Diesel PM Control Technology Options for Complying with TRU ATCM[1] (this page last updated July 2015[2])

Meet Ultra-Low-Emission TRU (ULETRU) In-Use Performance Standard: Retrofit with Level 3 Verified Diesel Emissions Control Strategy (VDECS)[3]

Company[4]	Technology	Designed for Trailer/Truck/Gen Set TRUs	Estimated Costs
Huss, LLC www.huss-filters.com	Active DPF (wall-flow filter with automatic fuel burner regeneration) Models: MK-35 and MK-50	Bobtail truck and trailer TRUs with engines in good condition that meet all compatibility assessment criteria.	MSRP $5,500 plus 6-8 hours installation labor Total cost about $6,200
Rypos, Inc. www.rypos.com	Active DPF with automatic electric regeneration Model: DPF/ULETRU	Single-temperature Carrier Transicold and Thermo King TRUs: Model years 2003 through 2011 Engine models: Kubota and Yanmar See Executive Order DE-11-008, Attachment 1 for engine families	$5,650 to $6,250
Carrier Transicold www.truepowerofblue.com	Active DPF (wall-flow filter with automatic flameless regeneration) Model: EES	EES: X4 7300 and 7500 TRUs, Vector 8500 and 8600MT TRUs, and Carrier UG and RG TRU generator sets	Contact Carrier dealer

Alternative Technologies[5] for Complying with TRU ATCM (compliance is achieved ONLY if ALL qualification criteria are met)

Technology	Company[4]	Designed for Trailer/Truck/Gen Set TRUs?	Estimated Costs
Electric standby[6] (ordered as option with new units, available for most new TRU models)	TRU dealers	Yes/Yes/NA	Truck TRU: $350 to $1,000 cost for option Trailer TRU: $2,000 to $4000 cost for option Electric plug infrastructure costs additional.[7]
Hybrid e-TRU[6] (diesel electric generator provides electric power to semi-hermetic electric refrigeration compressor & electric fans)	Carrier Transicold Models: Vector 6600MT & 8600MT (multi-temp), Vector 8500 (single temp)	Yes/No/NA	$3,000 to $4,000 over conventional TRU; maintenance costs about 30% less than standard TRU
Distribution center loading dock and parking space electric plug infrastructure for electric standby and hybrid e-TRU compliance	Shorepower Technologies	Yes/Yes/NA	Varies based on location; contact Shorepower. www.shorepower.com 503-892-7345; abates@shorepower.com

[1] Transport Refrigeration Unit (TRU) Airborne Toxic Control Measure (ATCM) is codified in title 13 California Code of Regulations (CCR), section 2477.1 through 2477.21.
[2] This document is subject to change as technologies are identified and added and as we become aware of cost changes.
[3] Level 3 VDECS retrofit is a compliance option for MY 2004 and newer TRUs (any hp) and MY 2005 TRUs equipped with less than 25 hp engines. Any control technology that meets ULETRU could be used to comply with LETRU. VDECS Executive Orders may be downloaded from the Verification Procedure website at: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm
[4] Trade names mentioned herein do not imply ARB endorsement.
[5] Alternative Technologies may be used to comply with ULETRU and LETRU only if ALL qualification criteria are met (e.g. TRU engine operation is eliminated at distribution centers and is limited to less than 30 minutes at delivery points). Electronic tracking systems (ETS) are required to provide monitoring, recordkeeping and reporting to demonstrate the qualification criteria are met. ARB's ETS supplier list is at: http://www.arb.ca.gov/diesel/tru/documents/ets_supplier_list.pdf
[6] See *Regulatory Guidelines for Electric Standby and Hybrid Electric Systems* at: http://www.arb.ca.gov/diesel/tru/documents/guidance_electricstandby_ets.pdf.
[7] Range of retail costs shown were provided by TRU manufacturers.

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Equipment replacement options (resets the compliance clock - compliance is required seven years after the engine's effective model year).

Company[9]	Technology Description	Estimated Costs
The replacement engine compliance option can no longer be used for MY 2008 engines, except under very narrow exceptions. Please review TRU Advisory 13-18, starting on page 7 to understand those exceptions at: http://www.arb.ca.gov/diesel/tru/advisories.htm		
TRU dealers	Replace the entire unit	Contact TRU and TRU generator set dealers.

Meet Low-Emission TRU (LETRU) In-Use Standard: Retrofit with Level 2 VDECS[10]

Company[9]	Technology Description and Model	Trailer/Truck/Genset Application	Estimated Costs
Proventia Emission Control www.proventiafilters.com	Passive flow-through filter with catalyzed regeneration Model: FTF	Thermo King Trailer TRUs: Model years 1985-2003: Isuzu D201, Yanmar 4TNE82-TK/ETK, and Yanmar 4TNE86TK/ETK See Executive Order DE-08-001-05, Attachment 1 for engine families	$4,325 plus $400 for injector replacements and 3-4 hours installation labor (about $350) Total cost about $5,075
Proventia Emission Control www.proventiafilters.com	Passive flow-through filter with catalyzed regeneration Model: Bobtail FTF	Carrier Transicold Truck TRUs: Model years 1994-2004: Kubota D722, D1105, D722-E, and D1105-E Thermo King Truck TRUs: Model years 1987-1999: Yanmar 3TNE66-TK and 3TNE72-TK Model Years 2000-2004: Yanmar 3TNE66KC-ETK & 3TNE72KC-ETK See Executive Order DE-08-001-05, Attachment 1 for engine families	$2,300 for filter system, $3,400 with injectors replaced and 2-3 hours installation labor (about $250) Total cost about $3,650
Rypos, Inc. www.rypos.com	Active diesel particulate filter (DPF) with automatic electric regeneration Model: DPF/LETRU	Carrier Transicold Trailer TRUs: Model years Pre-1999, 1999-2003 Engine models: Kubota V1903, V2203 Thermo King Trailer TRUs: Model years Pre-1999, 1999-2003 Engine models: Isuzu D201; and Yanmar 4TNE82, 4TNE86 See Executive Order DE-09-001-01, Attachment 1 for engine families	Total installed cost ~$4,825, with new alternator

[8] This document is subject to change as technologies are identified and added and as we become aware of cost changes.
[9] Trade names mentioned herein do not imply ARB endorsement.
[10] Level 2 VDECS retrofit is only a compliance option for model year (MY) 2003 and older TRUs (any horsepower (hp)) and MY 2004 TRUs equipped with less than 25 hp engines. VDECS Executive Orders may be downloaded from the Verification Procedure Website at: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

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Technologies in the table below are exempt from the TRU ATCM because they are not equipped with an integral diesel engine in the TRU housing (therefore does not meet definition of TRU). These are NOT zero-emission technologies because there are vehicle engine emissions related to powering the refrigeration system. Zero-emission technologies are also exempt from the TRU ATCM. Zero-emission technologies are listed separately at: http://www.arb.ca.gov/cc/cold-storage/documents/zero-emissiontr-list.pdf.

Technology	Company: Model/Web Address[12]	Estimated Costs
All-electric-powered refrigeration systems for truck vans.	Thermo King, Model: B-100 www.thermoking.com/tk/index.asp	Contact Thermo King
All-electric, plug-in transport refrigerator system for straight truck cargo boxes and vans, with battery pack on-road power, and range extension using vehicle-mounted alternator (hybrid) and optional solar panels.	Volta Air Models: VAR 150STH, 300STH, and 450DTH www.voltaair.ca	Pete Johnston (778) 772-3108 pjohnston@voltaair.ca
Electrically-driven transport refrigeration system that uses both evaporators and cold plates for single-temp truck applications. Stationary operation uses grid plug-in power; on-road uses vehicle transmission power-take-off-driven generator, battery pack and control unit to power electric drive refrigeration system.	Johnson Truck Bodies Model: EMX series www.johnsontruckbodies.com	Contact: Eduardo Navarro enavarro@johnsontruckbodies.com, 310-418-8905
All-electric refrigeration systems with cabinet based cold plates for van style truck bodies or trailers. Plug in while stationary to freeze eutectic cold plates. High airflow electric fans distribute cold air to load, fans powered by on-board batteries and vehicle alternator.	Kidron Manufacturing, Model: Vari-Temp System www.kidron.com	Contact Bruce Summers (805) 937-8597 bsummers@vthackney.com
All-electric refrigeration systems with cold plates for step vans. Plug in while stationary to freeze eutectic cold plates. Electric fan distribute cold air to load, powered by on-board batteries and vehicle alternator.	Hackney Manufacturing, Model: Flow Thru and Freezer/Cooler Combo www.hackneyservice.com	Contact Bruce Summers (805) 937-8597 bsummers@vthackney.com
Direct drive refrigeration systems for truck vans (compressor powered off vehicle engine).	Carrier Transicold Models: Integra, 20X, 30X, 40X, and 50X www.trucktrailer.carrier.com	Contact Carrier Transicold
Direct drive refrigeration systems for truck vans (compressor powered off vehicle engine).	Thermo King Models: V-200/Max,V-300/Max,V520/Max www.thermoking.com/tk/index.asp	Contact Thermo King
Cryogenic refrigeration: Indirect injection liquid nitrogen. Electric fans circulate air powered by on-board battery and vehicle alternator. For truck and trailer applications.	Linde Gas: FROSTCRUISE/http://www.linde-gas.com/en/products_and_supply/food_chilling_cooling/in-transit-refrigeration.html http://www.frostcruise.co.uk/en/index.html	Mark Ewig (608) 241-3167 mark.ewig@linde.com

[11] This document is subject to change as technologies are identified and added and as we become aware of changes.
[12] Trade names mentioned herein do not imply ARB endorsement.