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**Texas Environmental Research Consortium (TERC)**

and the

**Houston Advanced Research Center (HARC)**

under the

**New Technology Research and Development (NTRD) Program**

**RFGA-07 Project 21**

Development of Technologies to Reduce Oxides of Nitrogen Emissions  
from Diesel Engines on Tug and Tow Boats Operating in the Texas  
Waterways

Presented by:

**Advanced Global Engineering, Inc.**

**MIRATECH Corporation**

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# Project Summary

- Purpose: 50% NOx reduction Kit for Marine Diesel engines – an innovative & cooperative combination of two complementary emission reduction technologies to provide a 50% NOx reduction with similar reductions in PM, HC and CO levels.
- Final configuration: AGE Modified SOI injectors, MIRATECH V-Cats, ULSD fuel, ultra-low oil consumption power assemblies, no crankcase blow-by.
- Final test results successfully achieved project's goals.

	<b>NOx gms/bhp-hr</b>	<b>HC gms/bhp-hr</b>	<b>CO gms/bhp-hr</b>	<b>PM gms/bhp-hr</b>
<b>Baseline Test</b>	10.5	0.15	1.90	0.16
<b>Technology Applied</b>	AGE Modified SOI Injectors	MIRATECH Diesel Oxidation Catalysts	MIRATECH Diesel Oxidation Catalysts	MIRATECH Diesel Oxidation Catalysts
<b>Final Results</b>	<b>5.1</b>	<b>0.05</b>	<b>0.10</b>	<b>0.11</b>
<b>% Change</b>	<b>54% Decrease</b>	<b>67% Decrease</b>	<b>95% Decrease</b>	<b>31% Decrease</b>

# Advanced Global Engineering

## Mechanical Fuel Injectors

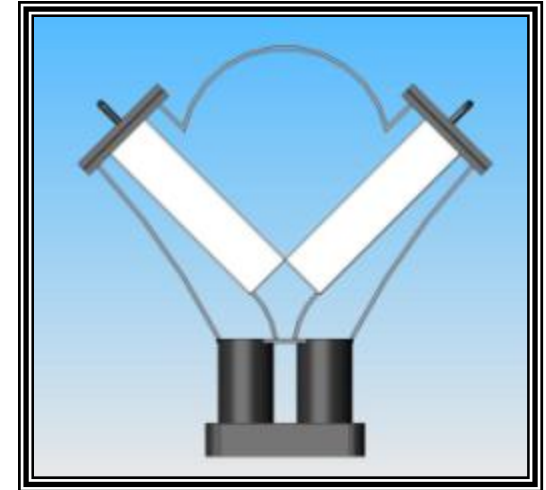
- Custom engineered, (patent pending), mechanical fuel injectors with unique start-of-injection timing positions specifically designed internally to provide significant NOx reductions over the entire duty cycle.
- This technology has been previously tested, proven and EPA certified to lower NOx emission rates on other medium speed engine applications, (marine, rail and stationary power), while minimizing the overall duty cycle fuel penalty.
- 100% interchangeable with no additional training or tooling required for installation or operational maintenance.
- No change required of the engine control system, (same mechanical governor).



# MIRATECH Corporation

## ‘V-CAT’ – Combines Exhaust Manifold/Oxidation Catalyst

- Patented integrated pre-turbo exhaust manifold/oxidation system has also been designed specifically for the medium speed diesel engine class, (marine, rail, stationary power).
- Testing at SwRI has shown significant emission reductions are achieved with little or no effect on the engine’s exhaust back pressure with no associated fuel penalty
- This exhaust system modification is also entirely interchangeable with the current exhaust manifolds with no additional tooling or training required.



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## Executive Summary

- This project represented a cooperative combination of two complementary emission reduction technologies that provided a 54% NO<sub>x</sub> reduction, 31% PM reduction, 67% HC reduction and a 95% reduction in CO emissions.
- Both technologies are 100% retrofittable requiring no additional training, tooling, engine control system or infrastructure changes.
- The feasibility of commercializing the combination of these two engine components into a single “certifiable” emissions reduction kit is in process.
- The testing identified other complementary emission related technologies that will provide even further reductions and has been submitted as a follow-up NTRD proposal for 2008.
- Applied for EPA Part 94 certification of this system.