# STUDI KELAYAKAN PEMASANGAN *CLOSED LOOP SCRUBBER* PADA SISTEM GAS BUANG KAPAL TANKER DITINJAU SECARA TEKNIS DAN EKONOMI

**ZIDAN AQSAL NUR AKBAR**

## ABSTRAK

Emisi sektor transportasi laut menjadi isu penting terkait dengan polusi udara yang dikeluarkan pada gas buang kapal. IMO menetapkan suatu kebijakan baru bernama Global Sulphur Cap 2020 dan pemerintah Indonesia menegaskan bahwa kapal berbendera Indonesia yang masih menggunakan bahan bakar sulfur lebih besar dari 0,5% m/m agar dilengkapi sistem pembersih gas buang. Tujuan dari penelitian ini adalah mengetahui kelayakan pemasangan closed loop scrubber pada sistem gas buang kapal secara teknis dan ekonomis. Metode yang digunakan adalah pengumpulan data yang diolah dengan metode numerik berdasarkan kebutuhan spesifikasi peralatan dalam pemasangan system closed loop scrubber dan kelayakan investasi. Scrubber merupakan alat tambahan untuk mengurangi kadar sulfur (SOx) dalam gas buang mesin kapal sampai batas tertentu. Berdasarkan hasil penelitian, secara teknis terdapat beberapa komponen yang diperlukan, diantaranya: Scrubber, Pompa freshwater, Pompa sea water, Pompa NaOH, Heat exchanger, dan Washwater treatment. Secara ekonomis, total biaya capital expenditure dari closed loop scrubber mengeluarkan biaya sebesar Rp51.077.744.859, total biaya operational expenditure yang dibutuhkan sebesar Rp5.206.913.306. Hasil kelayakan investasi diperoleh nilai Net Present Value (NPV) sebesar Rp147.286.579.845 dalam waktu 10 tahun, Nilai Internal Rate of Return (IRR) = 56,21% dan Payback Period (PP) pada tahun ke-1 bulan ke-9.

**Kata Kunci** : Emisi, Closed Loop Scrubber, Studi Kelayakan

# *FEASIBILITY STUDY TECHNICAL AND ECONOMIC OF INSTALLATION CLOSED LOOP SCRUBBER ON THE EXHAUST GAS SYSTEM OF TANKER SHIP*

**ZIDAN AQSAL NUR AKBAR**

***ABSTRACT***

*Emissions from the marine transportation sector are an important issue related to air pollution. IMO established a new policy called the Global Sulfur Cap 2020 and the Indonesian government emphasized that Indonesian-flagged ships that still use sulfur fuel greater than 0.5% m/m must be equipped with an exhaust gas cleaning system. The purpose of this study is to determine the feasibility of installing a closed loop scrubber on a ship's exhaust gas system technically and economically. The method used is data collection which is processed by numerical methods based on equipment specifications in the installation of a closed loop scrubber system and investment feasibility. Scrubber is an additional tool to reduce sulfur content (SOx) in ship engine exhaust gas to a certain extent. Based on the results of the research, technically the components needed include: scrubber, freshwater pump, sea water pump, NaOH pump, heat exchanger, and washwater treatment. Economically, the total cost of capital expenditure from the closed loop scrubber costs IDR 51,077,744,859, the total operational expenditure required is IDR 5,206,913,306. The investment feasibility results a Net Present Value (NPV) of IDR 147,286,579,845, Internal Rate of Return (IRR) = 56.21% and Payback Period (PP) in year 1st month 9th.*

***Keywords*** : *Emissions, Closed Loop Scrubber, Feasibility Study*