

# Studies of Microwave Removal of NO<sub>x</sub> and SO<sub>x</sub> from the Exhaust of Marine Diesel Engines Using Non-Thermal Plasma

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*Abstract*— Numerical analysis on removal of NO<sub>x</sub> and SO<sub>x</sub> from marine diesel gas engines using non-thermal plasma was carried out in this paper. The plasma chemistry and physics are investigated for the exhaust gas from two stroke slow speed marine diesel engines which contain high concentrations of N<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>O and CO<sub>2</sub> and low concentration of NO<sub>x</sub>, SO<sub>x</sub>, HC and CO. Computer simulations based on mass balance equations to calculate reduction efficiency of removal of NO<sub>x</sub> and SO<sub>x</sub> are presented in detail. It was found that in theory 100% removal of NO<sub>x</sub> and SO<sub>x</sub> are possible with the use of non-thermal plasma. Required plasma volume is also determined for a range of mean electron energy of the plasma to remove NO<sub>x</sub> and SO<sub>x</sub> by more than 99%. The results obtained in this computer simulation will be used to build laboratory based microwave Non-Thermal Plasma Reactor (NTPR) followed by pilot scale NTPR which will be tested on a real marine engine exhaust. This study is a part of the FP7 European project called DEECON (Innovative After-Treatment System for Marine Diesel Engine Emission Control).