Steel — the Preferred Material for PZEV

Automakers around the world agree that the impermeable nature of steel and its durability, coupled with its proven performance in design, manufacturing and recycling, make steel the preferred material for fuel tanks capable of meeting stringent evaporative emission standards.

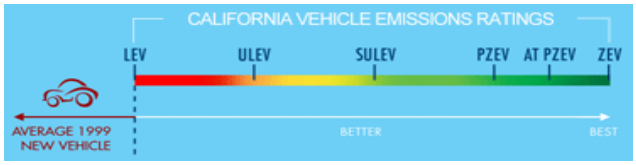
PZEV = Partial Zero-Emissions Vehicle

A Partial Zero Emissions Vehicle (PZEV) is an administrative category within the U.S. state of California for low emission vehicles. This vehicle category was created by the California Air Resources Board (CARB). The vehicles constructed to meet the PZEV requirements also meet the Super Ultra Low Emission Vehicle (SULEV) standard for tailpipe emissions. Various techniques are used to reduce pollution in these vehicles. Thus, to qualify as a PZEV, a vehicle must meet the SULEV standard and, in addition, have **evaporative emissions less than 0.35g/day. Additionally, the fuel system alone must meet a maximum of 0.054g/day evaporative emissions plus an extended (15-year/150,000-mile) warranty on its emission-control components**.

High-density polyethylene (HDPE) has been the resin of choice for plastic gas tanks since they were introduced in Europe in the 1980s. Monolayer-HDPE tanks offer long-term structural integrity but will not meet stringent permeation requirements, and hence, in North America are used only for diesel engines because diesel fuel does not evaporate.

For gasoline engines in North America, multilayer HDPE tanks are widely used to control evaporative emissions by incorporating a film of ethylene-vinyl alcohol (EVOH) as one of the layers. However, the conventional multilayer plastic tanks do not meet the very stringent evaporative emissions required for PZEV certification. Accordingly, plastic tank manufacturers are developing various additional approaches for reducing evaporative emissions to meet PZEV requirements.

Thus, although the improved HDPE multi-layer plastic tanks can meet the PZEV requirements, plastic tank producers are dialing in more cost into their tanks. Also, rising oil prices are likely to increase the price of plastic tanks, which can only increase the competitiveness of steel tanks further.



ZEV

Zero Emission Vehicles have zero tailpipe emissions and are 98% cleaner than the average new model year vehicle.

AT PZEV

Advanced Technology PZEVs meet SULEV tailpipe emission standards, have a 15-year / 150,000 mile warranty, have zero evaporative emissions and include advanced technology components. For example, a plug-in hybrid or a compressed natural gas vehicle would qualify in this category.

PZEV

Partial Zero Emission Vehicles meet SULEV tailpipe emission standards, have a 15-year / 150,000 mile warranty and have zero evaporative emissions.

SULEV

Super Ultra Low Emission Vehicles are 90 percent cleaner than the average new model year vehicle.

ULEV

Ultra Low Emission Vehicles are 50 percent cleaner than the average new model year vehicle.

LEV

Low Emission Vehicles are the least stringent emission standard for all new cars sold in California in 2004 and beyond.

[Source: www.driveclean.ca.gov]

Steel tanks are the material of choice to meet the PZEV standards, and virtually all of the PZEV fuel tanks for California service are steel (Table 1).

Table 1 -- 2007 PZEV Rated Vehicles and Fuel Tank Material (July 2006)

Identified Current PZEV Vehicle List and Fuel Tank Materials (July 2006)			
OEM	**Vehicle**	**Steel**	**Plastic**
BMW	325i	√	
Ford	Focus Escape/Mariner Fusion/Milan	√ √ √	
Honda	Accord Civic	√	 √
Hyundai	Elantra	√	
Mazda	Mazda 3 Mazda 6 Tribute	√ √ √	
Mercedes-Benz	E350	√	
Mitsubishi	Galant	√	
Nissan	Altima	√	
Subaru	Legacy Outback	√ √	
Toyota	Prius Camry	√ √	
Volkswagen	Jetta		√
Volvo	V70/S60	√	

[Source: The ITB Group, Ltd.]

Steel Technology

Steel successfully addresses the permeability and affordability issues. Advances in materials, such as highly formable steels that allow for greater flexibility in the forming of complex shapes, and improved corrosion-resistance make steel attractive for fuel tanks. These materials, coupled with leading edge processes, including 3threedimensional welding and hydroforming, enable the steel tank industry to continue to provide affordable, durable and environmentally sound products for its customers. The following benefits apply to steel:

- Helps Meet the CARB Emission Standards
- Durable
- Cost Competitive
- 100 Percent Recyclable
- Improved Design Flexibility
- New Forming / Welding Technology
- More Volume / Capacity
- Resistant to Hot Exhaust Gases
- Provides Thermal Stability
- Resists Gasoline Permeation
- Reduces Heat Build-up

California's Clean Cars Law Now Applies to One-Third of the North American Market

When California takes action, the impact is felt around the country. In 2002, California was the first state to limit global warming pollution from cars (both exhaust and evaporative emissions). The standards will reduce emissions from new vehicles by approximately 30% by 2016, while also saving California consumers more than $4 billion by 2020. Today, ten other states and Canada have followed California's lead. So California's standards now apply to more than one-third of the North American car market. According to California's estimates, these programs will reduce global warming emissions in 2020 by more than 64 million tons of carbon dioxide per year, an amount greater than the national emissions of more than 100 countries.

The Air Resources Board (ARB) of California estimates that about 507,000 PZEV vehicles are on the roads today in California. PZEV is the largest category of California's vehicle emissions rating system. As more states adopt the California ARB requirements, it is likely that PZEV vehicles will increase dramatically and steel fuel tanks will be the preferred approach for meeting the very low evaporative emissions required. The increase in steel fuel tanks for PZEV vehicles will be underscored by steel's suitability for newer, alternative fuels such as flex and bio-diesel fuels.