



TWO-STROKE

OUTBOARD MOTORS • CHAINSAWS • SNOWMOBILES • WEED EATERS

Two- and Four- Stroke Engine Applications and Lubrication Needs

Two-stroke and four-stroke engines are designed differently and operate under different conditions, requiring different lubrication methods.

Internal combustion engines are used to produce mechanical power from the chemical energy contained in hydrocarbon fuels. The power-producing part of the engine's operating cycle starts inside the engine's cylinders with a compression process. Following compression, the burning of the fuel-air mixture releases the fuel's chemical energy and produces high-temperature, high-pressure combustion products. These gases expand within each cylinder and transfer work to the piston, producing mechanical power to operate the engine.

Each upward or downward movement of the piston is called a stroke, and the two commonly used internal combustion engine cycles are the two-stroke cycle and the four-stroke cycle. The terms "two-cycle" and "two-stroke," as well as "four-cycle" and "four-stroke," are often interchanged.

Two-Stroke and Four-Stroke Differences

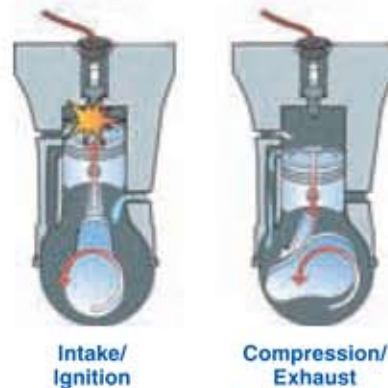
The fundamental difference between two-stroke and four-stroke engines is in their gas exchange process, or more simply, the removal of the burned gases at the end of each expansion process and the introduction of a fresh mixture for the next cycle. A two-stroke engine has an expansion, or power stroke, in each cylinder during each revolution of the crankshaft. The exhaust and the charging processes occur simultaneously as

the piston moves through its lowest or bottom center position.

In a four-stroke engine, the burned gases are first displaced by the piston during an upward stroke, and a fresh charge enters the cylinder during the following downward stroke.

Four-stroke engines require two complete turns of the crankshaft to make a power stroke, compared to the single turn necessary in a two-stroke engine. Two-stroke engines operate on 360° of crankshaft rotation, whereas four-stroke engines operate on 720° of crankshaft rotation.

Combustion cycle of a two-stroke gasoline engine



Intake/
Ignition

Compression/
Exhaust

FOUR-STROKE

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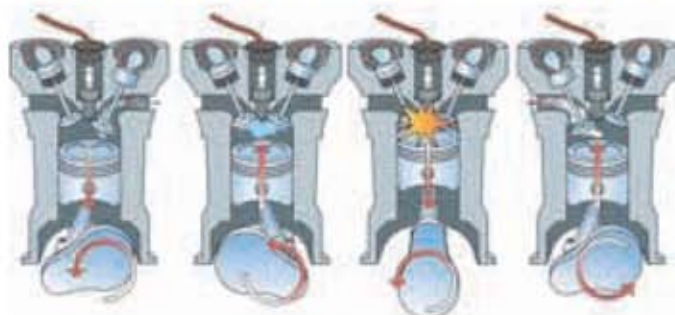
Applications

Two-stroke engines are generally less expensive to build compared to four-stroke engines, and they are lighter and can produce a higher power-to-weight ratio. For these reasons, two-stroke engines are ideal in applications such as chain-saws, weed eaters, outboard motors, off-road motorcycles and racing applications. Due in part to their design and lack of an oil sump, two-stroke engines are also easier to start in cold temperatures, making them ideal for use in snowmobiles.

Four-Stroke Lubrication

Four-stroke engines are lubricated by oil held in an oil sump. The oil is distributed through the engine by splash lubrication or a pressurized lubrication pump system; these systems may be used alone or together.

Combustion cycle of a four-stroke gasoline engine



Intake

Compression

Power

Exhaust

Splash lubrication is achieved by partly submerging the crankshaft in the oil sump. The momentum of the rotating crankshaft splashes oil to other engine components such as the cam lobes, wrist pins and cylinder walls.

Pressurized lubrication uses an oil pump to provide a pressurized film of lubricant between moving parts such as the main bearings, rod bearings and cam bearings. It also pumps oil to the engine's valve guides and rocker arms.

Two-Stroke Lubrication

Two-stroke engines collect some oil beneath the crankshaft; however, two-stroke engines employ a total-loss lubrication system that combines oil and fuel to provide both energy and engine lubrication. The oil and fuel are combined in the cylinder's intake tract and lubricate critical components such as the crankshaft, connecting rods and cylinder walls.

Oil-injected two-stroke engines inject the oil directly into the engine, where it mixes with the fuel, while pre-mix two-stroke engines require a fuel-oil mixture that is combined before being installed in the fuel tank. In general, two-stroke engines are known to wear more quickly than four-stroke engines because they don't have a dedicated lubricant source; however, high-quality two-stroke oil significantly reduces engine wear.

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