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I am a Mechanical Engineer specializing in Thermal Power Systems and have worked in and supervised the research, testing, design, maintenance and development of Internal Combustion Engines (ICE) and their components for over 30 years. I have also researched and taught ICE, Pollution Control and Energy Conversion (EC) during that span of years. I am past President of the National Society of Inventors and have an active interest in energy conversion systems, especially Internal Combustion Engines.

Mr. George J. Coates, President of Coates International, Ltd. invited me to his research & development facility to examine, review and evaluate engine systems having the Coates Rotary Valve System. I visited his plant a number of times, the last time being June 28, 2006.

During my first visit, September 25, 1998, I rode in three cars having Coates Rotary Valve engine systems. The engines performed smoothly and quietly and had exceptionally good acceleration.. There was no perceptible combustion knock or valve clatter.

I was shown a Coates Rotary Valve system disassembled for a 30,000-mile inspection. The system showed evidence of use in a combustion system but showed no discernable wear, scuffing or scratches. I expect the conventional piston and the piston rings will have a much greater limiting effect on the life of the engine than the Coates Rotary Valve System.

I also observed a number of other rotary valve applications in various stages of progress, including a motorcycle and racing car.

During my visit of June 28, 2006, 1 arrived at approximately 12 noon, and was introduced to the Coates latest development of an alternate-fuel 855 CI generator engine running on natural gas, which is capable of utilizing mixtures o£ hydrogen, natural gas, alcohol, diesel fuel, and/or gasoline. The engine was run under various loads, and its performance noted by George Coates, Mark Goldsmith, and myself.

The engine demonstrated its capability to utilize alternate fuels and air mixtures. The engine makes use of the unique Coates Rotary Shaft to phase in the various fuel and air mixtures.

The engine fuel flexibility lends itself to the current world situation wherein fuel-use flexibility is necessary in response to availability and costs.

TEST DATE JANUARY 3, 2003

On the first preliminary tests carried out on an electric power generator incorporating the 855 Natural Gas Coates CSRV Engine, it passed the EPA emission standards with a savings in fuel consumption of more than 35%.

TEST DATE FEBRUARY 27, 1995

A and B Tests were carried out by Compliance and Research Services, an independent EPA approved testing laboratory, showing the CSRV superior performance and lower emissions than the conventional poppet valve engine in hydro carbons (HC), carbon monoxide (C.O..), nitrous oxides (NOX), and (C02) and fuel savings.

A test carried out on a chassis dynamometer by Compliance and Research Services on a 351 Ford Windsor V8 engine equipped with the Coates CSRV System showed almost double the output of torque and horsepower at 3200 RPM. The conventional poppet valve version put out 139 H.P. and 278 ft. pounds of torque at 1400 RPM. The CSRV put out 460.4 ft. pounds of torque, and 280.6 H.P. and at 3704 RPM. The CSRV put out 471.2 ft. of torque and 332.3 H.P.

TEST DATE MARCH 24, 2003

Test by Compliance and Research Services - The CSRV 1600 motorcycle has passed EPA emission standards by 50%, and fuel economy 40 MPG.

I was also shown the latest Coates Motorcycle production units. They are capable of going up to 130 mph in response to the fuel demands of economy and versatility. The model as shown had neat attractive lines capable of competing successfully with foreign competition.

Opinion

While there have been other rotating valve systems, none have been successfully applied to internal combustion engines until now.

The Coates Rotary Valve System promises:

1. A quieter engine with higher specific power output (horsepower output/pound) and longer life than conventional poppet valve engines due to better "breathing" capability and higher speed capability.
2. The use of smaller, lighter and more efficient engines.
3. High temperature permanently lubricated exhaust and intake spherical valve assemblies.
4. Elimination of oil flow needed to cool the conventional exhaust poppet valve stem, cams, cam followers, camshaft bearings and assemblies and intake poppet valve assemblies; thereby eliminating contamination of the lube oil and atmospheric pollution from this source.

5. Flexibility in optimizing performance over a wide range of applications.
6. The prototype for the next generation of state-of-the-art ICE technology.

SUMMATION

In summation, I believe that the Coates CSRV Combustion Engine will substantially outperform the conventional poppet valve engines and the micro turbines in the following categories:

- A significant reduction in harmful emissions
- A reduction in fuel consumption while maintaining consistent power output
- Higher density power output resulting from complete combustion
- I predicate my findings on the utilization of higher compression ratios and higher volumetric efficiencies of the CSRV Valve System and the reduction in frictional losses versus the reciprocating spring-loaded components as in all conventional poppet valve engines.

THE CSRV VERSUS THE POPPET VALVE

Coates Spherical Rotary Valve	
The CSRV has a rotational motion, and requires no adjustments.	The poppet valve reciprocates in its working motion, which means it must stop at the top and stop at the bottom in mile-seconds of its working cycle. This causes component wearing out of adjustment.
The CSRV System has no possibility of float or bounce and is positively closed and positively opened and its motion is completely silent.	When it comes to rest at closing at approximately 2500RPM, it bounces on its seat. This is called bounce or float where the poppet valve is never fully closed and never fully opened. This causes tapping engine noise, inefficiency in fuel consumption, and adds un-burned fuel to the atmosphere creating high pollution.
The CSRV is not lubricated with engine oil. Its bearings are sealed and do not require lube oil. The valves themselves do not require lubrication, therefore, do not emit engine oil burning pollutants into the atmosphere. The CSRV reduces emissions by creating a cleaner complete combustion.	The poppet valve is lubricated with engine oil, which is sprayed over the entire valve system to cool and lubricate its components. Engine oil is inducted through the inlet poppet valve stem into the combustion chamber and is burned with the fuel It slows down the burning of the fuel mixture, and causes inefficiency in the complete combustion cycle.

THE CSRV VERSUS THE POPPET VALVE

Coates Spherical Rotary Valve

The CSRV exhaust valves do not utilize engine oil for its lubrication. All its bearings are sealed and there is no contamination of engine oil into the air and fuel mixture and no clogging of the catalytic converter while reducing pollution to our atmosphere. There is no break-down in the atomic structure of the engine oil and does not lower its viscosity.

The exhaust poppet valve is also cooled and lubricated with engine oil and reaches extremely high temperatures, which breaks down the atomic structure of the engine oil which lowers its viscosity. Engine oil must be changed every 3,000 to 5,000 miles. It is also lubricated at stem and when opened, oil is burned off into the exhaust system causing clogging of catalytic more pollution into our atmosphere.

The CSRV has a volumetric efficiency of twice that of the poppet valve with a complete open port and no poppet valve in the center. CSRV permits complete free flow of air into the combustion chamber and cylinder throughout the acceleration curve. Only one CSRV is needed for inlet and one for exhaust. Air pumps, super chargers are not necessary, unless there is a factor or extreme speed is required. Normally aspirated inlet air speed is 450 ft. per second good to 350 to 400 MPH, higher than that would require blowers.

The poppet valves have a limited capacity of volumetric efficiency because they inhibit the free flow of air into the combustion chamber and cylinder and causes pulsation of airflow mixture throughout the acceleration curve. That is why manufacturers incorporate 3, 4, and 5 poppet valves per cylinder, also adding air pumps, super chargers, turbos, etc.

The CSRV is free rotating with less than 90% of the friction losses that

All these poppet valves are spring loaded with very strong springs and

THE CSRV VERSUS THE POPPET VALVE

Coates Spherical Rotary Valve

the poppet valve system has with all the springs, of which use is completely eliminated.

The CSRV has unlimited valve timing possibilities and no restrictions within the valve timing duration and no possibilities of making contact with the pistons, preventing major damage to the engine.

The CSRV rotates away from the chamber and is moving constantly, which eliminates the possibilities of hot spots, and reduces the constant temperature of the combustion chamber. This reduces NOX, nitrous oxides, HC hydrocarbons, CO carbon monoxide.
Even though tetraethyl led is removed from fuel today, the CSRV can utilize higher compression ratios in its engine designs, which results in thermal efficiencies in the 40%. 50%. and possibly 60% range with significant reductions in fuel consumption, harmful emissions, and complete combustion.

sometimes double springs. This causes tremendous frictional losses and wear of components, which cannot be avoided while using poppet valves.

Valve timing is limited because the poppet valve opens into the combustion chamber and could make contact with the piston, where destruction of the engine occurs. This mostly happens on sport cars, racing cars and OHV engines or when a valve sticks, and on de-acceleration on engines with over 30,000 miles and more.

The poppet valve is in the combustion chamber permanently and the exhaust poppet valve gets, red hot, which causes hot spots, and at times, pre-ignition occurs, when the constant temperature of the combustion chamber exceeds 2,500°F. The engine manufactures NOX, oxides of nitrogen, and since tetraethyl led was removed from fuels, poppet valve engines cannot utilize higher compression ratios above 10 '/z to 1. This results in engine efficiency at only 22%. For every dollar worth of fuel you put into your vehicle, you get 22 cents of drivability, the other 78 cents is lost in heat, frictional

THE CSRV VERSUS THE POPPET VALVE

Coates Spherical Rotary Valve

	and pumping losses.
No maintenance, adjusting servicing is required to the CSRV for the life of the engine. No noise is caused by the CSRV System. No damage occurs to the engine.	Most poppet valve engines must have these valves adjusted manually every 5,000 miles when servicing intervals are due. This is downtime and costly, and if not done, will cause more excessive wear, noise and serious damage to the engine.
The CSRV will replace the poppet valve and eliminate all its problems.	The poppet valve is the main problem with the combustion engine which limits its efficiencies.
The CSRV System was invented and designed by George J. Coates. No other company has tried to improve on its design. It is fully patented worldwide. In the future, when it is in the main stream, no doubt people will try to improve it	Manufacturers have tried for more than 100 years with side valves, pushrod, overhead inlet poppet valves, and side exhaust valves, overhead camshafts, high lift camshafts, twin overhead camshafts,.air pumps, turbo chargers and the results in the 50s, 60s, 70s, were 29% thermal efficiencies and after the removal of lead, 22% thermal efficiencies today.
There are approximately 90% fewer parts in the CSRV System compared to conventional poppet valve systems and only two moving, easy to assemble, and relatively inexpensive parts per cylinder bank	There are literally hundreds and thousands of parts, springs, and components in the poppet valve system, most of which are

moving, are hard to assemble,
and are costly.

Sincerely,

Lawrence Schmerzler

Prof. Lawrence Schmerzler, P.E.

Sharon M. Dunn 6/28/06

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