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THE FRICTION EFFECTS IN THE HARMONIC FLOW

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ABSTRACT
In the paper we are present some theoretical consideration about the effect of the friction in the sonic installation. To begin to the sonic pressure and the sonic flow we can demonstrate the effects of the friction.
Keywords: sonic pressure, sonic flow, sonic circuits.

1. INTRODUCTION
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"

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, i. e. it is very economic. Here it has to be mentioned the fact that, this theory is a particular case of power transmission through movement.

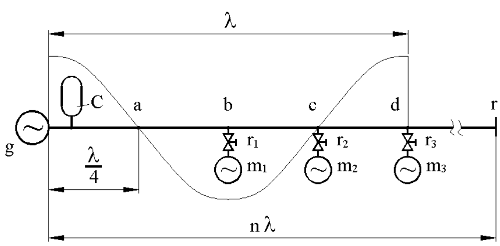

Figure 1. Harmonic installation

By using a precinct for each type (C) 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 rotative crack (m) will produce work only if the energy is efficiently used. It could be supposed that the pipe is 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 λ, figure 1.

We know, from the analyzed cases above, that if the tap (r) 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 (r) 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 (C) 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:

a) It is clear that if the tap (r_1), which leads directly to the engine m_1, is open, it will rotate with a synchronic speed, being able to absorb the whole energy communicated to the line. So, the stationary semi wave between (g) and (b) disappears, being replaced by a progressive wave, as long as between (b) and the need of the line (r), the stationary wave will persist.

b) If the tap (r_2), which will lead to the engine (m_2) (settled at $\frac{3}{4}\lambda$) is open, all other taps being closed, now in (c) point, the pressure variation is always zero, none energy will be absorbed by the engine, and the stationary wave will persist in the entire length of the pipe.

c) If the engine is connected at the intermediate point, a part from the energy will be absorbed by the engine, or stationary wave will persist with a reduced amplitude between the generator (g) and engine, the liquid state between it could be considered as result of two overlapped waves: one stationary wave and one progressive wave.

d) Let's assume that, in this case, the engine (m_3) is not able to absorb the whole energy communicated to the line by the generator (G). We will have then overlapped in the pipes a system of stationary waves and a system of mobile waves along the pipe, though there will not be any point in the pipe where the variation of the pressure will be permanently zero. So, a connected engine at any point of pipe will be an able to absorb and use anaction from the energy communicated to the line.

2. THE FRICTION EFFECTS IN THE HARMONIC FLOW

The differential equation for one pipe to taking into account inertia and liquid capacity, the equation can be:

$$\frac{d\overline{Q}}{dx} = j\cdot\omega\cdot\overline{C}_s\cdot\overline{p}_{a_{max}} \quad (1)$$

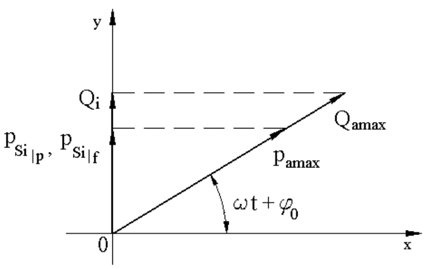

Figure 2.

$$\frac{d\overline{p_{a_{max}}}}{dx} = j\cdot\omega\cdot\overline{L}_s\cdot\overline{Q}_{a_{max}} \quad (2)$$

The instantaneous flow has one simple harmonic variation, of the form:

$$Q_i = Q_{a\,max}\cdot\sin(\omega t+\varphi_0) \quad (3)$$

In relation $\Delta p_{fi} = R_f\cdot Q_i$ and $Q_i = C_p\cdot\Delta p_{si}$ the friction coefficient R_f and the perditance C_p, are constants. The relationships above can be writing:

$$\Delta p_{fi} = R_f \cdot Q_i \qquad (4)$$

$$\Delta p_{si} = R_p \cdot Q_i \qquad (5)$$

where:

$$R_p = \frac{1}{C_p} \qquad (6)$$

Value *i* refers to the instantaneous values.
If the flow is sinusoidal we have the relation:

$$Q_{a\,max} = C_p \cdot p_{a\,max} \qquad (7)$$

For the friction we have the relation:

$$p_{a\,max} = C_f \cdot Q_{a\,max} \qquad (8)$$

In phase with flow, figure 2, where $R_f = C_f$ and is the friction coefficient.

We propose to observe the friction effects due to account of the variation of the different elements. We need to calculate this friction and the importance for the caloric effects that can developed.
To high light the caloric effects in a sonic circuit, we consider the circuit form by the condenser and the friction resistance (Figure 3).

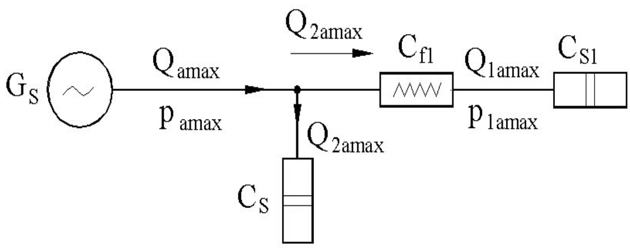

Figure 3. The sonic circuit

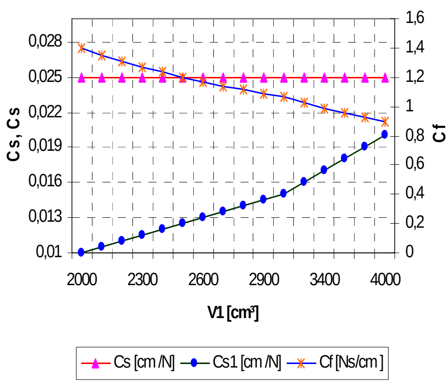

Figure 4. The value of the friction coefficient

If we take into account the volume of the condenser we see the variation of the friction resistance, function of this variation. We observe that at constant angle speed and constant volume of a condenser Cs, we see the upper to the value of the friction coefficient increase (Figure 4).

If we take into account the volume of the condenser we see the variation of the friction resistance, function of this variation. For volume constant to the two condensers and for C_{s1} variable capacity, we observe that at constant angle speed and constant volume of condenser, we see the upper the value of the friction coefficient increase, figure 5.

3. CONCLUSION

1. If we have the variation of the volume of the second condenser, we observe the increase of the value of the friction coefficient. In this case the angle speed is constant.
2. In the second case we see the variation of the volume of the first condenser; in the graphic we see increase of to the friction coefficient. The angle speed is also constant.

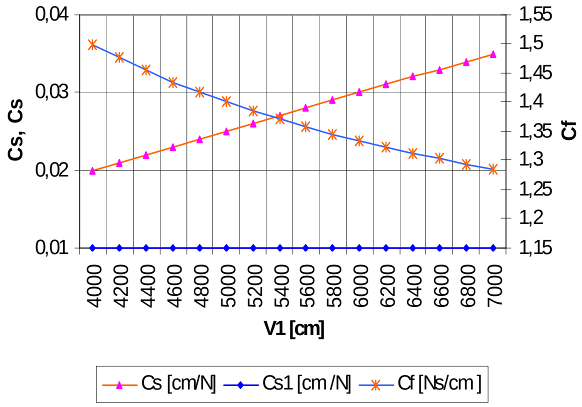

Figure 5. The value of the friction coefficient

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