



CARB's LSI Fleet Regulations – Are Your Propane Forklifts In Compliance?

Did you know that forklift fleets in California are subject to special California Air Resources Board (CARB) regulations and must meet new, lower emission levels as of January 1, 2011?

CARB's off-road large-spark ignited (LSI) engine fleet regulation says that users of propane-fueled and other types of spark-ignited forklifts, sweepers/scrubbers, tow motors, and airport ground support equipment with more than 25 horsepower each must meet special fleet-averaged emission levels and record-keeping requirements. And while the first fleet average emission level (FAEL) standards for forklifts in your fleet – differing slightly for groups of 4 to 24 lifts, or 25 or more lifts – became effective on January 1, 2009, the FAEL standard dropped to an even lower number on January 1, 2011.

While CARB's LSI fleet regulation covers different types of equipment, here are some basic requirements affecting fleets of propane-fueled forklifts, the most popular type of LSI equipment. Be aware that fleets of four or more propane-fueled forklifts must meet specific, reduced emissions rates for NO_x (oxides of nitrogen) plus HC (hydrocarbons).

If you or your customers use propane forklifts in California, familiarity and compliance with LSI's fleet-averaging emission requirements is very important. If your fleet is subject to these emission requirements and you fail to meet them, CARB can assess penalties of up to \$500 per day per piece of non-compliant equipment.

LSI Regulatory Highlights

- Forklift fleets of 4 or more lifts at one or more locations in California must meet LSI-defined NO_x+HC emission standards. Forklifts operated 250 hours per year or less have a limited hours of use (LHU) exclusion until January 1, 2011. Then they must be included in the fleet average calculations as well. The CARB Board recently approved amendments to the LSI fleet regulation that will extend the LHU exclusion, but with the LHU threshold changing to 200 hours use per year. Details are being finalized.
- Four or more lifts that operate at various locations but that are centrally controlled by one entity are treated as if they are a single fleet and are subject to the regulation.
- Record-keeping for forklifts is a must! **The LSI fleet regulation requires you keep a record of forklift serial numbers, model, year, and factory emission certification standard or the emission verification level of a retrofitted, "controlled emissions" lift. No longer are you required to keep records of fuel purchases or efforts to determine fuel quality.**
- LSI's fleet-averaged NO_x+HC emission rates vary by fleet size and compliance year:
 - Small Fleet 3 or fewer lifts
 - Medium Fleet 4 – 24 lifts
 - Large Fleet 25 or more lifts
- Only medium and large fleets must meet LSI's fleet-averaged emission requirements and keep records, but CARB also recommends that small fleets keep records. Records must be made available to CARB inspectors on request.
- Rented and leased forklifts are subject to LSI. Check with your lift supplier to ensure that the certification standard of your rented or leased lifts does not adversely affect your efforts to comply with the FAEL standards.

- Agricultural forklifts have slightly different LSI requirements. Consult the Agricultural Crop Preparation Services Fleets fact sheet (<http://www.arb.ca.gov/msprog/offroad/orspark/factsheets.htm>) or call CARB's forklift toll-free information line at (800) 387-2992.
- Riding electric Class I or Class II forklifts reflect a zero-emission rate. If you have them with your propane lifts, factor in their zero-emission rate in your overall fleet average. Class III electric lifts, also known as pallet jacks and walkies, cannot be counted in the averaging process. For more information on Class I, II, and III electric lifts see the tutorial at <http://www.arb.ca.gov/msprog/offroad/orspark/presentations.htm>.

Factory emission levels of propane lifts dropped in 2001 through 2004, in 2007, and again on January 1, 2010. A forklift's fleet-averaged emission level required under LSI is easier to achieve with later-model lifts and/or with use of CARB-verified retrofits on older, uncontrolled "open-loop" lifts.

- To find emissions information for your emissions-controlled forklift or other type of LSI equipment, consult the certification/verification standard labels found in the engine compartment. Uncontrolled equipment will not have an emissions label. Default emission values for uncontrolled lifts are provided below.
- If your "fleet-average" emission level is too high you can reduce it by retiring; retrofitting (adding an aftermarket "closed loop" conversion system); replacing; or repowering (new engine) an appropriate number of your lifts.

Estimating Your Fleet's Average Emissions Level

Estimate your forklift and non-forklift fleet's NOx+HC forklift fleet average emission level separately. To do so, you must know the emission certification or verification standard or default uncontrolled emission number for each forklift in your fleet.

For lifts, calculate the fleet average emission level by adding up the uncontrolled, manufacturer-controlled, or retrofit-controlled emission numbers for each fleet lift subject to LSI, then divide by the total number of fleet lifts.

Uncontrolled forklifts are assigned a default emission rate. See Generic Forklift Emission Rates table below for fleet average calculation input factors. If your lift uses a CARB-verified aftermarket retrofit emission control system (retrofit kit), use its emissions verification label in your fleet-average calculations. Be sure your emission rate averaging is accurate!

Generic Forklift Emission Rates by Model Year

Engine Model Year	NOx+HC	g/kW-hr (g/bhp-hr)
Uncontrolled* through 2003	16	(12)
Controlled; 2001 - 2006	4	(3)
2007	0.8-2.7	(2)
2010	.8	(.6)

*Uncontrolled: open-loop carburetion, no electronics or catalyst

Fleet Average Emissions Requirements For Your Forklifts Under CARB LSI

Fleet Average Emission Level Standards in grams per kilowatt-hour (brake-horsepower-hour) of hydrocarbons plus oxides of nitrogen		
Fleet Size	Compliance Date	
	1/1/2011	1/1/2013
Large	2.3 (1.7)	1.5 (1.1)
Medium	2.7 (2.0)	1.9 (1.4)
Non-forklift Fleet	3.6 (2.7)	3.4 (2.5)

I Want To Keep My Propane Lifts: Should I Retrofit? Are Any LPG Forklifts Exempt?

In many cases, retrofit kits make good, economical sense if the propane lift isn't worn out. Use only CARB-verified systems and affix the emissions label to the engine on installation. Retrofit manufacturers have CARB-verified kits for use on 1980-2003 smaller uncontrolled engines (those with a displacement of 3 liters or less), with NOx+HC levels as low as 1.3 g/kW-hr.

They have also verified kits for use on larger engines (greater than 3 liters) of the same vintage. These have been verified to NOx+HC levels of as low as 2.7 - 4.0 g/kW-hr, depending on model. However, if most of an operator's fleet is comprised of > 3L displacement engine equipment the operator may have difficulty achieving their FAEL standards through the use of retrofit kits alone.

In such cases, the ARB allows LSI fleet operators to exclude their uncontrolled > 3L LSI engine equipment from their FAEL calculations through April 15, 2011. Commencing April 16, 2011, fleet operator inventories must again include all > 3L LSI engine equipment in the operator's fleet. The ARB expects retrofit kits for larger engines to be verified to a level that will allow operators to achieve their FAEL requirements before that date. (See www.arb.ca.gov/msprog/mailouts/msc1015/msc1015.pdf)

Note: If you bought a 2001 – 2006 lift with factory emission controls, no CARB-verified retrofit system is currently available. CARB provides some relief in this area. If every lift in an operator's fleet was emission controlled prior to the first FAEL standard effective date (January 1, 2009), then the operator may exclude each of these lifts from the FAEL calculation until such time as the lift becomes seven years old. At that time, the lift may no longer be excluded and must meet the FAEL standard requirement.

LPG Forklift Retrofits—Cost and Availability

Two manufacturers currently sell CARB-verified retrofits for forklifts. See the latest verified systems at <http://www.arb.ca.gov/msprog/offroad/orspark/verdev.htm>.

Contact the retrofit manufacturers to determine if they have a product that can work on yours or your customers' lifts. Nett Technologies (www.nett.ca) sells the "Blue Cat" system. Contact: Wayne Moffat at Nett, (800) 361-6388. Nett Technologies has a helpful spreadsheet available online to assist with FAEL calculations. Another company, Engine Control Systems (www.enginecontrolsystems.com/terminox) sells the TermiNox system. Contact: Wayne Cochrane at Engine Control Systems, (775) 376-2664. Costs for the kits from these two companies, and what you will pay for installation, vary. You may be able to save by installing them yourself. We've been told that most are in the the \$2,500 - \$3500 range, but with some costing more.

Depending on the forklift's year of manufacture and its engine size, these systems can deliver substantial emission reductions. Three-liter and smaller 1980 – 2000 and uncontrolled 2001 – 2003 engines drop from 16 g/Kw-hr to 1.3 g/Kw-hr. Some larger engines (over 3 liters) in the same age ranges will see their emissions go from 16 g/Kw-hr down to 2.7 - 4.0 g/Kw-hr. These are serious emission reductions that will allow some fleets to continue using their existing propane forklifts for years to come.

CARB's LSI Required Recordkeeping

CARB's LSI fleet regulation requires equipment operators in California to collect and keep information on all of their LSI forklifts, industrial tow tractors, airport ground support equipment, and sweeper/scrubbers, as of November 12, 2007. Here are some guidelines for LSI equipment recordkeeping.

1. Keep, maintain, and update your LSI equipment information at your California company headquarters and at your California satellite-office locations where the LSI equipment is regularly used. Records must be shown to CARB on request. Owned, rented, leased, and borrowed equipment subject to LSI must be listed.
2. The suggested information below may help you record your fleet information in order to comply with CARB's LSI record-keeping requirements. You can also see and download recordkeeping tables from manufacturers and equipment dealer's websites—for example, see www.papemh.com/carb.aspx. Maintain your recordkeeping table regularly.
3. Suggested Information for CARB LSI Record-keeping Table:
 - a. Today's Date
 - b. Equipment ID "Name" (Example: Lumberyard Lift #1, #2, etc.)
 - c. Equipment Type ("Forklift") and Fuel Type ("LPG", "Gasoline", etc.)
 - d. Make (Example: Toyota)
 - e. Model Year
 - f. Model (Example: 5XG15)
 - g. Serial Number (See Engine Compartment Sticker)

h. Emissions Certification Standard or Retrofit Verification Level

Here is a suggested LSI recordkeeping table with an example. You can also find information on other possible table formats at CARB's tutorial (<http://www.arb.ca.gov/msprog/offroad/orspark/presentations>)

Today's Date	Eqpt "Name"	Eqpt & Fuel Type	Make	Model Year	Engine Size	Model	Serial #	Emissions NOx Cert or Retrofit Cert Level	Used over 251 hours/yr?
01/01/11	Yard Lift #1	Forklift (LPG)	Toyota	1999	2.2L	5XG15	X20111	16 g/kW-hr	Yes

Where Can I Find CARB's FAQ and LSI Regulatory Language?

For more information on the LSI requirements, see <http://www.arb.ca.gov/lisi>. For frequently asked questions (FAQ), see http://www.arb.ca.gov/msprog/offroad/orspark/documents/faq7_08.pdf. CARB's LSI Hotline number is (800) 387-2992.

If you need additional help on LSI's requirements or to estimate your propane forklift fleet-average emissions, contact WPGA at (916) 447-9742 or contact WPGA's air quality consultant Greg Gilbert at (916) 663-2222.