

Split-cycle engine now more efficient than traditional combustion engine (w/ Video)

January 24 2011, by Lin Edwards



Engine Prototype. Image: Scuderi Group

(PhysOrg.com) -- Split-cycle engines have been around for some time but until now have never matched the fuel efficiency of traditional internal combustion engines. That is about to change, with the latest split-cycle engines from the Scuderi Group offering greater fuel efficiency and up to 80 percent reduction in NO_x emissions and 50 percent reduction in CO_2 .

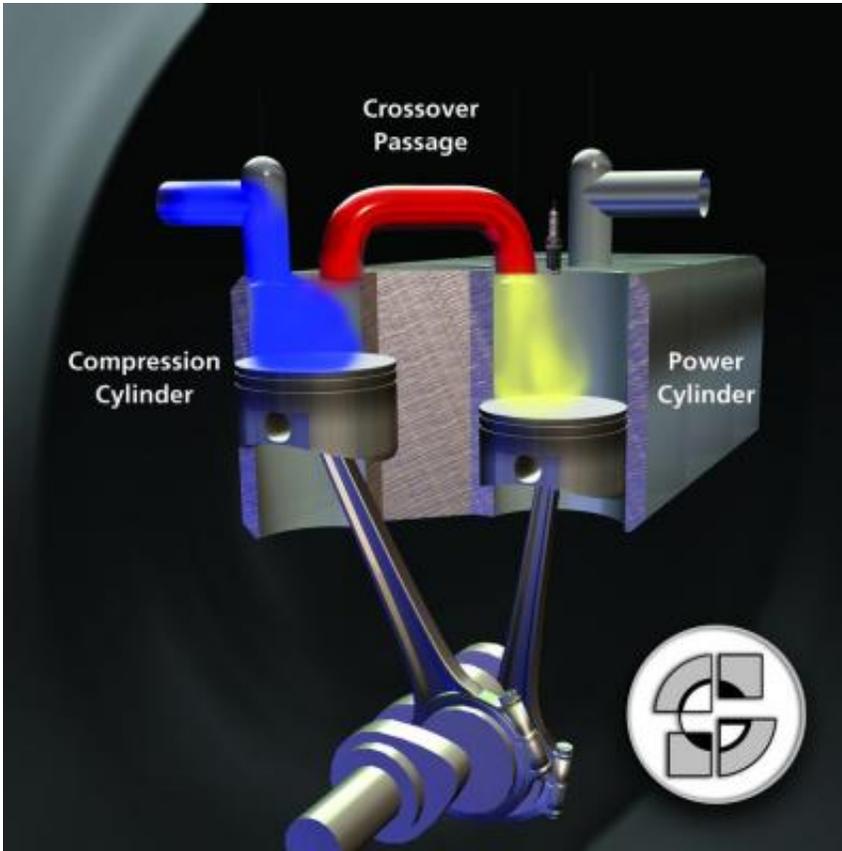
Split-cycle engines feature paired cylinders, so a four-cylinder engine

has two sets of paired cylinders working together, with a crossover passage linking the two cylinders in each pair to each other. The four strokes of the engine are split into two groups, with the left cylinder handling intake and compression and the second handling combustion and exhaust. The Scuderi™ Air-Hybrid design adds an air storage tank and controls that allow it to recapture and store the energy lost as the engine operates.

The new design solves some of the problems that have hampered previous split-cycle designs. The low volume breathing problem is solved by outward-opening pneumatic valves and a reduction in the clearance between the piston and cylinder head to under 1 mm, which means virtually 100 percent of the compressed air is pushed out of the cylinder.

The thermal efficiency problem of previous designs has been solved by adopting After Top Dead Center (ATDC) firing, which avoids losses caused by recompressing the gas. Firing ATDC is achieved by high pressure air entering the cylinder and resulting in massive turbulence. Firing ATDC is a cleaner burn that also dramatically reduces NOx emissions and improves [fuel efficiency](#).

The Southwest Research Institute (SwRI) has been testing a 1-liter, two-cylinder engine for almost a year. The preliminary results suggest a 30-36 percent increase in fuel efficiency for the naturally aspirated Scuderi™ Air-Hybrid and a 25 percent increase for the base model. The test engine generates 135 horsepower at 6,000 RPM, which is similar to results of bigger and more fuel-hungry cars.



Split Cycle Engine. Image: Scuderi Group

Scuderi president Sal Scuderi, son of the inventor Carmelo Scuderi who died in 2002, said he expected efficiencies should improve still further as the designs are fine-tuned and new simulations are run with the engines in different vehicles.

The Scuderi [engine](#) can be built using conventional parts and minimal re-tooling is necessary, which makes it easier for manufacturers to adopt it. Scuderi says the technology should be licensed and on the road within three years.

The US government is introducing fuel economy rules to force manufacturers to produce more fuel-efficient vehicles, and this may

make the adoption of alternatives such as the Scuderi engines more attractive.

More information: www.scuderigroup.com/our-engines/

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