Transport Refrigeration Unit ATCM

Overview

♦ Background
♦ TRU ATCM Overview
♦ Facility Reports
♦ Operator Requirements
♦ Verified Diesel Emission Control Strategies
♦ Technology Review
♦ Further Information and Contacts
♦ Questions and Comments
  – Webcast participants – email to coastalrm@calepa.ca.gov
Background

♦ TRU ATCM adopted February 26, 2004
♦ Effective December 10, 2004
♦ Requested U.S. EPA waiver, March 28, 2005
♦ EPA waiver hearing, January 2006
♦ Facility Reports due January 31, 2006

TRU ATCM

♦ ARB implementation
  – ARB inspectors audit facilities and conduct roadside inspections at scales and border crossings
♦ Two parts to regulation
  – Distribution facility requirements
  – Operator requirements
Distribution Facility Requirements

♦ Applies to “large” distribution centers in California where TRUs operate
  – “Large” is 20 or more loading spaces serving cold storage areas
♦ One time facility report was due January 31, 2006
♦ Required reporting of
  – Facility information
  – TRU activities and inventory

TRU Operator Requirements

♦ Requirements apply to TRU engines and TRU generator set engines, unless otherwise stated
♦ Engines must meet in-use performance standards
  – Applies to ALL TRUs and TRU generator sets that operate in California
  – Includes TRUs based out-of-state, that operate in California
♦ ARB I.D. number/registration – Apply by January 31, 2009
  – Required of California-based TRUs
  – Voluntary for out-of-state TRUs
♦ Operator reports – First report due by January 31, 2009
  – Applies only to California-based TRUs
  – Report compliance status and how compliance with in-use standards achieved
  – Update required within 30 days of any changes
TRU Operator Requirements (cont’d)

♦ Forms available by early December 2008
  – IDN Application Form
  – Initial Operator Report Form
  – IDN Information Revision Form
  – Operator Report Update Form
  – Download from TRU website and mail into ARB, or
  – Fill out and submit via Internet
    • Link will be added to TRU website

In-Use Performance Standards

<table>
<thead>
<tr>
<th>Less than 25 hp TRU Engines</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>LETRU</td>
<td>Use 0.30 g/hp-hr engine or Level 2 retrofit</td>
</tr>
<tr>
<td>ULETRU</td>
<td>Level 3 retrofit or Alternative Technology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>25 to 50 hp TRU and TRU Generator Set Engines</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>LETRU</td>
<td>Use 0.22 g/hp-hr engine or Level 2 retrofit</td>
</tr>
<tr>
<td>ULETRU</td>
<td>Use 0.02 g/hp-hr engine, Level 3 retrofit, or</td>
</tr>
<tr>
<td></td>
<td>Alternative Technology</td>
</tr>
</tbody>
</table>

LETRU = Low-Emission TRU In-Use Performance Standard
ULETRU = Ultra-Low-Emission TRU In-Use Performance Standard
Alternative Technology = ULETRU (and LETRU) if TRU engine use is eliminated at distribution facilities or diesel PM emissions are eliminated.
In-Use Performance Standards Compliance Schedule

<table>
<thead>
<tr>
<th>Engine Model Year</th>
<th>In-Use Compliance Standard Compliance Date</th>
<th>LETRU</th>
<th>ULETRU</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001 and older</td>
<td>December 31, 2008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>December 31, 2009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>-</td>
<td>December 31, 2010</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>-</td>
<td>December 31, 2011</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>-</td>
<td>December 31, 2012</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>-</td>
<td>December 31, 2013</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>-</td>
<td>December 31, 2014</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>-</td>
<td>December 31, 2015</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>-</td>
<td>December 31, 2016</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>-</td>
<td>December 31, 2017</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>-</td>
<td>December 31, 2018</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>-</td>
<td>December 31, 2019</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>-</td>
<td>December 31, 2020</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>-</td>
<td>December 31, 2021</td>
<td></td>
</tr>
</tbody>
</table>

Generally, the compliance date is December 31st of model year plus 7 years.

Compliance Options

- Replace in-use engine with new engine
  - Resets the compliance clock to the replacement engine model year plus 7 years
- Retrofit with VDECS
- Use an engine meeting LETRU or ULETRU
  - Provide test data and report that shows:
    - In-use emissions meet LETRU or ULETRU, AND
    - A maintenance program is in effect that will sustain emissions to meet LETRU or ULETRU (records required)
- Use Alternative Technology
  - Must eliminate diesel engine emissions from the TRU engine at distribution centers
Compliance Plan

- Start planning now
- Plan to comply early

Verified Diesel Emission Control Strategies (VDECS) for TRUs

- TRU VDECS are posted on TRU website
  http://www.arb.ca.gov/diesel/tru.htm
- All VDECS are listed on the Verification web page
  http://www.arb.ca.gov/diesel/verdev/vt/vt.htm
- Read VDECS’ Executive Order before you buy
  - Verified for specific engine models and model years
  - If not installed appropriately, then DECS is not verified
  - Warranty claims issues
- DECS owners manual
  - DECS and engine maintenance required for warranty
Alternative Technology

♦ Electric standby or hybrid electric/diesel
  – To qualify, the operator must plug in at distribution facilities so that diesel emissions at DCs are eliminated
  – Records to prove compliance are necessary.
♦ Cryogenic temperature control
♦ Alternative diesel fuel (e.g. 100% biodiesel)
  – Records required to show exclusive use of these fuels
♦ Qualifying Alternative Technologies meet LETRU and ULETRU

Technology Review

♦ Survey of DECS manufacturers
♦ DRAFT Control Option Matrix update
♦ Second workshop early Fall 2007 (tentative)
♦ Sign up for TRU list serve to get notices
♦ Technical assessment report by year-end
### LETRU (Level 2 – 50% PM Reductions)

<table>
<thead>
<tr>
<th>Technology</th>
<th>Company</th>
<th>Design Ready for Trailer/Truck/GenSet TRUs</th>
<th>Demonstrated in Trailer/Truck/Gen Set TRUs</th>
<th>Verified for Trailer/Truck/Gen Set TRUs</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive catalyzed flow-through filter</td>
<td>Thermo King/ FinnKatalyt</td>
<td>Yes/No/Yes</td>
<td>Yes/No/No</td>
<td>Yes/No/No</td>
<td>Isuzu D201 MY 1985-1998</td>
</tr>
<tr>
<td>Active flow-through filter (sintered metal fiber with periodic electric regeneration)</td>
<td>Rypos</td>
<td>Yes/Yes/Yes</td>
<td>No/No/No</td>
<td>No/No/No</td>
<td></td>
</tr>
<tr>
<td>Catalyzed Flow-Through Filter</td>
<td>Company A</td>
<td>Yes/Yes/Yes</td>
<td>Yes/Yes/Yes</td>
<td>No/No/No</td>
<td>Unknown.</td>
</tr>
<tr>
<td>Catalyzed Flow-Through Filter</td>
<td>Company E</td>
<td>Yes/No/No</td>
<td>Yes/No/No</td>
<td>No/No/No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Replace engine with new engine 'kit'</td>
<td>TRU Dealers</td>
<td>Yes/Yes/Yes</td>
<td>NA</td>
<td>NA</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

1. Replacing old engine with new or newer engine resets the compliance clock to 7 years after model year (compliance date is based on engine model year).

### ULETRU (Level 3 – 85% PM Reductions)

<table>
<thead>
<tr>
<th>Technology</th>
<th>Company</th>
<th>Designed for Trailer/Truck/Gen Set TRUs</th>
<th>Demonstrated in Trailer/Truck/Gen Set TRUs</th>
<th>Verified for Trailer/Truck/Gen Set TRUs</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active DPF (fuel burner regeneration)</td>
<td>Huss FS-MK Series</td>
<td>Yes/Yes/Yes</td>
<td>No/No/No</td>
<td>Yes/Yes/Yes</td>
<td>$6,000 (installed)</td>
</tr>
<tr>
<td>Active regeneration DPF</td>
<td>Company F</td>
<td>Yes/No/No</td>
<td>No/No/No</td>
<td>No/No/No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Active regeneration DPF (electric regeneration)</td>
<td>Company G</td>
<td>Yes/No/No</td>
<td>No/No/No</td>
<td>No/No/No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Passive DPF (catalyzed wall-flow filter)</td>
<td>Company B</td>
<td>Yes/Yes/No</td>
<td>Yes/No/No</td>
<td>No/No/No</td>
<td>$3,000 to $5,000</td>
</tr>
<tr>
<td>Replace engine with new engine.</td>
<td>TRU Dealers</td>
<td>Yes/Yes/Yes</td>
<td>NA</td>
<td>NA</td>
<td>Truck: $4,000-$5,000; Trailer: $6,000-$9,000 with parts &amp; labor</td>
</tr>
<tr>
<td>Active DPF (uncatalyzed wall-flow filter with electronically controlled intake throttle and Satacene® FBC additive)</td>
<td>European-American consortium¹</td>
<td>Yes/No/No</td>
<td>Yes/No/No</td>
<td>No/No/No</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

¹ Mayer, A. et al., Retrofiting TRU-Diesel Engines with DPF-systems Using FBC and Intake Throttling for Active Regeneration. SAE 2005-01-0662.
## Alternative Technologies

<table>
<thead>
<tr>
<th>Technology</th>
<th>Company</th>
<th>Designed for Trailer/Truck/Gen Set TRUs?</th>
<th>Demonstrated in Trailer/Truck/Gen Set TRUs?</th>
<th>Verified for Trailer/Truck/Gen Set TRUs?</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric standby (option available for most TRU models)</td>
<td>TRU OEMs</td>
<td>Yes/Yes/NA</td>
<td>Yes/Yes/NA</td>
<td>NA</td>
<td>Truck: $320-$1,000. Trailer: $2,000-$4,000. Plus facility electric plug infrastructure</td>
</tr>
<tr>
<td>Hybrid in TRU (diesel engine running generator or semi-hermetic electric motor running refrigeration compressor &amp; electric motor-driven fans)</td>
<td>Carrier Transicold – Vector 1900MT</td>
<td>Yes/No/NA</td>
<td>Yes/No/NA</td>
<td>NA</td>
<td>$3,000 to $4,000 over conventional TRU maintenance costs if equipment meets Diesel standard TRU</td>
</tr>
<tr>
<td>Biodiesel (100%)</td>
<td>Many producers</td>
<td>Yes/No/NA</td>
<td>Yes/No/NA</td>
<td>Some or all diesel with tax credits; additional fueling infrastructure costs, if dual fuel</td>
<td></td>
</tr>
<tr>
<td>Safe to liquid (90%/10% Diesel or Fischer-Tropsch 90%/10% Diesel (100%, ultra-low aromatic synthetic diesel fuel)</td>
<td>Many companies. Most current producers overseas.</td>
<td>Yes/No/NA</td>
<td>Yes/No/NA</td>
<td>No. Multimedia assessment and in-use verification are required.</td>
<td></td>
</tr>
<tr>
<td>Cryogenic Refrigeration (open cycle liquid carbon dioxide)</td>
<td>Thermo King</td>
<td>Yes/Yes/NA</td>
<td>Operating in EU</td>
<td>NA</td>
<td>Cost model available. Unit list price is within 10% of diesel unit.</td>
</tr>
<tr>
<td>Cryogenic Refrigeration (open cycle liquid nitrogen)</td>
<td>Union CoolFridge</td>
<td>Yes/Yes/NA</td>
<td>Operating in EU</td>
<td>NA</td>
<td>$16,000/Year, liquid nitrogen infrastructure lease costs $5,000/Yr, 25% less hourly operating costs.</td>
</tr>
<tr>
<td>Hybrid Cryogenic Temperature Control Systems (cryogenic temperature control in conjunction with diesel-powered TRU)</td>
<td>Thermo King</td>
<td>Yes/Yes/NA</td>
<td>In production for truck TRUs</td>
<td>Not Necessary</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

### Further Information/Contacts

- **TRU web site:** [http://www.arb.ca.gov/diesel/tru.htm](http://www.arb.ca.gov/diesel/tru.htm)
- **Verification web site:** [http://www.arb.ca.gov/diesel/verdev/vt/vt.htm](http://www.arb.ca.gov/diesel/verdev/vt/vt.htm)
- **TRU List Serve** [http://www.arb.ca.gov/listserv/tru.htm](http://www.arb.ca.gov/listserv/tru.htm)
- **Rulemaking record:** [http://www.arb.ca.gov/regact/trude03/tru03.htm](http://www.arb.ca.gov/regact/trude03/tru03.htm)
- **ARB contact:**
  - Rod Hill
    - 1-888-878-2826 (1-888-TRU-ATCM)
    - rhill@arb.ca.gov
Questions and Comments

♦ DECS manufacturers comments
♦ Other questions and comments
  – Webcast participants may email their comments now to: coastalrm@calepa.ca.gov
  – Conference call participants, just ask
♦ Please identify yourself:
  – Name and company