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SONIC EFFECTS OF UNCONVENTIONAL HEAT INSTALLATIONS

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ABSTRACT: The aim of this thesis is one of the problems fundamental mechanical engineering is to transmit the energy (present in various forms) from a distance, where at any point it can be converted into mechanical work useful.
Methods of vehicular of energy by liquids, currently applied, are generally based on transmitting continuous pressure-flow, so that they produced at one end of the line, and can be taken over to the other, the liquid is regarded as incompressible.
Energy in the new system shall also be transmitted from one point to another, at a distance which can be considerable, with the printing of periodic variations in the compression that produce vibrations longitudinal columns in solid, liquid or gaseous. The Energy transmitted through periodic these vibrations of pressure and volume in the longitudinal direction can be characterized as transmission of power through sonic cues required.
The science of which it is based application elastic properties of matter to energy transmission bearing the name of the scientists or *sonicity* sonic. Hydraulic *Sonicity* is different from in the sense that the latter, in practical applications considered fluids as being virtually incompressible.
For the transmission of power by mechanical waves, it is necessary to achieve means by which vibration in the line of transmission can be received by, and be converted to use.
In this work we make the friction effect in the parallel unconventional sonic system, were the sonic flow are influence by the friction. This effect makes the growing of the temperature in the sonic resistance, same the caloric effect of the alternative current. This paper is the base of departure for the future research about the caloric effects of the sonicity theory in the practice.

KEYWORDS: *sonic pressure, sonic flow, sonic capacity, friction resistance, condenser..*

I. GENERAL NOTION

The sonic actions permit the best combination of facilities offered by the processing of electrical signals (reduces energy) with sonically actions of great power and efficiency, which give the possibility of eliminating the biggest parts of a classical hydraulic system (hydraulic reservoir, flow-adjustment valve), leading to an action which combines the opportunities offered by the processing of the signals of low energy and the compact sonic actions, with high efficiency, with reduces volume, it is very economic (Gogu Constantinescu, 1985). Here it has to be mentioned the fact that, this theory is a particular case of power transmission through movement.
In conventional hydraulic transmission fluid (oil for example) makes a one-way movement between energy converters (pump and hydraulic motor) during power transmission (operation). Harmonic flow in hydraulic transmission fluid performs a periodic motion alternative (sinusoidal) between energy converters.
By analogy with electricity, this pump will be called "*hydraulic generator*". Harmonic flow hydraulic transmissions can be divided into two groups (all by analogy with electric motors): synchronous and asynchronous transmission.

II. THE PARAMETER USED TO THE INSTALLATION OF SYSTEM HARMONIC FLOWS

Parts of hydraulic systems with alternative flow show in figure 1 are: generator (pump) (G), motor (M) and the pipe works (c) that directs flow to the engine power.
If "v" is the speed with the wave circulate of long of the pipe and "f" the circular frequent to the crack, than the long wave is given by the relation, e.q 1:

$$\lambda = \frac{v}{f} \tag{1}$$

The sonic flow can be experimented by form, e.q 2:

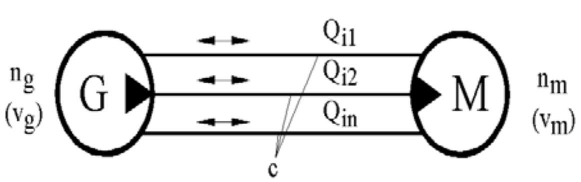
$$Q_i = Q_{a_{\max}} \sin(\omega t + \varphi_0) \tag{2}$$

where: Q_i – represent the instantaneous flow;
$Q_{a\ max}$ – the maximum sonic flow or amplitude flow;
ω – angular frequency.

The *sonic pressure* can be writing similar with the sonic flow in the pipe when are presuming one alternative flow, the instantaneous pressure are, e.q. 3:

$$p_i = p_m + p_{a_{\max}} \sin(\omega t + \varphi_0) \tag{3}$$

where:
- p_m – represent the medium pressure in the pipe;
- $p_{a\ max}$ – maxim (amplitude) of the sonic pressure.



G-generator (pump), c-pipes, M-motor, Q_{ii} – instantaneous flow for phases i
Fig.1. The harmonic hydraulic system

The *sonic displacement* δ_s are defined which the relation e.q 3:

$$\delta_s = \int_{t_1}^{t_2} Q_i \, dt \tag{4}$$

Represent the capacity of displacement in the time period $t_2 - t_1$.
The *inertia* is the propriety when depend the mass movements, so one liquid spout is "l" length, have hydraulics inertia, e.q 4:

$$L = \frac{\gamma \cdot l}{g \cdot S} \tag{5}$$

when: γ = is a specific gravity of the liquid;
S – interior section of the pipe;
g – gravitational acceleration.

The *sonic capacity* or the coefficient of the sonic capacity, C_s is defined by the relation, e.q 5:

$$C_s = \frac{\delta_s}{p_{s_i}} \tag{6}$$

in generally, the growing of the sonic displacement is proportionally which the growing of the pressure, the proportionality constant is the sonic capacity C_s.
The *perditance* represented all loss of liquid in the little interstice or other loss of flow result from the pressure. The flow that is lost down of the pressure is proportionally by the defenses of pressure. Noted by C_p the coefficient of the perditance, can be experimented by form, e.q 6:

$$Q_i = C_p \cdot p_{s_i} \tag{7}$$

are defined which the relation, e.q 7:

$$C_p = \frac{Sl}{E} \tag{8}$$

III. THE EXPERIMENTAL RESEARCH

Research focused on obtaining experimental heat effect as a result of heat transmission remote vibration (sonic waves in liquids). These studies were conducted on the stand presented in figure 1, starting at different frequencies of the engine that drives the piston sonic generator. For each frequency measurements were performed for various static pressure in the system (0.25, 0.5) Pa.

Stand in Figure 1, is large capacitor mounted in parallel with the resistance of friction [2].

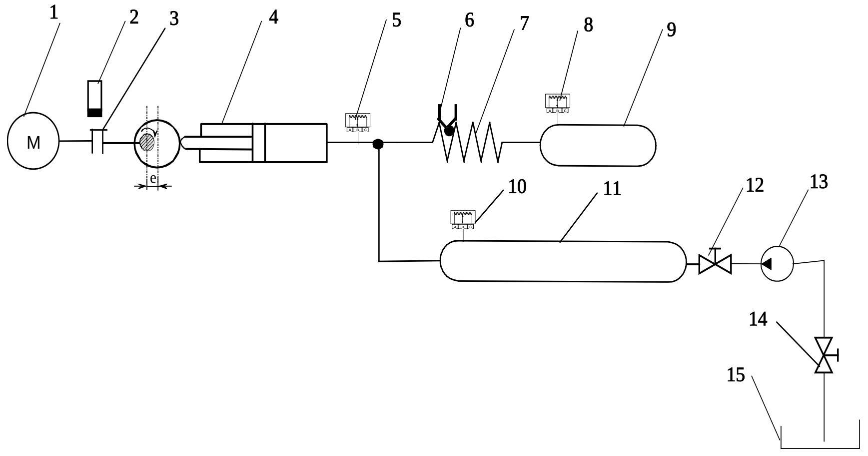


Fig.1 Block diagram of unconventional installation

After processing the files with experimental data from three sensors mounted in the system resulting histograms represented the primary form in Figure 2. This illustrates the pressures developments in general and two capacitors. You can also view the generator speed (position

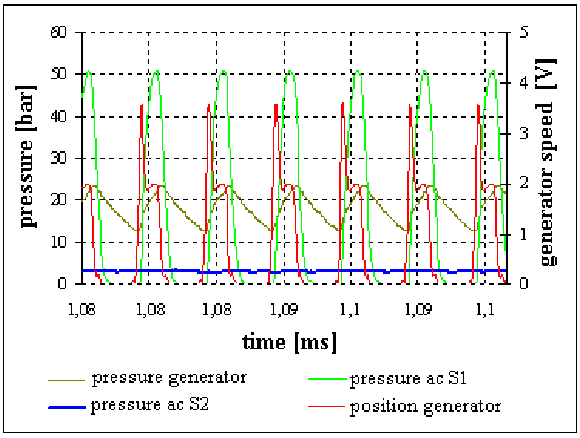


Fig. 2 Evolution mounting pressure over time for small capacitor in parallel

viewed by curve generator). Evolution of pressure curves reveal a phase shift between pressure from the pressure generator and capacitors [2].

The graphs in Figures 3 and 4 were built for a static pressure of 0,25E+05 Pa and starting speed n = 680 rpm. Pressure sensor has reached generator producing a 75E+05 Pa pressure drop in the

n = 680 rpm **p_s = 0,25E+05 Pa**

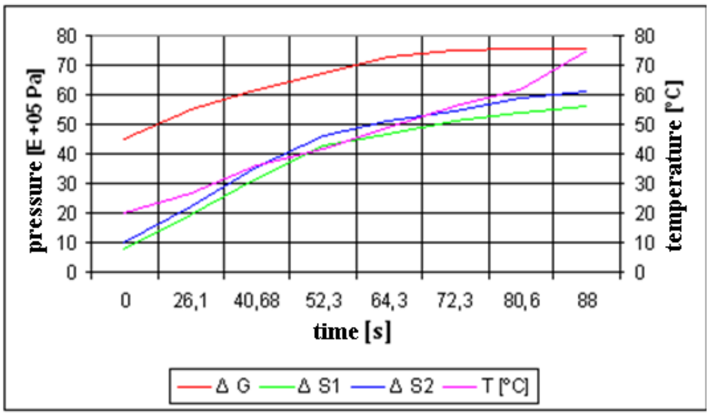


Fig. 3 Diagram of pressures and temperature variation with time in static pressure of 0,25E+05 Pa

p_s = 0,25E+05 P

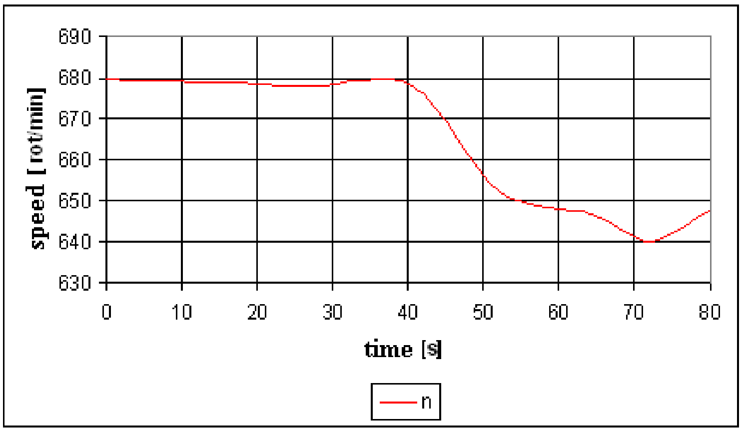


Fig. 4 Diagram of pressures and temperature variation of speed according to the static pressure of 0,25E+05 Pa

friction resistance of 20E+05 Pa.
Temperature reached after about 1 minute and a half working at 75° C continued to rise further to stabilize [3]. The results noted with graphics: ΔG - sonic pump pressure variation on the sensor 5;

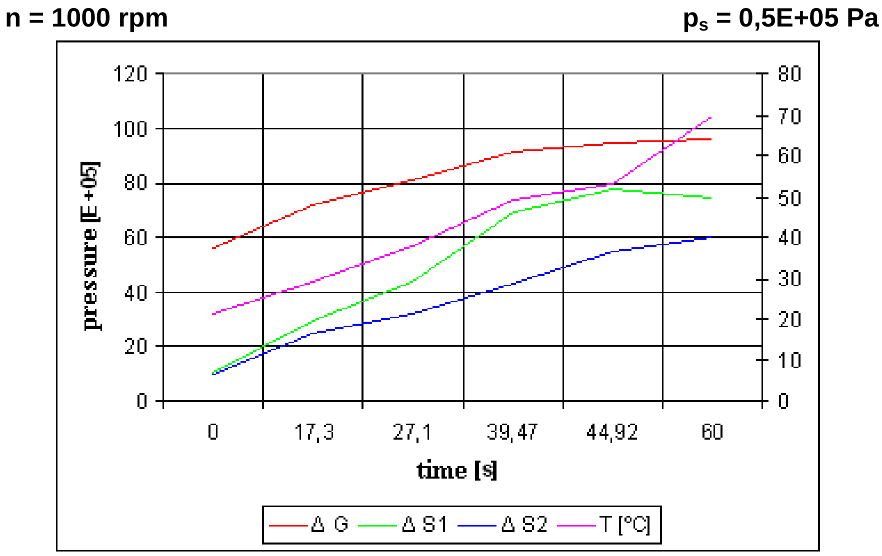


Fig.5 Diagram of pressures and temperature variation with time in static pressure of 0,5E+05 Pa

ΔS1 - pressure variation obtained from pressure sensor 8;
ΔS2 - pressure variation obtained from pressure sensor 10;
T - temperature.

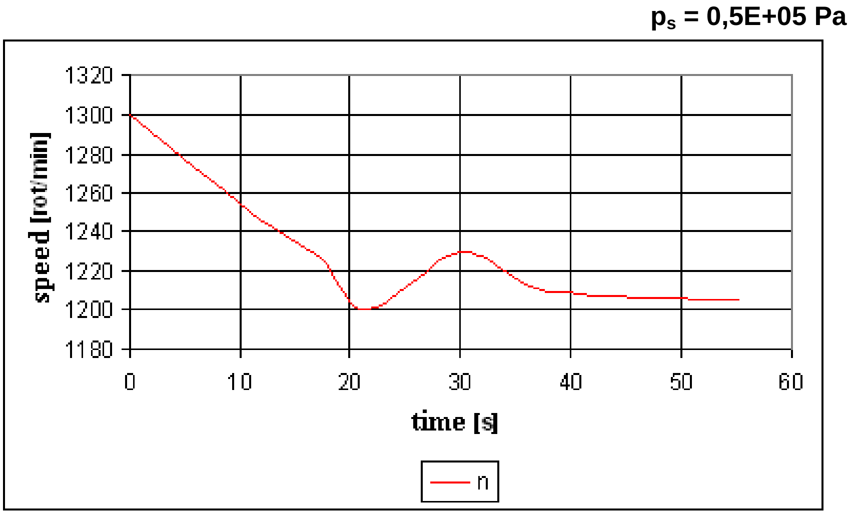


Fig. 6 Diagram of pressures and temperature variation of speed accordig to the static pressure of 0,5E+05 Pa

The graphs in Figures 5 and 6 were built for a static pressure of 0,5E+05 Pa and n = 1000 rpm power. Temperature reached after about one minute and a half working at 70ºC continued to rise further to stabilize. Pressure sensor to rise around de 95E+05 Pa and at the large cylinder at a pressure of 37E+05 Pa, the pressure drop on the resistance of friction is equal to 20E+05 Pa .

IV. CONCLUSION

The analysis of diagrams for assembly in parallel in Figure 1 the following conclusions can be drawn [3]:

- the link in parallel after about a minute stabilized speed;
- pressure drop across the resistance friction is around 20E 05 Pa to that calculated which is 25,86 $\cdot 10^{-5}$ Pa. Deviation between the two pressure was 22% deviation acceptable given the complexity of phenomena that occur across the system;
- after pressure stabilization is found that the speed remains constant;
- static pressure in the system does not influence significantly the pressure drop;
- based on the measurements it can be concluded that the optimal speed for a friction resistance with a diameter of 3 mm and length 1 m is comprised between 600 and 1000 rpm, as confirmed by the calculation
- the two capacitors sonic, in parallel linked via a pipe with a small diameter acting as "capillary type hydraulic resistance", which aims to transform the sonic waves produced by friction fluid environment with walls, into heat.

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