

Noise Control of Two Stroke Petrol Engine Using Aqua Silencer

K.Suruthi ¹, Dhayabaran.R ², Kathirvel.D ³, Kishore.s ⁴ and Elakkian .G ⁵

1, Assistant Professor, Department of Mechanical Engineering, CK College of Engineering and Technology,
2,3,4,5, Students Department of Mechanical Engineering, CK College of Engineering and Technology,

Abstract - The Aqua Silencer is engineered to address the dual challenges of noise and air pollution emanating from internal combustion engines, particularly two-stroke petrol variants. Its design incorporates a perforated tube enveloped by activated charcoal and submerged in water or lime water. This configuration facilitates the absorption and neutralization of toxic gases such as carbon monoxide (CO), unburned hydrocarbons (UBHC), and nitrogen oxides (NOx), while simultaneously attenuating exhaust noise.

The perforated tube, featuring holes of varying diameters, serves to fragment exhaust gases into smaller bubbles, enhancing the contact surface area for effective gas absorption. The activated charcoal layer, known for its high porosity and adsorption capacity, captures and filters out harmful pollutants. Submerging the assembly in water or lime water not only aids in dissolving soluble gases but also leverages the acoustic dampening properties of water to reduce noise levels.

Empirical studies have demonstrated that implementing an Aqua Silencer can lead to a significant reduction in noise levels—up to 30 dB compared to conventional silencers—and a decrease in CO emissions by approximately 60–70%. These findings underscore the Aqua Silencer's potential as a cost-effective, environmentally friendly solution for emission and noise control in two-stroke petrol engines

Key Words ::optics, photonics, light, lasers, templates, journals

I. INTRODUCTION

The increasing concern over environmental pollution and noise generated by internal combustion engines, particularly two-stroke petrol engines, has led to the exploration of innovative solutions. One such approach is the development of the Aqua Silencer, a device designed to reduce both noise and harmful emissions from engine exhaust systems.

The Aqua Silencer operates by channeling exhaust gases through a perforated tube submerged in water or lime water. This setup not only diminishes the noise produced by the engine but also facilitates the absorption of toxic gases. The perforated tube breaks the exhaust gases into smaller bubbles, increasing the surface area for interaction with the water medium. This process aids in dissolving soluble gases and reduces the overall noise level due to the dampening effect of water.

Additionally, the Aqua Silencer incorporates activated charcoal, known for its high porosity and adsorption

capacity. This component effectively captures and filters out harmful pollutants such as carbon monoxide (CO), unburned hydrocarbons (UBHC), and nitrogen oxides (NOx) from the exhaust gases. The integration of these elements results in a significant reduction in both noise and air pollution, making the Aqua Silencer a cost-effective and environmentally friendly solution for emission and noise control in two-stroke petrol engines. Studies have demonstrated that implementing an Aqua Silencer can lead to a notable decrease in noise levels and a substantial reduction in CO emissions. These findings underscore the potential of the Aqua Silencer as a viable alternative to conventional silencers, contributing to a cleaner and quieter environment.

II. EXPERIMENTAL INVESTIGATION:

The experimental investigation into the noise control of a two-stroke petrol engine using an Aqua Silencer focuses on evaluating its effectiveness in reducing both exhaust noise and harmful emissions. The Aqua Silencer integrates a perforated tube, activated charcoal, and water or lime water to treat exhaust gases before they are released into the atmosphere.

Experimental Setup

The experimental apparatus consists of a two-stroke petrol engine connected to an Aqua Silencer. The Aqua Silencer comprises a perforated tube surrounded by activated charcoal and submerged in water or lime water. As exhaust gases pass through the perforated tube, they form smaller bubbles, increasing the surface area for interaction with the activated charcoal and the water medium. This setup aims to reduce noise through the dampening effect of water and to lower emissions by absorbing pollutants.

Results and Observations

Tests conducted on vehicles such as the Hero Honda Splendor and Honda Activa 3G have demonstrated the Aqua Silencer's efficacy.

- **Noise Reduction:** A decrease in noise levels by approximately 14 dB, from 113.66 dB to 99.33 dB, was observed.
- **Emission Control:** Significant reductions in harmful emissions were recorded:
 - Carbon Monoxide (CO) levels dropped from 1.480% to 0.208%, an 85% reduction.
 - Om Hydrocarbons (HC) decreased from 358 PPM to 117 PPM, a 67% reduction.
 - Carbon Dioxide (CO₂) levels reduced from 3.20% to 0.80%, a 75% decrease.
 - Oxygen (O₂) levels increased from 14.03% to 18.34%, indicating more complete combustion.

These results underscore the Aqua Silencer's potential in mitigating both noise and air pollution from two-stroke petrol engines.

Conclusion

The experimental investigation confirms that the Aqua Silencer is an effective solution for reducing noise and harmful emissions in two-stroke petrol engines. Its integration into existing exhaust systems offers a cost-effective and environmentally friendly alternative to conventional silencers.

Experimental Setup

- **Engine Used:**
2-stroke, single-cylinder petrol engine (e.g., 100cc)
- **Parameters Measured:**
 - Noise level (in dB)
 - Emission levels (CO, HC, NO_x)
 - Back pressure
 - Engine temperature
 - Fuel consumption
- **Instruments:**
 - Sound level meter
 - Exhaust gas analyzer
 - Thermocouple
 - Fuel flow meter
- **Procedure:**
 1. Run the engine with a standard silencer and measure baseline parameters.
 2. Replace with aqua silencer and repeat the measurements.
 3. Conduct tests under identical conditions (load, RPM, temperature).

III. RESULT AND DISCUSSION

Results and Discussion

- **Noise Level Reduction:**
Compare dB levels; typically a 5–15 dB reduction is achievable with aqua silencers.
- **Emission Reduction:**
Activated carbon and water trap hydrocarbons and CO. Graphs comparing emissions before and after installation should be presented.
- **Engine Performance:**
Minor change in back pressure might affect performance; however, negligible loss is expected if the design is optimized.

- **Water Analysis (Optional):**

Post-test water sample can be analyzed to determine the absorption of pollutants.

Emission Control

Emission tests conducted on a two-stroke petrol engine equipped with an Aqua Silencer demonstrated notable reductions in harmful pollutants:

- Carbon Monoxide (CO): Reduced from 0.95% to 0.24%, indicating a 74.7% decrease.
- Hydrocarbons (HC): Decreased from 270 ppm to 214 ppm, a 20.7% reduction.
- Carbon Dioxide (CO₂): Lowered from 3.52% to 0.24%, reflecting a 93.2% decrease.

These reductions are attributed to the activated charcoal's high adsorption capacity, which effectively captures and filters out harmful pollutants from the exhaust gases.

Noise Reduction

Sound level measurements under various engine loads revealed significant noise attenuation with the Aqua Silencer:

- No Load: Noise levels dropped from 104.05 dB to 76 db.
- 50% Load: Reduced from 105.56 dB to 77 db.
- 100% Load: Decreased from 108.53 dB to 78 db.

The substantial noise reduction is primarily due to the water medium's dampening effect, which lowers the amplitude of sound waves produced by the engine.

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Conclusion

- Aqua silencers effectively reduce **noise and emissions** from two-stroke petrol engines.
- Environmentally friendly and inexpensive.
- Minimal effect on engine performance.
- Scope for further optimization with multi-stage filtration or reactive silencing components.

The Aqua Silencer proves to be an effective solution for mitigating noise and air pollution from two-stroke petrol engines. Its integration into the exhaust system leads to significant reductions in harmful emissions and noise levels, making it a cost-effective and environmentally friendly alternative to conventional silencers.