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Ecological Engineering, Industrial Ecology and Eco-Industrial Networking Aspects of Ship Recycling Sector in India

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Abstract

India is the world's leading ship recycling country which works on the principle of waste to wealth. In this paper an attempt has been made to articulate the Ecological Engineering, Industrial Ecology and Eco-Industrial Networking aspects which are embedded in beaching method of ship recycling in Alang, India. There is a need to promote such activities for sustainable growth, but, it is equally true that, if ship recycling is conducted haphazardly with very little scientific and technical knowledge, it will expose workers to hazardous conditions as well as would leave disproportionately large environmental footprint behind. In this context, Gujarat Maritime Board (GMB), Government of Gujarat, India has initiated many projects to defend human and environmental health. In India, already impressive positive changes can be seen as the GMB has set training and welfare institute and its efforts resulted in decrease of fatal accidents from 2.0 per 1000 workers to 0.13 per 1000 workers *i.e.* 93.5% decrease in the fatal accidents from the year 2003 to 2011 in the ship recycling yards. Present status of ship recycling in India is substantial. The overall trend of the industry is towards following more and more Health Safety & Environment (HSE) norms and has commitments with them. Zero accidents and near zero pollution to the surrounding environment should be the ultimate goal of beaching method of recycling in India to handle pile of end-of-life ships in environmentally sound manner - which are expected to reach ship recycling yards in near future.

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1. Introduction

The shipping industry plays a key role in the international market as more than 80% of goods in terms of volume is handled by ships in the world trade today [1]. It was reported that, the cumulative number of ships throughout the World as on 31 October, 2010 was 50, 054 - which included General Cargo Ships (16,224), Bulk Carriers (8,687), Container ships (4,831), Tankers (13,175), Passenger ships (6,597) [2]. Thus, shipping industry is the life line of business among the countries in the World. Most of the above mentioned vessels are owned and operated for transporting cargo by the developed countries. Typically, vessels are operated for 20 to 25 years and when maintenance cost of ships becomes more compared to its operational cost, ship owners usually sell their ships through brokers operating from different parts of world such as London, Dubai, Singapore and Hamburg for recycling. The other reason for selling may be owing to unfavorable market conditions which will push ship owners to sell their vessels for recycling. Auction of “end-of-life” is mainly based on the amount of steel in the ships and it is usually measured in terms of Light Displacement Tonnage (LDT). [2]-[5].

Ship breaking was a major on-shore business in USA and some European countries after World War II (before 1960's) as ships were damaged in the war and demand of steel was increasing for building new ships [1], [6]. The vessels were dismantled using floating method of dismantling (breaking vessel alongside quay). The end-of-life vessel breaking location slowly moved from developed countries to developing countries in Asia starting from Taiwan and South Korea. During 1980s, ship dismantling was well established in other Asian countries like India, Bangladesh, Pakistan, China, Philippines and Vietnam. The beaching method of ship recycling is typically followed in India, Bangladesh and Pakistan as some of the beaches in these regions have high tidal ranges and gentle sloping with hard bottom - which allows the vessels to beach by their own power [3]. The other reason for ship breaking in south asian countries is, increased cost of supporting environmental and health safety standards for workers of ship recycling industry in developed countries. The majority of the waste from ship is hazardous and its disposal in developed countries is strictly regulated under the existing 1989 Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, as well as removal of hazardous substance from the obsolete vessel is expensive process in the developed countries as a result ships are often demolished together with their toxic materials in developing countries [5].

2. Ecological Engineering, Industrial Ecology and Eco-Industrial Network Aspects of Ship Recycling Sector

The idea of ecological engineering was introduced by H. T. Odum. A simple definition of ecological engineering is “to use ecological processes within natural or constructed imitations of natural systems to achieve engineering goals” [7]. Industrial ecology uses ecological principles to design systems which uses energy and materials efficiently. In other words, industrial ecology make any industry adopt “green processes” by improving its material cycle [8], [9] as sighted in [10]. The acronym for Green as given in [11] is “Growth with Resources, Environment Enhancement and Nature”. On the other hand, the Eco-Industrial Networking is a concept in which waste generated in one firm becomes potential raw materials for an other firm [12]. It is a closed-loop system. The Ecological Engineering, Industrial Ecology and Eco- Industrial Network have a common goal that is balancing anthropogenic activities with nature [10]. Ship recycling is being carried out in India along the coast of Alang in the state of Gujarat. Presently, Alang beach is located 56 km away from Bhavnagar district in the Gulf of Cambay is the only major ship recycling location in India [1], [4], [6], [13], [14]. Ship recycling yards in Alang are working on the principle of *waste to wealth* In 1990s the Alang became largest ship recycling location in the World [1].

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