ROBUST AND CLEANER ENGINES USING NEGATIVE PRESSURE SUPERCHARGING

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Abstract - *NPS- Negative Pressure Supercharging is a ground-breaking new clean burn HTCSI (Homogenous thermal charge spark ignition) supercharging combustion process that significantly improves fuel efficiency,torque,rpm, acceleration, towing power and emissions. NPS does not use Turbocharger & Supercharger air pumps, mechanically complex parts & Computers. NPS is the same as Vacuum Supercharging. NPS is an easy technique which never tends to complicate a conventional engine. By replacing few parts of the engine and by adding few features we can convert an ordinary engine into a high performance and highly clean engines. NPS involves huge reduction of pressure in the cylinder before the suction stroke through which large amount of charge is being intaken. As amount of intake charge increases, Volumetric Efficiency of the engine also increases. Thus Brake thermal efficiency and mechanical efficiency of the engine increases subsequently. Thus NPS is a simple, unique, innovative and cheaper technology which increases the yield by 20-30%. For the present and the future automobile field NPS is a preeminent technology to produce efficient and cleaner engines.*

INTRODUCTION:

Parts Used In Negative Pressure Supercharging

The NPS kit can be installed to any kind of engines. The entire weighs only 1.5 to 2 kgs and to can be installed within a price range of 4000-5000 rupees.Ituses a unique combination of mechanically simple parts to supercharge and substantially improve the efficiency of engines.

• Compact high velocity Tri-Y Headers
• SVT Camshaft
• Hot Air Induction housing
• Cold Cooling System
• Special Ignition Timing.

The combination of parts used by Negative Pressure Supercharging produce several highly advanced processes that allow NPS to work. • CHVEG – Compressed High Velocity Exhaust Gas
• SVT – Synchronised Valve
•HPDT – High Pressure Differential Turbulence
• HAI – Hot Air Induction
•HTCSI – Homogeneous Thermal Charge Spark Ignition combustion Negative Pressure Supercharging is about making mechanically simple carbureted or fuel injected street engines produce -
•More torque and horsepower from idle to 4500 rpm using low octane fuel
• Faster acceleration
• More towing power
• More fuel economy
• Lower maintenance
• Lower running costs

Negative Pressure Supercharging Standard and Race engines

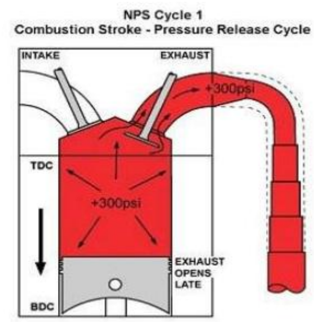
1 Combustion Stroke - Pressure cycle
2 Exhaust Stroke – Exhaust Cycle
3 Intake Stroke - Primary Induction Cycle
4 Intake Stroke – Secondary Induction Cycle
5 Compression Stroke - Compression cycle
6 Combustion Stroke - Pressure Drive Cycle

NPS 6 cycle process compared to the old 4 cycle process After 130 years of refinement the old 4 cycle process used by today's engines produce a lot more horsepower over a narrow high rpm range. However, they also produce poor low rpm torque, high fuel consumption and a lot more pollution. Therefore, to make the old 4 cycle process produce more torque and horsepower over a broader rpm range and reduce its high emissions and fuel consumption, today's street engines have become a nightmare of mechanical complexity and emission controls.

The NPS 6 cycle process is a lot more efficient than the old 4 cycle process. It produces substantially more torque and horsepower and much lower fuel consumption and emissions over a lower and wider rpm range. The NPS 6 cycle process achieves this using a unique combination of mechanically simple parts and NO emission controls. This eliminates the need to make engines mechanically complex in order to improve their efficiency. What's even more remarkable is that this new 6 cycle process is in its infant stage of development and is currently a lot more efficient than the old 4 cycle process used by today's engines. Therefore, given the same refinement as today's engines the NPS 6 cycle process has the potential to improve its rpm range and the efficiency of street engines far beyond the capability of the old 4 cycle process and mechanical complexity.

2.1 NPS Cycle 1 Combustion Stroke – Pressure Release Cycle

After combustion about 300psi of high pressure gas remains in the cylinder of a typical V8 engine before the exhaust valve opens. The Negative Pressure Supercharging process uses this high pressure gas to reduce the pressure (increase the vacuum) in the cylinder and pull a larger intake charge into the engine. As the exhaust valve opens, the high pressure gas from combustion forces itself through the small and short pipes of the NPS Tri-Y header at 600 ft/sec. This is twice the gas speed of the large pipe headers used by standard and race engines shown by the broken lines. The high velocity gas produces a much higher vacuum inthe small pipe header which pulls the exhaust gases out of the engine and reduces the pressure (increases the vacuum) in the cylinder. However, the high pressure gas will remain compressed in a small pipe for only a short distance before it builds up backpressure and restricts the gas flow. Therefore, the small pipes of the NPS Tri-Y header are very short and connect to a megaphone pipe. This allows the compressed gas in the small pipe to gradually expand into the larger section of the megaphone pipe at a high velocity BEFORE it builds up backpressure and restricts the gas flow.



2.2 NPS Cycle 2 Exhaust Stroke – Exhaust Cycle

At the end of the exhaust stroke, the lower pressure (higher vacuum) produced by the NPS Tri-Y header is trapped in the combustion chamber during the overlap period by - • Closing the exhaust valve 12° earlier before TDC • Using 10° less overlap duration.

• Using 150" less exhaust valve lift.

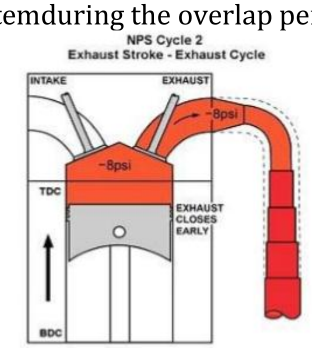
• Synchronising the above 3 valve timing events.

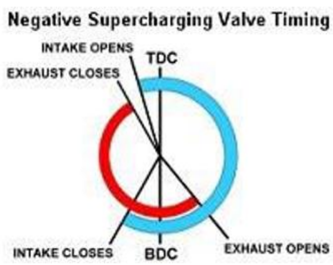
The lower pressure (higher vacuum) in the cylinder also helps pull the piston towards TDC during the exhaust stroke which reduces the engines pumping work. However, the above 3 valve timing events are part of a more complex valve timing process that requires synchronising 8 valve timing events and optimising them to within 1° duration and .010" lift in order to-

• Trap the lower pressure (higher vacuum) in the cylinder at the end of the exhaust stroke by closing the exhaust valve early and using less overlap duration and exhaust valve lift.

• Trap the larger intake charge pulled into the cylinder during the early part of the intake stroke by closing the intake valve early.

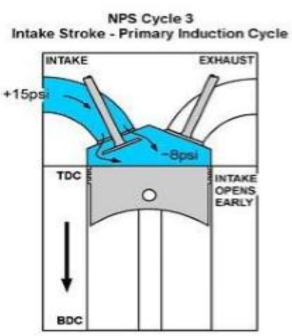
• Prevent the lower pressure (higher vacuum) frompulling the intake charge into the exhaust systemduring the overlap period.



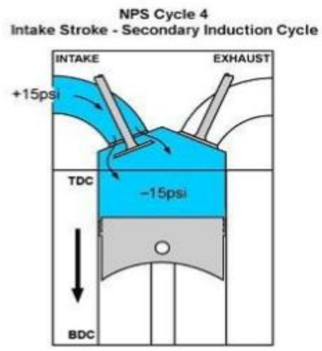


2.3 NPS Cycle 3 Intake Stroke – Primary Induction Cycle

At the beginning of the intake stroke, the intake valve opens 510° earlier before TDC. This allows the lower pressure (higher vacuum) trapped in the combustion chamber during the overlap period to pull the intake charge into the cylinder BEFORE the piston begins the intake stroke. As a result the intake charge rapidly fills the cylinder during the EARLY part of the intake stroke. Therefore, the lower the pressure (higher the vacuum) that is trapped in the combustion chamber during the overlap period, the larger intake charge the Negative Pressure Supercharging process pulls into the cylinder during the early part of the intake stroke.

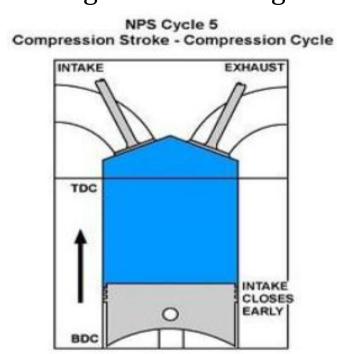


2.4 NPS Cycle 4 Intake Stroke – Secondary Induction Cycle As the piston moves down the cylinder during the intake stroke, it further reduces the pressure (increases the vacuum) in the cylinder in addition to the lower pressure (higher vacuum) trapped in the combustion chamber during the overlap period. As a result the much greater pressure differential between the higher atmospheric pressure outside the engine and the much lower pressure (higher vacuum) in the cylinder-• Pulls a larger intake charge into the cylinder at a higher velocity during the EARLY part of the intake stroke. • Produces violent air turbulence with NO restriction to air flow. • Creates a homogenous intake charge that burns faster and cleaner. • Allows large intake ports and valves with high lift to flow a larger volume of air into the cylinder from 1000- 4500 rpm than small intake ports and valves with low or high lift.



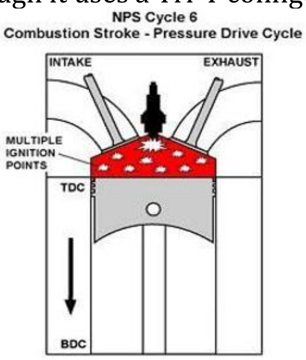
2.5 NPS Cycle 5 Compression Stroke – Compression Cycle

At the end of the intake stroke, the intake valve closes 10° earlier after BDC to-• Trap the larger intake charge pulled in the cylinder during the EARLY part of the intake stroke. • Prevent the larger intake charge from being forced back into the intake manifold during the compression stroke The lower pressure (higher vacuum) trapped in the combustion chamber during the overlap period causes the intake charge to rapidly fill the cylinder during the early part of the intake stroke. This pulls a larger intake charge into the cylinder from 1000-4500 rpm but requires the intake valve to close much earlier in order to trap the larger intake charge in the cylinder.



2.6 NPS Cycle 6 Combustion Strok – Pressure Drive Cycle

At the beginning of the combustion stroke the larger homogenous intake charge produces substantially more combustion pressure and a faster burn from 1000-4500 rpm than standard or race engines. This allows Negative Pressure Supercharging to produce a lot more torque and horsepower over a broader rpm range. vacuum in the cylinder at the end of the exhaust stroke and move it to the intake stroke during the overlap period. Otherwise with conventional valve timing the higher vacuum produced by the NPS Tri-Y header pulls the intake charge into the exhaust system instead of into the cylinder. Therefore, the NPS Tri-Y header works differently to other headers and does NOT work alone even though it uses a Tri-Y configuration.



Tri-Y Headers with small short pipes and megaphone collector produce Compressed High Velocity Exhaust Gas.

• Substantially reduces the pressure (increases vacuum) in the cylinder during the exhaust stroke. • Pulls a larger volume of air into the cylinder during the early part of the intake stroke by the lower pressure (higher vacuum) trapped in the combustion chamber during the overlap period with synchronised valve timing. • Produces a homogenous intake charge as a result of the violent air turbulence produced by the much greater difference in pressure between the cylinder and atmosphere.

Camshaft with Synchronised Valve Timing , high intake lift and low exhaust lift.

• Traps the lower pressure (higher vacuum) in the cylinder at the end of the exhaust stroke by closing the exhaust valve early and using less overlap duration and exhaust valve lift. • Moves the lower pressure (higher vacuum) to the intake stroke during the overlap period by synchronising the exhaust valve closing, overlap duration and exhaust valve lift events. • Traps the larger volume of air pulled into the cylinder during the intake stroke by closing the intake valve early. • Prevents the lower pressure (higher vacuum) from pulling the intake charge into the exhaust system during the overlap period Hot Air Induction housing Increases the temperature of the homogenous intake charge.

• Uses hot air to increase the speed of combustion to just BEFORE the point of self ignition.

• Vapourises the liquid fuel into a gas to reduce fuel consumption. • Produces a faster cleaner burn and more combustion pressure (torque) Cold Cooling System. • Reduces the water temperature to maintain the optimum combustion temperature and burn rate with the hotter and faster burn produced by the homogenous hot intake charge.

• Allows the homogenous hot intake charge to produce a faster cleaner burn and more combustion pressure (torque) than a cold intake charge. • Allows the engine to run HOT with cold water and hot air induction...ONLY the water passages run cold.

Special Ignition Timing Uses a special advance curve to increase combustion pressure (torque) and prevent the hotter and faster burn produced by the homogenous hot intake charge from igniting prematurely.

CONCLUSION:

Thus NPS is a clean & innovative technology to make conventional engine into a most efficient engine. NPS is a technology for the present and the future.

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