



<http://www.ijmp.jor.br>  
ISSN: 2236-269X  
DOI: 10.14807/ijmp.v11i3.930

v. 11, n. 3, May-June 2020

## ABOUT THE INTERNAL COMBUSTION ENGINES FORCES

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Submission: 12/10/2018

Revision: 2/8/2019

Accept: 9/19/2019

### 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. Dynamic, the gears can be distributed in the same way as forces. Practically, in the dynamic regimes, the velocities have the same synchronization as forces. The method shall be applied separately for two distinct situations: when the engine is working on a compressor and in the system of the motor. For the two individual cases, two independent formulae are obtained for the dynamic cinematic forces (gearbox). The calculations shall be made for an engine with a single cylinder. The change of speed in the dynamics feels like a variation of the angular speed of the engine. It is more difficult to be taken into account (theoretically) effect on an engine with several cylinders.

**Keywords:** Kinematics; Forces; Velocities; Powers; Engines; Efficiency; Geometry; Synthesis; Yield.



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## 1. INTRODUCTION

Today we are at a crossroads in terms of how the transports will be carried out in the future. Those who see a sudden change are insulting because such changes are made slowly, taking into account the continuous improvement of new technologies as well as the financial possibilities to change old production lines and sometimes a whole factory.

Changes began massively with automation and robotization, which overcame the industrialization of old mechanization. The electronics, software, digitization, computer science, the net also bring about big, permanent changes, fast and sometimes so hard it's hard to keep up with them. Robots so initially blamed helped us to live better, to work less, easier, safer, healthier, with breaks and vacations, but also with beautiful weekends.

They are now doing our hard, tiring, repetitive work in toxic, unfriendly, chemical, radiochemical, aquatic environments in the cosmos, thus avoiding many evils, protecting us, helping us, letting people work lighter and more beautiful, such as coordination, design, research.

In the field of transport, we have been helped for two hundred years by thermal engines, which even though still old we still wear today. How will it be in the future? A question that no one can answer right now. Much of public transport has already been electrified since 1970-1980, due to the major energy crisis of that period. But if about 70% of the railway transport (trains, trams, trolleybuses, subways) passed on electric, yet there are massive transports with ships, air and road which are still being used with thermal motorization, mostly for engines internal combustion, gasoline or diesel, most of which are four-stroke.

If we consider only personal cars that already exceed one billion and are almost all equipped with internal combustion engines, and every year this park is still augmented by about one 100 millions new personal cars, we can easily see that fact any past or current electrification attempt is just a minor try. Vessels consume a very large amount of fuel and all use only thermal engines today.

The same happens with aviation in general, and electrification attempts are also minor, to some small, light aircraft, and some helicopters and drones. The electrification attempts on buses have managed to bring some tens of thousands of electric buses into operation, as well as those with liquid gas (even more), but in total, they represent nothing in the fleet of over a billion cars in circulation.



When talking about hybrid cars we generally refer to hybrid vehicles with a hybrid transmission and not to hybrid engines. Hybrid engines on motor vehicles are rare and their percentage has remained insignificant.

There is talk of about twenty years of free energy, and different schemes are being developed to get it in much better ways. Why then do the magnetic or electromagnetic motors still not appear on the means of transport? The major problem here is a techno-financial one because these engines are not yet reliable, they do not have a life long enough to cushion the costs of their production, and the magnetic materials can degrade over the course of their operation. On the other hand, this is also the operational safety, which is vital for aircraft, and we could not bet on such engines if it would have to repair them on their return if they would give up during the flight, because the return with them would no longer be possible.

The future will be electric, but it will take some time with its implementation.

An interesting solution, which has already succeeded in imposing itself on the car market, is that of hydrogen cars, a future solution, but even if it has occupied a larger segment in total, it is also insignificant, but it still plays an important role in further development of transport.

In order to remove hydrogen from the water directly on the vehicle, we still have to expect sometimes even if the possible solutions are known today because there is no emphasis on this important scientific research part from which energy from water can be extracted. Today's modern methods can dissociate water with low energy consumption, using platinum and gold as catalysts, a medium with ultraviolet radiation intensity control and the forced passage of pressure water through minicells using nanotechnologies.

Then the hydrogen is burned with oxygen, resulting in water and more energy than the one used for dissociation, so water can become an energy storage medium. The cycle can then be used infinitely without losses and without pollution. The method is not yet desirable to be used even though it would only bring enormous benefits to shipbuilding, reducing pollution and massive use of oil, polluting, costly, unfriendly.

It is for the first time in the history of mankind when large companies begin to prepare for the construction of dynamic, high quality, high quality industrial electric cars, industrial scale. Several important Auto-Concerns have already dealt with this, but Volkswagen and Ford have already begun major changes to this. Years to come will bring massive production of fully electrified personal cars.



Even so, a fleet of over a billion vehicles equipped with internal combustion engines can not be removed overnight, so research in that field still needs to continue for a while, and any innovative solution will still be a solid link in diminishing consumption of classical fuels, pollution and noxes. In this context, the present paper is also written (ANTONESCU; PETRESCU, 1985; ANTONESCU; PETRESCU, 1989; ANTONESCU *et al.*, 1985a; ANTONESCU *et al.*, 1985b; ANTONESCU *et al.*, 1986; ANTONESCU *et al.*, 1987; ANTONESCU *et al.*, 1988; ANTONESCU *et al.*, 1994; ANTONESCU *et al.*, 1997; ANTONESCU *et al.*, 2000a; ANTONESCU *et al.*, 2000b; ANTONESCU *et al.*, 2001; ATEFI *et al.*, 2008; AVAEI *et al.*, 2008; AVERSA *et al.*, 2017a; AVERSA *et al.*, 2017b; AVERSA *et al.*, 2017c; AVERSA *et al.*, 2017d; AVERSA *et al.*, 2017e; AVERSA *et al.*, 2016a; AVERSA *et al.*, 2016b; AVERSA *et al.*, 2016c; AVERSA *et al.*, 2016d; AVERSA *et al.*, 2016e; AVERSA *et al.*, 2016f; AVERSA *et al.*, 2016g; AVERSA *et al.*, 2016h; AVERSA *et al.*, 2016i; AVERSA *et al.*, 2016j; AVERSA *et al.*, 2016k; AVERSA *et al.*, 2016l; AVERSA *et al.*, 2016m; AVERSA *et al.*, 2016n; AVERSA *et al.*, 2016o; AZAGA; OTHMAN, 2008; CAO *et al.*, 2013; DONG *et al.*, 2013; EL-TOUS, 2008; COMANESCU, 2010; FRANKLIN, 1930; HE *et al.*, 2013; JOLGAF *et al.*, 2008; KANNAPPAN *et al.*, 2008; LEE, 2013; LIN *et al.*, 2013; LIU *et al.*, 2013; MEENA; RITTIDECH, 2008; MEENA *et al.*, 2008; MIRSAYAR *et al.*, 2017; NG *et al.*, 2008; PADULA *et al.*, 2008; 2013; PERUMAAL; JAWAHAR, 2013; PETRESCU, 2011; PETRESCU, 2015a; PETRESCU, 2015b; PETRESCU; PETRESCU, 1995a; PETRESCU; PETRESCU, 1995b; PETRESCU; PETRESCU, 1997a; PETRESCU; PETRESCU, 1997b; PETRESCU; PETRESCU, 1997c; PETRESCU; PETRESCU, 2000a; PETRESCU; PETRESCU, 2000b; PETRESCU; PETRESCU, 2002a; PETRESCU; PETRESCU, 2002b; PETRESCU; PETRESCU, 2003; PETRESCU; PETRESCU, 2005a; PETRESCU; PETRESCU, 2005b; PETRESCU; PETRESCU, 2005c; PETRESCU; PETRESCU, 2005d; PETRESCU; PETRESCU, 2005e; PETRESCU; PETRESCU, 2011a; PETRESCU; PETRESCU, 2011b; PETRESCU; PETRESCU, 2012a; PETRESCU; PETRESCU, 2012b; PETRESCU; PETRESCU, 2013a; PETRESCU; PETRESCU, 2013b; PETRESCU; PETRESCU, 2016a; PETRESCU; PETRESCU, 2016b; PETRESCU; PETRESCU, 2016c; PETRESCU *et al.*, 2009; PETRESCU *et al.*, 2016; PETRESCU *et al.*, 2017a; PETRESCU *et al.*, 2017b; PETRESCU *et al.*, 2017c; PETRESCU *et al.*, 2017d; PETRESCU *et al.*, 2017e; PETRESCU *et al.*, 2017f; PETRESCU *et al.*, 2017g; PETRESCU *et al.*, 2017h; PETRESCU *et al.*, 2017i; PETRESCU *et al.*, 2017j; PETRESCU *et al.*, 2017k; PETRESCU *et al.*, 2017l; PETRESCU *et al.*, 2017m; PETRESCU *et al.*, 2017n; PETRESCU *et al.*, 2017o; PETRESCU *et al.*, 2017p; PETRESCU *et al.*, 2017q; PETRESCU *et al.*, 2017r;



PETRESCU *et al.*, 2017s; PETRESCU *et al.*, 2017t; PETRESCU *et al.*, 2017u; PETRESCU *et al.*, 2017v; PETRESCU *et al.*, 2017w; PETRESCU *et al.*, 2017x; PETRESCU *et al.*, 2017y; PETRESCU *et al.*, 2017z; PETRESCU *et al.*, 2017aa; PETRESCU *et al.*, 2017ab; PETRESCU *et al.*, 2017ac; PETRESCU *et al.*, 2017ad; PETRESCU *et al.*, 2017ae; PETRESCU *et al.*, 2018a; PETRESCU *et al.*, 2018b; PETRESCU *et al.*, 2018c; PETRESCU *et al.*, 2018d; PETRESCU *et al.*, 2018e; PETRESCU *et al.*, 2018f; PETRESCU *et al.*, 2018g; PETRESCU *et al.*, 2018h; PETRESCU *et al.*, 2018i; PETRESCU *et al.*, 2018j; PETRESCU *et al.*, 2018k; PETRESCU *et al.*, 2018l; PETRESCU *et al.*, 2018m; PETRESCU *et al.*, 2018n; POURMAHMOUD, 2008; RAJASEKARAN *et al.*, 2008; SHOJAEEFARD *et al.*, 2008; TAHER *et al.*, 2008; TAVALLAEI; TOUSI, 2008; THEANSUWAN; TRIRATANASIRICHAJ, 2008; ZAHEDI *et al.*, 2008; ZULKIFLI *et al.*, 2008).

## **2. METHODS AND MATERIALS**

### **2.1. 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. It shows the distribution of the forces (on the main mechanism of the engine) on engines with internal combustion. Dynamic, the gears can be distributed in the same way as forces. Practically, in the dynamic regimes, the gears have the same synchronization as forces.

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 dynamic cinematic forces (gearbox). The calculations shall be made for an engine with a single cylinder. It is more difficult to be taken into account (theoretically) effect on engine with several cylinders. Start with the mechanism of the primary engine in the compressor (when the motor mechanism operates the crank, see figure 1).

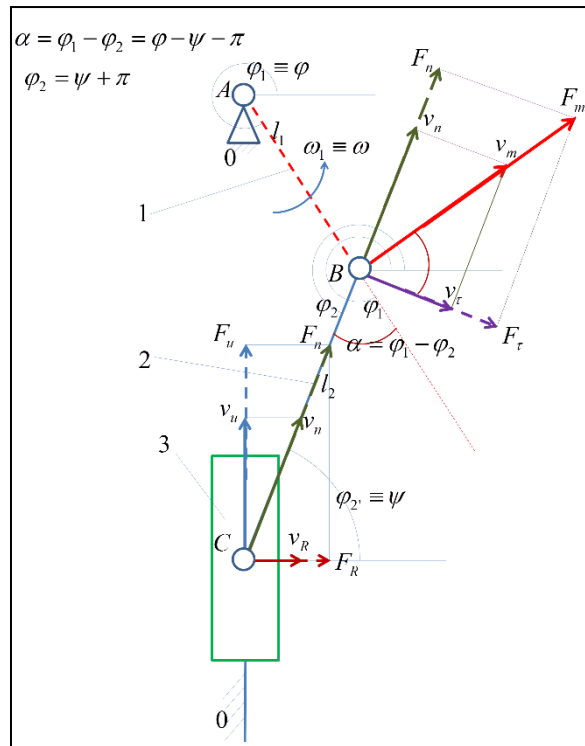


Figure 1: The forces and velocities distribution in engine mechanism, when it is operated of the crank (element 1)

Now we are going to watch forces distribution in this case (figure 1). The motor force  $F_m$ , perpendicular in B on the crank 1, is divided in two components:  $F_n$  and  $F_\tau$ . The normal force,  $F_n$ , is transmitted along the rod (connecting rod) from point B to the point C. The tangential force,  $F_\tau$ , 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.

Dynamic, the velocities can be distributed in the same way as forces. Practically, in the dynamic regimes, the velocities have the same timing as the forces:  $v_m$ : is the motor velocity;  $v_n$ : is the normal velocity, which is transmitted along the connecting rod;  $v_\tau$ : is the tangential velocity, which produces the rotation of the element;  $v_R$ : is the radial velocity, who press on the cylinder barrel in which guides the piston (This velocity produces a radial vibration);  $v_u$ : The utile velocity, moves the piston (when the mechanism is in compressor system). We can write the following relations of calculation (1-2) (PETRESCU; PETRESCU, 2005; PETRESCU; PETRESCU, 2011; PETRESCU; PETRESCU, 2013a; PETRESCU; PETRESCU, 2013b; PETRESCU; PETRESCU, 2013c; PETRESCU; PETRESCU, 2013d;

PETRESCU; PETRESCU, 2014; PETRESCU et al., 2005; PETRESCU, 2012a; PETRESCU, 2012b).

$$\left\{ \begin{array}{l}
 v_m \equiv v_B = l_1 \cdot \omega \\
 v_n = v_m \cdot \sin(\varphi - \varphi_2) = v_m \cdot \sin(\psi - \varphi) \\
 v_\tau = v_m \cdot \cos(\varphi - \varphi_2) = -v_m \cdot \cos(\psi - \varphi) \\
 \\
 v_u = v_n \cdot \sin \psi = v_m \cdot \sin(\psi - \varphi) \cdot \sin \psi \\
 v_R = v_n \cdot \cos \psi = v_m \cdot \sin(\psi - \varphi) \cdot \cos \psi \\
 \\
 v_C^{Din.c} = v_u = l_1 \cdot \omega \cdot \sin(\psi - \varphi) \cdot \sin \psi \\
 v_C^{Din.c} = v_C \cdot D^c = \frac{l_1 \cdot \omega \cdot \sin(\psi - \varphi)}{\sin \psi} \cdot D^c \Rightarrow D^c = \sin^2 \psi \\
 \\
 \Rightarrow w^c \equiv \omega^{Din.c} = \omega \cdot D^c; \quad \dot{D}^c = 2 \cdot \sin \psi \cdot \cos \psi \cdot \dot{\psi} = \sin 2\psi \cdot \dot{\psi} \\
 \\
 \left\{ \begin{array}{l}
 \frac{d}{dt} [v_C \cdot \sin \psi = l_1 \cdot \omega \cdot \sin(\psi - \varphi)] \Rightarrow \\
 \Rightarrow a_C \cdot \sin \psi + v_C \cdot \cos \psi \cdot \dot{\psi} = l_1 \cdot \omega \cdot \cos(\psi - \varphi) \cdot (\dot{\psi} - \omega) \Rightarrow \\
 \Rightarrow a_C = \frac{l_1 \cdot \omega \cdot \cos(\psi - \varphi) \cdot (\dot{\psi} - \omega)}{\sin \psi} - \frac{l_1 \cdot \omega \cdot \sin(\psi - \varphi) \cdot \cos \psi \cdot \dot{\psi}}{\sin^2 \psi}
 \end{array} \right. \quad (1) \\
 \\
 a_C^{Din.c} = \frac{d}{dt} (v_C^{Din.c}) = \frac{d}{dt} (v_C \cdot D^c) = a_C \cdot D^c + v_C \cdot \dot{D}^c
 \end{array} \right.$$

$$\left\{ \begin{array}{l}
 \cos \psi = \lambda \cdot \cos \varphi \\
 \sin \psi = \sqrt{1 - \lambda^2 \cdot \cos^2 \varphi} \\
 \psi = \arccos(\lambda \cdot \cos \varphi) \\
 \\
 \dot{\psi} = \frac{\lambda \cdot \omega \cdot \sin \varphi}{\sin \psi} \\
 \\
 v_C = l_1 \cdot \omega \cdot \sin(\psi - \varphi) \cdot \frac{1}{\sin \psi} \\
 \\
 D^c = \sin^2 \psi \\
 v_C^{Din.c} = v_C \cdot D^c \\
 \\
 \dot{D}^c = \sin 2\psi \cdot \dot{\psi} \\
 \\
 \left\{ \begin{array}{l}
 a_C = \frac{l_1 \cdot \omega \cdot \cos(\psi - \varphi) \cdot (\dot{\psi} - \omega) - v_C \cdot \cos \psi \cdot \dot{\psi}}{\sin \psi} \\
 a_C^{Din.c} = a_C \cdot D^c + v_C \cdot \dot{D}^c
 \end{array} \right. \quad (2)
 \end{array} \right.$$

The forces of mechanism can be seen in the Figure 2.

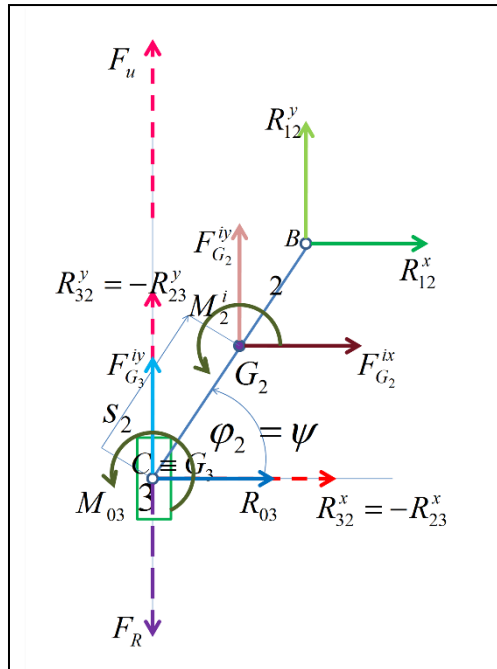


Figure 2: The forces of mechanism, when it is operated from the crank (element 1)

Express motive power through conservation of powers of all the mechanism (system 3) (Petrescu and Petrescu, 2005, 2011, 2013a-d, 2014; Petrescu et al., 2005; Petrescu, 2012a-b).

$$\left\{ \begin{aligned}
 \sum P = 0 &\Rightarrow F_m \cdot l_1 \cdot \omega_1 + M_2^i \cdot \omega_2 + F_{G_2}^{ix} \cdot \dot{x}_{G_2} + \\
 &+ F_{G_2}^{iy} \cdot \dot{y}_{G_2} + F_{G_3}^{iy} \cdot \dot{y}_{G_3} + F_R \cdot \dot{y}_C = 0; \quad F_u = -F_R \Rightarrow \\
 F_u &= \frac{F_m \cdot l_1 \cdot \omega_1 + M_2^i \cdot \omega_2 + F_{G_2}^{ix} \cdot \dot{x}_{G_2} + F_{G_2}^{iy} \cdot \dot{y}_{G_2} + F_C^{iy} \cdot \dot{y}_C}{\dot{y}_C} \\
 F_u &= F_m \cdot \sin \psi \cdot \sin(\psi - \varphi)
 \end{aligned} \right. \quad (3)$$

$$\Rightarrow F_m = \frac{F_C^{iy} \cdot \dot{y}_C + M_2^i \cdot \omega_2 + F_{G_2}^{ix} \cdot \dot{x}_{G_2} + F_{G_2}^{iy} \cdot \dot{y}_{G_2}}{\dot{y}_C \cdot \sin \psi \cdot \sin(\psi - \varphi) - l_1 \cdot \omega_1}$$

$$M_m = F_m \cdot l_1$$

In the diagram below (figure 3) we compare this new torque with the classic (PETRESCU; PETRESCU, 2005; PETRESCU; PETRESCU, 2011; PETRESCU; PETRESCU, 2013a; PETRESCU; PETRESCU, 2013b; PETRESCU; PETRESCU, 2013c; PETRESCU; PETRESCU, 2013d; PETRESCU; PETRESCU, 2014; PETRESCU et al., 2005; PETRESCU, 2012a; PETRESCU, 2012b).



The new torque was determined considering the variation of velocities with forces and forces variation due to velocities (system 3).

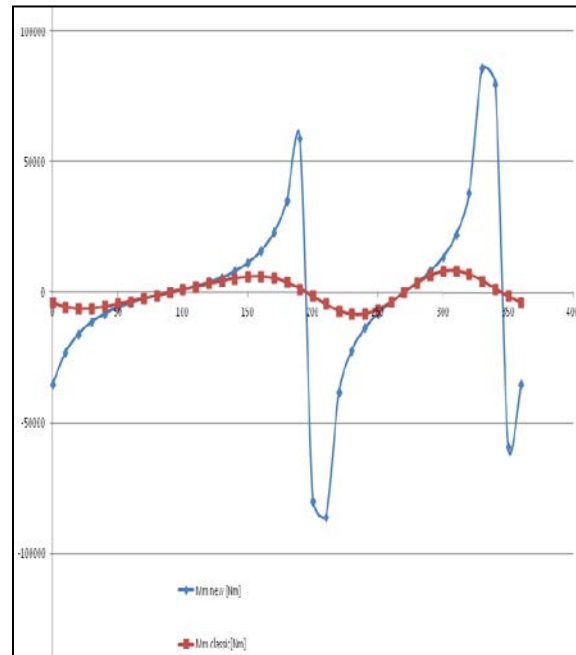


Figure 3: The classical torque and the new torque

## 2.2. Presents the Algorithm for the Otto Engine in Motor System

Now we will look at the main mechanism of the engine in the system with the engine (when the motor mechanism acting on the piston, see figure 4). In this case, useful is one real, be produced by the piston engine (item 3). It should be noted that the drive power from now on the piston is divided in two components, normal and tangential, only a normal part being transmitted through the cone rod to the coupler B, where shall be divided into two other components,  $F_u$  and  $F_c$ , out of which only useful components is turning the handle while the code by the mills of compression on crank (B) and then on the crank and bearing (A) (PETRESCU; PETRESCU, 2005; PETRESCU; PETRESCU, 2011; PETRESCU; PETRESCU, 2013a; PETRESCU; PETRESCU, 2013b; PETRESCU; PETRESCU, 2013c; PETRESCU; PETRESCU, 2013d; PETRESCU; PETRESCU, 2014; PETRESCU et al., 2005; PETRESCU, 2012a; PETRESCU, 2012b).

Dynamic, the gears can be distributed in the same way as forces. Practically, in the dynamic regimes, the gears have the same synchronization that forces: The  $v_m$ : is the speed of the engine;  $v_n$ : this is the normal speed, which is transmitted along the connecting rod;  $v_t$ : is the speed of the tangential, which produces rod from rotating (item 2);  $v_c$ : is the speed of compression and presses the button crank (B) and then on the crank and bearing (A); this speed

produces vibrations of bearings;  $v_u$ : the utile velocity, rotates crank (when the mechanism is in the system with the engine).

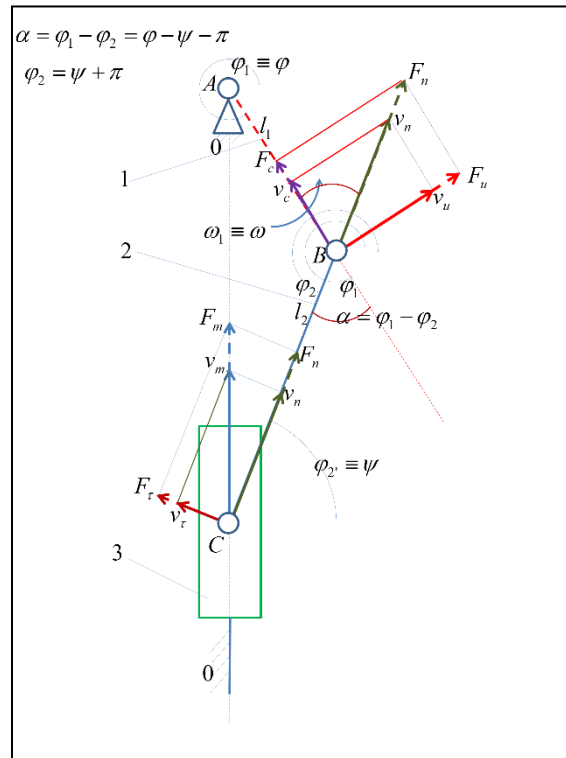


Figure 4: The forces and velocities distribution in engine mechanism, when it is operated of the piston (element 3)

We can write the following relations of calculation (4-5).

$$\left\{ \begin{array}{l} v_n = v_m \cdot \sin \psi \\ v_u = v_n \cdot \sin(\psi - \phi) = v_m \cdot \sin \psi \cdot \sin(\psi - \phi) \\ v_u = \frac{l_1 \cdot \omega \cdot \sin(\psi - \phi)}{\sin \psi} \cdot \sin \psi \cdot \sin(\psi - \phi) \\ \left\{ \begin{array}{l} v_u = l_1 \cdot \omega \cdot \sin^2(\psi - \phi) \equiv v_B^{Din.m} \\ v_B^{Din.m} = v_B \cdot D^m = l_1 \cdot \omega \cdot D^m \end{array} \right. \Rightarrow D^m = \sin^2(\psi - \phi) \\ \dot{D}^m = \sin 2(\psi - \phi) \cdot (\dot{\psi} - \omega) \\ \left\{ \begin{array}{l} a_c = \frac{l_1 \cdot \omega \cdot \cos(\psi - \phi) \cdot (\dot{\psi} - \omega) - v_c \cdot \cos \psi \cdot \dot{\psi}}{\sin \psi} \\ a_c^{Din.m} = a_c \cdot D^m + v_c \cdot \dot{D}^m \end{array} \right. \end{array} \right. \quad (4)$$

$$\left\{ \begin{array}{l} \cos \psi = \lambda \cdot \cos \varphi \\ \sin \psi = \sqrt{1 - \lambda^2 \cdot \cos^2 \varphi} \\ \psi = \arccos(\lambda \cdot \cos \varphi) \\ \\ \dot{\psi} = \frac{\lambda \cdot \omega \cdot \sin \varphi}{\sin \psi} \\ v_c = l_1 \cdot \omega \cdot \sin(\psi - \varphi) \cdot \frac{1}{\sin \psi} \\ \\ D^m = \sin^2(\psi - \varphi) \\ v_c^{Din.m} = v_c \cdot D^m \\ \\ \dot{D}^m = \sin 2(\psi - \varphi) \cdot (\dot{\psi} - \omega) \\ \\ a_c = \frac{l_1 \cdot \omega \cdot \cos(\psi - \varphi) \cdot (\dot{\psi} - \omega) - v_c \cdot \cos \psi \cdot \dot{\psi}}{\sin \psi} \\ a_c^{Din.m} = a_c \cdot D^m + v_c \cdot \dot{D}^m \end{array} \right. \quad (5)$$

### 3. RESULTS AND DISCUSSION

The diagrams of velocities and accelerations can be seen in the figures below. In figure 5 it presents the velocities (cinematic and dynamic) in compressor system and in the figure 7 the same velocities in motor system. The acceleration (cinematic and dynamic) can be seen in the figure 6 (compressor system) and 8 (motor system); ( $\lambda=0.33$ ;  $n=3000$  [rpm]).

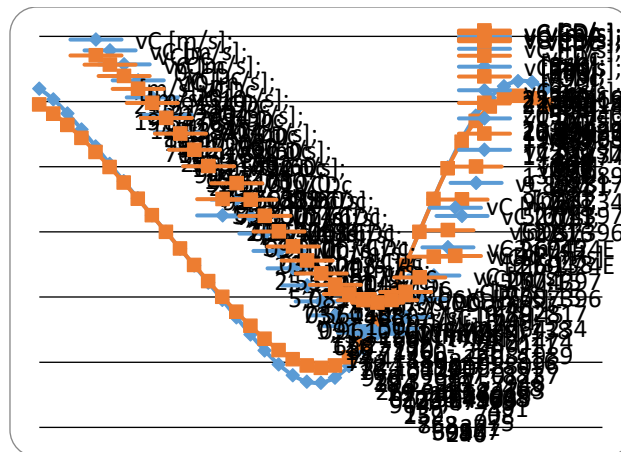


Figure 5: The cinematic and dynamic velocities to a heat mono cylinder engine, in compressor system

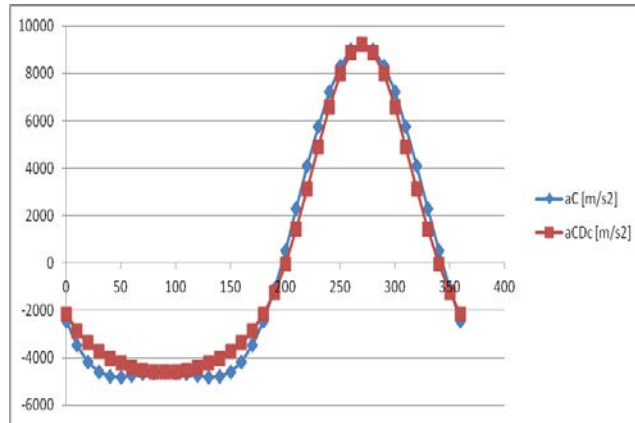


Figure 6: The cinematic and dynamic accelerations to a heat mono cylinder engine, in compressor system

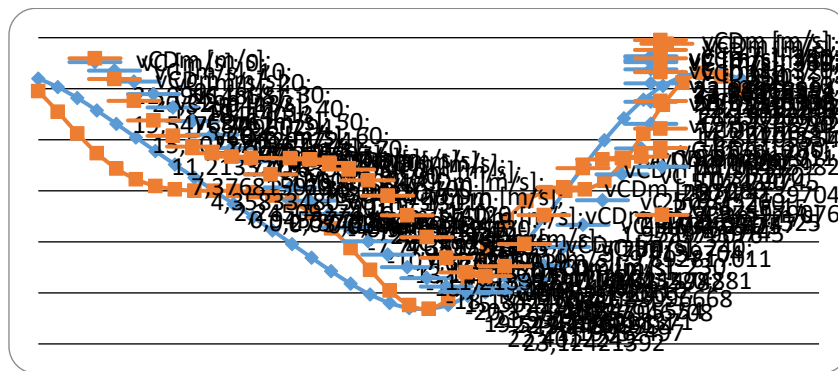


Figure 7: The cinematic and dynamic velocities to a heat mono cylinder engine, in motor system

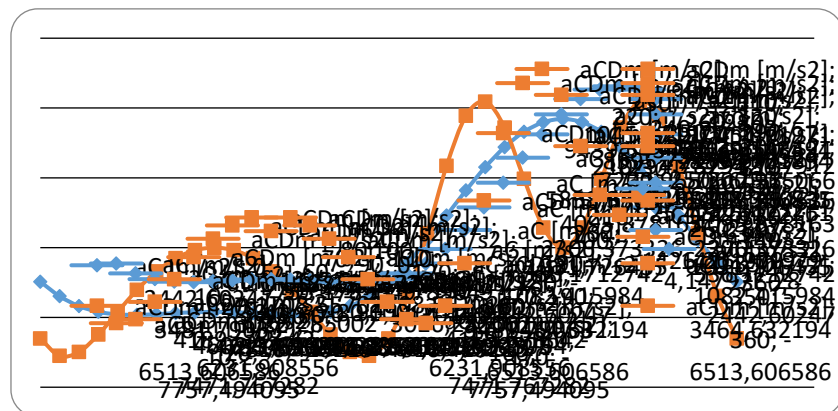


Figure 8: The cinematic and dynamic accelerations to a heat mono cylinder engine, in motor system

It 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 (AMORESANO et al., 2013). Dynamic, the gears can be distributed in the same way as forces. Practically, in the dynamic regimes, the gears have the same synchronization as forces (HRONES, 1948).

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 dynamic cinematic forces (gearbox). The calculations shall be made for an engine with a single cylinder.

It is more difficult to be taken into account (theoretically) effect on engine with several cylinders. Start with the mechanism of the primary engine in the compressor (when the motor mechanism operates the crank, see figure 1). Now we will look at the main mechanism of the engine in the system with the engine (when the motor mechanism acting on the piston, see fig. 4), (PETRESCU; PETRESCU, 2005; PETRESCU; PETRESCU, 2011; PETRESCU; PETRESCU, 2013a; PETRESCU; PETRESCU, 2013b; PETRESCU; PETRESCU, 2013c; PETRESCU; PETRESCU, 2013d; PETRESCU; PETRESCU, 2014; PETRESCU et al., 2005; PETRESCU, 2012a; PETRESCU, 2012b).

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Dynamic, the gears can be distributed in the same way as forces. Practically, in the dynamic regimes, the gears have the same synchronization as forces.

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.

Large variations appear in the engine system.

The change of speed in the dynamics feels like a variation of the angular speed of the engine.

The calculations shall be made for an engine with a single cylinder. It is more difficult to be taken into account (theoretically) effect on engine with several cylinders (PETRESCU; PETRESCU, 2005; PETRESCU; PETRESCU, 2011; PETRESCU; PETRESCU, 2013a; PETRESCU; PETRESCU, 2013b; PETRESCU; PETRESCU, 2013c; PETRESCU; PETRESCU, 2013d; PETRESCU; PETRESCU, 2014; PETRESCU et al., 2005; PETRESCU, 2012a; PETRESCU, 2012b).

#### **4. CONCLUSIONS**

Internal combustion engines of heat speeds and actual accelerations (in dynamic schemes) are different kinematic that speeds and accelerations (classical).

Dynamic, the gears can be distributed in the same way as forces.

Practically, in the dynamic regimes, the gears have the same synchronization as forces.

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 (ZHU et al., 2007).

Large variations appear in the engine system.

The change of speed in the dynamics feels like a variation of the angular speed of the engine.

The calculations shall be made for an engine with a single cylinder. It is more difficult to be taken into account (theoretically) effect on engine with several cylinders (PETRESCU; PETRESCU, 2005; PETRESCU; PETRESCU, 2011; PETRESCU; PETRESCU, 2013a; PETRESCU; PETRESCU, 2013b; PETRESCU; PETRESCU, 2013c; PETRESCU; PETRESCU, 2013d; PETRESCU; PETRESCU, 2014; PETRESCU et al., 2005; PETRESCU, 2012a; PETRESCU, 2012b).

#### **5. ACKNOWLEDGEMENT**



This text was acknowledged and appreciated by Dr. Veturia CHIROIU Honorific member of Technical Sciences Academy of Romania (ASTR) PhD supervisor in Mechanical Engineering.

## 6. FUNDING INFORMATION

Research contract:

- 1) Research contract: Contract number 36-5-4D/1986 from 24IV1985, beneficiary CNST RO (Romanian National Center for Science and Technology) Improving dynamic mechanisms.
- 2) Contract research integration. 19-91-3 from 29.03.1991; Beneficiary: MIS; TOPIC: Research on designing mechanisms with bars, cams and gears, with application in industrial robots.
- 3) Contract research. GR 69/10.05.2007: NURC in 2762; theme 8: Dynamic analysis of mechanisms and manipulators with bars and gears.
- 4) Labor contract, no. 35/22.01.2013, the UPB, "Stand for reading performance parameters of kinematics and dynamic mechanisms, using inductive and incremental encoders, to a Mitsubishi Mechatronic System" "PN-II-IN-CI-2012-1-0389".

All these matters are copyrighted! Copyrights: 394-qodGnhhtej, from 17-02-2010 13:42:18; 463-vpstuCGsiy, from 20-03-2010 12:45:30; 631-sqfsgqvutm, from 24-05-2010 16:15:22; 933-CrDztEfqow, from 07-01-2011 13:37:52. 421-qDiazjHkBu, from 01-03-2010 22:49:44; 3679-vpqggyvrhm, from 04-01-2015 01:44:46; 1375-tnzjHFAqGF, from 02-09-2011 15:19:23; 398-tDGpbsxgrD, from 18-02-2010 01:16:36 and 394-qodGnhhtej, from 17-02-2010 13:42:18.

## 7. ETHICS

Authors should address any ethical issues that may arise after the publication of this manuscript.

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