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STUDIES RELATED THE METHODOLOGY OF THE MACHINE SIZE DETERMINATION IN THE HIGH PRESSURE DIE CASTING TECHNOLOGY

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Abstract: The paper presents the determination method of the size of the high pressure diecasting machines used in the aluminium high pressure diecasting technology.
The size of the high pressure diecasting machine is function of several factors and parameters as the projected area of the part and runner system on the molds split surfaces in opening directions, weight of the injected aluminium, size of the mold, specific pressure.

1. Introduction

The size of the high pressure diecasting machine is necessary to be determinated from the part and runner system design stage. The size of the machine is dependent of the opening force which acts to the mold, which is directly in function of the surface of the projected aluminium in the split surface of the mould and the specific pressure of the alloy in the mould.

2. Methodology of machine size determination

The main input elements in the determination of the opening force FLI [N] are the surface of the projected aluminium in the split surface of the mould [cm^2] and the specific pressure of the alloy in the mould [N/cm^2], where 1 bar = 10 [N/cm^2].

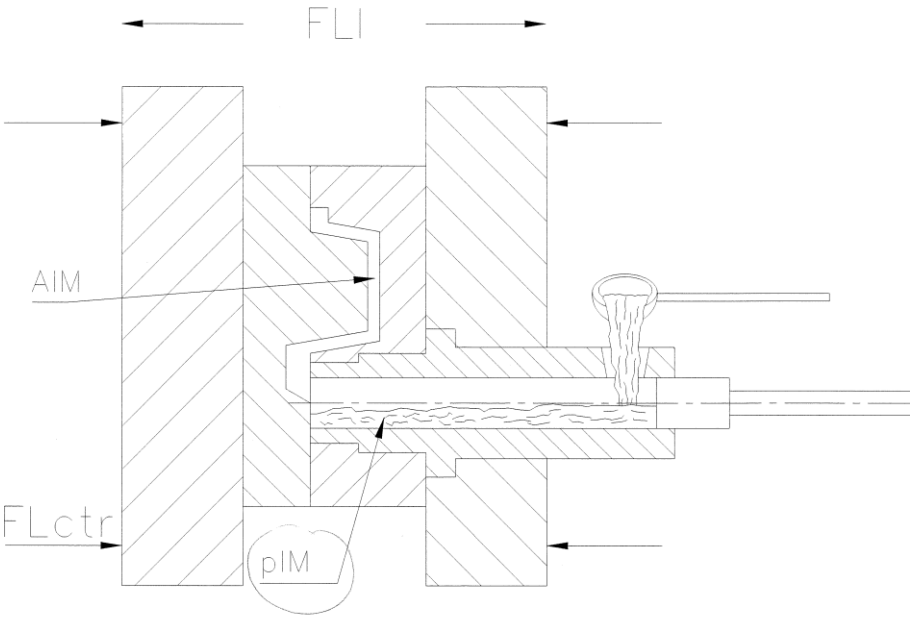

Figure. 2.1. The input elements of the calculation of the die casting machine size

In the figure 1.1. is presented the sketch of the input elements used in the calculation of the die casting machine.
FLI= opening force [N]
AIM= surface of the projected aluminium in the split surface of the mould [cm^2]
pIM= pressure of the alloy during casting [N/cm^2]

For the determination of the opening force is used the following formula:

$$FLI(kN) = \frac{AIM(cm^2) \cdot pIM(bar)}{100} \qquad (2.1.)$$

In most of the cases for the determination of the locking force the value of the opening force is considered higher with values between 10-25%, as it is presented in the formula 2.2.

$$F_L ctr = K \cdot FLI \qquad (2.2.)$$

K=1,20 when the mould is with slide cores
K=1,10 when the mould is without slide cores

In the calculation of the opening force is considered also the force introduced by the slidecores of the mould. In the figure 2.2. is ilustrated the decomposition of the forces acting on the cores of the slider which are increasing the value of the opening force of the mold. The value of the component of the force is function of the tangent of the angle between slider of the core and the wedge of the slider.

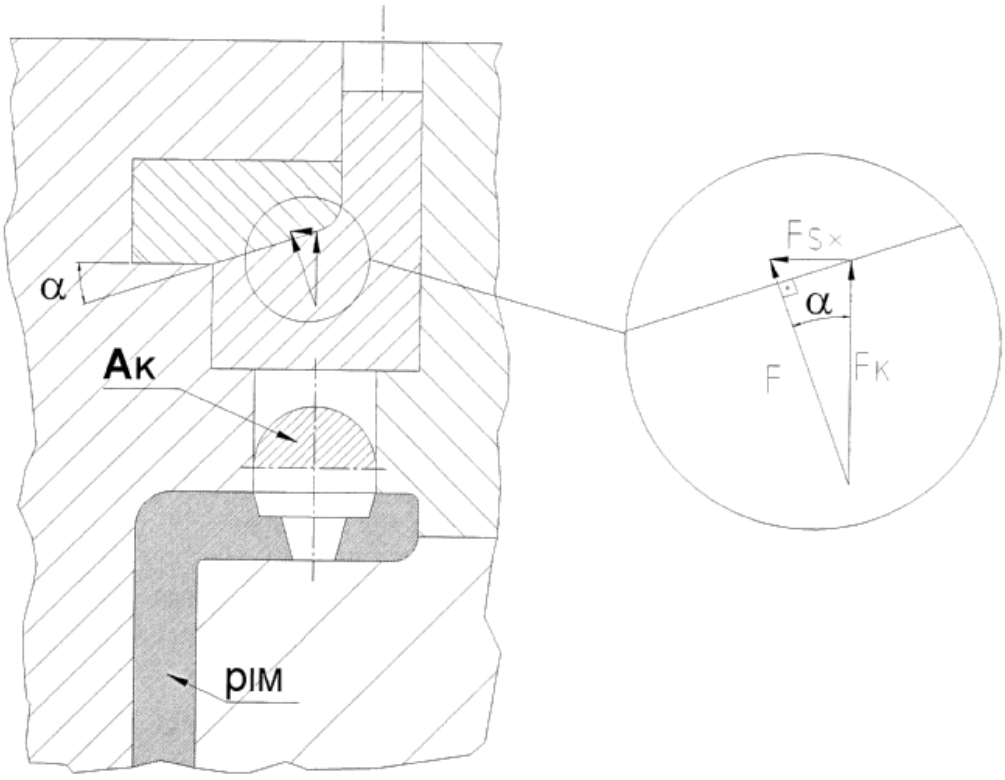

Figure. 2.2. The influence of the sliders to the locking force

The value of the projected surface of alloy to the lateral mobile slide cores is part of the secondary surface calculation which is taken into account as supplimentary surface over whom the injection pressure is applied, and it is calculated with the formula:

$$A_S^* = A_K \cdot \tan(\alpha) \qquad (2.3.)$$

The angle between the slider of the mobile insert and the wedge of the slider is in function of the way how the slider is actioned: mechanically or by hydraulical cylinders.
In the case of the sliders moved mechanically, where for the movement of the slider are used generally bolts or pins mounted in inclined position for the motion of the sliders is recommended an angle of 18º between the slider of the core and the wedge of the slider.
In this case the formula to calculate the supplementary surface is:

$$A_S^* = A_K \cdot \tan(18^\circ) \qquad (2.4.)$$

$$A_S^* = A_K \cdot 0{,}3 \qquad (2.5.)$$

In the figure 2.3. is presented the mechanical actioning system for the lateral sliders of a mould with bolt mounted inclined at 18º.

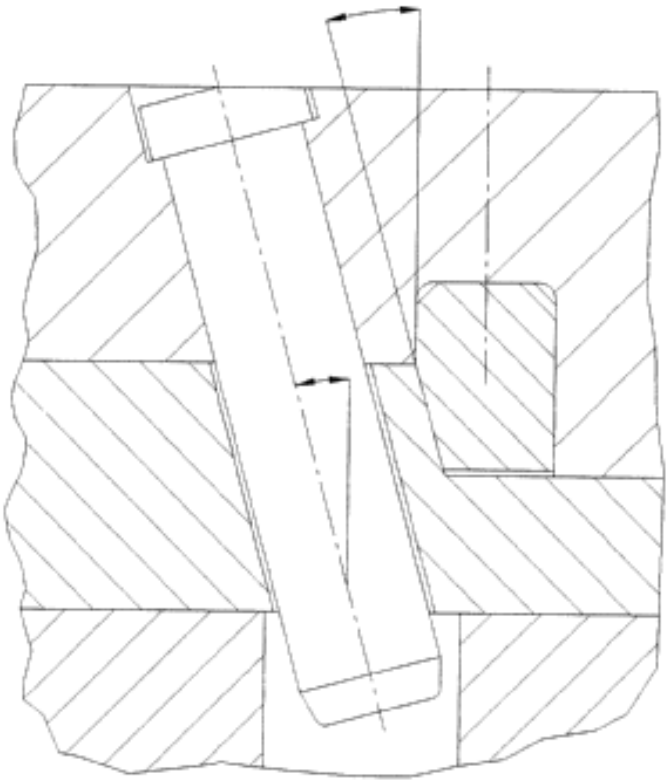

Figure. 2.3. The influence of the mechanically actioned sliders to the value of the locking force

In the case of the sliders actioned by hydraulical cylinders it is recommended an angle of 6º between the slider of the core and the wedge of the slider.
In this case the formula to calculate the supplementary surface is:

$$A_S^* = A_K \cdot \tan(6^\circ) \qquad (2.6.)$$

$$A_S^* = A_K \cdot 0{,}1 \qquad (2.7.)$$

In the figure 2.4. is presented the locking system for the sliders of a mould with a wedge inclined at 6º.

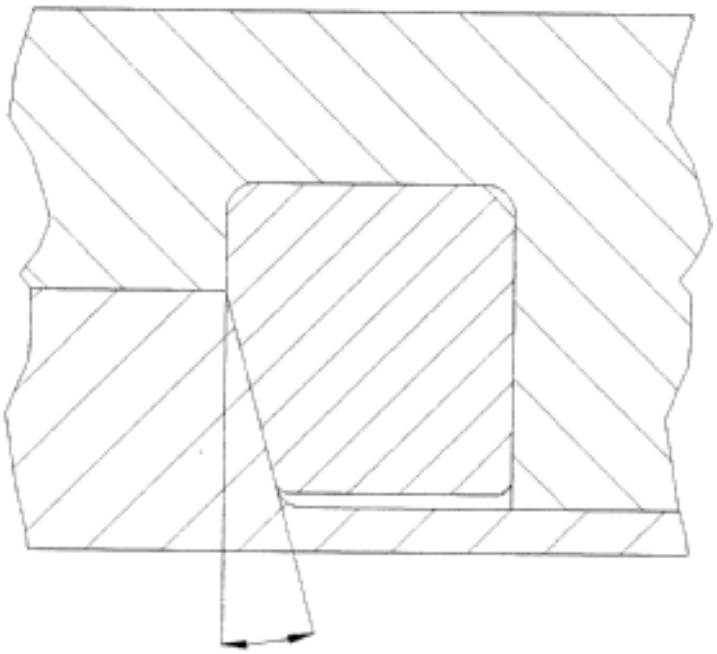

Figure. 2.4. The influence of the hydraulically actioned sliders to the value of the locking force

3. Conclusions

The size of the high pressure diecasting machine is directly dependent of the projected area of the alloy in the split surface of the mould. The projected surface of the alloy is sum of projection of the part, runner and the overflows. An important impact in the calculation of the opening force of the machine has the alloy projected to the supplementary surface created by the movable slide cores of the mould.

4. References

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