Regional Capacity Building Workshop
Measurement of Inland Transport CO2 Emissions and Mitigation Policies

IGES Silver Bullet on Transport Emission Reductions-European Experiences
Emission Reduction, Air Quality Improvement and Engine Efficiency Project Solutions

26-27 September 2013,
United Nations Conference Centre, Bangkok.

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Meeting the Challenge

Reducing emissions from diesel engines is one of the most important air quality challenges facing many countries and industries. Even with more complex and demanding standards that only apply to newly manufactured diesel engines, millions of diesel engines already in use will continue to emit large amounts of nitrogen oxides (NOx) and Particulate Matter (PM), SOx and CO2 which contribute to serious public health problems and global warming.

Evidence from the World Health Organization (WHO) June 2012 reports:
• Diesel exhaust emissions have significant effects on human health especially infant mortality and morbidity.
• Particulate Matter (PM or black carbon) and PM 2.5 are confirmed to increase cancer risk, cardiovascular illness and premature mortality. 2013 et al LIM Over 6 million mortalities per annum from PM globally.
• Clear links exist between air pollutants and the sources of GHG’s which cause climate change.
• Nitrogen Oxides NOx, PM and SOx causes a wide variety of health and environmental impacts: ground-level ozone (Smog), acid rain, water quality deterioration, toxic chemicals which may cause biological mutations and visibility impairment reducing visibility in urban areas.

Innovative technologies designed to reduce diesel emissions from existing engines and non-road, agricultural and port equipment from ICE engines are available and in operation today. These retrofit technologies ensure that older engines which are in operation today, combined with increasing usage, are not increasing emissions but can actually reduce them!

We - IGES Ltd are an environmental project development company bringing electro-catalytic hydrogen on demand combustion catalyst technology & others to the commercial transport market. On a project basis we offer a low cost/ high ROI retrofit application that has the ability to deliver a revolutionary impact on both emission (GHG) components and fuel consumption and the co-benefits of air quality improvement.

We implement projects in conjunction with Governments to provide solutions and methodology for emission reduction, air quality improvement & engine efficiency projects. These projects are undertaken in collaboration with programs such as: the Worldwide Program of Activities (POA), Clean Development Mechanism (CDM) and Nationally Approved Mitigation Actions (NAMA) in agreement with local governments and aligned with Millennium Development Goals (MDG) under the UNFCCC (United Nations Framework for Climate Change) and align with sustainable development goal locally.
Background – Scope Thailand

➢ Thailand today faces challenges in sustaining energy-environment-economic development with limited resources availability, minimal externalities and global climate change with the burden of increasing economic cost to meet the GHG reduction targets.

➢ Thailand had adopted climate-change mitigation and adaptation paths in accordance with the 11th National Economic and Social Development Plan (2012-2016) and the National Master Plan on Climate Change (2011-2050) prepared by the Natural Resources and Environment Ministry.

➢ Under the business as usual (BAU) scenario without mitigation measures, Thai GHG emissions would increase to 769,896 kt-CO2, 4.6 times higher than in the base year, 2005. It is projected that by 2050, GHG emissions from passenger and freight transport will be 25.6 per cent of total GHG emissions.

➢ Key mitigation areas that are targeted incorporate power, green industry, smart passenger transport, and effective freight transport. It emphasizes on the supply side, renewable-energy technologies and clean technologies would play crucial roles, while on the demand side, energy-efficient devices and fuel-switching could contribute to higher GHG reduction.

➢ The international environmental development mitigation focus is through measures such as the Clean Development Mechanism (CDM) UNFCCC framework and the newly funded NAMA (Nationally Aligned Mitigation Actions) initiative.

➢ It is within this context that we introduce our project. We have the technology and knowledge of working within this international framework to bring a sustainable solution to GHG mitigation to the country.

source - Thailand Low Carbon Road Map A joint research outcomes of support and collaboration between Thammasat University's Sirindhorn International Institute of Technology (SIIT), the Asian Institute of Technology, the National Institute for Environmental Studies at Japan’s Kyoto University, and the Mizuho Information and Research Institute in Japan.
The Solution:

Electro-Catalytic Combustion Assist (ECCA)

1. Waste Energy Recovery
2. Electro Catalytic Assist
3. Driver Controls

Heavy duty diesel engines

Substantially reduces emissions

Diesel enhanced efficiency

ROI by Fuel savings Emission Reduction

Exhaust Heat Energy Recovery Module
Electro Catalytic Combustion Assist
Eco driving module

Improved Fuel Economy & Reduced Emissions
Our Company and Approach

Project Company
- Air Quality Improvement
- Emission Reduction
- Engine Efficiency Projects
- National & Regional Policy
- Governments
- Development Banks

Technology Company
- Product Development
- Product Manufacturing
- Technology R&D
- Verification
- Certification
- Training
- Knowhow transfer

Distribution & Partner Company
- Local Partner & Participant
- Local Market knowhow & Development
- Local Assembly

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Customer Challenge
Our customer, MSC Home Terminal, is the largest container terminal in the port of Antwerp. Their aim was to improve the carbon footprint while increasing the competitiveness by reducing diesel fuel consumptions on their larger fuel users.

Solution
To make fuel consumption and the corresponding emissions more efficient and environment-friendly, MSC Home Terminal, has equipped 31 of its straddle carriers with the Electro-catalytic combustion Assist (ECCA).

Customer Benefits
The 31 modified straddle carriers now use less fuel and thus produce less harmful emissions. The project is a part of a programme by the Port Authority in an effort to promote more environment-friendly port equipment. The improvements are significant: independent monitoring and tests have shown that the system yields fuel savings, and fewer emissions, with the CO₂ content of exhaust gases falling from 6.4% to 5.3%, a reduction of more than 18%. The amount of carbon monoxide is also reduced by more than 10%, while almost 19% less nitrogen oxides (NOx) are emitted. Thanks to the more efficient combustion, soot (PM) emissions are cut by an amazing 85% at POINT OF COMBUSTION.
The Antwerp stevedore DP WORLD also installed our system on a Gottwald mobile crane used to unload ships. DP WORLD subsequently conducted a fuel consumption measurement by using an external fuel tank on a weighing scale in order to accurately verify the fuel consumption reduction. In this case, they run the engine at idle for 4 hours, with and without the system. Then another 2 hours under load with and without using our system. **The results are impressive with a 26% saving at idle and 16% under load** as presented here below. NB results vary by engine type.

![Diesel fuel consumption by weight](image)

- 26 %
- 16 %

<table>
<thead>
<tr>
<th></th>
<th>Idle</th>
<th>Under Load</th>
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</thead>
<tbody>
<tr>
<td>With AQS+</td>
<td>65kg</td>
<td>87kg</td>
</tr>
<tr>
<td>Without AQS+</td>
<td>104kg</td>
<td>124kg</td>
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Methodology & MRV

- NEW Simplified MRV – Algorithm of Particulate Matter (see next slide) – submitted to UNFCCC
- Integrated system solution – with annual MOT/ Emission Testing
- NAMA /CDM – compatibility and alignment

COMING SOON ----

- CO₂ Decomposition factor – at combustion point
- Optimising emission reductions and fuel efficiency benefits
Methodology and MRV Practice

III.BC. Emission reductions through improved efficiency of vehicle fleets (cont)

(g) (h) Retrofits that improve engine efficiency

Retrofits installed directly onto the vehicle/engine that improve the efficiency of engine operation by, for example, tapping into spare unused kinetic energy, solar energy or thermo-electric generation or using unburned hydrocarbons from incomplete combustion, and/or generating hydrogen on board to be used as a catalyst, eg. electro-catalytic efficiency technologies. Retrofits may improve the combustion efficiency of the engines.

\[ BE_y = \sum_{i,x} BEF_{km,i,x,y} \times AL_{km,i,x,y} \times 10^{-6} \]  

(1)

Where:
- \( BE_y \): Baseline emissions in the year \( y \) (tCO\(_2\))
- \( BEF_{km,i,x,y} \): Baseline emission factor per km of vehicle category \( i \) using fuel type \( x \) in the year \( y \) (gCO\(_2\)/km)
- \( AL_{km,i,x,y} \): Activity level of project in km of vehicle category \( i \) using fuel type \( x \) in the year \( y \) (tkm)

\[ BEF_{km,i,x,y} = \frac{SFC_{BL,i,x,y} \times NCV_{x,y} \times EF_{CO2,i,x,y} \times OXID_{BL,i}}{AW_{BL,i,x,y}} \]  

(2)
Replicating Projects in Thailand

- Our focus is on deploying innovative technology and financing options and share the resultant emission reductions/cost savings/operational benefits with project participants to ensure a we build a long term, sustainable replicable environmental model.

- We are moving towards CDM registration with our project based PoA (Program of Activities) initiative titled “IGES Eco Transport PoA for air quality and reducing GHG” in both Ghana and Pakistan, in collaboration with local partners, and are now in negotiation on projects in China, India and Brazil, with intended expansion into other regions including West Africa. Our Ghanaian initiative in which we are working with the CDM DNA (Designated National Authority – Ministry of Environment, Technology and Science) is to be based in the GPHA (Port of Accra) and is being supported by the UNFCCC Regional Collaboration Centre (RCC) - Lome.

- With the assistance by the CDM (RCC) Lome, we have submitted a revision request to a suitable methodology AMS.III.B.C to the UNFCCC for the purposes of MRV. http://cdm.unfccc.int/methodologies/SSCmethodologies/clarifications/17533, This has been recently recommended for approval by the Small-scale Working Group at its 41st meeting.

- Our aim is to focus on the catalytic development potential and cross collaborative approach to deliver knowledge transfer, technical capability, local template and infra-structure (and potential integration with policy under NAMA in the future) for replication and scale up within the country, thus creating a genuine value-added proposition (which will attract private and development agency funding) on an environmentally sustainable basis.
Contact us

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