CYCLONE ENGINE PROJECT

The Cyclone Engine is a proprietary design that is the property of Harry L. Schoell. The Cyclone Engine produces an environmentally friendly, multi-fuel, non-polluting exhaust, lightweight, vibration-free external combustion engine that requires no petroleum lubricants or water cooling, and produces no exhaust noise.

The cyclone engine has power applications for generator, automotive, industrial, marine, and commercial uses, and span horsepower ranges from less than 20 to several thousand. It is capable of constant or variable speeds with high torque from idle to full speed. Manufacturing costs are comparable with four stroke gas engines.

EXPECTATIONS: The goal of this project is to produce a lightweight, durable, highly efficient engine that will be cleaner, quieter, and more efficient than engines of comparable abilities that are now in use.

The attached pages explain the technical aspects of the project:

CYCLONE TECHNOLOGIES Attributes

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ATTRIBUTES OF THE CYCLONE ENGINE

A. HIGH EFFICIENCY;

The basic Rankin Cycle Steam Engine used to date has changed little since James Watt invented it over 150 years ago. Efficiency increases gained by raising temperatures and pressures peaked in the 1930's. The present philosophy is to pipe super-heated steam to the engine and thence to a condenser. Single tubes that carried sufficient surface area limited the pressures and temperatures achievable. These lower pressures and temperatures dictated a regime in which the water medium changed state between a liquid and a gas, making for a complicated control system. Though bulky and inefficient, these systems tended to be environmentally clean.

1. Heat regeneration — Most all of the heat rejection areas are transferred back into the heat section of the engine. **PROPRIATORY INFORMATION REMOVED**.

2. Super critical pressure, 3200 psi, used with 1,200°F temperature is normally used in high efficiency electrical power plants. They operate multi-tube generators for high efficiency turbines. Turbines normally have a poor efficiency in smaller engines. The cyclone engine is a piston engine with a special valve mechanism allowing it to operate at fluid pressures. The generator is **PROPRIATORY INFORMATION REMOVED**.

B. ENVIRONMENTALLY FRIENDLY

Environmental concerns have prompted costly, complex technological responses. Fuel cell technology is one example. The benefit of running on clean burning hydrogen is more than offset by the expense and bulk of the technology as well as the cost of creating, storing, and delivering fuel grade hydrogen. Clean running electric vehicles are limited to very short ranges, and still must be recharged by electricity from a coal, diesel, or nuclear-fueled power plant. Gas turbines are clean, but are constant speed engines. In small sizes, they are costly to build, run, and overhaul. Diesel and gas internal combustion engines are efficient, light, and cheap to manufacture, but they are very dirty and hazardous to our very health. Diesel, once thought to be clean, has been proven to be one of most toxic compounds known (*New Science, Oct. 25, 1997).*

"Diesel smoke is around 40 times as carcinogenic as cigarette smoke" and *"Research has indicated that life expectancy in large cities is reduced by around 15% by the inhalation of particulates . . ."*
Paper by Gong and Waring, "SAE Australia" May/June 1998.

These large diesel powered trucks are still needed for our livelihood. Gas powered cars have "catalytic converters that have so far failed to clean up air . . . converters only work

efficiently when car's engine has warmed up". . .Lots of stopping and starting - catalysts never get hot enough."

New Scientist" 1995 - Sept. 1996.

1. The cyclone engine utilizes external combustion where the fuel is burned in a controlled environment, similar to **PROPRIATORY INFORMATION REMOVED**.

2. The internal lubricant in the cyclone engine is the same as the working fluid - clean water. This is accomplished by using non-corrosive materials and **PROPRIATORY INFORMATION REMOVED**.

C. MULTI-FUEL CAPACITY.

Diesel and gasoline engines are fuel specific; neither can run on the other's fuel. Many gas engines even require a special octane. Electric vehicles require nearby receptacles for long recharging periods.

1. The cyclone engine can use almost any liquid fuel, kerosene, gasoline, diesel, alcohol, JP5 & 8 etc. Power produced would be predicated on the B.T.U. of the specific fuel. Trucks could burn gasoline mixed with diesel or whatever was the least expensive option at the time. Diesel in the United States is now more expensive than gasoline.

D. NO WATER COOLING

Trucks, cars, etc., require a separate system for cooling. Though the engine appears small, it has to have its parasites to operate. The cooling is from the air transferred to the water, and the heat loss blows by.

1. The cyclone engine uses outside, ambient air to condense **PROPRIATORY INFORMATION REMOVED**.

E. COMPACT SIZE

Normal Rankin Cycle Engines develop about half the horsepower and twice the weight of a normal gas engine. The generator, being a large separate unit, will occupy a space larger than a normal internal combustion engine of the same horsepower. The radiator capacity must be also three time larger.

1. The cyclone engine is a one-piece unit. High pressures allow the cubic capacity of the motor to be small for the horsepower. Gas engines generally are 1.5 cubic inch per horsepower, whereas the cyclone can be 3 horsepower per cubic inch. The Cyclone requires no separate radiator, transmission, or muffler.

F. NO TRANSMISSIONS

Internal combustion engines require multi-speed gears and high idle revolutions and a flywheel to carry over the torque.

1. The cyclone engine is self-starting. It has no throttle valve as in a standard steam engine. It operates **PROPRIATORY INFORMATION REMOVED**. After top dead center, the engine can develop full torque at starting. Two speed rear ends and over drives may be added.

G. NO VIBRATION / NO EXHAUST NOISE / CLEAN AIR EXAUST

Internal combustion engines have an explosion that emits sound waves out the exhaust valves to the atmosphere. It is necessary to install a muffler system 'downstream' of the exhaust manifold to contain some of this noise. A four-stroke engine is not inherently vibration free. The explosion between the piston and the head are balanced every other time of fire. A heavy flywheel and harmonic dampener is required to reduce these vibrations.

1. The cyclone engine does not exhaust its vapor explosions into the atmosphere, but into the **PROPRIATORY INFORMATION REMOVED** and is totally contained.

2. Vibration is not a problem as the crankshaft is counter weighted and the pulsations balanced in equal pressures. Being self-starting, it needs no flywheel.

H. MANUFACTURING COSTS COMPARABLE WITH FOUR-STROKE GAS ENGINES

Four-stroke engines are complicated in their valves — having a minimum of two valves or up to five valves per cylinder. These engines take up more space than a cyclone engine. The gas engine, in order to operate, needs more peripheral equipment such as water pumps, oil pumps, alternators, and distributors each with parasitic power losses.

1. The cyclone engine is smaller than a gas engine and has many fewer parts. However, the materials handling the high operating temperatures and pressures are more

expensive. On balance, the cost of manufacturing the Cyclone should be comparable to that of producing a conventional gasoline engine of comparable power output.

I. APPLICATIONS

1. Small electrical generators in the 6 kW - 10 kW output range. This would be the smallest practical scale of Cyclone engine. Being relatively light, compact, and clean running, this engine/generator package would be ideal for household, marine, and emergency applications.

2. Medium sized Cyclone of 100 horsepower to 300 horsepower. This would be ideal for passenger automobiles, light trucks, and small boats.

3. Large Cyclones from 400 to 1,000 horsepower. This engine would be targeting the Diesel truck, Motor home, Bus, and large Boat markets. These will run well because of the high torque of the cyclone engine, not to speak of the health/environmental benefits from operating zero pollution engines. Refrigeration units could be directly run off the small cyclone engines. Yachts and commercial craft would benefit greatly because of the lack of smoke and vibration in these engines from 400 to 1000 horsepower.

4. Larger yachts and stand-by generators, i.e. hospitals. The absence of vibration, noise, and smell will make this a very viable prospect - 1,000 horsepower to 2,000 horsepower.

5. Trains and large transports could work effectively as this system is quick to start-up and could drive axles through a worm gear, giving a simple traction engine at far less cost than a large diesel electric prime-mover. Applications from 2,000 horsepower to 5,000 horsepower.

J. ADDITIONAL INFORMATION:

Additional information may be made available under non-disclosure to interested qualified investors. Contact 954-788-5655