Different Types of Silencer Used in Royal Enfield Vehicles and Their effect on Engine, Performance and Mileage

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Abstract—To study the effects of different types of Royal Enfield Silencers on the performance of IC engine. Often the customers of Royal Enfield wish to tune their Exhaust only on the account of sound. Unknowingly, this might damage and decrease the engine life. Hence, the study of different types of exhaust is necessary.

Key words: Performance and Mileage, Royal Enfield Vehicles

I. INTRODUCTION

Royal Enfield has been providing its legendary two-wheelers, even before the country’s independence. Various changes in its Design parameters have resulted in more lighter and quieter two wheelers. However, people have started tuning or changing their Silencers in order to get that same 1950’s Enfield booming sound ignoring the big picture created by changing the exhaust system. Every Silencer has a predesigned back pressure and this could affect the engine life and performance. The Silencer provided to the customers initially has a low back pressure which leads to better scavenging.

To solve the global problem relating to fuel consumption, fuel efficiency and performance of the engine we automobile engineers must contribute. Even with noisy tuned Silencers, compromising a little sound to get equally powerful and healthy engine should be our aim. This can be done by experimenting endlessly by changing the design parameters of the Silencers.

There are mostly two types of exhaust systems:
1) Baffle type
2) Free flow type
3) Absorber type

It is found that the speed of sound in exhaust manifold is directly proportional to the square root of product of pressure and the ratio of specific heats and inversely proportional to the square roots of density.

Most Silencer contain glass wool or ceramic wool embedded in their expansion cylinders which absorb the higher frequencies and results in a huge bass sound eliminating the treble, conical baffles in other hand absorb lesser frequencies hence both bass and treble, free flow exhaust systems in other hand do not have any absorbers thus providing more treble.

II. EFFECT OF FOUR DIFFERENT TYPES OF SILENCERS ON ENGINE PERFORMANCE AND FUEL EFFICIENCY

A. Wild Boar

It’s a free flow type of Silencer and is extensively famous for its loud noise. We installed this type of Silencer in thunderbird 500 as well as classic 350. These bikes were driven an approx. of 20,000 km each. The wild boar affected the bike extensively. Vibrations started to occur and these vibrations were to such an extent that the pillion rider would have difficulties. The bike started consuming large amounts of engine oil (1.5 liters over a run of just 400 km). For further checking of the impact of wild boar Silencer on the bikes we opened the engine with the help of a mechanic at our college lab. We observed that the piston was way too loose to rectify, we even tried using oversized rings but it was still the same. The wild boar had a very negative impact on the engine of the bike.

The chrome used in this type is of inferior quality than the rest which may corrode after some time. Now a days Wild Boar is available in three type, which are Thumper, Classic and Reverse Cone. The following are the data derived from practical application of the Silencer.

1) Performance: At lower rpm the bike responds extremely well while at higher rpm not much change. There is 5% increase in pickup.
2) Mileage: initially there wasn’t much difference but with time the mileage decreases by 5%.
3) Sound: A lot of base can be considered as way to loud at times.

B. Red Rooster Performance Exhaust System

Again Red Rooster Performance Silencer (RRP) is free flow type of Silencer and it is considered one of the best custom made Silencers in the market. Although being a bit expensive this Silencer is very effective. We installed in on RE Thunderbird 350. After installation the Silencer itself is a head turner as its sound is neither too loud nor too less. RRP Silencer gives you thump like no other Silencer. And during initial stages mileage seemed fine by the users. And the Silencer also has a positive effect on the performance of the engine.

Being considered as one of the most sorted aftermarket exhaust the RRP is hot stuff for Royal Enfield customers. The grade of steel used in this type is STAINLESS STEEL 304 which is highly corrosion resistant. It has ceramic wool coating instead of glass wool like other conventional silencers. This is a single piece silencer.

The following are the various data available to us by the survey:

1) Performance: There is a slight increase in acceleration and top speed at well.
2) Mileage: Fuel efficiency is better than most of the Silencers as the whole design of the RRP Silencer is to provide exactly what the customers want without scarifying the qualities of the stock Silencer. The reported mileage was found to be 38.6 KMPL
3) Sound: the sound is quite subtle and mature
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Fig. 1.0:
The above shown figure is a comparison of RRP thunderbird 350_021 (RRP exhaust system) and RRP thunderbird 350_006 (stock Silencer). The Dynojet result clearly shows that there is an increase in performance of the engine over a mild range, which shows the effectiveness of RRP exhaust system.

C. Gold Star
Gold star is also commonly known a Patiala Silencer and is very famous for its extremely loud noise, even though this type of Silencer is not road legal we kept it in our study due to its extensive sale in all over India. Gold star doesn’t not have any baffle plates that is it is a free flow type of Silencer. We installed gold star on a RE thunderbird 350. And also we contacted various customers on the RE community forum. Once we verified all the feedback along with our personal observation we got the following results:

1) Performance: the back pressure is gold star is very low and this often results in backfiring during de-acceleration. The low back pressure also results in easy scavenging but this does not have much impact on the engine as performance is directly proportional and fuel economy is inversely proportional to back pressure. the acceleration also decreases and top speed is also affected due to the Silencer.

2) Mileage: Due to back firing there is a decrease in mileage. Even though there is high scavenging but all this is cancelled by back firing which is never good for the engine life.

3) Sound: it is extremely loud and has very techno base tune. The sound upon hearing is very artificial and not very soothing for ears. Treble is boosted.

D. 50’s Style (England Made)
This a Silencer which is made in England and it became famous in India due to its performance advantages. It is a free flow Silencer. We installed this type on a RE thunderbird 350 and observed that this kind Silencer itself is very effective. 50’s style Silencer is combination of 200087 series exhaust system or 91007 Silencers. The looks of this Silencer is very close to the English motorcycles available in the early 1950’s. On running Dynojet test on this system we found the following results.

Fig. 2.0:
The above shown graph is the Dynojet result between a 50’s style exhaust system and stock exhaust system.

The blue line that is the Alan014 is 50’s style exhaust system while the red line indicated alan005 which is stock system. You can clearly see the difference between them especially over mid-range.

The following results were obtained by testing the system on RE thunderbird 350:

1) Performance: As seen in the Dynojet graph the power increases over the mid-range. As these kind of system doesn’t damage much of the engine. So engine life is also remains unaffected.

2) Mileage: Unfortunately much difference wasn’t noticed while testing this system.

3) Sound: The system a low base thump sound which isn’t too loud and is actually suitable for ears.

III. CONCLUSION
The summary of the present literature are as follows:

As we just observed every Silencer has its own advantages and disadvantages also all these observations made above are in comparison to stock Silencer. The stock Silencer is a good Silencer and is well tuned with the vehicle but it does not have loud exhaust sound which is missed by the customers most. As a Royal Enfield enthusiast we all want the sound to be back just like the old days but things always comes at a price. High exhaust sound will result is various things like noise pollution , improper combustion due to low back pressure like in gold star Silencer , decreasing the life of the engine which is the worst apart from improper combustion leading to environmental impacts.

The Red Rooster Performance Silencer is very successful in this respect because the design of the Silencer has both what the engine as well as the customer needs. The key points of the stock Silencer are not lost in the RRP which is its best quality. The only other Silencer which came close to the RRP is the 50’s style (England made ) Silencer it is also very efficient but it’s expensive and customers tend to avoid too these a bit.

While others such as wild boar and gold star has very adverse effects on the engine and should be avoided.

Also one common problem with low back pressure silencers is that they loosens the tappets. The tappets used in
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RE are not well designed if we consider the engineering point of view. As these tappets are not able to withstand the high rpm, this happens simply because the motor used here has a low rpm unit. Hence this also causes a thumping sound when we ride slowly. More open exhaust systems in carbureted engine’s makes bike run lean which can be harmful for engine in long run. Also we recommend the users to get their vehicles Dyno tuned while using custom silencers for optimum performance.

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