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Yield at Thermal Engines Internal Combustion

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Abstract: The paper presents an algorithm to set the parameters of the dynamics of the classic mechanism the main of internal combustion. It shows the distribution of the forces (on the main mechanism of the engine) on engines with internal combustion. With these strong points and together with speeds of kinematic couplings shall be determined when the output of the engine heat shield. The method shall be applied separately for two distinct situations: When the engine is working on a compressor and in the system of the engine. For the two individual cases, two independent formulae are obtained for the efficiency of the engine. With these relations is then calculated with respect to the mechanical efficiency of the engine heat shield Otto, in four-stroke, for two-stroke engines and 4 stroke V. the final yield of the engine is obtained taking into account and thermal efficiency given by the Cycle Carnot program.

Keywords: Kinematics, Forces, Velocities, Powers, Gears, Efficiency, Geometry, Synthesis, Yield

Introduction

First motor in two stages, has been designed and built by Étienne Lenoir 1859. It has used a gas the luminaire. It shall operate in accordance with the cycle of Lenoir. The version of the economic, with a simple carburettor, its effectiveness is less and is more pollutant, but with a power considerably higher and a torque (60 to 70%) than an engine in four-stroke engines. He himself moved at the same speed; it remained for a long period of time and still remains engine only and powerful mopeds and some sports motorcycles reply of motorcycles of competition in the GP and off road. In 1990, we are again interested in the two-stroke engines in cars, but in injection1 direct air, a solution increasingly used at present in the small of travel on two wheels and which comply with the pollution standards Euro 3.

For two-stroke engines in complying with the drink the cycle of Rochas using both sides of the piston: The upper part for phase of compression and the flare and the bottom to ensure the transfer of inlet gases (and therefore the exhaust). They save the movement (so, latency, friction, etc.) of the two cycles which do not produce energy and produce more than torque and power. Between systems to clean up the existing two for two-stroke engines (System Schnürle - or into a loop and one-way flow Uniflux appointed or "equicouring"), recent researches have shown that the loop is always better than Uniflux System.

The power of the theoretical a 2-stroke engine is double that of a 4 stroke, but eliminating the two strokes creates difficulties because it is necessary to eliminate the combustion gases before the air inlet line and that in a very short time. The exhaust gases and must be carried out simultaneously in the vicinity of the PMB saving the mandatory a pressure of the air pressure greater than atmospheric pressure supplied either by a pump the sweeping (alternative or rotary) or through a turbocharger. 30 up to 40% of the energy generated by the stroke of driving is absorbed by the pumps paired scan; therefore, the use of the turbo hot (TS, which uses the energy of the exhaust gas which improves the efficiency of the global reach.

Two-stroke engines permit, theoretically, to benefit from the double cycle (cycle of an engine on the crankshaft rotation, instead of a single engine cycle for two the crankshaft turns for four-stroke engines). However, waterproofing remains difficult to ensure and certain effects on the location of the channels to transfer the gas inlet and exhaust) limits the practical gain to 70% of the work (Amoresano *et al*., 2013; Anderson, 1984; Bishop, 1950; Choi and Kim, 1994; De Falco *et al*., 2013a; 2013b; Ganapathi and Robinson, 2013; Heywood, 1988; Hrones, 1948; Karikalan *et al*., 2013; Leidel, 1997; Mahalingam and Ramesh Bapu, 2013; Naima and Liazid, 2013; Narasiman *et al*., 2013; Petrescu and Petrescu, 2005; 2011; 2013a; 2013b; 2013c; 2013d; 2014; Petrescu *et al*., 2005; Petrescu, 2012a; 2012b; Rahmani *et al*., 2013; Ravi and Subramanian, 2013; Ronney *et al*., 1994; Sapate and Tikekar, 2013; Sethusundaram *et al*., 2013; Zahari *et al*., 2013).

The main advantages of these engines include: Combustion in each rotation of the engine and a very high (capacity/shift), therefore a power of the table very high; a simplicity of construction (moving parts few); lubricate rotating components, irrespective of the tilt of the engine; the losses of the internal friction significantly smaller than at 4-stroke engines (the crankshaft bearings, without having to be led by the distribution, nor a segment of scraper, much lower than the wattage equivalent); a character with engine very expressive, which works better and better when he approached the speed of the vehicle to maximum. At the opposite side of the four times that seems to force and you want to remove its components, in this case; with equal power, a superior reliability 4 stroke, which must run more quickly, which is highlighted by comparing the NR500 Honda Grand Prix in 1980 to 500 2 stages of the time; a heat transfer less at the engine cooling system, compared with four-stroke engines, so a better efficiency from the point of view of the thermodynamic cycle.

The major disadvantages of the engines in two stages include: Specific consumption of fuel greater, due to the unburned gas, which are expelled from the engine during the transfer phase. In order to remedy this situation, direct injection allows a precise dose of fuel to enter the combustion chamber transfers closed. An exhaust pipe extension adjusted, known as an expansion bottle, avoid losses through the exhaust system and make the topping up a effect of "compressor" by filling the cylinder before the close of the exhaust outlet of the range Ok. A discharge valve extends this range, either by subtracting the height of the exhaust outlet or by the challenge of the camera to communicate with a room which will reduce the resonance frequency of the latter. Injecting the water in pot makes agree sump. The reduction of ignition advance causes it to warm up and to agree higher (wave speed is proportional to the temperature of the vessel); a wear faster thanks to the upper part of the port (E), which torture the segments during firing them: They are subject to different and important voltages, compensated by a speed of rotation of the less at the power equal; lubrication is achieved by mixing (1,5 to 3% of the oil in the fuel) or lubricate separated by the injection pump of oil directly into the bearings (sometimes Suzuki). Modern oils burn almost completely during combustion, however the pollution is due to unburned hydrocarbons, linked to the transfer simultaneously, a mixture of air/fuel up the cylinder and the exhaust; a low brake of the engine (Amoresano *et al*., 2013; Anderson, 1984; Bishop, 1950; Choi and Kim, 1994; De Falco *et al*., 2013a; 2013b; Ganapathi and Robinson, 2013; Heywood, 1988; Hrones, 1948; Karikalan *et al*., 2013; Leidel, 1997; Mahalingam and Ramesh Bapu, 2013; Naima and Liazid, 2013; Narasiman *et al*., 2013; Petrescu and Petrescu, 2005; 2011; 2013a; 2013b; 2013c; 2013d; 2014; Petrescu *et al*., 2005; Petrescu, 2012a; 2012b; Rahmani *et al*., 2013; Ravi and Subramanian, 2013; Ronney *et al*., 1994; Sapate and Tikekar, 2013; Sethusundaram *et al*., 2013; Zahari *et al*., 2013).

For these reasons, but especially because of the introduction of more stringent standards on emissions from all over the world, including for motorcycles, for two-stroke engines the fuel economy of the carburettor disappear, because they pollute much more than the equivalent engines, four stroke (Machines the lawnmower, mopeds, motors protection, small generators, motor cultivators of power, vehicles modelling). In contrast, several companies have developed for two-stroke engines with direct injection (Orbital Australian Engine Corporation-now Synerject-and in particular its Asdi-Air-assisted by injection direct Synerject) and the major producers scooter 1 have adopted on some of their models (Peugeot, Piaggio and Honda).

However, two-stroke engines still have great potential in specific sectors, for example the very high powers (marine propulsion or power generation) where two-stroke diesel engines called "slow engines" deliver more than 100,000 hp 50%. These are engines with five to fourteen cylinders in line with a piston diameter of 1 meter and a stroke of 2.50 m. The speed of rotation of their shaft is about 100 revolutions per minute. Their main qualities are reliability and low consumption. On the other hand, their height (about 17 m) and their mass (more than 1 000 tons) limit their use. Four-stroke engines of equivalent power are about three times lighter and less expensive, at the cost of a drop in efficiency of about 3% and less durability. Some of these two-stroke engines used in electric generation have lasted more than fifty years.

Some aircraft engines also use this principle, quite old, since already used by the Clerget engines of the 1930 s. Today, the best known is the Wilksch engine, a twin-stroke 120-hp supercharged by compressor. There are also in 2 and 4-cylinder, as well as the promising prototype undergoing the Zoche star engine certification (300 hp). The advantage in this case of the two-stroke diesel engine is a weight/power ratio equivalent to a 4-stroke gasoline, but with better efficiency and the use of a fuel three times cheaper, kerosene, instead of Costly and polluting aviation gasoline to lead.

In the same way as the engine with the ignition engines, diesel engine is composed of sliding the pistons in the cylinders, closed by a head of cylinder which connects the cylinders at the inlet and the exhaust manifolds, the head of the cylinder fitted with valves are controlled by one or more of the axis of the camshaft sensor. The operation is based on the playful murmuring of diesel, heavy fuel oil or vegetable oil gross in compressed air at a ratio of compression of more than 1:15 of the volume of the cylinder, the temperature of which is increased to approximately 600°C that as soon as the injected fuel (sprayed) in compressed air, illuminates almost instantly, without the need for spark ignition engines.

The burning of the mixture increases very much temperature and pressure (on the old diesel injection the injection pressure has been 130 to 200 bar, while in the modern common rail diesel can be reached at 2 000 bar, which promotes a most complete and less polluting materials), pushing back the piston, which offers jobs on a connecting rod, what makes that the crankshaft turns (or acting crankshaft as a tree of the engine, see connecting rod-crank).

The cycle diesel in the four stroke comprises: Air intake by opening the valve (valve clearances) the inlet and fall of the piston; the air compression by raising the piston, the inlet valve (E) is closed; Injecting-Burning-Expansion bottle: Shortly before the top dead center, fuel is entered via a high pressure injector to form a rough mixing with the oxygen in the compressed air. That followed the quick burning is the time of the engine, hot gases in rapid expansion pushes back the piston, by releasing a part of their energy. This can be measured by the power curve of the engine; the exhaust gases from valve (E), which are pushed the piston on the rise. Only the heater on a diesel engine are "plugs" spark plugs which, as the name suggests, heat in advance the combustion chambers (or pre-rooms in depending on the type of diesel), for the purpose of obtaining when the engine is cold, of sufficient coolant temperature for self-ignition of the fuel. This system provides also sometimes "post-heating" to ensure stability of rotation of the motor and to reduce pollutant emissions at low temperatures.

The efficiency of the engine is the ratio of the mechanical power delivered and thermal power supplied by fuel. This depends on the thermodynamic cycle chosen, the operating parameters (the compression ratio) thermal and mechanical (friction), flow (the inlet and the exhaust) losses as well as the losses due to the accessories needed its operation, such as the injection pump (diesel engine), cooling fan, the coolant pump, the oil pump, alternator, air conditioning compressor and other accessories.

Old engine on gasoline, we will carry every day for almost 150 years. "The Old Otto cycle engine" (and his brother, Diesel) is today: Younger, more powerful, more clean more robust, more streamlined, more economic, more independent, more reliable, more silent and more compact, more sophisticated and more elegant, more secure and especially necessary. At world level, we can manage to eliminate every year almost 60,000 cars. But appear in each year other million cars (Table 1).

The planet now supports about one billion of motor vehicles in circulation. Even if we should stop in full production thermal motors, would have the need for another 10,000 years ago to eliminate the total amount of the existing motor vehicle fleet.

The electric current is still produced in the majority by the combustion of hydrocarbons, which makes the hydrocarbon losses to be greater when using electric motors.

When we have electric current obtained only from green energy, sustainable and renewable sources of energy, only then will we be able to enter gradually and electric motors.

Otto and diesel engines are today the best solution for the transport of our day-to-day work together and with electric motors and those with a reaction.

For these reasons, it is imperative that we can calculate exactly the engine output to may increase permanently.

Table 1. World cars produced

Year	Cars produced in the world
2011	59,929,016
2010	58,264,852
2009	47,772,598
2008	52,726,117
2007	53,201,346
2006	49,918,578
2005	46,862,978
2004	44,554,268
2003	41,968,666
2002	41,358,394
2001	39,825,888
2000	41,215,653
1999	39,759,847

Presents the Algorithm for the Otto Engine in Compressor System

It presents an algorithm to set the parameters of the dynamics of the classic mechanism the main of internal combustion (Petrescu and Petrescu, 2005; 2011; 2013a; 2013b; 2013c; 2013d, 2014; Petrescu *et al.*, 2005; Petrescu, 2012a; 2012b). It shows the distribution of the forces (on the main mechanism of the engine) on engines with internal combustion. With these strong points and together with speeds of kinematic couplings shall be determined when the output of the engine heat shield. The method shall be applied separately for two distinct situations: When the engine is working on a compressor and in the system of the engine. For the two individual cases, two independent formulae are obtained for the efficiency of the engine. Start with the mechanism of the primary engine in the compressor (when the motor mechanism operates the crank, Fig. 1).

Now we are going to watch forces distribution in this case (Fig. 1). The motor force F_m, perpendicular in B on the crank 1, is divided in two components: F_n and F_τ. The normal force, F_n, is transmitted along the rod (connecting rod) from point B to the point C. The tangential force, F_τ, is a rotating force which made the rotation of the connecting rod (element 2). The F_n (normal) force from the point C is divided as well in two components: F_u and F_R. The utile force, F_u, moves the piston and the radial force, F_R, press on the cylinder barrel in which guides the piston. We can write the following relations of calculation (1):

$$
\begin{cases}
\begin{cases} F_\tau = F_m \cdot \cos(\phi_1 - \phi_2) \\ F_n = F_m \cdot \sin(\phi_1 - \phi_2) \end{cases}; \\
\sin(\phi_1 - \phi_2) = \sin(\phi - \psi - \pi) = \sin(\psi - \phi) \\
\begin{cases} F_n = F_m \cdot \sin(\psi - \phi) \\ F_u = F_n \cdot \sin\psi = F_m \cdot \sin\psi \cdot \sin(\psi - \phi) \end{cases} \\
\begin{cases} y_C = l_1 \cdot \sin\phi - l_2 \cdot \sin\psi \\ \\ v_C \equiv \dot{y}_C = l_1 \cdot \cos\phi \cdot \dot{\phi} - l_2 \cdot \cos\psi \cdot \dot{\psi} \\ = l_1 \cdot \cos\phi \cdot \dot{\phi} - l_2 \cdot \cos\psi \cdot \lambda \cdot \dfrac{\sin\phi}{\sin\psi} \cdot \dot{\phi} \\ = \dfrac{l_1 \cdot \dot{\phi}}{\sin\psi} \cdot (\sin\psi \cdot \cos\phi - \sin\phi \cdot \cos\psi) \\ = \dfrac{l_1 \cdot \sin(\psi - \phi) \cdot \omega}{\sin\psi} \end{cases} \\
\begin{cases} P_c \equiv P_m = F_m \cdot v_m = F_m \cdot l_1 \cdot \omega; P_u = F_u \cdot v_C \\ = F_m \cdot \sin\psi \cdot \sin(\psi - \phi) \cdot \dfrac{l_1 \cdot \sin(\psi - \phi) \cdot \omega}{\sin\psi} \\ P_u = F_m \cdot l_1 \cdot \omega \cdot \sin^2(\psi - \phi) \end{cases} \\
\eta_i^c = \dfrac{P_u}{P_c} = \dfrac{F_m \cdot l_1 \cdot \omega \cdot \sin^2(\psi - \phi)}{F_m \cdot l_1 \cdot \omega} \\
= \sin^2(\psi - \phi) = \sin^2\beta, with: \beta = \psi - \phi
\end{cases}
\tag{1}
$$

It can be seen that instantly mechanical efficiency of the engine in the compressor system is sinus square angle beta (2):

$$
\begin{cases}
\eta_i^c = \dfrac{P_u}{P_c} = \dfrac{F_m \cdot l_1 \cdot \omega \cdot \sin^2(\psi - \phi)}{F_m \cdot l_1 \cdot \omega} \\
= \sin^2(\psi - \phi); \beta = \psi - \phi \\
\\
\eta_i^c = \sin^2(\psi - \phi) = \sin^2\beta
\end{cases}
\tag{2}
$$

The angle beta is the difference between the position angle of the con rod and the crank handle.

It can be calculated now mechanical efficiency of engine mechanism in scheme by the compressor, through the integration of instantly yield (relations system 3):

$$
\begin{cases}
\begin{cases} \eta_i^c = \dfrac{P_u}{P_c} = \dfrac{F_m \cdot l_1 \cdot \omega \cdot \sin^2(\psi - \phi)}{F_m \cdot l_1 \cdot \omega} = \\ = \sin^2(\psi - \phi); \ \beta = \psi - \phi; \end{cases} \\
with \ \ \beta_M = \pi; \beta_m = 0 \Rightarrow \\
\begin{cases} \eta^c = \dfrac{1}{\Delta\beta} \cdot \displaystyle\int_{\beta_m}^{\beta_M} \sin^2\beta d\beta = \\ = \dfrac{1}{\Delta\beta} \cdot \displaystyle\int_{\beta_m}^{\beta_M} \dfrac{1 - \cos 2\beta}{2} d\beta = \\ = \dfrac{1}{2 \cdot \Delta\beta} \cdot \displaystyle\int_{\beta_m}^{\beta_M} (1 - \cos 2\beta) d\beta = \\ = \dfrac{1}{2 \cdot \Delta\beta} \cdot \left[\beta - \dfrac{\sin 2\beta}{2}\right]_{\beta_m}^{\beta_M} = \\ = \dfrac{\Delta\beta}{2 \cdot \Delta\beta} - \dfrac{1}{4 \cdot \Delta\beta} \cdot (\sin 2\beta_M - \sin 2\beta_m) = \\ = \dfrac{1}{2} - 0 = \dfrac{1}{2} \end{cases} \\
\eta^c = \dfrac{1}{2} = 0.5 = 50\%
\end{cases}
\tag{3}
$$

If they neglect losses due to friction, it can be considered mechanical efficiency of the engine Otto in scheme by the compressor equal to 0.5.

Presents the Algorithm for the Otto Engine in Motor System

Now, we shall see the engine main mechanism in motor system (when the motor mechanism is acting from the piston; Fig. 2) (Petrescu and Petrescu, 2005; 2011; 2013a; 2013b; 2013c; 2013d; 2014; Petrescu *et al.*, 2005; Petrescu, 2012a; 2012b). In this case the useful power is a real one, being produced by the motor piston (element 3).

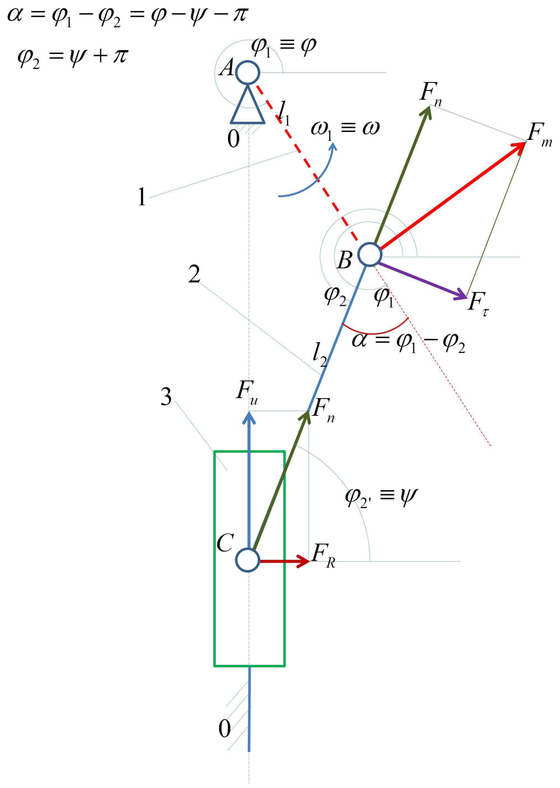

Fig. 1. The forces distribution in engine mechanism, when it is operated of the crank (element 1)

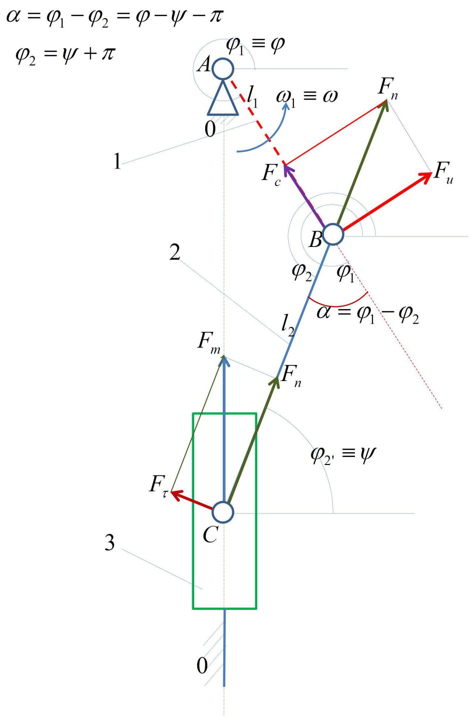

Fig. 2. The forces distribution in engine mechanism, when it is operated of the piston (element 3)

It is to be noted that motive power on now from the piston is divided in two components, normal and tangential, only normal component being transmitted through con rod to the coupler B, where shall also be divided into two other components, F_u and F_c, of which only useful component is turning the handle, while component of compression presses on the crankpin (B) and then on the crank and bearing (A).

One can write the following relations of calculation (4):

$$\begin{cases}
\begin{cases} F_\tau = F_m \cdot \cos\psi \\ F_n = F_m \cdot \sin\psi \end{cases}; \\
\sin(\phi_1 - \phi_2) = \sin(\phi - \psi - \pi) \\
= \sin(\psi - \phi) \\
\begin{cases} F_c = F_n \cdot \cos(\phi - \phi_2) \\ F_u = F_n \cdot \sin(\phi - \phi_2) \\ = F_m \cdot \sin\psi \cdot \sin(\psi - \phi) \end{cases} \\
\begin{cases} y_C = l_1 \cdot \sin\phi - l_2 \cdot \sin\psi \\ \\ v_C \equiv \dot{y}_C = l_1 \cdot \cos\phi \cdot \dot{\phi} - l_2 \cdot \cos\psi \cdot \dot{\psi} \\ = l_1 \cdot \cos\phi \cdot \dot{\phi} - l_2 \cdot \cos\psi \cdot \lambda \cdot \dfrac{\sin\phi}{\sin\psi} \cdot \dot{\phi} \\ = \dfrac{l_1 \cdot \dot{\phi}}{\sin\psi} \cdot (\sin\psi \cdot \cos\phi - \sin\phi \cdot \cos\psi) \\ = \dfrac{l_1 \cdot \sin(\psi - \phi) \cdot \omega}{\sin\psi} \end{cases} \\
\\
\begin{cases} P_u = F_u \cdot v_u = F_m \cdot \sin\psi \cdot \sin(\psi - \phi) \cdot l_1 \cdot \omega \\ P_c = F_m \cdot v_c = F_m \cdot l_1 \cdot \omega \cdot \dfrac{\sin(\psi - \phi)}{\sin\psi} \end{cases} \\
\eta_i^m = \dfrac{P_u}{P_c} \\
= \dfrac{F_m \cdot \sin\psi \cdot \sin(\psi - \phi) \cdot l_1 \cdot \omega}{F_m \cdot l_1 \cdot \omega \cdot \dfrac{\sin(\psi - \phi)}{\sin\psi}}; \\
\eta_i^m = \sin^2\psi
\end{cases} \tag{4}$$

It can be seen that instantly mechanical efficiency of the engine in the motor system is sinus square angle ψ (5):

$$\eta_i^m = \sin^2\psi \tag{5}$$

The instantly efficiency of the engine in motor system depends only on the position angle of the con rod.

It can be calculated now approximately the mechanical efficiency of engine mechanism in scheme by the motor, through the integration of instantly yield (relations system 6):

$$\left\{\begin{aligned}
&\eta^m = \frac{1}{\Delta\psi}\cdot\int_{\psi_m}^{\psi_M}\sin^2\psi\,d\psi\\
&=\frac{1}{\Delta\psi}\cdot\int_{\psi_m}^{\psi_M}\frac{1-\cos 2\psi}{2}d\psi\\
&=\frac{1}{2\cdot\Delta\psi}\cdot\int_{\psi_m}^{\psi_M}\left(1-\cos 2\psi\right)d\psi\\
&=\frac{1}{2\cdot\Delta\psi}\cdot\left[\psi-\frac{\sin 2\psi}{2}\right]_{\psi_m}^{\psi_M}\\
&=\frac{\Delta\psi}{2\cdot\Delta\psi}-\frac{1}{4\cdot\Delta\psi}\cdot\left(\sin 2\psi_M-\sin 2\psi_m\right)\\
&=\frac{1}{2}-\frac{1}{4\cdot\Delta\psi}\cdot\left(\sin 2\psi_M-\sin 2\psi_m\right)\\
&\left\{\begin{aligned}
&\Delta\psi=\psi_M-\psi_m=\pi-2\cdot\psi_m;\\
&\psi_M=\pi-\psi_m;\\
&\sin\left(2\psi_M\right)=\sin\left(2\pi-2\psi_m\right)=-\sin 2\psi_m\\
&\cos\psi=\lambda\cdot\cos\phi;\ \ \psi=\arccos\left(\lambda\cdot\cos\phi\right)\\
&\psi_m=\frac{\pi}{2}-\arcsin\lambda;\ \ \cos\psi_m=\lambda;\\
&\sin\psi_m=\sqrt{1-\lambda^2}
\end{aligned}\right.\\
&\eta^m=\frac{1}{2}-\frac{-2\cdot\sin 2\psi_m}{4\cdot\Delta\psi}\\
&=\frac{1}{2}+\frac{\sin 2\psi_m}{2\cdot\left(\pi-2\cdot\psi_m\right)}\\
&=\frac{1}{2}+\frac{\sin\psi_m\cdot\cos\psi_m}{\pi-2\cdot\psi_m}\\
&=\frac{1}{2}+\frac{\sin\psi_m\cdot\cos\psi_m}{2\cdot\arcsin\lambda}\\
&\eta^m=\frac{1}{2}+\frac{\lambda\cdot\sqrt{1-\lambda^2}}{2\cdot\arcsin\lambda}
\end{aligned}\right. \tag{6}$$

Only are retained relations (7) in the calculation of mechanical efficiency for the two situations of the mechanism Otto cycle engine, when mechanism working in arrangements by the compressor and then when mechanism working in arrangements by the motor:

$$\begin{cases}\eta^c=\dfrac{1}{2}\\[2mm] \eta^m=\dfrac{1}{2}+\dfrac{\lambda\cdot\sqrt{1-\lambda^2}}{2\cdot\arcsin\lambda}\end{cases} \tag{7}$$

The Final Yield

The yield heat shield (to be used as a general rule the one given by Carnot cycle) is a function of the average temperature of the engine (see diagram in Fig. 3).

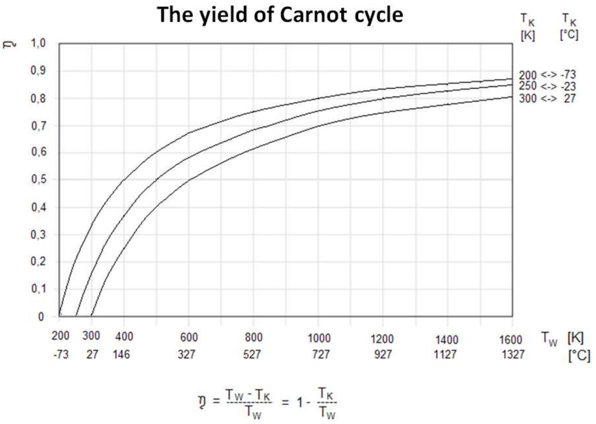

Fig. 3. The heat yield of Carnot cycle

For a minimum temperature (cooling) (Rahmani *et al.*, 2013) equal to that of the external air and a maximum working temperature of the engine of about 1,000 (K) it obtains a yield motor heat judged good, of 0.7 i.e., 70% (Petrescu and Petrescu, 2005; 2011; 2013a; 2013b; 2013c; 2013d, 2014; Petrescu *et al.*, 2005; Petrescu, 2012a; 2012b).

Consider below this value of thermal efficiency which may be obtained for thermal engines internal combustion, but it's difficult and especially to keep those with external combustion, will be determined the values of final yield of an internal combustion engine for three individual cases: A two-stroke engine (Lenoir) (Ronney *et al.*, 1994), a four-stroke engine (Otto or diesel) normally (Sapate and Tikekar, 2013; Sethusundaram *et al.*, 2013) and one four-stroke in V (see the relationship 8):

$$\left\{\begin{aligned}
&\eta^c=\frac{1}{2};\ \ \eta^m=\frac{1}{2}+\frac{\lambda\cdot\sqrt{1-\lambda^2}}{2\cdot\arcsin\lambda}\\
&\eta^{mot.in.two.stroke}=\eta^t\cdot\eta^{mec};with\\
&with\ \ \eta^{mec}=\frac{\eta^c+\eta^m}{2}=\\
&=\frac{1}{2}\cdot\left(\frac{1}{2}+\frac{1}{2}+\frac{\lambda\cdot\sqrt{1-\lambda^2}}{2\cdot\arcsin\lambda}\right)=\frac{1}{2}+\frac{\lambda\cdot\sqrt{1-\lambda^2}}{4\cdot\arcsin\lambda}\\
&\eta^{mot.in.four.stroke.normal}=\eta^t\cdot\eta^{mec};with\\
&with\ \ \eta^{mec}=\frac{3\cdot\eta^c+\eta^m}{4}=\\
&=\frac{1}{4}\cdot\left(\frac{3}{2}+\frac{1}{2}+\frac{\lambda\cdot\sqrt{1-\lambda^2}}{2\cdot\arcsin\lambda}\right)=\frac{1}{2}+\frac{\lambda\cdot\sqrt{1-\lambda^2}}{8\cdot\arcsin\lambda}\\
&\eta^{mot.in.four.stroke.in.V}=\eta^t\cdot\eta^{mec};with\\
&with\ \ \eta^{mec}=\frac{3\cdot\eta^c+2\cdot\eta^m}{4}=\\
&=\frac{1}{4}\cdot\left(\frac{3}{2}+\frac{2}{2}+\frac{2\lambda\cdot\sqrt{1-\lambda^2}}{2\cdot\arcsin\lambda}\right)=\frac{5}{8}+\frac{\lambda\cdot\sqrt{1-\lambda^2}}{4\cdot\arcsin\lambda}
\end{aligned}\right. \tag{8}$$

Discussion

The efficiency of the engine is the ratio of the mechanical power delivered and thermal power supplied by fuel. This depends on the thermodynamic cycle chosen, the operating parameters (the compression ratio) thermal and mechanical (friction), flow (the inlet and the exhaust) losses as well as the losses due to the accessories needed its operation, such as the injection pump (diesel engine), cooling fan, the coolant pump, the oil pump, alternator, air conditioning compressor and other accessories.

Maximum efficiency for modern car is approximately 35% for engines with the ignition and 45% for diesel engines, while most large industrial engines exceeds 50%. The energy lost in necessarily as a result of the Carnot cycle may be recovered by cogeneration (to reheat another refrigerant, such as domestic hot water), improving significantly the balance of the global energy of the plant as a whole.

In the case of a ground-car motor that operates slowly in high load and always in a transitional regime, production actual practice is a lot lower. To drive at a constant speed of 120 km/h, with the most machines need something more than 20 kW, while the motors can provide many times three up to eight times more, resulting in a performance very practical impaired (Amoresano *et al*., 2013; Anderson, 1984; Bishop, 1950; Choi and Kim, 1994; De Falco *et al*., 2013a; 2013b; Ganapathi and Robinson, 2013; Heywood, 1988; Hrones, 1948; Karikalan *et al*., 2013; Leidel, 1997; Mahalingam and Ramesh Bapu, 2013; Naima and Liazid, 2013; Narasiman *et al*., 2013; Petrescu and Petrescu, 2005; 2011; 2013a; 2013b; 2013c; 2013d; 2014; Petrescu *et al*., 2005; Petrescu, 2012a; 2012b; Rahmani *et al*., 2013; Ravi and Subramanian, 2013; Ronney *et al*., 1994; Sapate and Tikekar, 2013; Sethusundaram *et al*., 2013; Zahari *et al*., 2013). Due to losses of the additional transmission, engine high idle times inactive, the performance of the actual practice of a car does not exceed 12%.

Conclusion

The old classic the yield of the motors can be improved by the use of an engine in two stroke or four stroke in the motor V.

The four stroke efficiency can be improved by increasing the effectiveness of the mechanism of distribution and the efficiency of the heat shield, by increasing the working temperature and or decrease the temperature of the cooling system.

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Ethics

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