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IMPROVING DYNAMIC CHARACTERISTICS OF INTERNAL COMBUSTION ENGINE

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Can you imagine that 2023 is the year of 200th anniversary since the creation of internal combustion engine? However, at the present days people could create a passenger car gasoline engine with a power that exceed almost 1900 horse power. This record belongs to Hennessey Venom F5. It shows that the time is changing and people wanted to make engines faster and more powerful. That's why there have been created so many types of engines, that are used nowadays almost in every spheres of our life.

Cars became the regular part of our life. People use them to get to their destination much faster, that's why there have been done lots of researches to make this type of engine more powerful. Every leading car manufacturer have their own developments, which are used in branded cars and many of them can reach great speeds in such a short time. Due to this lots of people think that internal combustion engines are full of their potential, but it is far from it. Despite of the fact, that there are lots of extremely fast engines, their potential has not reached yet.

As it is known an engine is a complicated mechanism, consisting from different parts, that making their own function. There are some main parts, which make a great impact in engine power. For example, crankshaft converts the reciprocating motion of the pistons into rotational, which is transmitted through the flywheel and transmission to the wheels. Then connecting rods serve to transfer the gas forces of the reciprocating piston to the rotating crankshaft. Next pistons convert the energy of the compressed gas into the energy of translational motion. And there is a camshaft which controls the opening and closing the inlet and exhaust valves of the engine at the right time, with the exact stroke and in a precisely defined sequence [1–3].

The most objective rate of dynamic characteristics of an internal combustion engine can be received after analyzing its full-load curve. Full-load curve is a dependence of engine operation indicators, such as power, torque, coefficient of admission, effective fuel rate and etc. All of these factors effect the vehicle's engine power. But the main parameter is still efficiency of an engine.

There are lots of ways of improving the power of engine, starting from basics rules, that are used in factories and ending with some other side details. In that way if we want to improve dynamic characteristic the most effective way, we should start with gas-distributing system and change some parameters in some engine's details. But changing one characteristic means that we need to change another one, because engine is a complicated mechanism. So, in order to improve cubic capacity, it is needed to change piston-rods, pistons and camshaft. These changes make cubic capacity larger and with the growth of it a torsion moment is increasing in a zone of medium and low rounds of engine. Such an engine doesn't need to be spinned, that makes its exploitation very comfortable. Also, there are used light pistons, that decrease charging on a camshaft. And in the end, there need to be a setup for air-fuel system and ignite system.

For instance, let's remember an internal combustion engine made by Honda in 1989. That time Honda got presented the innovative system of gas-distributing system, which is called VTEC. That system literally improves all the characteristics of engine, starting with good traction at the low revs, low levels of exhaust toxicity and also high fuel efficiency.

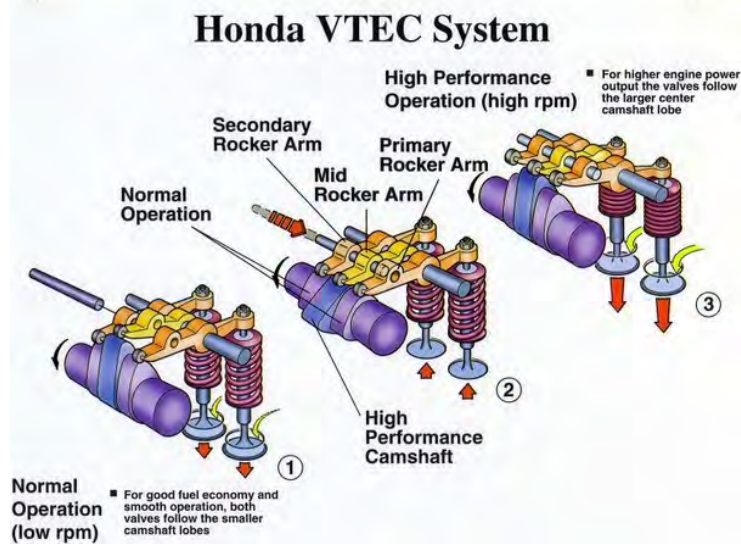


Figure – Honda VTEC System

Coming back to nowadays, Ford company has its own unique engine technology, which is called «EcoBoost». This technology provides 30 % better economy and 15 % reduction in greenhouse gas emissions. At the same time, the units provide power that was previously inaccessible for engines of such volumes. At the same time, high torque is obtained in almost the entire speed range. Thanks to this, cars equipped with EcoBoost are more adapted to various road conditions (primarily to driving on public roads), demonstrate an instant response to the gas pedal, and provide the reserve necessary to perform complex maneuvers (for example, overtaking at high speed). And to achieve such good characteristics engineers use: direct fuel injection system with precise dosing, new turbochargers for high pressure air injection and variable valve timing.

References

1. Швецов А.Ю. Улучшение динамических показателей двигателя внутреннего сгорания // Вестник НГИЭИ. 2010. № 10. URL: <https://cyberleninka.ru/article/n/uluchshenie-dinamicheskikh-pokazateley-dvigatelya-vnutrennego-sgoraniya>.
2. Гусаков С.В., Биссенбаев С.С., Приядака А. Показатели динамических качеств двигателей внутреннего сгорания // Вестник Российского университета дружбы народов. Серия: Инженерные исследования. 2004. № 5. URL: <https://cyberleninka.ru/article/n/pokazateli-dinamicheskikh-kachestv-dvigatelya-vnutrennego-sgoraniya>.
3. Масуев М.А., Аливагабов М.М. Улучшение эксплуатационных качеств и показателей ДВС на основе новых конструктивных схем // Нефтегазовые технологии и экологическая безопасность. 2008. URL: <https://cyberleninka.ru/article/n/uluchshenie-ekspluatatsionnyh-kachestv-i-pokazateley-dvs-na-osnove-novyh-konstruktivnyh-shem>.