PROJECT

DEECON

Innovative After-Treatment System for Marine Diesel Engine Emission Control

Funding: European (7th RTD Framework Programme)
Duration: Sep 2011 - Aug 2014
Status: Complete with results
Total project cost: €3,465,492
EU contribution: €2,645,435

Call for proposal: FP7-SST-2011-RTD-1
CORDIS RCN: 100218

Background & policy context:
The emission of exhaust gases from ships has been recognised as a main source of pollution causing a significant exposure risk to people living close to harbours or coastal areas. In spite of the large contribution to air pollution by maritime transport, this sector has remained largely unregulated until now. The adoption of the new restrictive IMO emission regulations requires modification of the entire commercial fleet that has to be retrofitted with innovative solutions.

Objectives:
The aim of this project is to create a novel, modular, on-board, after-treatment unit that combines different sub-units, each of which is optimized to remove a specific primary pollutant (SOx, NOx, PM including BC, VOC, and CO). This new integrated retrofit system will reduce the environmental footprint of existing and new ships well below the limits imposed by the current and envisaged future regulations, while giving EU marine industry a competitive edge.

Methodology:
The system must be designed to avoid or minimise the use of external chemicals, and promote the use of reliable and robust technologies to allow easy maintenance and fast retrofit. The project considers the use of innovative processes for the treatment of each pollutant: i) a new concept of Electrostatic Seawater Scrubbing to capture submicron PM, SO2 and other water soluble compounds and ii) an innovative Non Thermal Plasma Reactor, using Electron Beam and Microwave, to remove NOx, VOC and CO. It is envisaged that these two processes are sufficient to successfully remove all gaseous pollutants from ship exhaust. However, if needed, in the final stage, state-of-the-art Selective Catalytic Reduction or NOx Storage Reduction will be implemented for residual NOx removal. The system will also include innovative processes to purify scrubber wash water before discharging into the sea without harming marine life. The outcome of this work programme will yield a technology demonstrator, which will be validated by an independent organisation.

Parent Programmes:
FP7-TRANSPORT - Transport (Including Aeronautics) - Horizontal activities for implementation of the transport programme (TPT)

Institute type: Public institution
Institute name: The European Commission
Funding type: Public (EU)

Lead Organisation:
### Brunel University

**Address:**
Kingston Lane  
UXBRIDGE  
UB83PH  
United Kingdom  

**EU Contribution:** €799,861

### Partner Organisations:

#### Rafako Spolka Akcyjna

**Address:**
Lakowa 33  
47N/A400 Raciborz  
Poland  

**EU Contribution:** €85,740

#### Universita Degli Studi Di Napoli Federico II

**Address:**
CORSO UMBERTO I, 40  
80138 NAPOLI  
Italy  

**Organisation Website:**
[http://www.unina.it](http://www.unina.it)  

**EU Contribution:** €585,881

#### Sustainable Maritime Solutions Ltd

**Address:**
The Island Wraigsbury 8  
Staines  
TW19 5AS  
United Kingdom  

**EU Contribution:** €317,575

#### Ixscient Limited

**Address:**
Popes Grove 76  
Twickenham Middlesex  
TW1 4JX  
United Kingdom  

**EU Contribution:** €175,000

#### Instytut Maszyn Przepływowych Im Roberta Szewalskiego Polskiej Akademii Nauk - Imp Pan

**Address:**
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Poland  

**Organisation Website:**
Przedsiebiorstwo Specjalistyczne Telechem Spolka Z Ograniczona Odpowiedzialnoscia

Address:
Ul. Msciwoja ii 32A
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EU Contribution: €167,430

Vessel Technical Services (V.t.s.) Srl

Address:
Piazza Giovanni Bovio 8
80100 Napoli
Italy

EU Contribution: €81,578

Technologies:

- Emissions control systems
- Electrostatic seawater scrubber

Development phase: Research/Invention

- Emissions control systems
- Non-thermal plasma reactor

Key Results:

Reducing pollutants from ship exhausts

Engine exhaust from ships is one of the most pervasive pollutants in the world today. An EU initiative has built a device that can remove gases and particles from diesel exhaust.

Ships use a type of low-cost diesel that is high in sulphur and other pollutants. In 2010, the International Maritime Organization put into place strict regulations on ship emissions to limit this major source of air pollution.

The EU-funded DEECON (Innovative after-treatment system for marine diesel engine emission control) project set out to build a modular exhaust scrubbing unit to remove pollutants from diesel exhaust.

Work started with a full analysis of ship engines to determine system requirements. The device's sub-units, namely the electrostatic seawater scrubber (ESWS), a plasma reactor, a catalytic reactor and a washwater treatment unit, were developed and tested primarily on gaseous pollutants.

Trials show that the ESWS can remove up to 93 % of particulate matter and reduce sulphur dioxide by about 70 %. Similarly, the plasma reactor prototype that uses microwaves as an energy source could scrub up to 90 % of gaseous pollutants and reduce nitric oxide by nearly 100 %.

Following testing, all sub-units were assembled to form the prototype DEECON exhaust scrubbing system. A demonstration at Gdynia Maritime University in Poland was then conducted to treat the exhaust of a marine diesel engine. Results show that the system uses up much less power and water than existing systems.

Thanks to DEECON, commercial fleets will ultimately be retrofitted with an innovative solution that sufficiently removes all gaseous pollutants from their exhausts. This will pave the way for eco-friendly ships that lessen air pollution and do much less harm to coastal communities and marine life.

Documents:
- Final Report Summary - DEECON (Innovative After-Treatment System for Marine Diesel Engine Emission Control)

STRIA Roadmaps: Vehicle design and manufacturing
Transport mode: Water transport (sea & inland)
Transport sectors: Passenger transport, Freight transport
Transport policies: Societal/Economic issues, Environmental/Emissions
Geo-spatial type: Other