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Produced Water Discharge Monitoring

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Abstract

This paper describes how Memorial University is using a new ocean going autonomous underwater vehicle (AUV) to collect ocean environmental monitoring data to take detailed environmental measurements in the water column and to validate ocean environmental monitoring and modeling tools. The research team is developing models to anticipate, manage and mitigate changes in environmental quality, habitat changes and pollutant effects of produced water discharges from offshore oil and gas platforms. Hydrodynamic discharge models that have been developed and validated are described. In the process of executing this research program, highly qualified personnel are being trained in the area of offshore environmental monitoring, risk assessment, and risk management to ensure the sustainability of offshore oil and gas projects.

1. INTRODUCTION

Atlantic Canada is in the process of developing offshore oil and gas fields. Within the Province of Newfoundland and Labrador, three offshore fields are already operational and other fields are good prospects. On the Grand Bank, the Hibernia oilfield, 315 km east and south-east of St. John's, has been producing oil since 1997. Average water depth in this area is 80 m and the field is operated using a gravity-based platform. The Terra Nova oilfield is 35 km south-east of Hibernia. It has been producing since 2001. It has a floating platform with average water depth at 95 m. The White Rose oilfield is also close to Hibernia and it has been producing since 2005. The water depth in this area is about 125 m. The Hebron oilfield, which is also close to Hibernia and Terra Nova, may be the next field to be developed. Recent studies estimate a combined recoverable reserve on the Grand Banks of 2.751 billion barrels of oil, up 696 million barrels from previous estimates. In order to predict, manage and mitigate the potential impacts of changes associated with offshore oil and gas development there is a need to develop decision-making tools.

The research team in the Faculty of Engineering and Applied Science at Memorial University has been involved in developing environmental decision-making tools to manage waste discharges from offshore oil and gas projects since 1999. The team has conducted several studies on environmental risk assessment and risk management tools for discharge of drilling wastes and produced waters in the marine environment.

In the last eight years, the team has focused mainly on the following topics:

1. Development of a probabilistic hydrodynamic model and risk-based design procedure for produced water discharges (Mukhtasor, 2001).
2. Risk-based decision model for drilling waste discharges in the marine environment (Sadiq, 2001).
3. Assessment of performance characteristics of sensors for environmental monitoring using underwater vehicles (Pennell, 2003).
4. Laboratory investigation of the settling characteristics of drilling cuttings (Niu, 2003).
5. Evaluation of various offshore drilling waste treatment technologies using multi-criteria decision-making (Thanyamanta, 2003).
6. Development of decision support software to manage produced water in offshore oilfields (Chowdhury, 2004).
7. Environmental effects monitoring of fish plant effluent in coastal Newfoundland (Adams, 2005)
8. The dispersion of offshore discharged produced waters in the marine environment: hydrodynamic modeling and experimental study (Niu, 2008).