



Contents lists available at ScienceDirect

Ocean Engineering

journal homepage: www.elsevier.com/locate/oceaneng

Challenges and solutions for ship recycling in China

Zunfeng Du^{a,b}, Haiming Zhu^{a,b}, Qingji Zhou^{c,*}, Yiik Diew Wong^{dd}^a State Key Laboratory of Hydraulic Engineering Simulation and Safety, School of Civil Engineering, Tianjin University, Tianjin 300072, China^b Maritime Institute@NTU, Nanyang Technological University, Blk N1.1-B3-01, 50 Nanyang Avenue, Singapore 639798, Singapore^c Tianjin University-Hu Yunchang Recycling Technology and Research Center of Vessel and Marine Structure, School of Civil Engineering, Tianjin University, Tianjin 300072, China^d Centre for Infrastructure Systems, School of Civil and Environmental Engineering, Nanyang Technological University, Blk N1-01b-51, 50 Nanyang Avenue, Singapore 639798, Singapore

ARTICLE INFO

Keywords:

Chinese ship recycling
Laws and regulations
Economic environment
Advanced practice
Strategies and solutions

ABSTRACT

The world ship recycling centre has shifted from developed countries to developing countries in Asia. However, Chinese ship recycling companies are experiencing a recession in the ship recycling market and intense price competition from South Asian countries. In this study, Chinese economic environment is analysed, including depressed recycled steel market and price, non-preferential tax policy and high investment cost of ship recycling yards. This paper presents Chinese major laws and regulations related to the ship recycling industry for environmental protection and the workers' health and safety. From the comparison between Chinese laws and international conventions, we find that no specific enforcing mechanism exists in the Chinese ship recycling industry. However, Chinese large-scale ship recycling yards have been taking advanced practices including site environmental protection, dismantling procedures and technologies, and safety management. Arising from this study, several strategies and solutions for Chinese ship recycling facilities are recommended.

1. Introduction

Approximately 90–95% of international commercial goods are transported by sea because of cost efficiency (Chang et al., 2010). However, weak recovery of the world economy in recent years coupled with constant deliveries of a large number of new-built ships that were ordered before the outbreak of the international financial crisis, has resulted in a significant depressions in the shipping market. The continuously depressed market and the excess shipping capacity led to a vigorous development of ship recycling business in the world.

The dismantling and recycling of end-of-life ships are primarily carried out in India, Bangladesh, Pakistan, China and Turkey (Mikelis, 2008; Deshpande et al., 2012; Hiremath et al., 2015). The amounts of ship dismantling in the above five countries are shown in Fig. 1. China and Turkey are the first two countries to provide relatively-reliable standards in terms of safety measures and/or environmental protection (Engels, 2013). In recent years, India is facing new pressure as it has lost some of its market share in the ship recycling industry to other places like China and Turkey, where more advanced facilities are attracting shipowners with government help. According to the Ship Recycling Industries Association of India, for Alang, the number of ship recyclers had declined by 50% in 2014 alone (Schuler, 2015).

Nevertheless, India and Bangladesh continue to lead in the number of ship dismantling, according to the NGO Shipbreaking Platform (NGO, 2015). Apparently, several Indian beaching recycling yards in Alang have improved their working procedures and have upgraded their facilities to include concrete floors with drainage, bilge water pumps, protective clothing, hazardous-waste disposal facilities as well as segregated work areas among other things (Howard, 2015). As of December 2015, four Indian recycling yards had Class NK-verified ship recycling facilities (Class NK, 2015).

The ship recycling industry is an important part of the economy for developing countries since it is a major source of local employment. Yujuico (2014) presented the economics of ship recycling and pointed out that ship recycling was affected by broader macro-economic trends. Knapp et al. (2007) applied econometric modelling to a unique dataset to provide a holistic insight into the dynamics of the ship recycling market. Meanwhile, the ship recycling sector faces various challenges including pollution of the environment, safety and health of personnel, unclear/incomplete legal system, and so on. A number of pollutants, comprised mainly of heavy metals, petroleum hydrocarbons and other xenobiotic compounds are accumulated in the coastal sediment (Reddy et al., 2005; Neşer et al., 2012; Patel et al., 2013, 2015). Therefore, the ship recycling industry, a highly price sensitive market, has to adopt

* Corresponding author.

E-mail addresses: dzf@tju.edu.cn (Z. Du), zhuhaoming921214@163.com (H. Zhu), qjzhou@ntu.edu.sg (Q. Zhou), cydwong@ntu.edu.sg (Y.D. Wong), >d.<http://dx.doi.org/10.1016/j.oceaneng.2017.04.004>

Received 22 January 2016; Received in revised form 15 February 2017; Accepted 2 April 2017

0029-8018/ © 2017 Elsevier Ltd. All rights reserved.

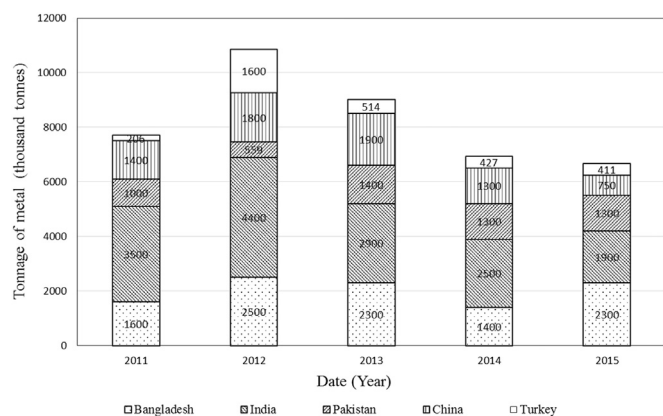


Fig. 1. Comparison of ship dismantling in different countries.

Data source: <http://www.robindesbois.org/>

health and environmental regulations that may result in significant costs in a competitive business environment. However, international efforts to establish enforceable regulations have achieved very limited success so far (Yujuico, 2014).

The ship recycling industry in China officially started in the 1960s and moved onto the world's stage upon its economic reform in the 1980s. The ship recycling industry is regarded as a legitimate industry by the government of China (McCarthy, 2010). Similar to other Asian ship recycling states, China has experienced fluctuations in its fortunes in the ship recycling business, while taking cognisance of the differing conditions under which it operates (Galley, 2014). In China, ships are usually broken up alongside quays, which makes it easier for ships to be delivered to the recycling site for dismantling. In this way, ships are dismantled in a manner that mirrors the reverse of the shipbuilding process, rather than being cut up in chunks or in slices as in the beaching method (Jones, 2007). Better dismantling techniques in China result in better dismantling quality (Basu, 2004), but the costs associated with the safety and environmental management mean that the greener yards can only offer lower prices to the shipowners (McCarthy, 2010). Although the Chinese yards provide low salaries, the shipyards provide good housing and food, structured staff training, personal protection equipment, good environmental controls, lesser number of accidents, programmes for cleaning the yards, and plans for improvement. Therefore, more and more European shipowners prefer the Chinese yards due to their superior facilities and huge capacities (Puthucherril, 2010). The more recent tightening of environmental and safety laws by Chinese authorities has not halted the industry's development, although it may have detracted certain profitability.

Nowadays, the Chinese ship recycling industry seems to be headed into a future full of risks and opportunities. As the main shipbuilding and ship recycling country, China always insists on sustainable development. In the ship recycling industry, China cooperates closely and jointly discusses green ship recycling with the International Maritime Organisation (IMO) in fulfilment of the Convention in protecting the environment. According to the statistics of China National Ship recycling Association (CNSA), from 2011 to June 2015, a total of 44 million deadweight tonnages of ships were dismantled, thousands of tonnes of recyclable metal resources were re-used, 11 million tonnes of ore concentrate fines were salvaged, 29 million tonnes of raw iron ore mining were reduced, and 3.5 million tonnes of standard coals were saved; these recycling activities resulted in a reduction of 11.5 million tonnes of carbon dioxide emissions in China (Zhao, 2015a).

The focus of the present study is to analyse the challenges of ship recycling industry in China. By evaluating the dismantled steel market and price, tax policy and investment cost of ship recycling yards, major laws and regulations related to ship recycling industry, and practices in ship recycling yards, solutions and strategies for Chinese ship recycling

companies are proposed in order to strengthen international competitiveness of the ship recycling industry.

2. Methodology

A three-stage approach was used in this study, namely interview, field survey, and literature review. First, in-depth personal interviews were undertaken to collect information regarding the current situation, underlying economics, international regulations and domestic laws on ship recycling in China. Purposive sampling techniques were used to select interviewees in order to make the samples as diverse as possible. A total of 20 experts participated in the interviews, including staff members of CNSA, officers of government agencies such as the Maritime Safety Administration of the People's Republic of China (hereinafter referred to as China MSA) and the Environmental Protection Bureau, experts in charge of ship recycling facilities, and cash buyer representatives. Each interview typically lasted about 30 min and each interviewee was initially informed of the purpose of the research. Then the interviewees were asked to analyse the political, economic and social factors of ship recycling. They were encouraged to seek answers to questions in the ship recycling industry in China. All the factors and opinions from these interviewees were presented with acknowledged sources and references in the study.

Second, a field survey was carried out in order to study the ship recycling dock, ship recycling process, and yard layout and to obtain information about the equipment and facilities in ship recycling yards. The survey served to understand how a Ship Recycling Plan (SRP) is developed and what a Ship Recycling Facility Plan (SRFP) consists of. Sufficient details were covered to garner a thorough understanding of the production processes and project management tasks associated with ship recycling. In addition, a structured questionnaire was used in the survey. The questionnaires were divided into two parts. The first part, for managers in the yards, included questions on applicable statutory and regulatory requirements, worker health and safety, and protection of the environment. The second part, for workers on site, was to seek information regarding the practical solutions to technical problems and their own feelings inherent to ship recycling. The survey was conducted in several ship recycling companies of different sizes, such as Changjiang Ship Recycling Yard (with an area of 370 acres), Zhoushan Changhong International Ship Recycling Co., Ltd (with an area of 1500 acres and about 2000 m coastline), and Tianma Ship Recycling Yard (with an area of 101 acres and 1000 m coastline), and so on.

A total of 120 questionnaires were distributed to 25 managers and 95 workers. 22 responses were collected from the managers and 62 responses were collected from the workers samples. The figures accounted for 88.0% of response rate from the managers and 65.3% from the workers. Some valuable findings are obtained from the questionnaire survey results. From the managers' point of view: (1) although the managers have made the ship recycling plans, they are unfamiliar with the distribution of the hazardous materials on-board. Therefore, the recycling methods and procedures for the hazardous materials on-board are not clear in the ship recycling plans; and (2) in order to save the cost, the workers' safety training is lacklustre, the personal protect equipment is inadequate. From the workers' point of view: (1) although they know the distribution and the existence forms of the hazardous materials, they haven't attached great importance to the hazardous materials, also with low safety awareness during ship recycling; (2) the workers often do not follow the ship recycling plans made by the managers, and usually take short cut actions; and (3) the aged people make a big proportion, with little experience and great fluidity, so that the sense of responsibility for environmental protection is low. These feedbacks from administrators and workers were valuable inputs for subsequent study stages.

Third, the literature was used extensively to back up the findings from the interviews and the field surveys. For better understanding, the logical flow of this research is explained using the Fig. 2.

Download English Version:

<https://daneshyari.com/en/article/5474261>

Download Persian Version:

<https://daneshyari.com/article/5474261>

[Daneshyari.com](https://daneshyari.com)