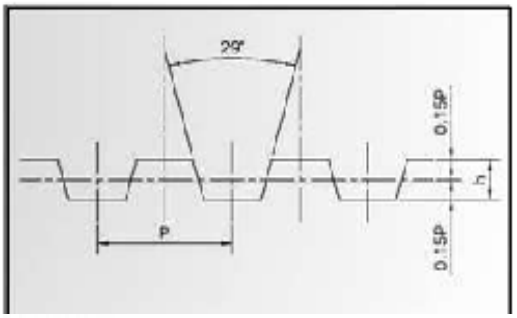
best at 0.25 L / D and in highest test pressure. Increasing the valve lift and test pressure can increase the air flow, valve air flow and coefficient of discharge in intake manifold system or in exhaust manifold system, but after the maximum valve lift per diameter 0.25L / D, the air flow, valve air flow and coefficient of discharge is stable and did not increase.



From the review of literature, it can be analyzed the design of inlet manifold configuration is very important in an IC engine. In general, the presence of a swirl in the cylinder of

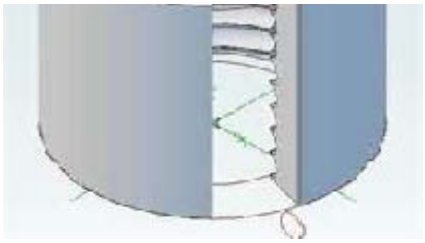


Figure 1: Internally Threaded Inlet Manifold

accepted definition of thermal efficiency does not exist. The Brake Specific Fuel Consumption Vs load for diesel engine with inlet manifolds having three different types of internal threads viz. acme, buttress and knuckle threads is compared with the engine with normal inlet manifold and is shown in fig.5. From Fig, it is inferred that the brake specific fuel consumption is decreasing with an increase in load for all the configurations that are under consideration. The brake

specific fuel consumption of engine with normal inlet manifold at 3/4 of rated load is 0.48. It can be observed that the engine with inlet manifolds having acme and buttress internal threads give brake specific fuel consumption of 0.44 and 0.43, respectively, at 3/4 of rated load. It is significant to note that 11.62% of reduction in BSFC is observed at 2.5kW load for inlet manifold having buttress internal threads compared to engine with normal inlet manifold. The decrease in BSFC may be due to higher swirl produced in inlet manifold having buttress internal threads compared to engine with normal inlet manifold.

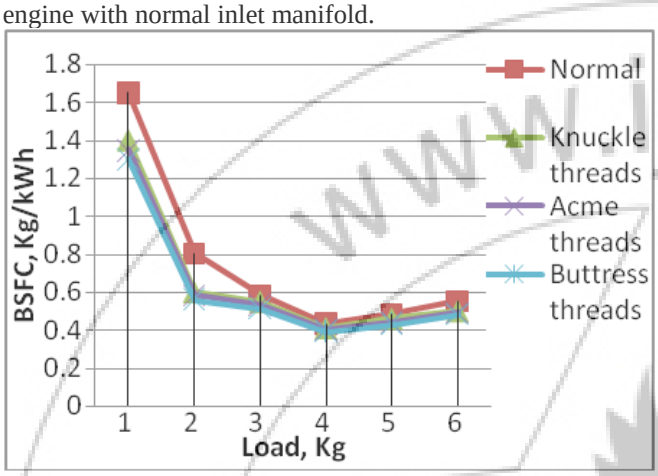


Figure 5: Brake Specific Fuel Consumption Vs Load

3.2 Exhaust Gas Temperature

Figure.6 depicts the variation of exhaust gas temperature for diesel engine with inlet manifolds having three different types of internal threads viz. acme, buttress and knuckle threads is compared with the engine with normal inlet manifold. Exhaust gas temperature is indication for conversion of heat into work that takes place in the cylinder. The exhaust gas temperature is higher for diesel engine with inlet manifolds having three different types of internal threads viz. acme, buttress and knuckle threads than engine with normal inlet manifold. At various load conditions it is observed that the exhaust gas temperature increases with load because more fuel is burnt to meet the power requirement. It can be seen that in the case of the engine with normal inlet manifold exhaust gas temperature is 223^0C at 2.5kW load. For diesel engine with inlet manifolds having knuckle and acme internal threads are exhaust gas temperature marginally increases to 232 and 238^0C respectively. The exhaust gas temperature is more for diesel engine with inlet manifolds having buttress internal threads is 247 ^{0}C at 2.5kW load.

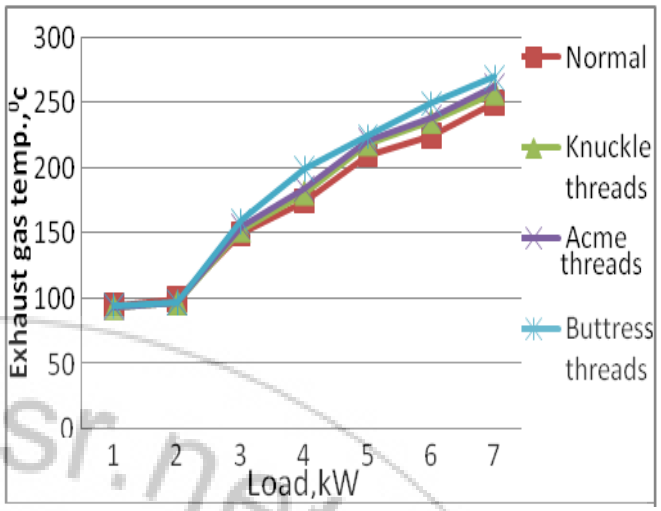


Figure 6: Exhaust gas temperature Vs Load

3.3 HC Emission

The comparison of Hydrocarbon emission in the exhaust is shown in Figure 7. Unburnt hydrocarbon emission is the direct result of incomplete combustion. It is apparent that the hydrocarbon emission is decreasing with the increase in the turbulence which results in complete combustion. The lowest hydrocarbon emission is for engine with inlet manifold having buttress internal threads when compared to engine with normal inlet manifold is about 18.88 % by volume at 3/4 of rated load. It is also observed that for diesel engine with inlet manifolds having acme and knuckle internal threads reduction in HC levels is about 12.32 % and 9.33% by volume at 3/4 of rated load when compared to engine with normal inlet manifold.

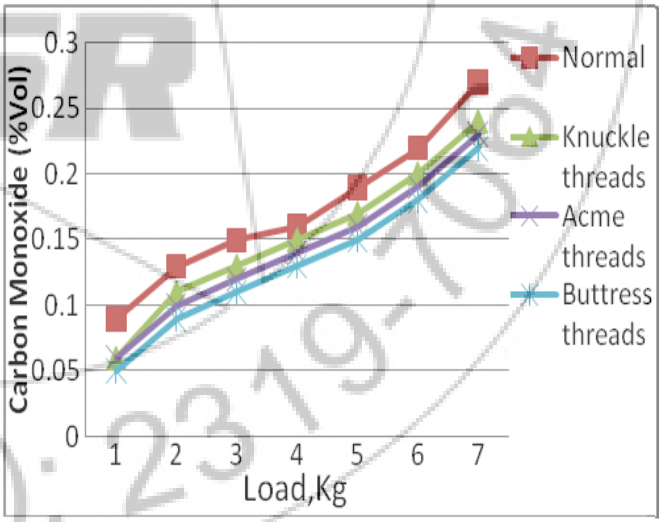


Figure 7: Load Vs Hydro carbons

3.4 CO Emission

Fig. 8 shows the comparison of Carbon monoxide emission with Load for diesel engine with inlet manifolds having three different types of internal threads viz. acme, buttress and knuckle threads is compared with the engine with normal inlet manifold. Generally, C.I engines operate with lean mixtures and hence the CO emission would be low. With the higher air turbulence in the inlet manifolds with internal

threads, the oxidation of carbon monoxide in the engine is improved and which reduces the CO emissions. The lowest carbon monoxide emission is for engine with inlet manifold having buttress internal threads when compared to engine with normal inlet manifold is about 26.66 % by volume at 3/4 of rated load. It is also observed that for diesel engine with inlet manifolds having acme and knuckle internal threads reduction in CO levels is about 21.7% and 19.53% by volume at 3/4 of rated load when compared to engine with normal inlet manifold.

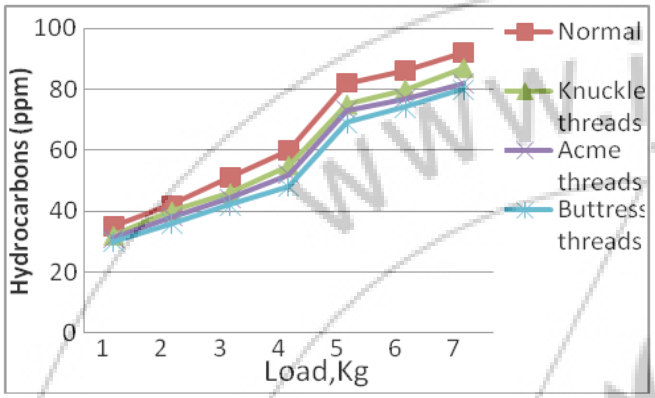


Figure 8: Load Vs Carbon monoxide

3.5 NOx Emission

Fig.9 shows the comparison of NOx emission with Load for diesel engine with inlet manifolds having three different types of internal threads viz. acme, buttress and knuckle threads is compared with the engine with normal inlet manifold. The NOx emissions for diesel engine with inlet manifolds having buttress internal threads is 499 ppm and whereas for engine with normal inlet manifold is 516 ppm. NOx emissions are lower for diesel engine with inlet manifold having buttress internal threads when compared to engine with normal inlet manifold at 3/4 of rated load. This is due decrease in the operating temperature in the cylinder by the air swirl inside the cylinder and leads to less NOx formation. Therefore, the NOx formation is lower with inlet manifold having buttress internal threads and is about 3.6% than normal inlet manifold at 3/4 of rated load. The decrease in NOx emissions for the engine with inlet manifolds having acme and knuckle internal threads are 2.9 % and 1.8 % at 3/4 of rated load respectively.

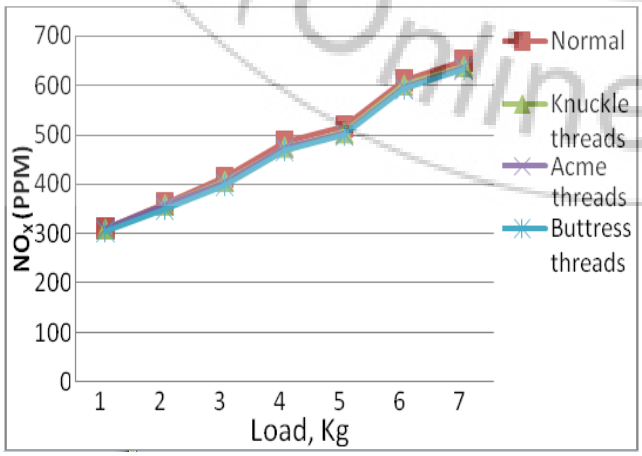


Figure 9: Load Vs NO_X Emissions

4. Conclusion

The Configuration inlet manifold with buttress internal threads enhances the turbulence and hence results in better air-fuel mixing process among all the configurations of inlet manifolds. As a result, the thermal efficiency is increased and BSFC and exhaust emissions are reduced. It can be concluded that inlet manifold with buttress internal threads is the best trade-off between performance and emissions.

1. It is observed that 11.62% of reduction in BSFC at 2.5kW load for engine with inlet manifold having buttress internal threads compared to engine with normal inlet manifold.
2. The exhaust gas temperature is higher for diesel engine with inlet manifolds having three different types of internal threads viz. acme, buttress and knuckle threads than engine with normal inlet manifold.
3. It is observed that 12.32%, 26.66% and 3.6% of reduction in HC, CO and NOx emissions respectively at 2.5kW load for engine with inlet manifold having buttress internal threads compared to engine with normal inlet manifold.
4. The results indicate that inlet manifold with buttress threads is identified as optimum configuration based on performance as well as exhaust emissions of diesel engine.

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