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Mitigating Ship Source Air Emissions in the Ocean Sub Sector: Control and Compliance

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Abstract

The issue of climate change a ecting the ozone layer demands critical e orts from di erent sub sectors of the world carbon source emission sources cutting across the Agricultural sub sector, the oil and gas sub sector, the fossil fuel technology sub sector to mention but a few. Under the fossil fuel technology sub sector, the marine industry by having fossil fuel powered ships in the waters contributes a good measure to greenhouse gas emissions. In view of this fact the sector has instituted good number of measures to address the mitigation of ship source emissions through regulations developed by the International Maritime Organization (IMO).The work ýrst reviewed the various air emissions control mechanisms developed for the sector. Next, the work developed a model of compliance to these rules for both þag states and port states using port state control mechanisms. Both oxides of nitrogen NOx and oxides of sulphur SOx compliance were covered in the light of IMO, Marine pollution convention MARPOL73/78 as currently amended. The theories of e ciency and responsiveness were applied in eliminating laxity in the overall ocean emissions sub sector.

K / , , ' . . : Ocean sub sector; Control and compliance; Emissions; Green house gas; Marine Transportation

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E orts by the global community towards clean fuel and Green House Gas elimination has been hydra headed in recent years. e development pathway of the future certainly will be driven by this singular purpose. e prosperity of nations will depend on what e orts they make to adapt to the technologies which are climate change compliant as this will become the prosperity driver of several sectors the global economy, the transportation sector not being the least. To this end all development models must be sustainable. Sustainability is the single parameter that will drive future development [1-3]. Present de nition of sustainability de nes it as a 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (World Commission on Environment and Development 1987) MARPOL Chapter VI has contributed immensely to the control of air source marine pollution in the stratosphere. e regulation through limits controls emissions from ships plying the world oceans. Continual reductions of pollutions are ensured by the regulation with increasing years [4-6]. e pollution from ships via compliance by ships thus reduces as years go by. In the current year 2020 MARPOL has demanded the implementation of her more stringent requirements with reduced Sox emissions from ships of over 5000 grt from 3.5ppm to 1.5 ppm.

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Diesel fuel energy type over the years remained the dominant energy option for marine transportation in the global maritime industry. In recent times however, the use of diesel fossil fuel type in ship propulsion led to serious problems of climate change, health and the environment, hazards associated with carbon oxides and sulphur oxide emissions as exhaust products of diesel combustion. ough the diesel the use of diesel as main propulsive energy source in ships is marked every high energy performance index and associated low cost, high availability, commercial competitiveness, etc., the environmental impacts and woes of its usage informed the serious search for alternative energy sources that could replace diesel fossil fuel type while also maintaining the high propulsive performance of diesel fuel used in the maritime operations. is has led to the development of various renewable and

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M [illegible] M [illegible]

e research adopted impact assessment method to estimate the e ects of the new policy on the industry using revealed preference approach available in the Sox and NOX data estimates that was got from the industry. ese data are valid estimates of the revealed direction of pollution in the years of estimation.

R [illegible] F [illegible]

e Sox and NOx set out by MARPOL has required a technology change beginning from January 2020 thus forcing ship operators to diversify in order to comply thus bringing about a new regime of compliance in the cur- rent shipping and maritime industry. is new regime of compliance just in line with the expected gures will consistently reduce emissions coming from the maritime sector over the years making 2030 expected emissions the least compared to the current year emissions. In line with the more stringent restrictions brought about by the MARPOL VIregulation, ships are expected to diversify their source to use of more alternative energy sources such as Lique ed natural gas LNG thus creating the need for LNG bunkering facilities. Marine engine builders are then required to produce new vessel fuel sources from compliant fuel sources only. e big marine engine builder Wartsilla is already complying with this rule. New vessels built in the period of the twenties will certainly comply with the MARPOL VI more stringent requirements (Figures 1, 2).

More research is thus expected in the development of cleaner fuel sources as expressed in gure 2 to meet the more stringent rules. Fuel cells ammonia red ships and other less NOx and Sox containing marine fuel sources will be used all in a bid to comply with new rules.

us we have entered a new regime known as the compliance regime in the maritime industry and this new regime will bring about the required gas emissions reduction necessary to bring about the protection of the ozone layer. e breakage of the ozone layer in the Northern hemisphere was naturally healed based on reduction in the use of fuels brought about by the COVID 19 stay at home order.

Natural forces may have a way of instigating actions that will bring about balance of the ozone layer science is yet discover this.

C [illegible]

e implementation of 2020 MARPOL has brought a lot of innovations into the marine air pollution sector causing ships and their owners to take steps towards diversi cation to remain compliant. Alternative energy as well as gas has been the latest areas as they contribute less to air pollution. A re nery also has invested more in order to produce fuel that will comply with the new MARPOL convention requirements.

A [illegible]

We thank all the patients who participated in the trial, the referring

References

1. Veritas DN (2018)