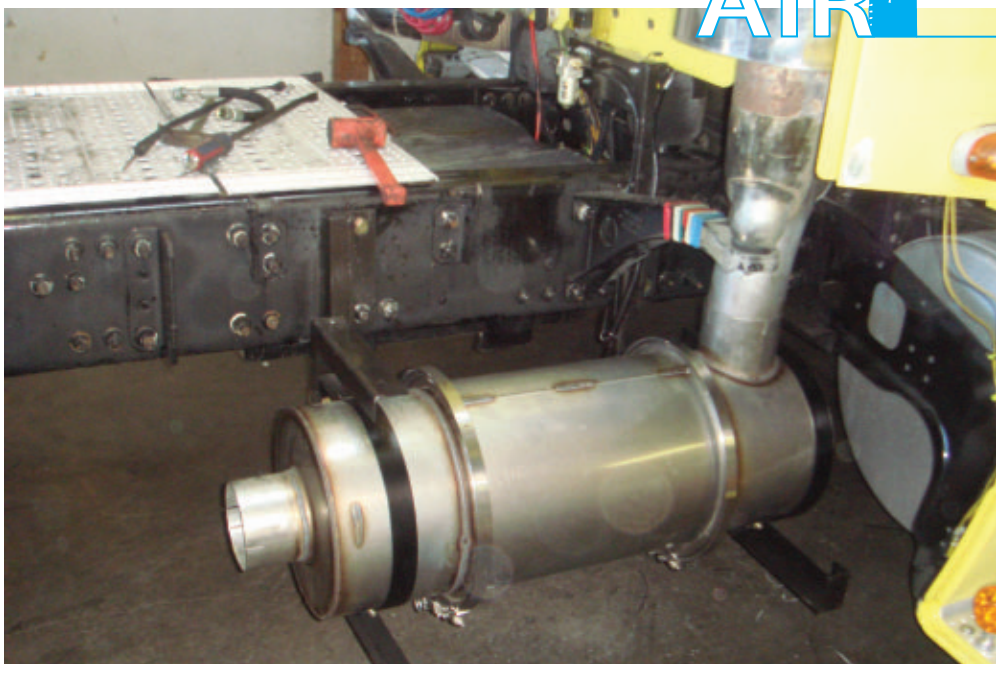

When California's Port of Oakland adopted the California Air Resources Board (CARB) Port Truck Rule, it led to more than 1000 retrofits of trucks with emissions-reduction technology. One of the major participants in the retrofit effort was Engine Control Systems (ECS), which supplied more than 600 aftertreatment systems.

COPING WITH A RUSH OF RETROFITS

Port of Oakland experience highlights challenges, solutions for retrofitting vehicles with emissions-reduction technology

When large seaports were identified as one of the more significant contributors to air pollution in the mid-2000s, federal, state and local agencies worked to develop new programs to address the issue. Yet while it's one thing to establish a program, it's something else to implement it in the real world, particularly when facing tight deadlines.

As is often the case in such instances, those on the ground floor can come up with creative ways to make things happen and the emissions-reduction efforts at the Port of Oakland is a good example. Like other seaports in California, the Port of Oakland adopted the California Air Resources Board (CARB) Port Truck Rule, which in intended to address the significant air quality concerns of port areas.

In terms of reducing engine exhaust emissions, ports are among the most challenging venues around, as many different types of diesel-powered equipment — everything from seagoing vessels to cargo-handling equipment, to locomotives to trucks — are used to move goods in and out of the area. In the case of the Port of Oakland, studies conducted by the Bay Area Air Quality Management District indicated that residents in the West Oakland area faced a significantly increased risk of cancer from exposure to diesel engine exhaust from the port.

In response, in mid-2009, the port created the Port Truck Retrofit Program. Through a partnership between the air district, the port, CARB and the U.S. Environmental Protection Agency (EPA), the program was funded with a $2 million federal grant supplementing $20 million in state and local monies. At the heart of the program was the implementation of the CARB Port Truck Rule, which requires trucks with 1994 to 2003 engines to install a CARB-verified retrofit device to access the port after Jan. 1, 2010. Trucks 1993

For the Port of Oakland retrofits, ECS supplied its Purifilter and Purifilter Plus CARB-verified aftertreatment systems. The Purifilter is a passively regenerating diesel particulate filter (DPF) designed for 1993 to 2006 non-EGR engines. The Purifilter Plus, used on 1993 to 2010 EGR and non-EGR engines up to 16 L and 625 hp, combines the DPF technology of the Purifilter with electrical heating elements that can be engaged to provide active DPF regeneration.

and older have been banned from operating in California ports entirely.

In the case of the Port of Oakland, the new rule affected nearly 1100 truck operators who regularly operated in and out of the port. While the Port Truck Rule exempts new and late-model vehicles, few operators at that time were in a position to buy a new vehicle, making retrofit the only real answer for many.

One of the key players that helped facilitate that transition was Engine Control Systems (ECS), Ventura, Calif. A wholly owned subsidiary of Clean Diesel Technologies Inc. (CDTI), ECS manufactures a range of EPA- and CARB-verified exhaust emissions control systems.

The company and its distributors estimated they provided retrofit options for more than 600 trucks operating at Oakland, which consisted of the Purifilter and Purifilter Plus aftertreatment systems.

The Purifilter is a passively regenerating diesel particulate filter (DPF) that is designed to reduce as much as 90% of particulate emissions from engines up to 16 L and 625 hp from 1993 to 2006 non-EGR engines. Incorporating a silicon carbide substrate and precious metal catalyst coating, the Purifilter automatically oxidizes accumulated particulates under normal operating conditions and is CARB verified as a Level 3+ reduction technology, meaning it reduces PM emissions by at least 85%.

The Purifilter Plus combines the DPF technology of the Purifilter with electrical heating elements that can be engaged to provide active DPF regeneration, which can maximize vehicle uptime across a variety of highway and urban drive-cycle applications, ECS said. Verified by CARB as a Level 3+ technology, the Purifilter Plus targets 1993 to 2010 EGR and non-EGR engines up to 16 L and 625 hp.

While having the appropriate technology in hand is important, retrofits are more than just a case of swapping out mufflers with aftertreatment modules. For the Port of Oakland retrofit project, ECS and its distributors —

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primarily Coast Counties Peterbilt, Diesel Emissions Service, Emissions Retrofit Group and NorCal Kenworth — had to communicate both the procedures operators needed to follow to receive financial assistance as well as capture vital operating information. Program grants were available to cover the cost of new filter installations with truck operators only responsible for paying the sales tax when applying for a grant. Technical data was required to facilitate the selection and installation of the appropriate aftertreatment system.

Initially, truck operators had data loggers installed on their vehicles to monitor and record the exhaust gas temperature, time and date information. After a week of regular service, the operator returned to the ECS dealer facility to have the data downloaded. This gave installers the emissions data needed to prepare quotes, complete the appropriate filter installation process, deliver the requisite information to the Air Quality Management District and receive payment via the grant.

While the time required for a system installation varied from six to eight hours for a Purifilter to 10 to 12 hours for a Purifilter Plus, the entire process — from ordering to when the retrofit truck left the distributor — took significantly longer, usually around eight weeks. And as the deadline grew closer, the lag time between submitting finished paperwork and receiving payment from the Air Quality District also lengthened. The deadline created strain in many areas — truck operators concerned about being able to enter the port, installers needing to manage cash flow through the bureaucratic process and manufacturers trying to manage delayed orders with challenging lead times.

"As the December deadline approached, we were overwhelmed with orders," said Ian MacDonald, ECS vice president of sales and marketing. "Since the economy was down in 2009, the entire supply chain was reducing their inventory and manpower.

Retrofits on trucks such as this 1994 Freightliner with a Detroit Diesel Series 60 took an average of six to eight hours, depending on which Purifilter system was used.

"We had to work a lot of overtime, put a lot of pressure on our suppliers and manufacture the parts within a very tight timeframe."

An additional challenge was the multicultural mix of the truck operators, which included Chinese, Vietnamese, Japanese, Spanish, Punjabi, Hindi, Polish and Russian. "At many times, the installation process was difficult because of the language barriers," said Wayne Cochrane, regional sales manager at ECS. "The truck drivers involved spoke about 30 different languages and it was a challenge to communicate."

As part of its communications effort, ECS distributors arranged workshops at the local truck stop, where they met with operators, explained the installation process and helped them fill out the appropriate paperwork. They also created display cards in different languages to familiarize customers through the process.

"We did everything we could do to help the truck operators understand what we were doing and make it easier to comply with regulatory requirements," said Steve Hoke of Diesel Emissions Service, ECS's largest distributor in Northern California.

As more truck operators got help from ECS' team of distributors, the ECS installers created an effective process where at one point, they installed filters on approximately 15 trucks a day.

"We worked 20 hours a day and had about 200 data loggers," Hoke said. "If the truck operator wanted their truck worked on during the night, we worked through the night.

"We learned a lot about many different people and cultures. After about a month, the truck operators knew we were there every Tuesday. We didn't speak the same language, but one group of truck operators from Somalia stopped by every Tuesday and handed us a big bag of these small, orange-type fruits with a big smile. I guess in Somalia, these are a sign of friendship."

When orders came to a standstill due to the large demand for products and services by the December deadline, the Air Quality District extended the implementation date to February 2010, giving the truck operators and installers more time for the retrofits.

The results on the local air quality were almost immediate, according to a University of California Berkeley study conducted in the Port of Oakland area in June 2010. The study indicated that exhaust particulate matter was reduced by approximately 50% and NO_x was down approximately 40%. **dp**

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