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*Make Harmony Between Technology and Nature, and Your Mind will Fly Free as a Bird*
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# THE IMPORTANTS ELEMENTS OF THE SONIC FRICTION CIRCUIT

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***Abstract:*** *In the last time, the development of the science and the technicians are realised the big progress and the level of the general knowledge of the persons implicated in this activity are advances and probable the knowledge of the sonicity are not brake by the wrong idea or disregarded by "incompressibility of flow"*

*Sonicity is the science of transmitting mechanical energy through vibrations. Starting from the theory of the musical accords, Gogu Constantinescu found the laws for transmitting the mechanical power to the distance through oscillations that propagate in continuous environments (liquid or solid) due to their elasticity.*

*In the paper we make the effect of the friction in the 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.*

***Key words:*** *sonic pressure, sonic flow, sonic generator, perditance, sonic capacity, resistance, inertia*

## 1. INTRODUCTION

The sonicity theory is an old field, though new from the perspectives which it offers: the possibility of development and application of the principles exposed in the sonicity's theory. Energy transmission through fluid compressibility has been approached for the first time, both theoretically and experimentally, by Gogu Constantinescu, who performed his research in the British Navy Laboratory of Coniston and developed the so-called „theory of sonicity". The great inventor has spent a considerable amount of money in order to convince the world the fluids are much more compressible than generally accepted, and that this feature is essential to vibration propagation through fluids.

Sonic actuation permits the optimal combination between the ease of processing electric signals (of low energy) and the high-power sonic actuation, which eliminates the greatest parts in a classical hydraulic system (such as hydraulic reservoirs, control systems for pressure, flow, direction, etc), resulting in an actuation which melts the virtues of low-energy signal processing and the high-output, small-volume, economical and compact sonic actuation.

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. Here it has to be mentioned the fact that, this theory is a particular case of power transmission through movement [3].

By using a precinct for each type © the pipe could be closed partially or totally. So, it will be possible to fait at one end or at one intermediate point, as apparatus for the partial use of wave energy, and the rotary crack (m) will produce work only if the energy is efficiently used. It could be supposed that the pipe is

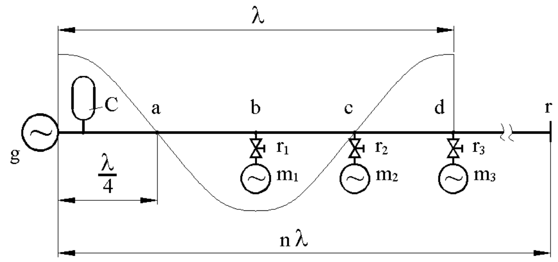


Fig. 1. Sonic system

closed in point ( r ) at a equal distance with a full multiple, n, of wave length, beginning from the wave generator (g) and that there are branches b, c, d at distance of $\frac{\lambda}{2}$; $\frac{3}{4}\lambda$ and $\lambda$, (Fig. 1).

We know, from the analyzed cases above, that if the tap © is closed and the tap ($r_{3)}$ is open, leading to engine ($m_3$), which is spilling with a synchrony speed, it will be able to absorb the energy introduced in liquid by whole the generator (g).

If all taps are closed, in the pipe will appear stationary waves, having the maximum of variation of pressure at the end of © and at $\frac{\lambda}{2}$ (though in b point). In these points the flow will be always zero, and the pressure will alternate between the extreme values determined by the © capacity. At the distances of $\frac{\lambda}{4}$ and $\frac{3}{4}\lambda$ in points (a) and (c), the flow will alternate between the extreme values, but the pressure variation will be zero.

In this case, the pressure and maximum movement points not move along the pipe, but are fix in position, and theoretically, no-energy don't flows from the generator. However, at maximum movement points, the pressure variation is null, and the points of maximum variation pressure, it will not produce any fluid movement.

## 2. THE IMPORTANTS ELEMENTS OF THE SONIC FRICTION CIRCUIT

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 give by the relation, Eqn 1:

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

*The sonic flow* [3] can be experimented by form, Eqn 2:

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

were: $Q_i$ – represent the instantaneous flow;

$Q_{a\,max}$ – the maximum sonic flow or amplitude flow;
$\omega$ – 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 [2] are, Eqn 3:

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

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

The *sonic displacement* $\delta_s$ are defined which the relation [2] Eqn 4:

$$\delta_s = \int_{t_1}^{t_2} Q_i \, dt \quad (4)$$

represent the capacity of displacement in the time period $t_2 - t_1$. The *inertia* is the propriety when depends the mass movement, so one liquid spout is "l" length, have hydraulics inertia, Eqn 5:

$$L = \frac{\gamma \cdot l}{g \cdot S} \quad (5)$$

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

The *sonic capacity* or the coefficient of the sonic capacity, $C_s$ is defined by the relation, Eqn 6:

$$C_s = \frac{\delta_s}{p_{s_i}} \quad (6)$$

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* [3] represented all lost of the liquid in the little interstice or other lost of the flow result from the pressure. The flow that is lost down of the pressure is proportionally by the defense of pressure. Noted by $C_p$ the coefficient of the perditance, can be experimented by form, Eqn 7:

$$Q_i = C_p \cdot p_{s_i} \quad (7)$$

are defined which the relation, Eqn 8:

$$C_p = \frac{Sl}{E} \quad (8)$$

The friction reflected the fact that in time of the alternant movement the liquid into the pipe produce the friction to the interne surface to this and also in the liquid corp. We can suppose a deference of the pressure or sonic pressure need for produce the flow (the current of liquid) is proportional of this [3].

The relation of the sonic pressure [4] and the instantaneous flow can be writing by form, Eqn 9:

$$p_{s_i} = C_f\,(R_f) \cdot Q_i \quad (9)$$

or Eqn 10:

$$C_f = \frac{k\gamma l}{gS} \quad (10)$$

## 3. THE INTERDEPENDENT RELATION BY THE SONIC PARAMETERS

If considerations one flow that traversed one line and have one capacity, for example one condenser, the volume variation of this is, Eqn [11]:

$$\delta_S = \int Q_i \cdot dt + c \quad (11)$$

By the relation who define the sonic capacity coefficient result, Eqn [12]:

$$p_{Si|_C} = \frac{\delta_S}{C_S} \quad (12)$$

were $\delta_s$ it is the sonic deplasment, than:

$$p_{Si|_C} = \frac{1}{C_S} \cdot \int Q_i \cdot dt + c$$

The maxim of the sonic pressure is $p_{Si\,max} = \dfrac{Q_{a\,max}}{\omega \cdot C_S}$ and in the all moment we have, Eqn [13]:

$$p_{Si|_C} = p_{a\,max} \cdot \sin\left(\omega t + \varphi_0 - \frac{\pi}{2}\right) = p_{a\,max} \cdot \sin(\omega t - \Psi) \quad (13)$$

were $\Psi = \dfrac{\pi}{2} - \varphi_0$.

The sonic pressure have a variation by the sinus law, with the same period with the flow to condenser, and the phases angle $\psi$ is more little if to the angle flow with *π/2* (Figure 2).

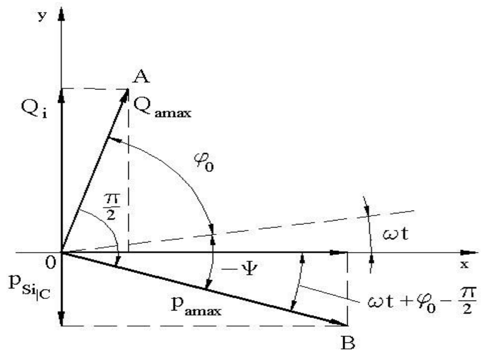


Fig. 2 The vector graphic to the sonic pressure and the sonic flow

If the vector OA = $Q_{a\,max}$ is the maxim flow, the maxim sonic pressure is the vector OB = $p_{a\,max}$ by emphases with the angle *π/2,* the two vectors are rotated solidary. His project by the Ox axes represent in the all moment the values to $Q_i$ and to the $p_{Si}$.

Numerical is $p_{a\,max} = \dfrac{Q_{a\,max}}{\omega \cdot C_S}$ and symbolic we can write, Eqn [14]:

$$\vec{p}_{a\,max} = -j \cdot \frac{Q_{a\,max}}{\omega \cdot C_S} \quad (14)$$

***-j*** is the symbol who indicated the $p_{a\,max}$ vector equal by *π/2* and is ago the $Q_{a\,max}$ vector.

## 4.CONCLUSION

The sonic pressure $p_{a\,max}$ it is with *π/2* behind to the $Q_{a\,max}$ *flow, the* $Q_{amax}$. Flow it gets the start with *π/2* to the sonic pressure $p_{a\,max}$. Result *–* $j^2 = 1$ and $j^2 = -1$.

The relation give can be writing:

$$Q_{a\,max} = j \cdot \omega \cdot C_S \cdot p_{a\,max}$$

These equations are used for the connection about the sonic pressure and the sonic flow. The sonic *deplasment it is in phases with the sonic pressure*

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