**Expected Outcomes**

In this report the performance and emission characteristics of diesel fuel and DME blends with Variable valve timing mechanism will be investigated. The results obtained of this study are summarized as follows.

1. Compared with conventional diesel fuel, the exhaust NOx will be analyzed

2. The HCCI engine will be simulated over a wide range of speed and loads with VVT and change in injection timing and the time delay between the end of injection and the start of combustion effect will be simulated to see the a potential HCCI control parameter. This enhance the computational efficiency of the multi-dimensional models, with reduced chemical kinetic mechanisms that consist of limited numbers of species and reactions are being developed.

3. Modeling of a multi-cylinder heavy-duty engine is being conducted using a CFD method to assess the potential of HCCI in applications.

4. The HCCI engine over combustion is analyzed over a wide range of temperatures and fuel compositions, and the effect of fuel composition on the ignition delay will be evaluated.

5. The influences on ignition timing, CO emissions, and unburned hydrocarbon (UHC) emissions of variations in global equivalence ratio, wall temperature, swirl level, degree of mixture in homogeneity (premixed versus direct injection – DI; start-of-injection – SOI – timing, for DI cases), and a TRLC will be investigated.

6. The model can be used for detailed investigation of the dynamic behavior of a HCCI engine.

7. The response of HCCI engine to different to fuels can be analyses. the fuel of lower octane, higher sensitivity, lower aromatics and higher olefins, with boiling points in the lower range can be evaluated.

8. With this CFD analysis a detail investigation of three-dimensional effects on the in-cylinder processes, like the effect of tumble and swirl, the influence of combustion chamber geometry, position of injection nozzle, spray angle, number of injection holes, etc. can be done.

9. Zero-dimensional simulations will be done to verify and analyze the NOx emission and chemistry influence on ignition delays, temperature, pressure etc.