Diesel Retrofit Technologies for Off-Road Construction Equipment

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Extengine Transport Systems

- Based in Fullerton, California.
- Designs, assembles, and installs retrofit systems for older diesel-powered vehicles and off-road equipment.
- Developed proprietary SCR system that cuts smog-causing NOx and PM emissions by as much as 90 percent without diminishing engine performance or increasing fuel consumption.
- Provides field service and technical support to users.
- Presently has the ONLY CARB-verified SCR system with NOx reduction of 80% (ADEC-1)
  - Applicable to selected Tier 0 off-road engines
  - Nearly 100 installed systems
## Typical Extengine Technology Performance

<table>
<thead>
<tr>
<th>PM Level</th>
<th>PM</th>
<th>NOx</th>
<th>HC</th>
<th>CO</th>
<th>Fuel Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADECI</td>
<td>I*</td>
<td>28%</td>
<td>88%</td>
<td>97%</td>
<td>95%</td>
</tr>
<tr>
<td>20% TruBlue Biodiesel</td>
<td>I</td>
<td>30%</td>
<td>8%</td>
<td>20%</td>
<td>5%</td>
</tr>
<tr>
<td>LEV2</td>
<td>II</td>
<td>60%</td>
<td>5%</td>
<td>70%</td>
<td>80%</td>
</tr>
<tr>
<td>ADECII</td>
<td>III</td>
<td>95%</td>
<td>75%</td>
<td>98%</td>
<td>80%</td>
</tr>
<tr>
<td>MaxTRAP</td>
<td>III</td>
<td>95%</td>
<td>5%</td>
<td>95%</td>
<td>90%</td>
</tr>
</tbody>
</table>

*Verified at 25% PM and 80% NOx for selected off-road applications*
Extengine ADECI DOC/SCR System
New Generation Products in Verification

**ADEC II – Level 3 Active PM filter with SCR (75-90% NOx control)**
- currently in joint CARB/EPA verification for on-road engine applications

**MaxTrap – Level 3 Actively regenerated PM filter**
- currently beginning aging as part of the ADECII system and has been installed on off-road construction equipment

**LEV2 – Level 2 Flow Through Filter**
- currently in ARB verification for on-road engines as a stand alone device and combined with TruBlue biodiesel fuel

**TruBlue - Level 1 Biodiesel Fuel**
- currently in ARB verification as alternative diesel fuel
Extengine ADECIi SCR/Active DPF System Undergoing Laboratory Testing
Extengine ADECII SCR/Active DPF System Installed on Typical Front Loader
Small Engine Active Level III Filter

Pressure Sensor

Inlet Temp

2.5

6

Outlet Temp

3

4.7

3

Heater

DPF

1.75

Heater Power Connection
Extengine LEV2 Level II Flow Though Filter

Filter is preceded by a DOC in same 10” long body
ADECII SCR System Components
Advantages of SCR for NOx Reduction Combined with PM Controls

• Easy retrofit installation
• Very cost-effective for continuous duty NOx emission equipment
• Operating cost is approximately 5% of fuel cost
• NOx emission reductions may be surplus which could be off-set by emission credits
Summary

Extengine has

- a verified and field proven Level1 PM system which includes NOx control.
- Extengine has new technologies for PM and NOx reduction which are available for demonstration projects in 2007.
- Extengine has PM and NOx reduction technologies that are cost-effective and have low user risk.