Fulfillment of Diesel Cycle in Internal Combustion Engines

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PERSPECTIVE

It could be fairly called combustion the oxidization of the fuel in engines, if it does not happen with rapid pressure increase, with other words, explosion. Opposite of that, the fulfillment of Diesel cycle in internal 'combustion' engines, or different way to compose, the realizations of the burning in vicinity of constant pressure, the quiet burning competes against the loos soot development. Also, avoiding the explosion and its result of high peak pressure and peak temperature, that would limit the development of harmful Nitrogen oxides (NOx). By keep maintaining the average temperature of fuel burning, it preserves the efficiency of the motor, alongside with lover peak pressure in it. The lower peak pressure reduces the requirement of the motor strength and weight, though by keeping the same performance ability. So that the fulfillment of Diesel cycle in internal 'combustion' engines, it is a favorable probability for environment protection without compromising efficiency and would provide significant transformations the status and approval of the engine. This technique is a vital tool for a real substantial way improving the Diesel engine, which engine role in application indispensable in wide important areas of the practical life and many places cannot be substituted with other kind of engine. The fact is that the conventional contemporary Diesel engine is not anymore accepted of environment protection reason and the industry has no other option than introducing the vitally improved Diesel engine operating with a proximate Diesel cycle.

At Diesel cycle, the process of combustion is in the region of maintaining constant pressure. This can be achieved, if the combustion chamber of the engine let be interconnected a relatively larger ballast chamber during the combustion phase and, by it, providing extra space to prevent the pressure increase. Another way can be accomplished this, if the motor cylinder head is furnished with a supplemental small cylinder with auxiliary piston, loaded with pre-activated spring that

by its flexible movement able to give space expanding the heated gases. This supplemental auxiliary piston otherwise can be moved such way that its speed for the direction of expanding the space of the combustion chamber let be the fastest at the start the moment of combustion. For this, that piston would move by connecting rod from a crankshaft and this crankshaft would be connected with the main shaft of the engine, but at an alternate phase. At all these cases, no energy would be wasted, just momently stored.

This improvement should be evaluated with the engineering science of the thermodynamic. For comparison, on the attached Figure 1, the conventional and the Diesel cycle like operational engines are indicated on a pressure and volume diagram, and also, on a temperature and entropy diagram. The indications of the cycles are the usual simplify forms as the thermodynamic customary handles them. The cycle of the Diesel cycle like engine is signposted with number 1 and the conventional engine's cycle with number 2. The indicated engines perform the same capacity; because the size of the areas, not covered overlapping both, are the same. Their efficiency is also same, because they consume the same volume of heat, as the temperature/enthalpy diagram shows. The compression final pressure p2 can be selected higher for the Diesel cycle like engine compare with as it selected for the conventional Diesel engine, since there need not expect its sudden elevation by explosion as a high level then p1, the maximum pressure of the conventional engine, because here, the combustion chamber is flexible. Also, it shows that the p1, the highest pressure of the conventional engine is higher than p2, the highest pressure of the Diesel cycle like engine. This explains that the demand for strength of the Diesel cycle like engine will be less at the same performance and the motor can be built on lighter weight at the same effective mean pressure. The diagram shows that T3, the ignition temperature of the Diesel cycle like engine is higher than T3, the ignition temperature of the conventional engine. These circumstance assistances the easier and more effective ignition during the injection, promotes the calm burning and reducing soot formation against an occurrence of explosion. This is also evident here that the T2, the maximum temperature generated during operation of Diesel cycle like engine is lower than T1, the highest temperature is generated in the conventional engine. This achievement, the generated reduced maximum temperate in conjunction with the lower maximum pressure is perhaps the most significant benefit because, exactly its high pressure and temperature of the current Diesel engine is responsible for the development the harmful gases of NOx. It is also helps to be calmer the combustion in the Diesel cycle like engine that here, longer stroke section is available for injection, so that, longer period of time is available for the combustion. In practice the cylinder of the auxiliary piston to do its job can be approximately as tiny as the volume of the combustion chamber when the main piston is at the top dead center position, since later part of the burning occurs then, when the main piston is already expanding these volumes by its movement.

In case, when for its flexibility, the combustion chamber is interconnected with a ballast chamber in order to implement the Diesel like cycle, can be an additional benefit, if limited pre-firing is performed in the ballast chamber by introducing adequately limited amount of secondary air into it. This pre-firing can be the backbone for more perfect combustion inside the combustion chamber of the cylinder. The pressure inside of the ballast chamber is the highest pressure of the motor, which pressure we want to maintain regulated way. It is advisable adjust this pressure by auxiliary compressor

before to start the engine. During engine operation, the moment the pressure in the cylinder reaches the pressure in the ballast chamber during the compression stroke, you open the connection between the combustions chamber and the ballast chamber and you only close this connection, when the pressure starts dropping in the cylinder below the pressure in the ballast chamber during the stroke of the expansion. Thus the pressure in the ballast chamber will be maintained by this regulation. Otherwise, you can open the connection discussed above by using a check valve, a non-return valve, when it opens by the rising pressure, but its closing over would be delayed up to a certain operating point. Solenoid or piezo electric valve can also be used to control this connection.

The engines with Diesel like cycle provide opportunity realizing machine group of engine gas turbine. It is known that cylinder with piston at higher pressures, while turbine at lower pressure has the higher internal efficiency. Aware of this advantage, who wanted to implement the machine group of engine gas turbine in the past, it was a mistake that aiming to leave the crankshaft of the engine instead of trying to realize the really necessary high pressure engine. The Diesel like cycle engine is the ideal one for that machine group, because selecting the charging pressure of the engine, you can decide on the pressure and the temperature of exhaust gas of the engine. Choosing data of these targeting, the exhaust gas of the engine can be perfect for a gas turbine supply. Thus, it is such an advantageous option that possible to select the intake data of a gas turbine supply propulsion gas, so that the turbine blades do not have to be built from very special expensive structural materials, without sacrificing overall efficiency of this machine group of engine gas turbine. With this solution the machine group would spread wide in practical use. Also, these parameters can be selected such, that the engine's power shall be sufficient driving the charging compressor and to fulfill the requirement of all ancillary equipment needs and the turbine can be free for alone delivering the power in ships, locomotives, power plants and cars. With the realization of the light Diesel engine that NASA had longed for, the machine group of engine gas turbine provides an opportunity even for aircraft to increase efficiency.

Spread of the Diesel like cycle engine is facilitated by the fact that its production is based on entirely the fabrication and parts are usual in the industry. The parts you use in all of them are well known and used in the engine industry. All the additional parts to achieve the goal are relatively simple and the sizes of the required parts are all very small, because they are used exclusively for the maximum pressure of the cycle, when the specific volume of the gases is low. By applying the idea of Diesel cycle like engine with its introduction, by constant pressure firing, the diesel engine could be reborn and would also provide a completely new future for the use of the gas turbine. Spread of Diesel cycle like engine could significantly care for our environment by reducing the harmful effects of exhaust fumes.