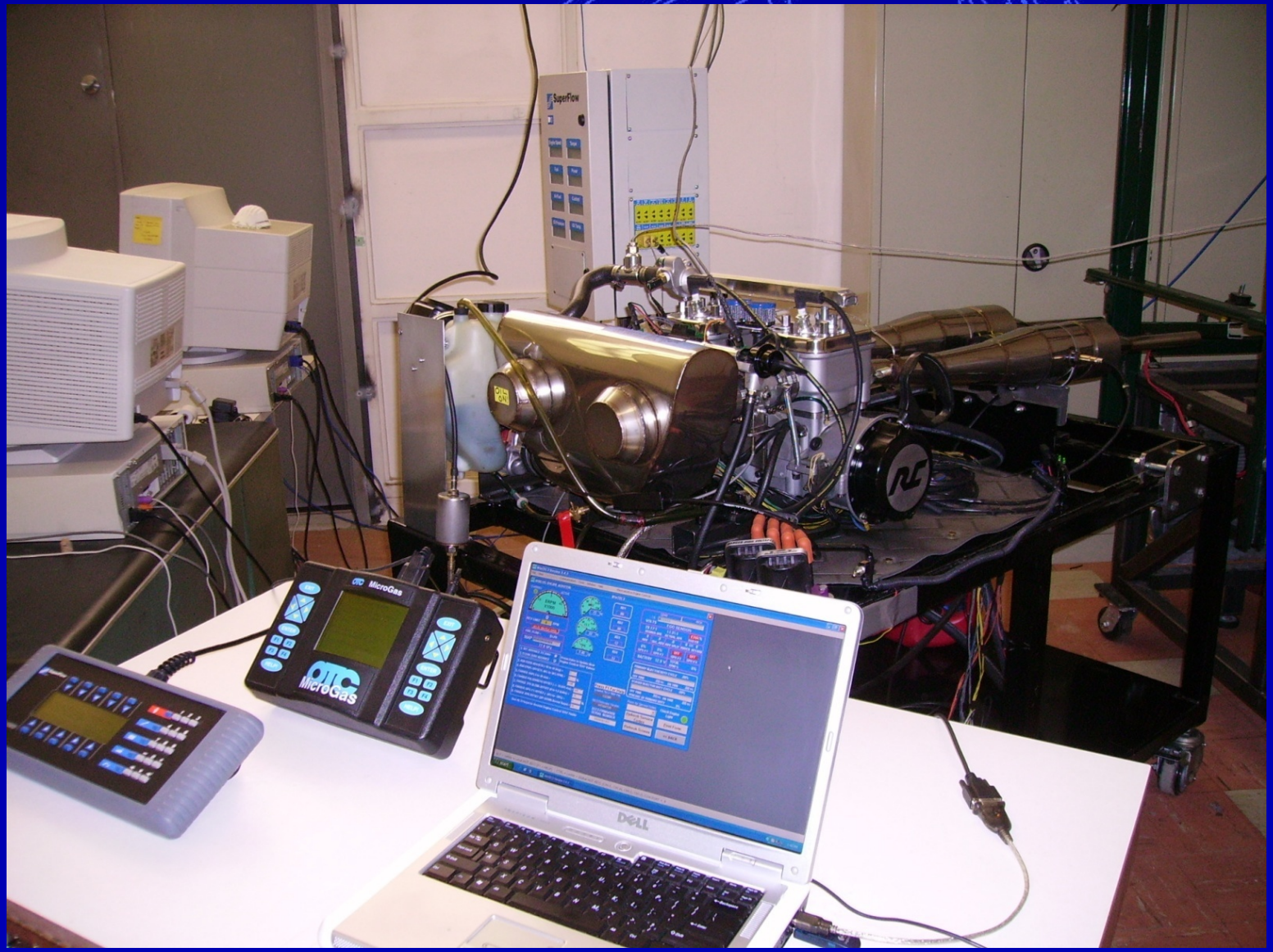
APT Case Supercharged Induction



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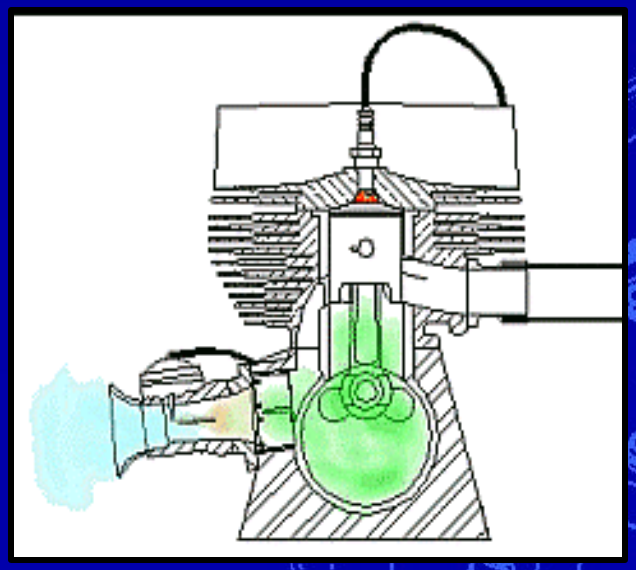

Primary induction (scavenging) in conventional two-cycle engines is accomplished by the piston as it travels upward in the cylinder bore, creating a vacuum in the crankcase.

Outside air, at atmospheric pressure, rushes in to fill the void. As the piston descends, it partially compresses the air/fuel mixture before transferring it through ports to the combustion chamber.

Crankcase induction requires the lubricating oil to either be mixed in with the fuel or injected directly into the crankcase or incoming air-stream.

APT Case Supercharged Induction

The consumption of oil through the combustion process, not the least being excessive visible emissions, has plagued two-cycle engines with numerous performance and economic disadvantages for years.

Some of which are:

- *Total oil-loss*
- *Spark plug fouling*
- *Piston ring sticking*
- *Lowered combustion temperatures*
- *Fuel dilution*
- *Oil dilution*

APT Case Supercharged Induction

Major emissions reductions can be achieved in two-cycle engines by abandoning traditional crankcase induction practices.

The heart of the CSI process is the incorporation of a specifically designed centrifugal impeller, contained within the crankcase, for the purpose of isolating the induction process from the lubricating oil.

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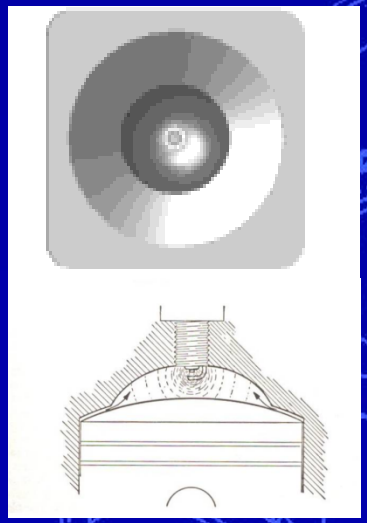
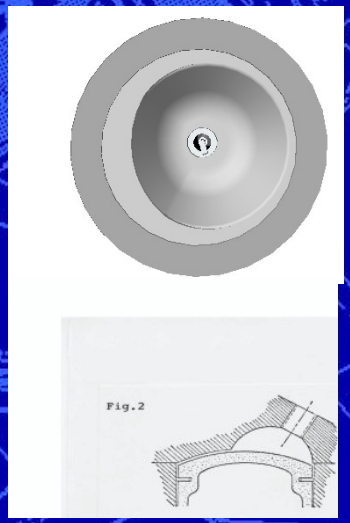


Traditional combustion Chamber

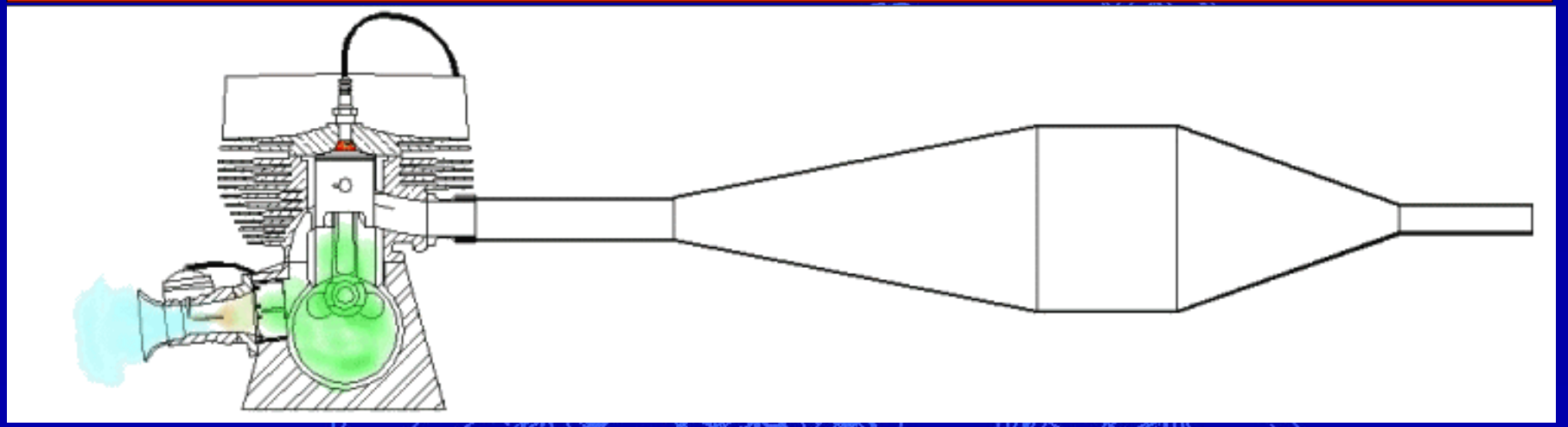


CSI lean-burn combustion chamber

Conventional crankcase induction , and the resulting oil consumption, has forced two-cycle engine manufacturers to develop combustion chambers designed more with an eye toward combating the effects of burning oil than aimed at achieving efficient and consistent cyclic combustion events.

Today this has left two-cycle engineers with a major impediment for any means of rapid integration of modern combustion technology.

APT Case Supercharged Induction

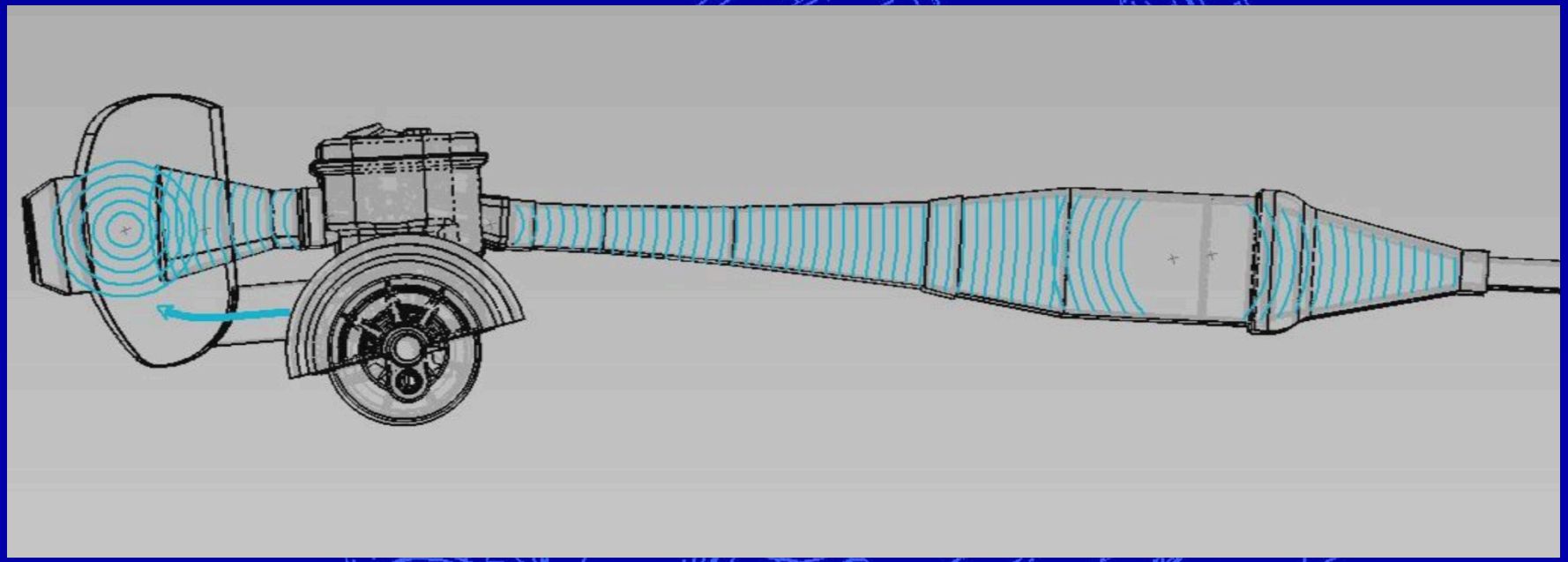


High speed high-RPM two strokes further overlay crankcase pumping by a combination of gas inertia, and to a much greater extent, pressure differentials created by acoustic resonances travelling throughout the exhaust tract.

Sonic supercharging is only effective within narrow exhaust temperature ranges and at specific engine speeds (RPMs).

Resulting in large amounts of unburned fuel and oil being released into the environment during these areas of inefficiency.

APT Case Supercharged Induction

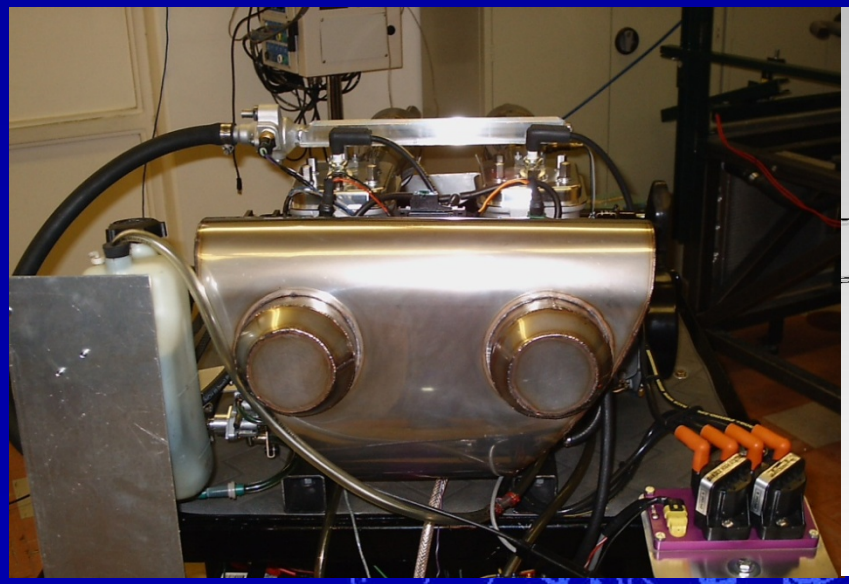


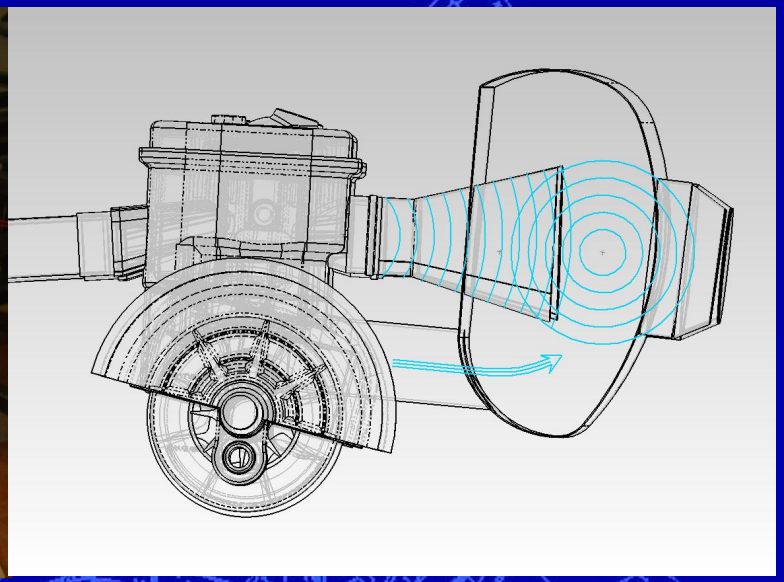
Efficient scavenging (induction) air-delivery rates in high speed two-cycle engines are made possible only by controlled acoustic activity.

It is possible to make a given intake timing work over a wide speed range by varying intake/exhaust tract length and/or volume.

Few realize that what permits the efficient high speed transfer of gases in a two-cycle engine is attributed to acoustic wave activity and inertia ramming effects, not crankcase pumping at all.

APT Case Supercharged Induction





The key to the CSI process and what sets it apart from all previous attempts to externally scavenge small two-cycle engines is that the process uses powerful acoustic resonances that are present within the intake tract of a running engine.

The Sonic Boost Plenum (SBP) functions multi-dimensionally as an intake manifold and tuned resonance chamber.

The SBP, is a vital part of the CSI induction process and provides a major advancement in the air-delivery capabilities of high-speed, high output two-cycle engines.

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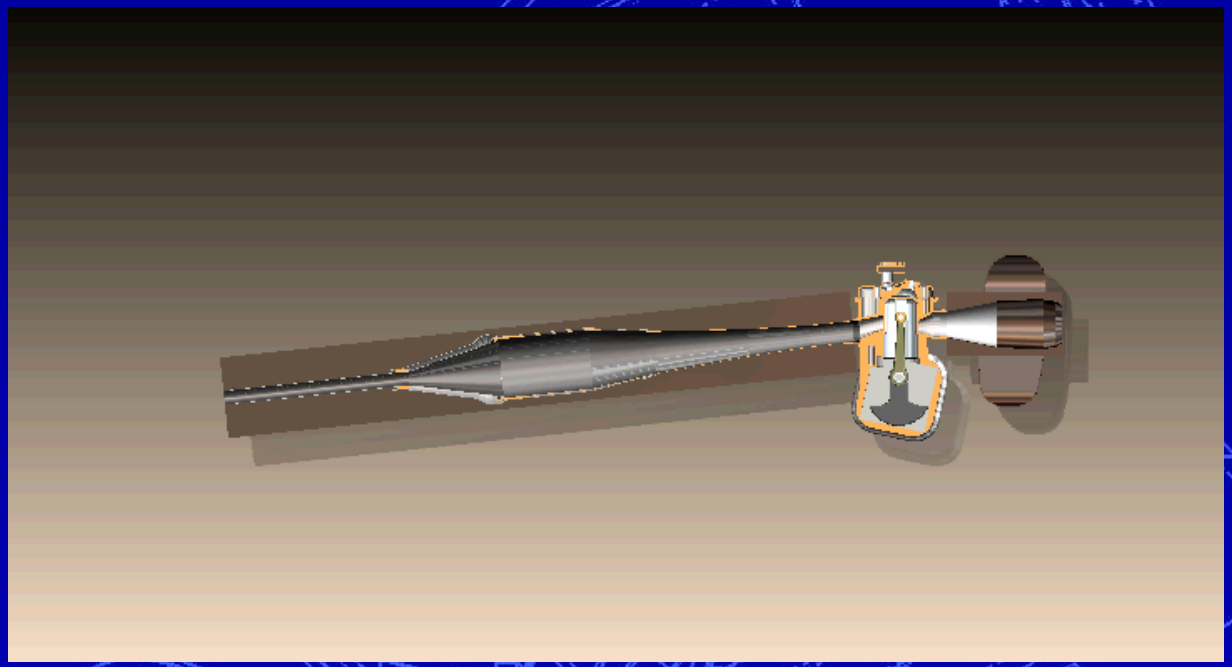


APT has the beginning of a long term solution to emissions reductions in small high power density engines.

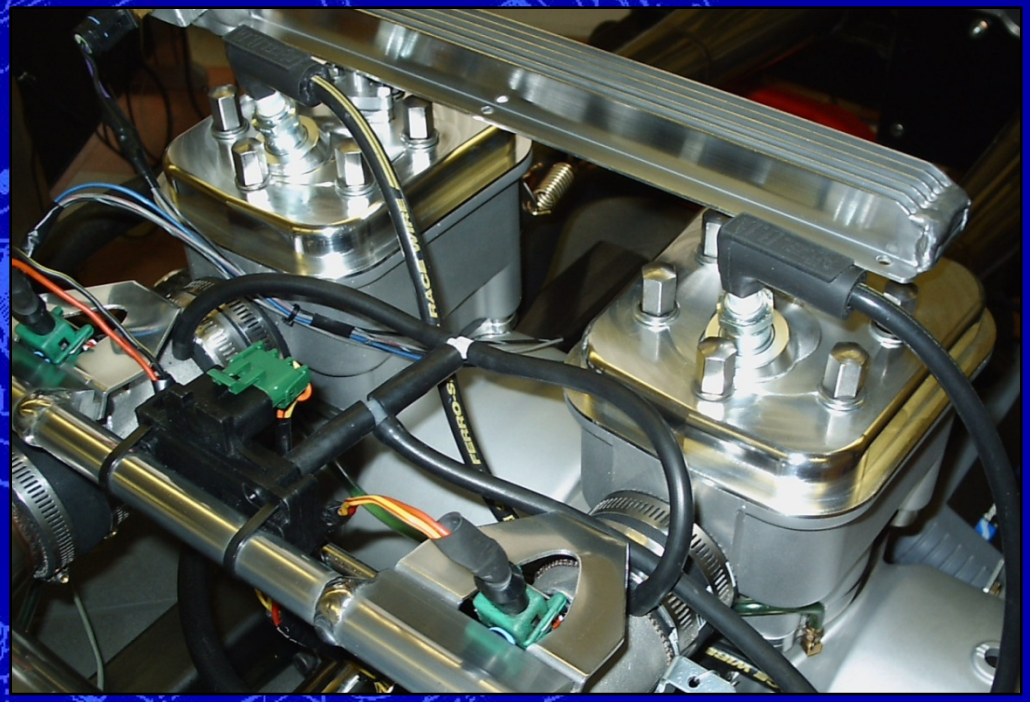
Oil-less combustion is key to integrating future two-cycle engines with many of the pioneering emissions reduction strategies being developed today. Such as; multi-fuels capability, lean-burn stratified charge combustion, variable geometry intake and exhaust systems and state of the art catalyst after-treatment techniques.

APT Case Supercharged Induction

Acoustic frequency modulation is accomplished by actively varying the length of the expansion chamber(s).

APT Case Supercharged Induction

The clear distinction of CSI technology lies in its ability to provide oil-less combustion; imparting the means to significantly reduce combustion chamber quench areas, which trap and release large quantities of unburned fuel.



Engines using CSI technology will minimize, at the source, the disproportionately high level of total hydrocarbons (THC's), carbon monoxide (CO) and particulate emissions that result from contemporary two-cycle engine induction and combustion practices.

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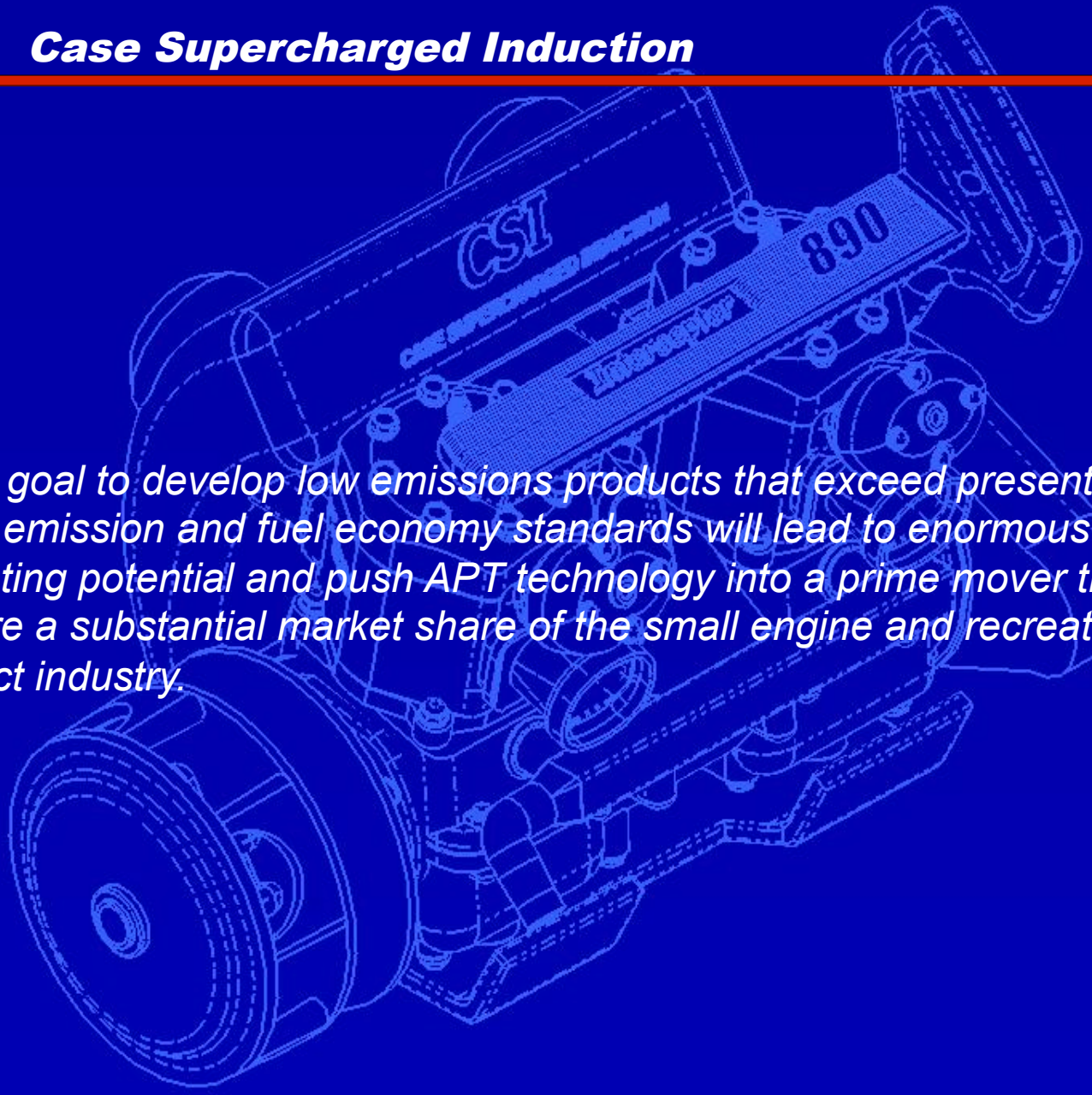

APT's goal to develop low emissions products that exceed present and future emission and fuel economy standards will lead to enormous marketing potential and push APT technology into a prime mover that can capture a substantial market share of the small engine and recreational product industry.