Appendix L

Requirements of Two-Engine Cranes

I. REQUIREMENTS FOR TWO-ENGINE CRANES

A. Two- Engines Cranes

Staff is proposing to address issues regarding two-engine on-road and off-road cranes by making both engines of two-engine cranes subject to the In-Use Off-Road Diesel Vehicle regulation and to remove the upper engines from the Portable ATCM regulation performance requirements. These issues facing the crane operators are related to safety and feasibility of repowering or retrofitting crane engines, and the complexity and unnecessary cost associated with complying with multiple regulations without any appreciable emission benefits.

Two-engine cranes are defined as mobile diesel-powered machines with a hoisting mechanism mounted on a specially constructed truck chassis or carrier; one engine provides motive power, and a secondary engine is used to lift and move materials and objects. There are three general categories of two-engine cranes: lattice boom (conventional), all terrain or truck mounted. All terrain and truck mounted crane are very similar and can be categorized as truck mounted hydraulic cranes. The motive or drive engine is on-road engine. The secondary engine is off-road engine.

B. Issues

Concerns by crane operators regarding on-road cranes raised late during the off-road regulatory development process and could not be evaluated and workshopped in time to include them in the off-road regulation. The crane owners and operators requested that the two-engine cranes be included in the In-Use Off-Road Diesel Regulation. Please refer Chapter VII, Diesel Emission Reduction Regulations, of this document more information. The following were identified as reasons to support their request:

- Compliance with more than one regulation
- Replacement and retrofit of secondary Tier 0 engine feasibility
- Manufacturers' approval, technical support and availability for modifications
- Compliance creates safety and design concerns
- OSHA and Cal-OSHA re-certifications
- Costs

Two-engine cranes would fall under two regulations: one applying to the motive engine and another to the secondary engine. Generally, the motive engine would be subject to either the proposed On-Road Regulation, the Off-Road Regulation, or the Cargo Handling Equipment Regulation, depending on whether the engine is an on-road or off-road engine and where the crane operates. The secondary or upper engine of a two-engine crane is considered a portable engine and would be subject to the Portable ATCM Regulation if the engine is greater than 50 horsepower. Crane owners and operators can opt to register their secondary engine into PERP, which allows statewide equipment registration instead of individual air district permits or registrations (ARB, 2007a). State fees associated with PERP on Tier 1 and 2 resident engines range from

$30 to $5,000 and district inspection and service fees ranged from $30 to $500 for non TSE cranes.

The Portable Equipment ATCM Regulation requires retirement of all Tier 0 portable engines on January 1, 2010 and replacement with engines meeting the latest engine standard (Tier 3 engines for 75 to 750 horsepower). Additional portable engine PM emission reduction is achieved by engine exhaust retrofits or engine replacements, repowering, to meet PM emission fleet average based on engine horsepower. The compliance dates are January 1, 2013; January 1, 2017; and January 1, 2020 respectively (ARB, 2007b).

The Portable ATCM Regulation would require crane owners and operators to buy new cranes instead of used units due to the issues with repowering, retrofitting and safety discussed later in the document. In comparison, the Off-Road Regulation exhibit a smoother transition and spreads out vehicle replacements, allows fleets to clean-up other fleet vehicle engines to offset emissions, addresses safety issues, addresses replacement availability, and usage and flexibility provisions are already included in the Off-Road Regulation.

For single-engine cranes where the motive engines serve a dual purpose of motive and lifting power, the proposed Statewide Truck and Bus Regulation would apply, since most single-engine cranes are equipped with an on-road engine. In cases where the single-engine crane is equipped with an off-road engine, the Off-Road Regulation will apply. However, if a crane operates at any time at a port of intermodal rail yard in California, the propulsion engine is subject to the Cargo Handling Equipment Regulation, regardless of whether the engine is on-road or off-road or whether the crane has only one engine or two (ARB, 2006). Many crane operators own cranes that are brought onto the port or intermodal rail yard facilities on an as-needed basis. These cranes would be required to comply with the Cargo Handling Equipment Regulation, whereas, they would otherwise be required to comply with the proposed On-Road Regulation or the Off-Road Regulation, along with rest of the owners' fleets.

1. Feasibility of Repowering and Retrofitting

Any changes to the crane requires the manufacturers to approval those changes. The willingness of manufacturers to approve such changes is limited or unlikely and would be cost prohibitive. Crane manufacturers assume a huge financial risk for a failure of their product. They are reluctant to assume liability for a California market requirement which represents low sale volume of cranes worldwide. Some OEM crane manufacturers are no longer in existence since there has been a contraction in the number of companies producing cranes.

Crane's secondary engines are frequently controlled by electronic control systems and software unique to the crane make, model and model year (Sierra, 2007). Reprogramming the control system to accept a different model or model year engine would require technical support of the crane manufacturer. Crane manufacturers would

have to update the operation/safety manuals to document the affect of any of the changes.

The repowering or retrofitting of the secondary engine has considerable feasibility issues not present for most portable engines including other two-engine vehicles. Since the engine and the diesel particulate filter, DPF, could be physically larger than the original engine, this fact could lead to space limitations. The engine compartment may be too small to physically fit the new engine or allow for proper air circulation in a confined area and require modification to the cooling system. Repowering to a Tier 3 and Tier 4 engine would require the use of electronic fuel injection and an electronic control module, ECM. Modification to the existing wiring harness or a new wiring harness would be necessary to connect the ECM to engine function sensors and other electrically controlled devices to monitor/control engine performance. Modifications to the exhaust system may be required to accommodate exhaust exit and DPF locations.

2. Safety and Design

The design complexity of cranes and modifications to the original design cannot be easily accomplished. Cranes manufacturers would have to engineered the changes and design/specify parts to ensure safe crane operations. For example, the repowering or retrofitting secondary engine creates safety and design concerns. The secondary engine is part of the counterweight system of the crane. A small weight change could have a significant impact on a crane's lifting capacity and interfere with the electronic controls programmed into the crane's positioning system year (Sierra, 2007).

3. Certifications

Cranes manufacturers certify their equipment to OSHA and ANSI requirements to ensure safe operation and to prevent damage to the crane. Any modification, alteration or change to a crane which affects its original design, and not authorized and approved by the crane manufacturer is strictly prohibited and voids any manufacturer warranties. Repowering or retrofitting secondary crane engines will first require crane manufacturers' approval and secondly require recertification by OSHA and Cal-OSHA (Sierra, 2008 and Sierra 2007).

Even with crane certifications, accidents do occur. There were 72 fatalities in 2006 and average of 78 fatalities per year from 2003 to 2005 associated with cranes in construction (US BLS, 2008). Crane fatalities can be caused crane tip-over, struck by the load or cab/counterweight and boom/cable failures.

4. Cost

The crane cost curves were developed from MachineryTrader.com. A limited number of two-engine truck mounted hydraulic/all terrain cranes and truck lattice boom cranes were for sale and listed with the necessary engine or horsepower information. The price curves developed were in dollars per horsepower since the off-road model utilizes cost data in this format. These cost curves are located in Appendix. I. Besides age of

the crane, cost will vary based on lifting capacity and boom length of these cranes. Both types of cranes are expensive compared to most other vehicles.

C. Emission Impact

Thirteen crane owners and operators provided us with fleet information. Fleets included off-and on-road cranes powered by single off- or on-road motive engines, and off-road two-engine cranes powered by off- or on-road motive engines with off-road secondary engines. The different crane types listed in various fleets included: all terrain, lattice boom, crawler, and rough terrain. The fleets were either medium or large fleets based on their total horsepower which included the motive and secondary engines.

The off-road model was utilized to determine fleet actions and the off road inventory was used to calculate the PM and NOx emissions for 2010 through 2030 for both off- and on-road motive and secondary engines. The off-road model is able to calculate emissions for on-road engines since it has both on- and off-road emission factors. Hours of usage, emissions and load factors from the off-road model were used in the emission calculations.

Table 1 and Table 2 contain details of the two-engine cranes used in emission calculations.

Table 1: Two-Engine Crane Types

Crane Type	Quantity
Truck Mounted Hydraulic	59
Truck Mounted Lattice Boom	34
Total	93

Table 2: Two-Engine Crane Engines

Crane Type	Off-Road Drive Engine	On-Road Drive Engine	Off-Road Secondary Engine
Truck Mounted Hydraulic	6	53	59
Truck Mounted Lattice Boom	NA	34	34

Currently, PERP has approximately 262 crane secondary engines registered in their program. The California Department of Motor Vehicle (DMV) 2006 database had 2,113 cranes registered as passenger vehicle. The information provided by the crane owners and operators had 227 DMV registered cranes. Ninety three of them were two-engine cranes or 41 percent (93 divided 227). Using this percentage and applying it to the DMV database information, staff estimates that there are 866 two-engine cranes. Staff used 93 two-engine cranes in their analysis using the off-road model to estimate the emissions benefits of the proposed changes. The results was scaled up by a factor of 9.31 (866 divided by 93) to reflect the total emissions from the cranes affected. The results are compared to the emissions expected with normal replacement and the

expected benefits from the Portable Equipment ATCM Regulation and the Off-Road Regulation.

It appears that a minority of crane owners and operators registered their secondary or portable engine in PERP and they instead opt to register or permit with the appropriate local air quality districts.

Staff used the off-road model to determine baseline emissions with all existing regulations applied to the crane operator fleet equipment. First, the baseline emissions were calculated by determining the normal replacement cycle expected to be used by the individual fleets analyzed. Second, staff estimated the emissions reductions from two engine cranes that would have occurred from eliminating the operation of uncontrolled (Tier 0) secondary engines starting January 1, 2010 and by calculating the PM reductions expected from the portable ATCM requirements phased in from 2013 to 2020. Secondary engines in lattice boom cranes are exempt until 2020 and no reductions from these engines are estimated until 2020 when few are expected to remain operational. Third, staff calculated the emissions reductions expected from all of the off-road drive engines subject to the off-road vehicle regulation. Since the off-road vehicle regulation does not have engine replacement requirements for fleets with less than 2501 hp there were no NOx benefits expected from a number of the fleets. The new baseline was then calculated by subtracting the benefits expected from the Off-Road Regulation and the Portable Equipment ATCM from the emissions expected without regulation.

As shown in Figure 2 and Table 3, there is a slight increase in NOx emissions in 2010 through 2013 from the current proposal compared to emissions with existing regulations, but there is a considerable benefit after 2013.

Figure 1: NOx Emissions Benefits of Staff Proposal

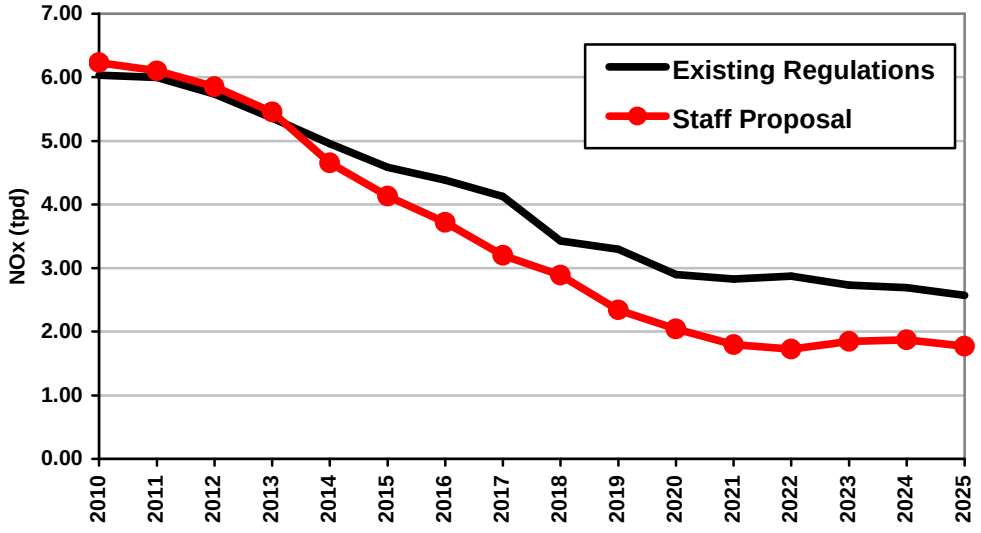

Table 3: Statewide NOx Emissions Reductions from Proposed Regulation

Calendar Year	NOx Emissions (tons per day)		Projected Reductions	
	Baseline	With the Regulation	(tons per day)	Percent from Baseline
2010	6.0	6.2	-0.2	-3%
2014	5.0	4.7	0.3	6%
2017	4.1	3.2	0.9	22%
2020	3.3	2.0	1.3	38%
2023	2.9	1.8	1.0	36%

As shown in Figure 1 and in Table 4 the PM emissions would be slightly higher in 2010 and 2011, but would be substantially better thereafter. The baseline emissions with existing regulations, shows a considerable drop in 2018 because many of the crane fleets would be considered small fleets in the off-road vehicle regulation and would not need to replace engines or install PM retrofits until 2015. Because of normal replacement, most fleets in 2015 would meet the PM average and would not need to install a significant number of exhaust PM retrofit devices until 2018 and 2019.

Figure 2: PM Emissions Benefits of Staff Proposal

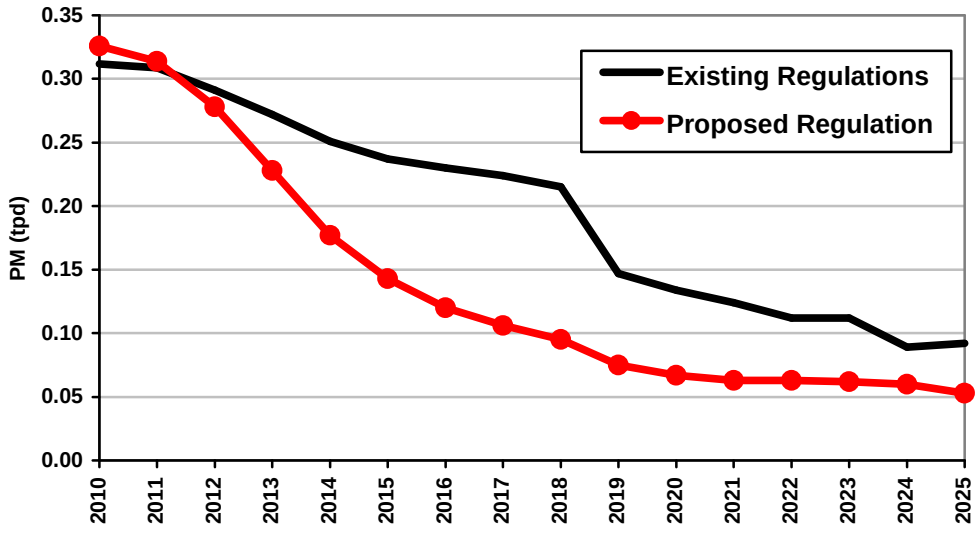

Table 4: Statewide PM Emissions Reductions from Proposed Regulation

Calendar Year	PM Emissions (tons per day)		Projected Reductions	
	Baseline	With the Regulation	(tons per day)	Percent from Baseline
2010	0.312	0.326	-0.013	-4%
2014	0.251	0.177	0.074	29%
2017	0.224	0.106	0.118	53%
2020	0.134	0.067	0.066	50%
2023	0.112	0.062	0.050	45%

D. References

ARB, 2006. Air Resources Board. Regulation for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards. December 2006.

ARB, 2007a. Air Resources Board, Regulation to Establish a Statewide Portable Equipment Registration Program. September 27, 2007. http://www.arb.ca.gov/regact/2007/perp07/froreg.pdf

ARB, 2007b. Air Resources Board. Airborne Toxic Control Measure for Diesel Particulate Matter From Portable Engines Rated at 50 Horsepower and Greater. September 12, 2007. http://www.arb.ca.gov/portable/perp/peatcm091207.pdf

ARB, 2008. Air Resources Board. Regulation for In-Use Off-Road Diesel Vehicles. June 15, 2008. http://www.arb.ca.gov/regact/2007/ordiesl07/frooal.pdf

US BLS, 2008, US Bureau of Labor Statistics. Crane Related Occupational Fatalities Fact Sheet July 2008.

MachineryTrader, 2008. Machinery Trader. Construction Equipment for Sale: Crane. October 5, 2008. www.machinerytrade.com

Sierra, 2008. Sierra Research. Letter From Gary Rubenstein of Sierra Research to Tony Brasil of ARB with attachments. March 14, 2008.

Sierra, 2007. Sierra Research. Letter From Allan Daly to Clerk of the Board of ARB of ARB with attachments. March 21, 2007.

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March 21, 2007

Clerk of the Board
California Air Resources Board
1001 "I" Street
P.O. Box 2815
Sacramento, CA 95812
(via email)

Subject: Crane Owners Comments on the Amendments to the Portable Equipment Registration Program and Airborne Toxic Control Measure for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater

Dr. Robert Sawyer, Chair and Board Members:

On behalf of the Mobile Crane Operators Group (MCOG) and the Crane Owners Association (COA), collectively the "Crane Owners," we are pleased to submit the following comments for consideration in the adoption of amendments to the Portable Equipment Registration Program (PERP) and the Airborne Toxic Control Measure for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater (Portable ATCM). We understand that CARB seeks to pursue adoption of these amendments during the March 22, 2007 Board meeting to be held in Sacramento. Similar comments were first submitted prior to the emergency amendments to these same regulations which were adopted at the December 7, 2006 Board meeting in Bakersfield.

MCOG and COA are trade organizations representing approximately 20 member crane rental companies that own and operate approximately 1,000 cranes statewide. While the Crane Owners are supportive of ARB's efforts to improve air quality through the reduction of emissions of precursors to ozone and particulate matter (including Diesel particulate matter), we are concerned that both the current PERP requirements, and the changes under consideration by ARB, will leave Crane Owners with equipment that, while essential to building and maintaining California's infrastructure, will be unusable in California. Therefore, we are submitting the following comments and proposal pertaining to the crane rental industry.

1. Allow PERP Registration of Certain Retrofitted Crane Upper Engines and Certain Nonresident Tier 1 and Newer Crane Upper Engines

The proposed regulatory language was released as part of the February 2, 2007 Initial Statement of Reasons (ISOR). In the ISOR, CARB proposes to "open" the PERP for Tier 1 and Tier 2 engines that have demonstrated California residency during the period commencing on March 4, 2004, and ending on October 1, 2006. To demonstrate residency, the owner would be required to produce purchase, service, or jobsite documentation. This "open" period will continue until January 1, 2010, provided the above residency requirement is satisfied.

We recognize that the proposed amendments will address the registration of any unregistered Tier 1 or higher, portable (upper) crane engines currently operating within California. However, CARB's current proposal continues to prohibit the purchase of used dual-engine cranes from out-of-state (or from within California when residency cannot be established). This prohibition would persist, even if portable crane engines purchased from out-of-state were retrofitted with Verified Diesel Emission Control Strategies (VDECS), or if repowering such equipment were infeasible.

The ability to purchase used cranes is critical to the crane rental industry. A substantial fraction of cranes added to crane rental fleets are purchased as used equipment. Crane upper engines are typically small in size (<150 HP), yet are associated with some of the most expensive equipment units contained in the PERP. For example, a new all-terrain crane may have a purchase price well in excess of two million dollars. The purchase price is reduced by as much as 50% for a comparable used crane (5-10 years old). Therefore, the inability of an owner to purchase a used crane has an indirect economic cost of over one million dollars. Although this cost is great, the emissions benefit from a Tier 3 engine compared to a Tier 1 engine is minimal, mainly because these portable engines are small and have low annual hours of operation.

For other (non-crane) types of portable equipment, a possible solution could be repowering the unit with a new (Tier 3) engine. However, as the attached letter from Liebherr Cranes, Inc. demonstrates, repowering of crane upper engines is generally infeasible and potentially illegal. Additionally, the attached email message from Terex- Cranes North America demonstrates that repowering a specific crane upper engine is infeasible. As the crane upper engine is part of the counterweight, a small weight change resulting from an upper engine repower could have a significant effect on a crane's lifting capacity and interfere with the electronic controls programmed into the crane's positioning system. Also, crane upper engines are frequently controlled by electronic control systems and software unique to the crane make, model, and model year.

In most cases, the control systems cannot be reprogrammed to accept a different model or model year of engine, nor can newer engines function properly in older cranes not equipped with compatible electronics.

For these reasons (and others), altering or repowering a crane upper engine is expressly prohibited by crane manufacturers. We have attached pages from the operation/safety manuals of three other manufacturers to illustrate this point. We believe that this is the reason that the "lattice boom crane" exemption was added into the Portable ATCM several years ago. At that time, it was believed that this issue affected only cranes with lattice booms; however, it is now understood that this affects all dual engine cranes, regardless of boom type.

A manufacturer's prohibition on altering cranes affects the certification of the crane required under federal Occupational Safety & Health Administration (OSHA) regulations. These regulations state:

> *No modifications or additions which affect the capacity of safe operation of the equipment shall be made by the employer without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced. [40 CFR 1926.550(a)(16)]*

The above OSHA regulation does allow for the possibility of repowering or retrofitting a crane upper engine if manufacturer's approval is granted. Therefore, the Crane Owners are proposing that the following two categories of crane upper engines be eligible for PERP registrations, under the following limited conditions:

<u>Crane Upper Engines Equipped with a Level 3 VDECS</u>

Any crane upper engine, including Tier 0 and nonresident engines, may be registered if a Level 3 VDECS has been installed and is properly operating.

<u>Tier 1 and Newer Nonresident Crane Upper Engines</u>

Tier 1 and newer nonresident crane upper engines may be registered if all of the following conditions are met. (Nonresident, Tier 0 crane upper engines would not be eligible unless they have been retrofitted with a Level 3 Verified Diesel Emission Control System (VDECS), as described above.)

- The applicant must demonstrate that it is not feasible to repower the crane upper engine. This demonstration may include a statement of prohibition from the manufacturer or a statement of infeasibility from a replacement engine dealer.

- The applicant must demonstrate that it is not feasible to retrofit the crane upper engine with a Level 3 VDECS. This demonstration must include either an analysis of available VDECS at the time of application, a statement of prohibition from the crane manufacturer, or a statement of infeasibility from the VDECS manufacturer.

- The applicant must demonstrate that the purchase of a new or newer crane would not be cost effective. The cost effectiveness of the incremental reductions will be determined according to the methodology described in CARB's 2005 Carl Moyer Program Guidelines. The most similar crane commercially available may be substituted if a comparable new crane is no longer manufactured. Assumptions on annual hours of use will become PERP conditions.

2. Allow Initial and Continued of Registration of Resident Tier 0 Crane Upper Engines

The lattice boom crane exemption within the Portable ATCM was added to the regulation during the 45-day comment period as a result of input from the crane industry. At that time, the term "portable lattice boom crane engine" was intended to have the same meaning as "crane upper engine." Since many crane upper engines are found in lattice boom crane, the terms likely became synonymous. As mentioned above, the boom type (lattice versus hydraulic) does not affect the technological feasibility of a retrofit. Therefore, using the same rationale under which the lattice boom crane exemption was first established, all resident Tier 0 crane upper engines should now be eligible for the exemption, until 2020, regardless of boom type. Furthermore, the registrations of Tier 0 crane upper engines that have been granted CARB-approval for use until 2020 should be allowed to maintain their PERP registrations over the same period.

3. Allow Initial PERP Registration of All Resident Tier 0 Engines for 3 Years and Continued Registration for Tier 0 Crane Upper Engines

The current proposal does not allow the registration of any Tier 0 engines, regardless of whether California residency can be established. While it is unfortunate that many owners failed to register or permit their portable engines during previous "open" periods of the PERP, we believe it is

overly punitive to force this equipment out of service immediately. Under the existing Portable ATCM, Tier 0 portable engines are allowed to operate through December 31, 2009. After this date, they must be retired from service in California. A process was also established whereby Tier 0 lattice boom crane engines may continue to operate until 2020 if CARB approval is granted.

As the Portable ATCM facilitates the retiring of most Tier 0 engines by 2010, the PERP regulation should be harmonized to allow continued operation for the same time period. This will encourage the registration of cranes with Tier 0 upper engines, which will facilitate the forced retirement of these engines at the end of 2009. We believe that a residency requirement should be established for any Tier 0 engines in this category prior to issuance of a PERP. This would prevent the importation of Tier 0 engines from out of state.

4. **Eliminate Penalties for Portable Engines Operating in Areas where a District Permit to Operate Has Not Been Required Under District Rules, such as the BAAQMD and SBCAPCD**

It is an oversimplification of the regulatory landscape to assume that every unregistered/unpermitted portable engine has been operating in violation of air district permitting regulations and therefore should be subject to penalties.

For example, the rules and regulations of the Bay Area AQMD contain explicit exemptions for portable engines operating in a broad range of situations. Specifically, BAAQMD Regulation 2-1, Sections 113 & 114 exempt portable engines from permit requirements if they operate at a location for less than 72 hours; meet the Vehicle Code definition of "special construction equipment"; perform road construction, widening, or rerouting activities; or perform building construction activities at any source not otherwise requiring a permit. In combination, these provisions exempt most portable engines from permit requirements in the nine-county BAAQMD, which includes the Cities of San Jose, San Francisco, and Oakland—the third, fourth, and eighth largest cities in the state.

Additionally, Santa Barbara County APCD Rule 202, Section F contains permitting exemptions for portable engines used in construction. This would include most crane engines. Additional exemptions contained in the rule apply to temporary sources operating less than 60 days.

We therefore request that, because of the exemptions for portable equipment contained in district rules, no penalties be assessed for PERP applications where the home district is the BAAQMD or the SBCAPCD.

Registration of these engines would be entirely voluntary due to no underlying district permit requirement. This provision in no way would limit a district or CARB from issuing a violation or penalties for engines operating in violation of the requirement for a district permit.

The Crane Owners appreciate CARB's consideration of these comments in the amendment of the PERP and the Portable Diesel Engine ATCM. Feel free to contact me at (916) 444-6666 if you require any further information concerning the issues addressed herein.

Sincerely,

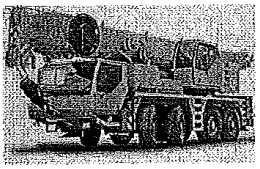
Allan Daly

Allan Daly

Encl.

cc: Sam Meyer, MCOG
Bill Davis, MCOG
Michael Vlaming, COA
Alvan Mangalindan, COA

LIEBHERR



LIEBHERR CRANES, INC.
4100 Chestnut Avenue
P O Drawer "O"
Newport News, VA 23605

2-20-07

Mr. Allan Daly
Sierra Research

Subject: Superstructure Engine repower/replacement for Mobile Cranes

Mr. Daly:
This reply will address only the superstructure (upper) engine and non current production cranes.

In reference to the replacement of superstructure engines, Liebherr's position is very clear, for non current model cranes, replacement or re-power is not economically possible and not allowed.

Liebherr's product line is referred to by model and serial number.
I will use as an example a LTM1160/2, a non production crane model.
Customers requesting a replacement engine are advised replacement engines are not available for this model crane.
The customer must rebuild the existing engine with approved factory parts.
This non-current model crane is not prepared to except a Tier three engine.
A tier three engine would require electronic ignition which the crane does not have.
The crane would also require additional cooling and air systems.

Changing an upper engine could change the load chart of the crane.
The upper engine of a crane is part of the counterweight system. Additional or less weight would result in a change to the lifting capacity of the crane which in turn would require a complete load test and re-programming of the computer.

Replacement of a engine without manufactures approval is a violation of OSHA and ANSI regulations.

Respectfully,

W. John Bray
W. John Bray
Manager-West
Liebherr Cranes, Inc.

Allan G. Daly

From: Gary Rubenstein
Sent: Thursday, January 04, 2007 3:02 PM
To: Mike Tollstrup
Cc: Gary Rubenstein; Allan G. Daly
Subject: Champion Crane Repower Request
Attachments: image001.png

Mike - below is an e-mail that Champion Crane received from Terex cranes regarding a request for cost/availability information regarding the replacement of an existing engine with a Tier 3 engine.

Gary

From: Joshua Cotton [mailto:JCotton@american-crane.com]
Sent: Tuesday, January 02, 2007 12:05 PM
To: hallett32@sbcglobal.net
Cc: championcr@aol.com
Subject: FW: AC-435 ser# 37236

John,

Here is the response from Germany concerning the retrofit of your engine.

Joshua Cotton
Training Manager
Terex-Cranes North America
202 Raleigh St.
Wilmington N.C. 28412
281-726-1030 Mobile
910-332-8570 Office
jcotton@american-crane.com

Josh,

great to hear from you!

We see no chance to change to a Tier 3 EPA friendly engine. All new engines are computer controlled with CAN BUS system as you know. The electric of that AC 435 can not be modified easily nor is the money it takes to do all the engineering and changes/ parts worth it.

Kind regards / Mit freundlichen Gruessen
Guntram Jakobs
Manager International Sales

Terex-Demag GmbH & Co. KG

2/23/2007

Dinglerstraße 24
66482 Zweibruecken

Von: Cotton, Josh
Gesendet: Dienstag, 19. Dezember 2006 23:50
An: Molinari, Scott, 1420; Jakobs, Guntram, 1240
Cc: Jones, Roger; Valentine, Kevin; Creel, Chris
Betreff: AC-435 ser# 37236

Guntram,

How are things in Germany, I hope all is well. Thing are going good in Wilmington.

I am not sure if this falls under your department however I am going to start with you. Mike Konle with Champion Crane has requested a quote to replace the OW engine on his AC-435 37326 with a tier 3 EPA friendly engine. He would like the following questions addressed specifically;

1. We need to know if this is possible since his crane has a mechanical injection pump etc.
2. We need to know the price and how soon this engine would be available.
3. He would also like to know if we TEREX-CRANES can install this engine and assist him in getting it recertified through Cal OSHA and the Calif Air Regulatory Board.

If this is not your dept can you please forward this to someone who can help me?

Thank you

Happy Holidays

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CRANE

CIMA

FOREWORD

- The Department of Labor, Occupational Safety and Health Administration, publishes safety and health regulations and standards under authority of the Occupational Safety and Health Act (OSHA). Its address is: Occupational Safety and Health Administration, U.S. Dept. of Labor, Washington, D.C. 20210.
- American National Standards Institute (ANSI), c/o The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017, includes standards for safe operation, inspection, and maintenance in their ANSI/ASME B30.5.

Unauthorized modifying of machines creates hazards. Machines should not be modified or altered unless prior approval is obtained from the manufacturer.

DO NOT OPERATE any crane that has been modified without the manufacturer's written approval.

IMPORTANT: If you do not have the manufacturer's manual(s) for your particular machine, get a replacement manual from your employer, equipment dealer, or from the manufacturer of your machine. Keep this safety manual and the manufacturer's manual(s) with your machine.

BADGER DIVISION

WARNER & SWASEY

Airport Industrial Park
Winona MN 55987

IMPORTANT SAFETY NOTICE

Safe operation depends on reliable equipment and the use of proper operating procedures. Performing the checks and services described in this manual will help to keep your crane in reliable condition and use of the recommended operating procedures can help you avoid unsafe practices. Because some procedures may be new to even the experienced operator we recommend that this manual be read, understood and followed by all who operate the crane.

Warning and caution notes have been included throughout this manual to help you avoid injury and prevent damage to the equipment. These notes are not intended to cover all eventualities; it would be impossible to anticipate and evaluate all possible applications and methods of operation for this equipment.

It is important that any procedure not specifically recommended by Warner & Swasey be thoroughly evaluated from the standpoint of safety before it is placed in practice.

Do not modify this machine without written permission from the Warner & Swasey Company.

Keep this manual with the crane at all times.

NOTICE

The Warner & Swasey Co. retains all proprietary rights to the information contained in this manual.

The Company also reserves the right to change specifications without notice.

COVERED UNDER U.S. PATENTS 4038794, 3368695 & 2984373

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SIDE FLYER A REGISTERED TRADE-MARK

Form No. 7818
Replaces Form No. 7602

Printed in U.S.A. 6/78 1M V

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SERVICE AND REPAIRS

Service and repairs to the crane must only be performed by a qualified person. All service and repairs must be performed in accordance with manufacturer's recommendations, this handbook and the Service Manual for this machine. All replacement parts must be Grove approved.

Any modification, alteration or change to a crane which affects its original design and is not authorized and approved by Grove Worldwide is STRICTLY PROHIBITED. Such action invalidates all warranties and makes the owner/user liable for any resultant accidents.

Before performing any maintenance, service or repairs on the crane:

- The boom should be fully retracted and lowered and the load placed on the ground.
- Stop the engine and disconnect the battery.
- Controls should be properly tagged. Never operate the crane if it is TAGGED–OUT nor attempt to do so until it is restored to proper operating condition and all tags have been removed by the person(s) who installed them.

Recognize and avoid pinch–points while performing maintenance. Stay clear of sheave wheels, holes, and lattice work in crane booms.

After maintenance or repairs:

- Replace all guards and covers that had been removed.
- Remove all tags, connect the battery and perform a function check of all operating controls.
- Load tests must be performed when a structural or lifting member is involved in a repair.

LUBRICATION

The crane must be lubricated according to the factory recommendations for lubrication points, time intervals and types. Lubricate at more frequent intervals when working under severe conditions.

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March 14, 2008

Mr. Tony Brasil, P.E.
California Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

Subject: Two-Engine Crane Proposal

Dear Mr. Brasil:

Thank you for your continued efforts in working with the mobile crane industry to produce regulations that both are effective and address the unique aspects of the industry. During our January 22, 2008 meeting, the Mobile Crane Operators Group and Crane Owners Association committed to providing CARB with sample rule language addressing three key issues requiring further scrutiny within CARB's "two-engine crane proposal": portable equipment registration; turnover requirements that result in excessive cost; and inclusion of single-engine all-terrain cranes with certified off-road engines. Each of these issues is discussed below.

Portable Equipment Registration

CARB has proposed to regulate both the "carrier" and "upper" engines of two-engine cranes under the In-Use Off-Road Diesel Vehicle Rule ("Off-Road Rule"), and thus eliminate the problems caused by two separate "in-use" rules applying to the same crane. We believe that this proposal indeed eliminates most of the problems (such as multiple turnover/retrofit, recordkeeping, reporting, and labeling requirements), but does not address the issues that arise from registration/permitting requirements.

As you are aware, in most California air districts registration in CARB's Portable Equipment Registration Program (PERP) is required for operation of portable engines >50 HP in lieu of obtaining individual air district permits. This requirement has been interpreted as extending to portable engines mounted on/within vehicles, such as crane upper engines. In order to qualify for registration in the PERP, CARB applies Best Available Control Technology (BACT) requirements to crane upper engines[1] that are separate from those contained in the Off-Road Rule. This again creates a second set of requirements applicable to the same crane (and engine).

Crane upper engines cannot simply be "exempted" from PERP registration through the Off-Road Rule because this would once again activate individual air district permit

[1] H&S §41754(a)(2)

requirements. Rather, the requirements of the Off-Road Rule must be substituted for the PERP BACT requirements. This would result in the desired outcome of upper engines being eligible for initial and continued registration in the PERP program, provided they are part of a compliant off-road fleet.

While this could be done through an amendment of the PERP regulation, CARB should also consider adding language to the Off-Road Rule that would produce the same effect. This language could mirror the "automatic registration" provisions in the PERP regulation that pertain to emergency equipment, which states:

> *Except for engines or equipment units permitted or registered by a district in which an emergency event occurs, an engine or equipment unit operated during an emergency event as defined in section 2452 (i) of this article, is considered registered under the requirements of this article for the duration of the emergency event and is exempt from sections 2455, 2456, 2457, 2458, and 2459 of this article...*

This language could be adapted to crane upper engines and inserted into the Off-Road Rule as follows:

> *The upper engines of two-engine cranes that are part of an off-road fleet in compliance with this article are considered registered under the requirements of 13 CCR Division 3, Chapter 9, Article 5. These engines are exempted from the requirements of 13 CCR Division 3, Chapter 9, Article 5, Sections 2455, 2456, 2457, 2458, and 2459 and from 17 CCR Division 3, Chapter 1, Subchapter 7.5, Section 93116.*

Turnover Requirements that Result in Excessive Cost

The crane owners have maintained that the NOx turnover requirements contained in the Off-Road Rule may result in required actions that would generate excessive costs unique to cranes. During our January 22, 2008 meeting, it was stated that the "specialty vehicle" provisions of the Off-Road Rule were intended to address these situations. Specifically, cranes subject to NOx turnover requirements would be exempt from turnover, provided that all of the following criteria are met:

1. The fleet has turned over all other off-road vehicles and engines first;
2. No repower is available for the crane engine(s);
3. A used vehicle with a cleaner engine is not available to serve a function and perform the work equivalent to the crane; and
4. The crane engine(s) has been retrofit with the highest level of VDECS.

We believe that the first and third requirements still may result in excessive costs for mobile crane fleets. The first criterion requires that an owner turn over <u>every</u> other

applicable off-road vehicle or engine before any particular crane may be considered "exempt" from turnover. This equates to a near 100% turnover of the off-road fleet in a single calendar year, as opposed to the normal maximum turnover of 8%. Many of these vehicles may be other two-engine vehicles that do not meet the definition of "specialty vehicle."

The third criterion requires that no other used vehicle with a cleaner engine be "available." The geographic extent over which "availability" will be determined is not well defined—must the crane owner conduct a nationwide search for a used crane that can be legally registered in California and perform the same functions as the crane being replaced? Additionally, this "trading" of an older used crane for a newer used crane can also result in excessive costs.

To support the above points, we have attached an example of the actual costs associated with importing a used, 300-ton, two-engine crane into California from the Chicago area in late 2007. Delivery of the crane and associated appurtenances required 12 flatbed trucks making the journey. As shown, excessive costs arose from the following items:

- Transport;
- Repainting;
- Modifications to meet California Dept. of Transportation weight limits; and
- Recertification and inspection of the crane required by Cal-OSHA.

The attachment does not show the costs of operator re-training and sales tax paid to the Dept. of Motor Vehicles; however, import costs still exceeded $247,000. Additionally, these costs are only for the purchase of the used crane and do not reflect potentially equivalent costs associated with the required sale of the existing crane. Therefore, replacing a 300-ton crane with a newer used 300-ton crane would likely result in a cost in excess of $300,000 in addition to the differential value of the cranes.

The fourth criterion requires that the exempted crane be retrofitted with the highest level of VDECS. Although it may have been CARB's intention, it is not explicitly stated that this criterion is fulfilled if no VDECS is available or if no VDECS can be safely installed on the crane.

To remedy this, the crane owners recommend that a special exemption from the NOx turnover requirements for cranes be added to the Off-Road Rule with the following two criteria:

1. *No repower is available for one or both engines. Where a repower is available for one engine but not both, the available repower must be performed.*

2. *The crane engines have been retrofit with the highest level of VDECS. If a VDECS is not available for one or both crane engines, or a VDECS cannot be safely installed on one or both crane engines, this criterion has been satisfied.*

Inclusion of Single-Engine All-Terrain Cranes with Certified Off-Road Engines

The crane owners also propose that single-engine all-terrain cranes be included in the Off-Road Rule in addition to two-engine cranes. The carrier engines of all-terrain cranes (both single and two-engine) are almost universally certified as nonroad/off-road engines by the manufacturers. In fact, we are unaware of any currently or formerly produced all-terrain cranes (domestic or foreign) that contain carrier engines certified to EPA/CARB on-road standards. New single-engine all-terrain cranes are often approved by CARB for registration in California under case-by-case exemptions issued pursuant to 13 CCR Division 3, Chapter 1, Section 1956.8(f).

While engine/vehicle certification is the responsibility of the manufacturer and not the end user, it would be logical to include any all-terrain cranes with carrier engines certified to nonroad/off-road standards in the Off-Road Rule, regardless of whether those engines have been granted exemptions by CARB to enable them to be registered as on-road vehicles. We suggest that the following sentence be added to the "applicability" section of the Off-Road Rule:

> *This rule shall apply to both engines of two-engine cranes, single engine cranes certified to the requirements contained in 13 CCR Division 3, Chapter 9, Article 4, and cranes that have been exempted pursuant to 13 CCR Division 3, Chapter 1, Section 1956.8(f).*

We appreciate the opportunity to submit these additional comments and look forward to your response. Feel free to contact me directly with regard to this matter.

Sincerely

Allan Daly FOR

Gary Rubenstein

Attachment: 300-ton crane import costs

cc: Seth Hammond, Mobile Crane Operators Group
Michael Vlaming, Crane Owners Association

SCR Crane #128
Startup Costs

Bennett Motor Express	50,064.40		Transport
Landstar Express America	42,930.00		Transport
SCR Payroll	5,984.83		Transport
U.S. Air	2,064.15		Transport
Marriott	792.30		Transport
Danny Rich	672.99		Transport
Fairfield Inn	101.30		Transport
		102,609.97	
A-1 Truck & Equip.	59,477.53		Paint
SCR Payroll	8,545.94		Paint
C&S Industrial Coatings	887.59		Paint
The Permit Company	82.00		Paint
Custom Colors	4.72		Paint
		68,997.78	
Nelson Mfg. Co.	33,798.00		Modifications
SCR Payroll	3,126.97		Modifications
		36,924.97	
Liebherr Cranes	13,541.09		Parts, Repairs
SCR Payroll	1,932.39		Parts, Repairs
Hose & Fittings Etc.	1,117.00		Parts, Repairs
Central Coast Batteries	297.45		Parts, Repairs
Santa Maria Tool	240.00		Parts, Repairs
Western Welding	70.77		Parts, Repairs
Cuesta Equipment	69.50		Parts, Repairs
American Hose & Coupling	35.75		Parts, Repairs
		17,303.95	
SCR Payroll	15,404.08		Certification
All-Cal Equip. Services	1,785.00		Certification
		17,189.08	
SCR Payroll	1,562.88		Inspection
Expedia Travel	1,074.98		Inspection
United Air	1,053.20		Inspection
Brett Parish	739.94		Inspection
		4,431.00	
TOTAL		**247,456.75**	

Emission Benefits

CY	Total Nox TPD No Rule All Engines	Total Nox TPD Off Road Rule Upper & Drive Engines	Nox Reduction TPD ATCM Rule Upper Engine	Nox Reduction TPD Off Road Rule Drive Engine	Nox TPD Net Benefit	Nox % Net Benefit
2010	0.647893	0.638169	0.030540	0.000610	-0.021425	-3%
2011	0.644393	0.622010	0.032895	0.000626	-0.011138	-2%
2012	0.615869	0.591812	0.035673	0.001151	-0.012766	-2%
2013	0.575626	0.549508	0.035891	0.000543	-0.010317	-2%
2014	0.532712	0.467304	0.027673	0.004681	0.033053	6%
2015	0.492167	0.411966	0.024546	0.007408	0.048248	10%
2016	0.470984	0.365102	0.022374	0.012039	0.071469	15%
2017	0.443090	0.304467	0.022227	0.016714	0.099683	22%
2018	0.426081	0.275418	0.020704	0.014005	0.115955	27%
2019	0.367785	0.221082	0.009371	0.021179	0.116153	32%
2020	0.353574	0.183434	0.006642	0.028922	0.134576	38%
2021	0.311082	0.163597	0.007075	0.022192	0.118219	38%
2022	0.303903	0.157305	0.007557	0.020635	0.118404	39%
2023	0.308561	0.167239	0.008098	0.022854	0.110370	36%
2024	0.293607	0.167522	0.008722	0.024468	0.092896	32%
2025	0.289411	0.166875	0.007280	0.015749	0.099507	34%
2026	0.276511	0.158615	0.007695	0.014034	0.096167	35%
2027	0.252758	0.158022	0.006110	0.008944	0.079683	32%
2028	0.245726	0.157766	0.006145	0.009528	0.072288	29%
2029	0.235109	0.152322	0.006231	0.004361	0.072195	31%
2030	0.233823	0.151475	0.003906	0.010224	0.068218	29%

CY	9.31X Scaled Baseline Nox TPD	9.31X Scaled Off-Road Rule Nox TPD
2010	6.032	6.231
2011	5.999	6.103
2012	5.734	5.853
2013	5.359	5.455
2014	4.960	4.652
2015	4.582	4.133
2016	4.385	3.719
2017	4.125	3.197
2018	3.967	2.887
2019	3.424	2.343
2020	3.292	2.039
2021	2.896	1.796
2022	2.829	1.727
2023	2.873	1.845
2024	2.733	1.869
2025	2.694	1.768
2026	2.574	1.679
2027	2.353	1.611
2028	2.288	1.615
2029	2.189	1.517
2030	2.177	1.542

CY	9.31X Scaled Nox TPD Net Benefit	Average Nox TPD
2010	-0.199	-0.130
2011	-0.104	
2012	-0.119	
2013	-0.096	
2014	0.308	0.847
2015	0.449	
2016	0.665	
2017	0.928	
2018	1.080	
2019	1.081	
2020	1.253	
2021	1.101	
2022	1.102	
2023	1.028	
2024	0.865	
2025	0.926	
2026	0.895	
2027	0.742	
2028	0.673	
2029	0.672	
2030	0.635	

CY	Total PM TPD No Rule All Engines	Total PM TPD Off Road Rule Upper & Drive Engines	PM Reduction TPD ATCM Rule Upper Engine	PM Reduction TPD Off Road Rule Drive Engine	PM TPD Net Benefit	PM % Net Benefit
2010	0.033563	0.032050	0.002794	0.000161	-0.001441	-4%
2011	0.033198	0.030533	0.002817	0.000353	-0.000505	-2%
2012	0.031231	0.026363	0.002885	0.000583	0.001401	4%
2013	0.029248	0.020427	0.002825	0.001283	0.004713	16%
2014	0.026917	0.014911	0.002592	0.001475	0.007939	29%
2015	0.025449	0.010859	0.002633	0.001876	0.010081	40%
2016	0.024720	0.007738	0.002762	0.002386	0.011835	48%
2017	0.024082	0.004689	0.003073	0.003660	0.012660	53%
2018	0.023073	0.003844	0.003150	0.003226	0.012853	56%
2019	0.015755	0.003109	0.002256	0.002689	0.007701	49%
2020	0.014345	0.002266	0.002425	0.002541	0.007113	50%
2021	0.013344	0.001815	0.002640	0.002312	0.006577	49%
2022	0.012050	0.001741	0.002645	0.002341	0.005323	44%
2023	0.012021	0.001619	0.002600	0.002398	0.005404	45%
2024	0.009550	0.001563	0.002606	0.002259	0.003122	33%
2025	0.009829	0.001573	0.002315	0.001836	0.004106	42%
2026	0.008709	0.001565	0.002168	0.001882	0.003093	36%
2027	0.007202	0.001562	0.002059	0.001797	0.001784	25%
2028	0.006899	0.001569	0.002064	0.001196	0.002070	30%
2029	0.006503	0.001558	0.001964	0.001051	0.001930	30%
2030	0.006452	0.001558	0.001758	0.001063	0.002073	32%

CY	9.31X Scaled Baseline PM TPD	9.31X Scaled Off-Road Rule PM TPD
2010	0.312	0.326
2011	0.309	0.314
2012	0.291	0.278
2013	0.272	0.228
2014	0.251	0.177
2015	0.237	0.143
2016	0.230	0.120
2017	0.224	0.106
2018	0.215	0.095
2019	0.147	0.075
2020	0.134	0.067
2021	0.124	0.063
2022	0.112	0.063
2023	0.112	0.062
2024	0.089	0.060
2025	0.092	0.053
2026	0.081	0.052
2027	0.067	0.050
2028	0.064	0.045
2029	0.061	0.043
2030	0.060	0.041

CY	9.31X Scaled PM TPD Net Benefit	Average PM TPD
2010	-0.013	-0.009
2011	-0.005	
2012	0.013	0.055
2013	0.044	
2014	0.074	
2015	0.094	
2016	0.110	
2017	0.118	
2018	0.120	
2019	0.072	
2020	0.066	
2021	0.061	
2022	0.050	
2023	0.050	
2024	0.029	
2025	0.038	
2026	0.029	
2027	0.017	
2028	0.019	
2029	0.018	
2030	0.019	