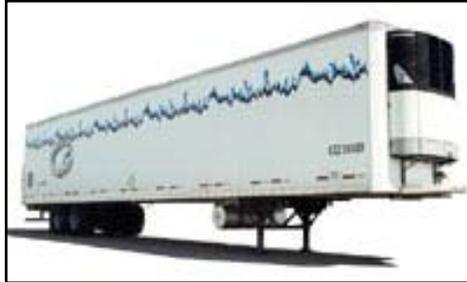


Transport Refrigeration Unit ATCM



1

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

2

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

3

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



4

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



5

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

6

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

Less than 25 hp TRU Engines

In-Use Performance Standard	Requirement
LETRU	Use 0.30 g/hp-hr engine or Level 2 retrofit
ULETRU	Level 3 retrofit or Alternative Technology

25 to 50 hp TRU and TRU Generator Set Engines

In-Use Performance Standard	Requirement
LETRU	Use 0.22 g/hp-hr engine or Level 2 retrofit
ULETRU	Use 0.02 g/hp-hr engine, Level 3 retrofit, or Alternative Technology

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

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

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

9

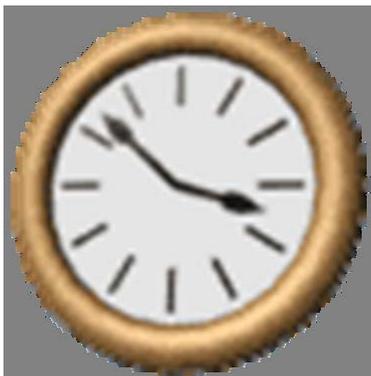
Compliance Options

- ◆ 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

10

Compliance Plan

- ◆ Start planning now
- ◆ Plan to comply early



11

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

12

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

13

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

14

LETRU (Level 2 – 50% PM Reductions)

Technology	Company	Design Ready for Trailer/Truck/GenSet TRUs	Demonstrated in Trailer/Truck/Gen Set TRUs	Verified for Trailer/Truck/Gen Set TRUs	Estimated Cost
Passive catalyzed flow-through filter	Thermo King/ FinnKatalyt	Yes/No/Yes	Yes/No/No	Yes/No/No Isuzu D201 MY1985-1998	\$4,000 - \$5,500 installed (includes pre-installation tests)
Active flow-through filter (sintered metal fiber with periodic electric regeneration)	Rypos	Yes/Yes/Yes	No/No/No	No/No/No	\$4,000 to \$5,000, installed
Catalyzed Flow-Through Filter	Company A	Yes/Yes/Yes	Yes/Yes/Yes	No/No/No	Unknown.
Catalyzed Flow-Through Filter	Company E	Yes/No/No	Yes/No/No	No/No/No	Unknown
Replace engine with new engine ¹ kit	TRU Dealers	Yes/Yes/Yes	NA	NA	Truck: \$4,000-\$5,000; Trailer/Gen Set: \$6,600 - \$9,000 with parts & labor.

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).

15

ULETRU (Level 3 – 85% PM Reductions)

Technology	Company	Designed for Trailer/Truck/Gen Set TRUs	Demonstrated in Trailer/Truck/Gen Set TRUs?	Verified for Trailer/Truck/Gen Set TRUs?	Estimated Cost
Active DPF (fuel burner regeneration)	Huss FS-MK Series	Yes/Yes/Yes	No/No/No	Yes/Yes/Yes	\$6,000 (installed)
Active regeneration DPF	Company F	Yes/No/No	No/No/No	No/No/No	Unknown
Active regeneration DPF (electric regeneration)	Company G	Yes/No/No	No/No/No	No/No/No	Unknown
Passive DPF (catalyzed wall-flow filter)	Company B	Yes/Yes/No	Yes/No/No	No/No/No	\$3,000 to \$5,000
Replace engine with new engine.	TRU Dealers	Yes/Yes/Yes	NA	NA	Truck: \$4,000-\$5,000 Trailer: \$6,600-\$9,000
Active DPF (uncatalyzed wall-flow filter with electronically controlled intake throttle and Satacene [®] FBC additive)	European-American consortium ¹	Yes/No/No	Yes/No/No	No/No/No	\$2,000

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

16

Alternative Technologies

Technology	Company	Designed for Trailer/Truck/Gen Set TRUs?	Demonstrated in Trailer/Truck/Gen Set TRUs?	Verified for Trailer/Truck/Gen Set TRUs?	Estimated Cost
Electric standby (option available for most TRU models)	TRU OEMs	Yes/Yes/NA	Yes/Yes/NA	NA	Truck: \$350-\$1,000 Trailer: \$2,000-\$4000, plus facility electric plug infrastructure
Hybrid e-TRU (diesel engine running generator w/ semi-hermetic electric motor running refrigeration compressor & electric motor-driven fans)	Carrier Transicold – Vector 1800MT	Yes/No/NA	Yes/No/NA In production for multi-temp models	NA	\$3,000 to \$4,000 over conventional TRU Maintenance costs about 30% less than standard TRU
Biodiesel (100%)	Many producers	Potentially, if meets ASTM 6751 specification and BQ9000 quality standard.	Yes/No/No	No. Multimedia assessment and in-use verification are required	Same as CARB diesel with tax credits; additional fueling infrastructure costs, if dual fuel
Gas to Liquid (GTL) Diesel or Fischer-Tropsch (F-T) Diesel (100% ultra-low aromatic synthetic diesel fuel)	Many companies. Most current production overseas.	Any diesel engine	Yes/No/No	No. Multimedia assessment and in-use verification are required.	\$7/gal until bulk transport systems needed for volume, then \$0.15 to \$0.25 per gal more than ULSDI.
Cryogenic Refrigeration (open cycle liquid carbon dioxide)	Thermo King	Yes/Yes/NA	Yes/Yes/NA Operating in EU.	NA	Cost models available. Unit list price is within 10% of diesel unit.
Cryogenic Refrigeration (open cycle liquid nitrogen)	Ukram ecoFridge	Yes/Yes/NA	Yes/Yes/NA Operating in EU.	NA	\$18,000/unit, liquid nitrogen infrastructure lease costs \$5,000/yr, 25% less hourly operating costs
Hybrid Cryogenic Temperature Control Systems (cryogenic temperature control in conjunction with diesel-powered TRU)	Thermo King	Yes/Yes/NA	Yes/Yes/NA In production for truck TRUs.	Not Necessary	Unknown

17

Further Information/Contacts

- ◆ TRU web site:
<http://www.arb.ca.gov/diesel/tru.htm>
- ◆ Verification web site:
<http://www.arb.ca.gov/diesel/verdev/vt/vt.htm>
- ◆ TRU List Serve
<http://www.arb.ca.gov/listserv/tru.htm>
- ◆ Rulemaking record:
<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

18

Questions and Comments

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