, on their fields is a real option that they cannot afford not to try, especially since it may also help image the overburden and reduce operational risk.

Introducing and implementing new technology has traditionally been a challenge in the oil industry. In projects such as this one, the successful implementation of a full solution required a multi-disciplinary team from the operator as well as the service company.

Acknowledgement

The authors would like to thank the management of Petrobras and PGS for the opportunity to do the project as well as to present the same.