Abstract

Nowadays, development of export import activities increases significantly. It causes the demand of shipping vessel services grows as well, where sea transportation considers as the most effective and cheapest way to distribute commodities. However, increasing demand of shipping vessel services to distribute goods brings serious impact which is about the exchange of water ballast during loading and unloading at the port. Water ballast is seawater which is pumped into the tank at the bottom hull of the ship to ensure the stability of the ship, to replace the current load of cargo ships during loading and unloading, also to keep the propeller remain in the water. The exchange of water ballast during loading and unloading generates huge risks when Nonindigenous Species contaminates the environment. The impacts involve ecological imbalance; mutation of species; even increasing the spread of diseases. One of the examples of water ballast impact is Zebra Mussel, a mutation species contaminates Great Lakes – Canada which is first found in South Russia. It clogs the culverts in Lake Erie – Michigan. Eventually people in Monroe experience water outage for two years and the government should pay about 4 Million Rupiah to clean it up.
Responding to the problem, International Maritime Organization (IMO) cooperates with International Convention state that every ship should implement ballast water management and treatment system. According to the role, this research analyzes two treatments simultaneously to destroy microorganism in water ballast, they are heat treatment and inert gas obtained from exhaust gas of the main engine of the ship. ECOGREENSHIP mechanism to destroy microorganism is by flowing the exhaust gas from the main engine directly to the ballast pipe while loading (suction) or filling the ballast tank. From this modeling designed - mixing two phases of fluid - where mass flow rate of gas is 8.78 kg/s at 330°C and mass flow rate of ballast water is 43.745 kg/s at 28°C, the result analysis showed that: the water ballast temperature on intersection point (Point 1) is 405 K or 132°C, then on 0.3 meter above decreases into 345 K or 72°C (point 2), and on 1 meter above elbow approaches initial temperature close to 305 K or 32°C (point 3).

Keywords: Water Ballast, Mutation Species, Water Ballast Management, Exhaust Gas of the Main Engine, Temperature, ECOGREENSHIP.