Marine Spark-Ignition Engines and Vehicles: Exhaust Emission Standards

	Engine Type		Model Year	HC + NOx [a] (g/KW-hr)		CO [C] (g/KW-hr)		Useful Life (hours/years) [d]	Warranty Period (hours/years) [d]
				P ≤ 4.3 kW [b]	P > 4.3 kW [b]	P ≤ 4.3 kW [b]	P > 4.3 kW [b]		
Federal [e]	Personal Watercraft & Outboard Marine Engines		1998	278 [ABT]	(0.917 x (151 + 557/P $^{0.9}$ + 2.44) [ABT]	-	-	350 / 5	All Emission-Related Components: 1 year [f]
			1999	253 [ABT]	(0.833 x (151 + 557/P $^{0.9}$ + 2.89) [ABT]	-	-		
			2000	228 [ABT]	(0.750 x (151 + 557/P $^{0.9}$) + 3.33 [ABT]	-	-		
			2001	204 [ABT]	(0.667 x (151 + 557/P $^{0.9}$) + 3.78 [ABT]	-	-		All Emission-Related Components: 1 year Specified Major Emission Control Components: 200 / 3
			2002	179 [ABT]	(0.583 x (151 + 557/P $^{0.9}$) + 4.22 [ABT]	-	-		
			2003	155 [ABT]	(0.500 x (151 + 557/P $^{0.9}$) + 4.67 [ABT]	-	-		
			2004	130 [ABT]	(0.417 x (151 + 557/P $^{0.9}$) + 5.11 [ABT]	-	-		All Emission-Related Components: 200 / 2 Specified Major Emission Control Components: 200 / 3
			2005	105 [ABT]	(0.333 x (151 + 557/P $^{0.9}$) + 5.56 [ABT]	-	-		
			2006-2009	81 [ABT]	(0.250 x (151 + 557/P $^{0.9}$) + 6.00 [ABT]	-	-		
			2010 + [g]	30.0 [ABT]	2.1 + 0.09 x (151 + 557/P $^{0.9}$) [ABT]	500 - 5.0 x P	300	Personal Watercraft: 350 / 5 [h] Outboard: 350 / 10 [h]	Personal Watercraft: 175 hours or 30 months Outboard Engines: 175 / 5
	Sterndrive / Inboard Engines	Conventional Engines [g]	2010 +	5.0 [ABT]		75.0 [ABT]		480 / 10 [i]	Electrical & Mechanical Components: 480/3
		High-Performance Engines		P ≤ kW [b]	P > 485 kW [b]	350		P ≤ 485 kW: 150 / 3 P > 485 kW: 50 / 1	Electrical Components: 480 / 3 Mechanical Components: P ≤ 485 kW: 150 / 3 P > 485 kW: 50 / 1
			2010	20.0	25.0				
			2011+	16.0	22.0				

Notes on following page.

Notes:

a The numerical emission standards for hydrocarbons (HC) must be met based on the following types of HC emissions for engines powered by the following fuels: (1) total hydrocarbon equivalent for alcohol; (2) non-methane hydrocarbon for natural gas; and (3) total hydrocarbons for other fuels.

b P stands for the maximum engine power in kilowatts.

c Manufacturers may generate or use emission credits for averaging, but not for banking or trading.

d Useful life and warranty period are expressed hours or years of operation (unless otherwise indicated), whichever comes first.

e The test procedure for federal standards uses the International Organization for Standardization (ISO) 8178 E4 5-Mode Steady-State Test Cycle.

f Also applies to model year (MY) 1997 engine families certified pursuant to 40 Code of Federal Regulations (CFR) 91.205.

g Not-to-exceed emission standards specified in 40 CFR 1045.107 also apply.

h A longer useful life in terms of hours must be specified for the engine family if the average service life is longer than the minimum value as described in 40 CFR 1045.103(e)(3).

i The useful life may not be shorter than: (1) 150 hours of operation; (2) the recommended overhaul interval; or (3) the engine›s mechanical warranty. A longer useful life must be specified in terms of hours if the average service life is longer than the minimum value as described in 40 CFR 1045.105(e)(3).

Code of Federal Regulations (CFR) Citations:

- 40 CFR 91.104 = Outboard and personal watercraft (PWC) exhaust emission standards (1998-2009)
- 40 CFR 91.105 = Outboard and PWC useful life (1998-2009)
- 40 CFR 91.1203 = Warranty period (1998-2009)
- 40 CFR 1045.103 = Outboard and PWC exhaust emission standards (2010+)
- 40 CFR 1045.105 = Sterndrive/Inboard exhaust emission standards
- 40 CFR 1045.107 = Not-to-exceed exhaust emission standards
- 40 CFR 1045.120 = Warranty requirements (2010+)