

March 2004

## **Airborne Toxic Control Measure for Transport Refrigeration Units (TRU) and TRU Generator Sets**

### **What is a TRU and TRU Generator Set?**

TRUs are refrigeration systems powered by diesel engines designed to refrigerate temperature-sensitive products that are transported by semi-trailer vans, truck vans, shipping containers, and rail cars. Shipping containers with temperature-sensitive cargo come and go on ocean-going ships through ports. When these containers are on board the ship, their electrically-driven refrigeration systems are plugged into ship power. But when these containers are transported on land, a diesel-powered generator (TRU gen set) is typically attached to the container to provide electric power to the refrigeration system.

### **Why is an airborne toxic control measure (ATCM) for TRUs and TRU gen sets needed?**

The Air Resources Board identified diesel particulate matter (PM) as a toxic air contaminant (TAC) in 1998. In 2000, the Board approved the Diesel Risk Reduction Plan. The ATCM for TRUs and TRU gen sets is one of many ATCMs that is approved by the Board to fulfill the goals of the Diesel Risk Reduction Plan. Currently about 40,000 TRUs and TRU gen sets operate in California, contributing to approximately 730 tons per year of diesel PM. TRUs and TRU gen sets congregate at distribution centers throughout California, resulting in elevated health risks to those living near-by. The ATCM is designed to minimize the public's exposure to diesel PM by establishing in-use performance standards for these engines.

### **What are the effects of exposure to diesel particulate matter?**

The amount of emissions to California's air and its potency cause diesel PM to be the number one contributor to the adverse health impacts of TACs. Exposure to diesel PM may result in both cancer and non-cancer health effects. Non-cancer health effects may include irritation to the eyes and lungs, allergic reactions in the lungs, asthma exacerbation, blood toxicity, immune system dysfunction, and developmental disorders.

### **Who will be affected by the ATCM?**

Owners and operators of TRUs in California, including those coming into California from out-of-state, will be affected by this ATCM. Also, facilities where TRUs operate will be subject to a special, one-time, reporting requirement if they have 20 or more loading dock doors serving refrigerated areas. Examples of businesses that could be affected include grocery and wholesale food distribution centers; perishable food manufacturers; meat, poultry, egg, and produce packers and distributors; refrigerated truck, trailer, railcar and container leasing companies; cold storage warehouses; port shipping terminal operators; and railroad operators. A small number of school districts and correctional facilities that operate TRUs may also be affected.

### **What are the requirements of the ATCM?**

The ATCM requires in-use TRU and TRU gen set engines that operate in California, including out-of-state units while they are operating in California, to meet specific performance standards that vary by horsepower (hp) range. The performance standards (shown on the next page) affecting in-use engines follow the proposed U.S. EPA Tier 4 new nonroad engine standards, and could be met by: (1) using an engine that is certified to the Tier 4 diesel PM emission level, (2) equipping the existing engine with the appropriate level of verified diesel emissions control system (VDECS), or (3) using an "alternative technology" that eliminates TRU diesel engine operation (and emissions) while at a facility. Alternative technologies include electrification, cryogenic refrigeration systems, alternative fuel systems, exclusive use of alternative diesel fuel, fuel cell-powered refrigeration systems, and other technologies that eliminate diesel engine PM emissions while at a facility.

A thorough technology review will be provided to the Board in 2007 and 2009 to ensure that technologies are available to meet the compliance schedule (shown on the next page). The in-use performance standards will be phased-in over time. This phase-in will accelerate the upgrade or replacement of TRUs and TRU gen sets by requiring incrementally more stringent in-use engine performance standards on a seven-year cycle. (Note: according to the refrigerated transportation industry, most TRUs are currently replaced after 10 or more years of use).

### <25 hp TRU and TRU Generator Set In-Use Performance Standards

In-Use Emission Category	Engine Certification (g/hp-hr)	Level of VDECS Equipped with
Low Emission TRU	0.30	Level 2
Ultra-Low Emission TRU	NA*	Level 3

\* Not Applicable - ARB and U.S. EPA will perform a technical review in 2007 to evaluate a diesel oxidation catalyst- or filter-based standard for <25 hp category new engines in 2013. If a more stringent "long term" level for new Tier 4 engines is adopted by U.S. EPA for this horsepower category, staff will recommend adopting an engine certification in-use performance standard.

### = 25 hp TRU and TRU Generator Set In-Use Performance Standards

In-Use Emission Category	Engine Certification (g/hp-hr)	Level of VDECS Equipped with
Low Emission TRU	0.22	Level 2
Ultra-Low Emission TRU	0.02	Level 3

### TRU and TRU Generator Set Compliance Dates

Model Year of Engine	Compliance Date for Low Emission Standard	Compliance Date for Ultra-Low Emission Standard
2001 or older	December 31, 2008	December 31, 2015*
2002	December 31, 2009	December 31, 2016*
2003	N/A	December 31, 2010
Future years	N/A	December 31st of the model year + 7 years

\* Early compliance (in 2005 to 2007) with low emission standard for model year 2002 or older may extend compliance date for ultra-low emission standard by up to three years.

### **Are there any additional requirements?**

A Facility Report applies to large facilities in California where TRUs operate. Facilities with 20 or more doors serving a refrigerated storage area are required to submit a one-time report to ARB in early 2006. This information will help to evaluate the overall effectiveness of the regulation in reducing diesel PM near facilities where TRUs operate. A second reporting provision applies to owners of TRUs operating in California. They will be required to submit an initial report to ARB in early 2009 that provides information about the TRUs they operate in California. Updates are needed as TRUs are leased, purchased, sold, or brought into compliance, furthermore, this information will assist in the implementation of the ATCM.

The ATCM includes a registration program that uses an ARB identification (I.D.) numbering system. The I.D. numbers will include codes that indicate key compliance information such as model year of engine. California-based TRUs will be required to have I.D. numbers. For out-of-state operators, obtaining an ARB I.D. number will be voluntary. The I.D. number allows for a quick inspection by ARB so that trucks can get back on the road as quickly as possible.

### **What are the environmental and health impacts?**

Staff estimates that diesel PM emission factors for TRUs and TRU gen set engines will be reduced by approximately 65 percent in 2010 and 92 percent in 2020. Daily diesel PM emission reductions will range between 0.5 to 1 ton per day due to the TRU ATCM, totaling about 3,000 tons reduced by 2020. California's air quality will also experience benefits from reduced NOx emissions (between 0.9 and 1.0 ton per day) and reduced HC emissions. The health benefits from reduced emissions is estimated to reduce both cancer and non-cancer illnesses. The number of premature deaths avoided is estimated at 211, accounting only for directly emitted diesel PM reductions.

### **How much will the ATCM cost?**

ARB staff estimates the cost per TRU or TRU gen set will be about \$2,000 to \$2,300 if the retrofit option is chosen and about \$4,000 to \$5,000 if the engine replacement option is chosen. In the latter case, the ATCM cost has been adjusted based on the useful life of the engine. The total capital costs of the ATCM to affected businesses and government agencies will range from \$90 million to \$160 million over the 13-year implementation period (i.e. 2008 to 2020). We estimate the cost-effectiveness of the ATCM to be between \$10 and \$20 per pound of PM reduced, considering only the benefits of reducing diesel PM.

### **For more information:**

Contact Rod Hill at 916.323.0440 (e-mail: [rhill@arb.ca.gov](mailto:rhill@arb.ca.gov)) or Tony Andreoni at 916.324.6021 (e-mail: [tandreoni@arb.ca.gov](mailto:tandreoni@arb.ca.gov)), or visit our web site at <http://www.arb.ca.gov/diesel/dieselrrp.htm>. Regulatory documents may be viewed and downloaded from <http://www.arb.ca.gov/regact/trude03/trude03.htm>