

Glossary of Engine Terms

Aftertreatment system

Reduces exhaust, NOx and particulate emissions

Bar

Unit of pressure that is about the same as atmospheric pressure at sea level (Approximately 14.5 lbs per square inch)

Camshaft

Shaft that is moved by the crankshaft with two or more offset cams (lobes) that operate the valves

Combustion

Process in which a substance reacts with oxygen to give heat and light (burning)

Compression

Phase in the working of an internal combustion engine where a combination of fuel and air is compressed in a cylinder before being ignited

Crank/crankshaft

Rod that spins and drives a piston movement in the cylinder

Crank angle

Angle that can be measured between the crankshaft and top dead center

Cylinder

Central working part of a reciprocating (or piston) engine, the space through which a piston travels

Exhaust

Gases ejected from an engine as waste products

Flame speed

Fuel's ability to undergo controlled combustion without detonation. Flame speed can be used as a measure of efficiency

Fuel injection

System for mixing fuel with air. Fuel injection atomizes the fuel by forcibly pumping it through a small nozzle under high pressure

Jake Brake (compression release engine brakes)

A trademark for engine brakes developed/manufactured by Jacobs Vehicle Systems. A braking system that modifies engine valve operation, using engine compression to slow the vehicle. Primarily used on semi-trucks or other large vehicles. Known for being extremely loud

Knock

A phenomenon that occurs when combustion starts off correctly, but one or more pockets of air/fuel mixture explode outside the envelope of the normal combustion front. This causes timing to be thrown off, creating a shock wave that makes a pinging sound and increases cylinder pressure dramatically. The effect of engine knock ranges from inconsequential to completely destructive

Miller cycle

A combustion process for the four stroke internal combustion engine first used by Ralph Miller in the 1940s. The intake valve is left open longer than it would be in an Otto cycle engine. In effect, the compression stroke is two discrete cycles: the initial portion when the intake valve is open and final portion when the intake valve is closed

Miller effect

The effect of the Miller cycle: A lower final charge temperature allowing ignition timing to be advanced beyond what is normally allowed before the onset of detonation. The result is an increase in overall efficiency and a reduction of NOx emissions

Inlet valve

One way valve that allows air into a compressor

Naturally aspirated

An internal combustion engine devoid of forced induction methods

NOx

A chemical term for nitrogen oxides produced during combustion and a contributor to smog and acid rain

Otto cycle

A four stroke cycle for internal combustion engines: (1) suction of gas/air into the firing cylinder (2) compression, ignition, explosion (3) expansion of gasses (4) expulsion of the products of combustion from the cylinder. Invented by Beau de Rochas in 1862 and applied by Dr. Otto in 1877 in the Otto-Crossley gas engine, the first commercially successful internal combustion engine

Outlet valve (exhaust valve)

One way valve that allows compressed air out of a compressor

Piston

Rod inside a cylinder that is moved by pneumatic pressure

Poppet

Valve mechanism that continually opens and closes in response to variations in pressure

Poppet valve

Pneumatic control valve that redirects the flow of gas when actuated

Power

The rate which work is performed or energy is transmitted, or the amount of energy required or expended for a given unit of time

Power curve

Graphical representation of the changing relationship between speed and revolutions per minute (RPM)

Pressure volume (PV) curve

Pressure volume curve - a graphical representation of the changing relationship between pressure and volume in the cylinder during engine cycles. A PV curve or diagram shows the impact of early or late ignition timing on peak cylinder pressure

Regenerative braking

Regenerative braking (seen in hybrid vehicles) takes energy normally wasted during braking and turns it into usable energy. This energy is saved in a storage battery and used to power the motor whenever the vehicle is in electric mode

Spark plug

Electrical device that fits into the cylinder head of some internal combustion engines and ignites compressed aerosol gasoline by means of an electric spark

Split cycle engine

A type of internal combustion engine that divides four cylinder strokes between two paired cylinders: one for intake/compression and another for power/exhaust

Supercharger

Air compressor used for forced induction of an internal combustion engine. The greater mass flow-rate provides more oxygen to support combustion than would be available in a naturally-aspirated engine, which allows more fuel to be provided and more work to be done per cycle, increasing power output

Thermal efficiency

Ratio of engine work to heat energy of consumed fuel

Thermodynamics

The study of relationship between thermal energy (heat) and all other forms of energy (i.e. mechanical, electrical)

Top dead center, after top dead center

The position of a piston that is farthest from the crankshaft (at its highest point). The Scuderi Engine fires after top dead center, meaning the piston has just begun moving toward the crankshaft

Turbocharger

Air compressor used for forced induction of an internal combustion engine. Like a supercharger, it serves to increase the mass of air entering the engine to create more power. However, a turbocharger differs in that the compressor is powered by a turbine driven by the engine's own exhaust gases

Volumetric efficiency

Ratio of fuel and air entering the cylinder to the capacity of the cylinder under static conditions