Ship’s Propeller Jet-Induced Scour in Westports Malaysia

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ABSTRACT
Recent studies proposed the necessity of investigating the ship’s propeller jet-induced scour in Westports Malaysia with an annual growing traffic of 11.63%. The prediction of potential seabed scour in Westports was demonstrated through a joint interview and analytical study. Data were collected through interviews with port personnel as inputs for the analytical study. Semi-empirical equations were selected to predict the velocity field within the jet. This paper concluded that Westports has high risk to the damage of propeller jets due to the direct impingement of high velocity jet and the absence of scour protection system on the seabed.

KEY WORDS: Ship propeller jet; Westports; Malaysia; seabed scour; velocity prediction; scour protection system.

INTRODUCTION
Ship’s propeller jet-induced seabed scour has caused serious damages in various harbours and ports over the past four decades. The harbours and ports that encountered scour damages include Larne harbour in Northern Ireland, Port Elizabeth in South Africa, piers in France, quays in Sweden, Port of Amsterdam in the Netherlands, a car ferry terminal in Swinoujscie, Poland, and 42% of ports in the United Kingdom (Hamill et al., 1999). Propeller wash has become a severe problem in recent years, which may cause instability in berthing structures by undermining the foundation. Consequently, the affected ports and harbours require costly remedies and maintenance works.

Whitehouse (1998), Sumer and Fredsoe (2002), and Gaythwaite (2004) described the formation of scour and proposed equations for velocity distributions within a ship’s propeller wash in their books. Furthermore, numerous researchers such as Hamill et al. (1999), Lam et. al. (2012a, b, c, d), Hong et al. (2013), Johnston et al. (2013), and Ryan et al. (2013) have also investigated the predictive means for propeller wash-induced scour and proposed equations for scour prediction and velocity distributions within the jet based on their experimental work. Predictive techniques for propeller wash are still in the area of active research.

Malaysia is a maritime country, which is strategically surrounded by the Straits of Malacca and the South China Sea. The country comprises two large land masses separated by the South China Sea, namely West Malaysia (ordinarily referred to as Peninsular Malaysia) and East Malaysia (Central Intelligence Agency, 2012). Over the period 2008 to 2010, Malaysia’s total trade was ranked in the range of 24th to 27th among the world trade organization members (Ministry of International Trade and Industry Malaysia, 2011; World Trade Organization, 2009, 2010, 2011). Ports are an important trade facilitator in the country. According to Khalid (2006, 2008)”s study, 95 % of the nation’s trade is transported through the sea. Fig. 1 shows the map of Malaysia with the location of ports (Ports World Sdn Bhd, 2000).

Presently, Malaysian government increasingly recognises the significance of maritime sector (Saharuddin, 2001). Several efforts have been made to strengthen the maritime sector in the country (Othman and Bruce, 2011). For example, the government set up the Maritime Institute of Malaysia (MIMA) with the objectives to look into the maritime affairs and address the maritime issues that affecting the country (Maritime Institute of Malaysia, 2012). The shipping activities are definitely a key drive in the country’s economic growth. Nevertheless, the environment could be vulnerable to damages from these frequent shipping activities if it exceeds the communities’ ability to preserve the environment. For instance, seabed without adequate protection system is easily scoured by high speed ships, particularly close to a harbour or port (Evans, 2010; Hamill et. al., 1999).

Although there are many ports in Malaysia, no literature could be found on the study of propeller-induced scour in the country. A recent study by Soon and Lam (2013) proposed that the study of ship propeller wash should be conducted in the Port of Tanjung Pelepas and Westports Malaysia due to the growing demand in container trade with an average annual growth rate of 11.63% and 8.64%. The current study aims to carry out an investigation of potential seabed scour induced by propeller jets in Westports through analytical study. The understanding of propeller wash study will help in preserving Malaysian ports from the risk of propeller scour by implementing the corresponding measures.