

**WRITTEN COMMENTS OF THE
MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION
ON THE CALIFORNIA AIR RESOURCES BOARD'S PROPOSED
EVAPORATIVE EMISSIONS CONTROL REQUIREMENTS FOR SPARK-
IGNITION MARINE WATERCRAFT**

February 16, 2015

The Manufacturers of Emission Controls Association (MECA) is pleased to provide comments in support of the California Air Resources Board's proposed evaporative emissions control requirements for spark-ignition marine watercraft (SIMW). MECA commends ARB for proposing more stringent evaporative emission standards than those adopted by U.S. EPA's 2008 rule for marine watercraft greater than 30 kW.

MECA is a non-profit association of the world's leading manufacturers of emission control technology for mobile sources. Our members have over 40 years of experience and a proven track record in developing and manufacturing emission control technology for a wide variety of on-road and off-road vehicles and equipment, including extensive experience in developing exhaust and evaporative emission controls for gasoline and diesel light-duty vehicles in all world markets. Our industry has played an important role in the emissions success story associated with light-duty vehicles in California, and has continually supported efforts to develop innovative, technology-forcing, emissions programs to deal with California's unique air quality problems.

MECA agrees with ARB staff's assessment that achieving the proposed evaporative emissions requirement for SIMW will help California achieve its goal of meeting its ozone national ambient air quality standards (NAAQS). MECA also agrees with ARB staff that the evaporative emissions control technologies equipped on on-road vehicles, which have a proven track record of emissions control, can readily be applied to SIMW. The function of the automobile evaporative emission control system is to block or capture the sources of vaporized hydrocarbons and prevent their release into the atmosphere. There are varying levels of complexity and efficacy of these controls with the most advanced systems equipped on partial zero emission vehicles being certified to California's PZEV standard under the state's LEV II emission standards. These evaporative emission control technologies are being further optimized to meet the more stringent ARB LEV III evaporative emission standards.

Companies that manufacture evaporative emission controls have responded to the challenge of reducing VOCs from gasoline powered vehicles. Through their efforts, a wide range of cost-effective technologies have been developed to reduce HC evaporative emissions. MECA member companies, together with engine manufacturers, have worked together to meet California's PZEV requirements on millions of light-duty vehicles and employed evaporative canisters on motorcycles and marine engines. Today's cleanest gasoline vehicles, certified to California's PZEV emission limits require near zero evaporative emissions and include additional technologies such as canister scrubbers to virtually eliminate bleed emissions from the carbon canisters during periods of low purge. Some vehicles also incorporate carbon based air-intake HC traps to prevent engine breathing losses from escaping.

Viable emission control technologies exist to reduce fuel systems based HC evaporative

emissions from all types of spark-ignited engines, including marine engines. The major technologies that control permeation emissions include: fuel tanks made of low permeation polymers; multilayer co-extruded hoses; and low permeation seals and gaskets. Technologies designed to control diurnal, hot soak and refueling HC emissions include: advanced carbon canisters; high working capacity activated carbon; honeycomb carbon scrubbers; and air induction system (AIS) HC traps. Vehicles certified to California's PZEV low emission vehicle standards must demonstrate near zero evaporative emissions from the fuel system at 0.054 g/test using a rig test of a vehicle's fuel system. ARB extended these requirements across the entire light-duty and medium-duty passenger vehicle fleet by 2022 as part of their LEV III regulations.

Permeation emissions can be addressed by reducing the permeability of plastics and polymers to gasoline in either the liquid or vapor phase. This can be accomplished through both design and selection of materials. Reducing the number of joints and connectors in a fuel system and the design of the fuel tank are some of the ways to reduce fuel leakage and permeation. Similar approaches of material selection can be applied to fuel hoses, seals, fuel caps and gaskets used within the fuel system. The use of coextruded, low permeation polymers such as nylon, fluoropolymers, and fluoroelastomers can be employed in fuel lines to significantly reduce permeation emissions. Special challenges in permeation emissions and materials compatibility have resulted since the introduction of ethanol blends in gasoline. The newest vehicles and, in particular, Flexible Fuel Vehicles (FFV) are equipped with the lowest permeation materials in the fuel tanks, hoses, seals, and gaskets. Marine engines can take advantage of the same low permeation materials that have been developed for the automotive industry in fuel lines and fuel tanks used to comply with ARB's proposed SIMW stringent evaporative emission standards.

One of the essential components of evaporative emission control system is the carbon canister. The canisters employed on automobiles, and other gasoline powered vehicles and equipment, are similar and consist of a plastic housing containing high surface area carbon adsorbent material. Canister filling occurs during diurnal events and refueling. Advanced canisters employ multiple chambers and specially designed carbon adsorbents to achieve very low or zero evaporative emissions. The zero evaporative emissions required of PZEV vehicles has put engineering focus on the small levels of bleed emissions from the canister which occur during diurnal loading. Additionally, smaller displacement engines, or partial electric operation like that of gasoline-electric hybrids will result in less available purge air to clean the carbon canister. The canister designs for these applications use a third, smaller chamber filled with specifically designed, easy to purge carbons, known as a scrubber, to effectively capture these canister bleed emissions. Bleed emissions from incorporating a scrubber or auxiliary chamber on a carbon canister are reduced by 95 to 295 mg/test depending on the level of purge. The most advanced canisters being developed for the lowest purge vehicles such as plug-in hybrids may incorporate a heat transfer medium to warm the carbon and improve the purge efficiency. At the core of the canister function is the activated carbon that is charged inside the chambers. Marine applications utilize a special waterproof pelletized carbon.

Demands on vehicle manufacturers to achieve higher fuel efficiency through the use of smaller displacement, boosted engines and hybrid electric powertrains will create challenging operating conditions for evaporative emission control technologies. The lower purge volumes that result from smaller displacement engines or hybrid systems under partial or full electric

drive will require the development of specialty carbon adsorbents and advanced canister designs to achieve the lowest evaporative emissions demanded by future regulations. Gasoline vehicles in other parts of the world and SI off-road equipment everywhere can benefit from much of the same technologies applied to passenger vehicles in the U.S.

MECA believes that some of the proposed test procedures included in the ARB SIMW proposal need to be modified to make sure that these regulations are implementable by the marine industry. Our suggested changes to proposed ARB SIMW test procedures are as follows:

TP-1501:

6.1 Fuel Tank/Fuel System Preconditioning

This section does not address anything related to canister stabilization or pre-conditioning prior to testing. Such steps are essential to meaningful and repeatable test results. We recommend that ARB include provisions such as those specified in 40 CFR 86.132-96(h) in the 15-day changes.

There are tank permeation standards proposed in TP 1504. It is not clear what the slosh test in 6.1 accomplishes. Furthermore, in the test procedure is not clear that the tank can be removed from the watercraft before the slosh test and re-installed afterwards.

6.2 Refueling and Hot Soak Procedure

The test procedure prescribes bench purging at 400 bed volumes of dry air or nitrogen before the test. This 400 bed volumes of purge seems too high and a specification of nitrogen or dry air seems unrepresentative. ARB should consider something like 300 bed volumes of air at 50+/- 25 grains water vapor per lb. of dry air at 20-30°C at 0.8-1.0 cfm. We recommend that this approach be considered in the 15-day changes.

TP-1503:

Figure 3.1 and Section 6 Test Procedures

As was the case with TP 1501, TP 1503 does not include provisions related to canister stabilization or pre-conditioning, such as would be found in US light-duty procedures at 86.132-96(h). These measures are important and should be added in the 15-day changes.

Also, the test procedure as written does not appear to present any opportunity for purge after the prescribed butane load to breakthrough, making the test basically unimplementable as written. EPA's 40 CFR 1060.525 and the ABYC standard (C-2) are silent as well. However, the marine evap final rule preamble from EPA indicates that the three day test is to be preceded by placing the loaded canister in the SHED and allowing one full diurnal cycle (24 hr at 72-96-72F) in the SHED before starting the official three day test. This basically creates the situation where the canister back purge from the first day in the SHED is the purge for the upcoming 3-day test (see 73 FR 59114, Oct 8, 2008 bottom of column 1 top of column 2). If this is the approach intended by CARB it should be clarified in the regulations. If the approach intended by CARB is to only have three days in the SHED and not to measure the first day, it is not a three day test. In either of the back purge approaches above, there are potential SHED contamination problems from the breakthrough which will occur on the first day since the test starts with a loaded canister. This breakthrough on the first day (before measurement) will dump 30+ grams of vapor in to the SHED before the test starts. Thus, after the first day back purge, it may be necessary to cap the canister ports, purge the SHED and complete all of the steps needed to ready the SHED for testing before starting the official test. In any event this is not clear in any part of TP 1503.

An alternative way would be to start the official test with the canister, fuel tank, and SHED stabilized at 96 F and let the 12-hr back purge occur as the tank cools to 72F, then follow with three consecutive days of diurnal tests. This shortens the test by 12 hours and avoids the breakthrough problem and related SHED purge steps discussed above. We recommend that this alternative approach be considered in the 15-day changes.

In conclusion, MECA commends ARB for taking important steps to reduce evaporative emissions from spark-ignited marine watercraft by proposing more stringent regulations than those set forth by the U.S. EPA's 2008 rule for gasoline-fueled SIMW for engines greater than 30 kW. Evaporative emission control technologies that have proven track record on on-road vehicles can readily be transferred to SIMW. MECA believes that implementation of these evaporative emission control technologies on spark-ignited marine watercraft will help California to achieve its goal of meeting its ozone NAAQS. Our industry is prepared to do its part and deliver cost-effective, advanced evaporative emission control technologies to the marine market.

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