

Holistic environmental assessment for Marine Scrubber systems

Hayoung Jang(hayoung.jang.2017@uni.strath.ac.uk)

University of Strathclyde

Abstract

This paper aimed to evaluate the environmental impacts of three different SO_x reduction scrubber systems: (1) 'wet open-loop', (2) 'wet closed-loop', and (3) 'wet hybrid'. In a case study designed with MV 'Glovis Cougar', an ocean-going car carrier, the technique of life cycle assessment was applied to model and quantify various emissions, such as CO₂, SO_x, NO_x, etc., associated with the proposed systems from the cradle to the grave. A commercial software, 'GaBi' was aided to embody the analysis. Consequently, research results revealed that the most optimal scrubber system is unexpectedly the wet closed-loop scrubber system in the GWP (Global Warming Potential) with 1.7685 million tonnes CO₂ Eq and in the AP (Acidification Potential) with 37.658 tonnes SO₂ Eq. as well as in the aspect of the other environmental impacts. Moreover, in the case of hybrid scrubber systems, it turns out that the more operation in closed-loop than open-loop, the less all environmental emissions. The novelty of this paper can be placed on an appropriate response to the impending international maritime regulation, MARPOL Annex VI Reg. 14, to curb SO_x arising from shipping activities. Particularly, the environmental performance of the proposed systems was discussed in a holistic point of view.

Keywords: *SO_x regulation, scrubber systems, LCA, life cycle assessment.*

References

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Biography

2008-2012: BSc in Korea Maritime and Ocean University

2012-2015: Onboard marine Engineer at Haeyoung Shipping Ltd

2017-18: MSc in University of Strathclyde

2018-Present: Pursuing PhD in University of Strathclyde