



Backgrounder

OUTBOARD ENGINE TECHNOLOGIES AND EMISSIONS LEGISLATION

Two-Stroke versus Four-Stroke Emission Facts

There has been a long-standing argument in the engine industry debating the advantages of four-stroke technology versus two-stroke technology. In the outboard engine industry, Evinrude E-TEC direct fuel injection two-stroke technology has won that argument. Since the debate centers around the cleanliness of the engines, it's important to point to the facts about emissions regulations.

Outboard engine emissions legislation is regulated by three governing agencies; the U.S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB), and the European Union (EU). The legislation enacted by the U.S. Environmental Protection Agency (EPA) and the European Union (EU) Recreational Craft Directive as well as the California Air Resource Board (CARB), regulate emissions, not outboard engine technologies, and manufacturers, not consumers. **There is nothing in the EPA or EU outboard emissions legislation that will ban the use of any outboard motor on the waterways.** Following is a summary of those agencies' regulation standards.

- **EPA legislation**

All technologies including carbureted and electronic fuel injection (EFI) two-strokes, can be sold past 2006 as long as the manufacturer's corporate average will be within the maximum limit.

- **CARB legislation**

Only engines in compliance with CARB 1-Star (as of 2001), 2-Star (as of 2004) and 3-Star (as of 2008) limits can be sold.

Only HC + NOx are regulated. CO is reported, but not regulated.

- **EU legislation**

Only engines in compliance with specific emission limits set can be sold past December 31, 2005 (four-strokes) and past December 31, 2006 (two-strokes).

Separate levels for HC, NOx, and CO are regulated.

The complete line of Evinrude E-TEC outboards are designed to be cleaner running engines, and the entire lineup complies with all three governing agencies' stringent emissions standards. In fact, both the EPA and CARB have acknowledged E-TEC's advancements in outboard engine emissions and the benefit they bring to the environment.

With the industry's best ultra-low emissions rating, Evinrude E-TEC engines produce fewer emissions than any outboard engine in the world. Here is how BRP made it possible;

- The oil in an E-TEC outboard is completely combusted in the cylinder the same way as fuel and is already accounted for in its 3-Star emission rating. Unlike four-stroke oil, specially blended TCW3 oil is designed for complete combustion, preventing any oil from escaping into the environment. Unlike four-stroke engines that need to dispose of used oil, E-TEC engines will never have oil to dispose into the environment.
- Thanks to Evinrude E-TEC exclusive stratified combustion, which uses far less fuel at low rpm engine speeds, and the precise control of direct injected fuel, tests show that E-TEC engines get better fuel economy than the same horsepower four-stroke model. Some engine manufacturers only show fuel economy at the engine's "sweet spot", which doesn't account for the entire operating range of the motor.
- Evinrude E-TEC engines are consistently lower in total reportable emissions than virtually all four-stroke engines. In addition, E-TEC engines produce dramatically lower carbon monoxide emissions for a cleaner, safer boating environment.
- According to the Southwest Research Institute, a government-approved emissions testing lab, a competitor's 115 hp four-stroke outboard engine consumed 4.9 quarts of oil in 100 hours of testing. The oil capacity of the engine is only 4.8 quarts.

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