THERMAL CONTROL OF A STEERING HOUSING DIE CASTING MOLD

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Abstract: This paper presents how is obtained the thermal control in one cavity mold for a steering housing part. Thermal control plays a vital role in the quality of the part, life of the mold and the die casting process it self. Without thermal control you can not manage the die casting process.

1. INTRODUCTION

Steering housing, as its name says houses the main steering system rack-pinion, as shown in the figure below (Figure 1.1) [4].

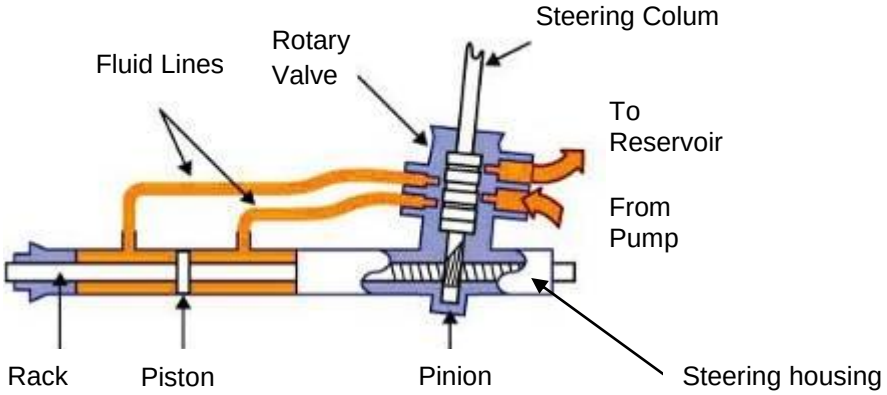


Figure 1.1 The steering housing in assembly

2. THERMAL CONTROL WITH OIL THERMO-REGULATOR UNITS.

The use of thermo-regulators facilitates obtain the heat balance of the mold, allow to preheat the mold before the start of production and after the process started it maintains a constant temperature of the mold. This favors the extension of mold life, and gives you a control over the die casting process.

For a mold where you need to thermo-regulate different zones with different temperatures you need to have different separate circuits on the mold to have control over every zone separately, then you need one thermoregulation unit for every circuit that will be heated differently.

Thermo-regulator units for oil have a maxim working temperature around 360-380ºC.

Figure 2.1 Double thermo-regulator unit (left) side simple thermo-regulator unit (right)

For higher capacities are mounted in series several thermoregulation units. Each individual heater must be equipped with a temperature controller [2].

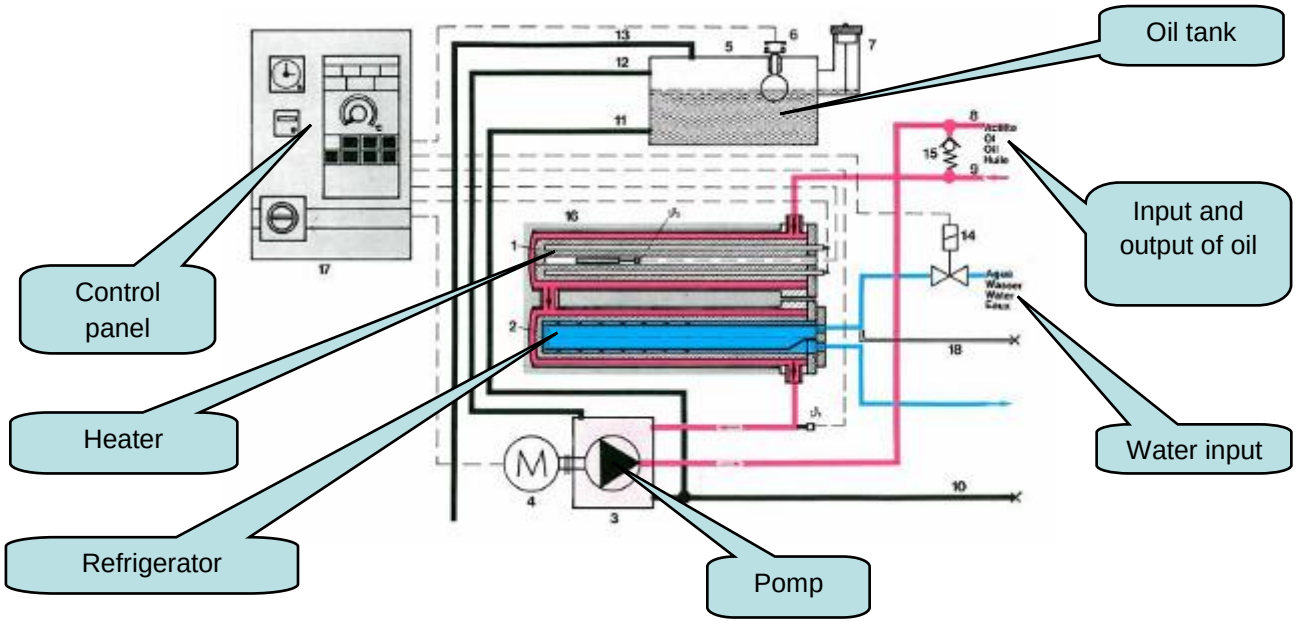


Figure 2.2 Operating diagram of a thermoregulation unit

3. THERMOREGULATION CIRCUITS OF THE MOLD

The thermoregulation units are connected to the circuits of the mold.

Internal circuits in the mold interconnected by hoses are used for the thermoregulation of the cavities. Oil and water circuits are used for thermoregulation (Figure 3.1).

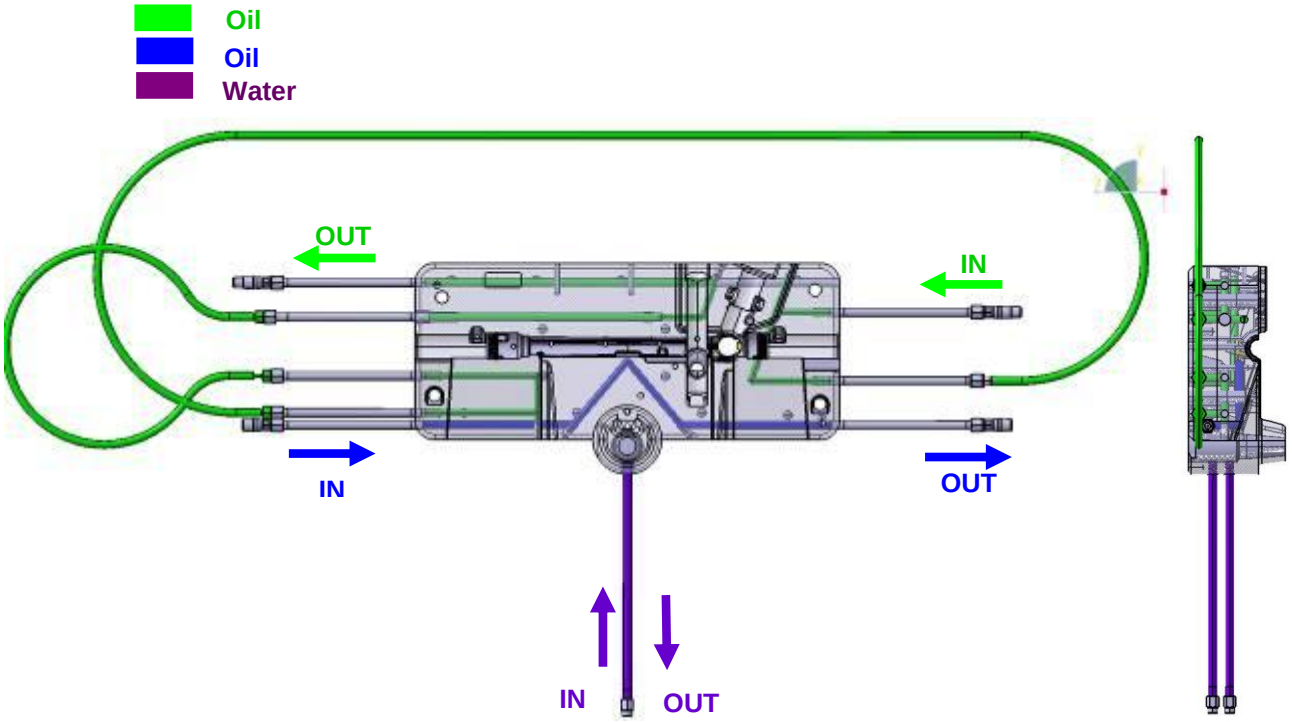


Figure 3.1 Thermoregulation circuits with oil and water in the mobile side of the mold

With oil thermoregulation circuits you have better control over the temperatures in the mold and the thermal shock is smaller, than in water circuits, very important for the life of the mold. The disadvantage is that the response is slower in oil circuits than with water.

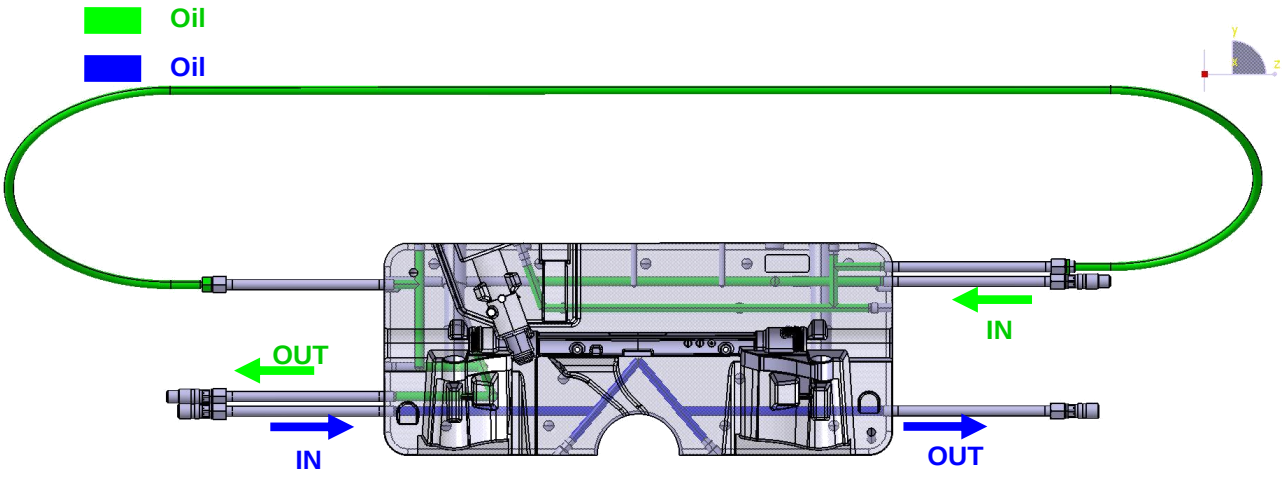


Figure 3.2 Thermoregulation circuits with oil in the fix side of the mold

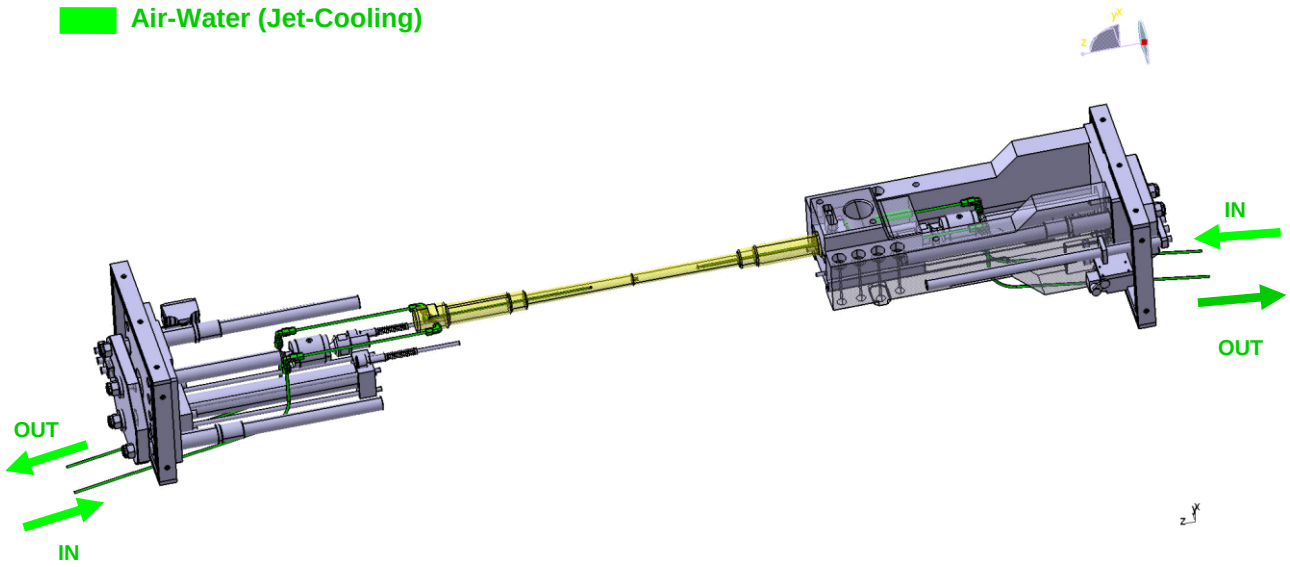


Figure 3.3 Thermoregulation circuits of the pins with JET-COOLING system

This JET-COOLING system is very efficient in cooling pins in sliders, small inserts, local and concrete areas (Figure 3.3).

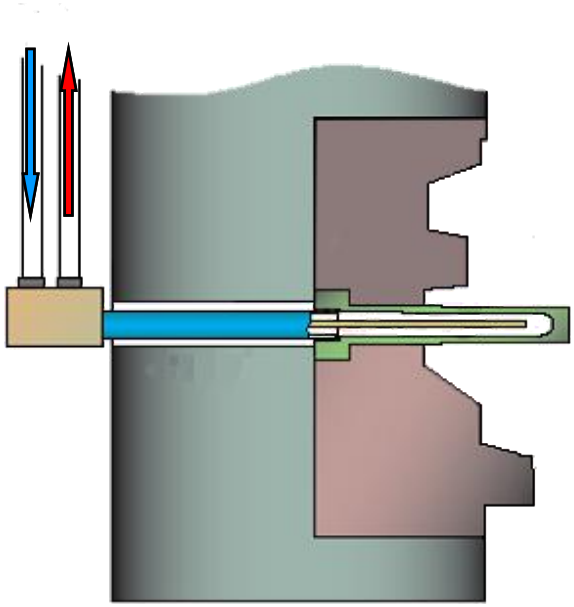


Figure 3.3 JET-COOLING system in the mold

The best method of cooling a specific point or area is through a localized cooling high efficiency system (JET-COOLING). This system has the advantage of being able to position it very close to the area where the heat accumulates.

In the figure below is presented the whole JET-COOLING system, with its components (Figure 3.4) [2].

The high efficiency of the cooling system is do to its unique functioning system, using air and water in alternating mode (Figure 3.5).

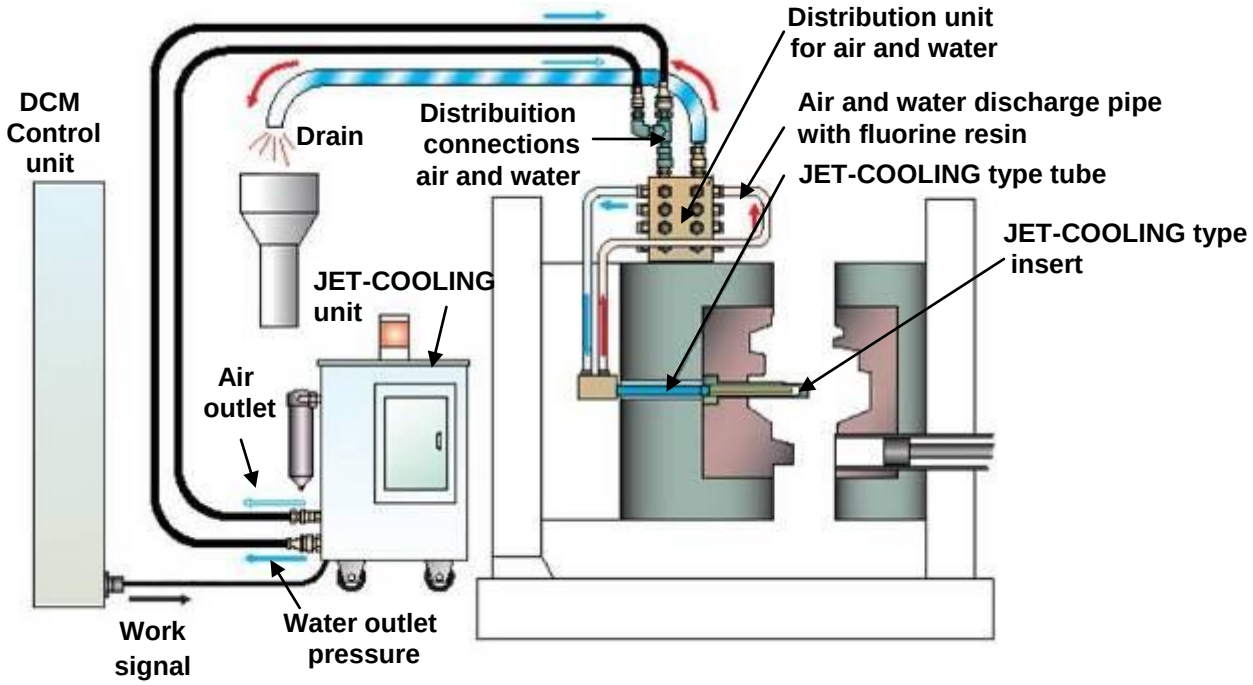


Figure 3.4 Entire JET-COOLING system

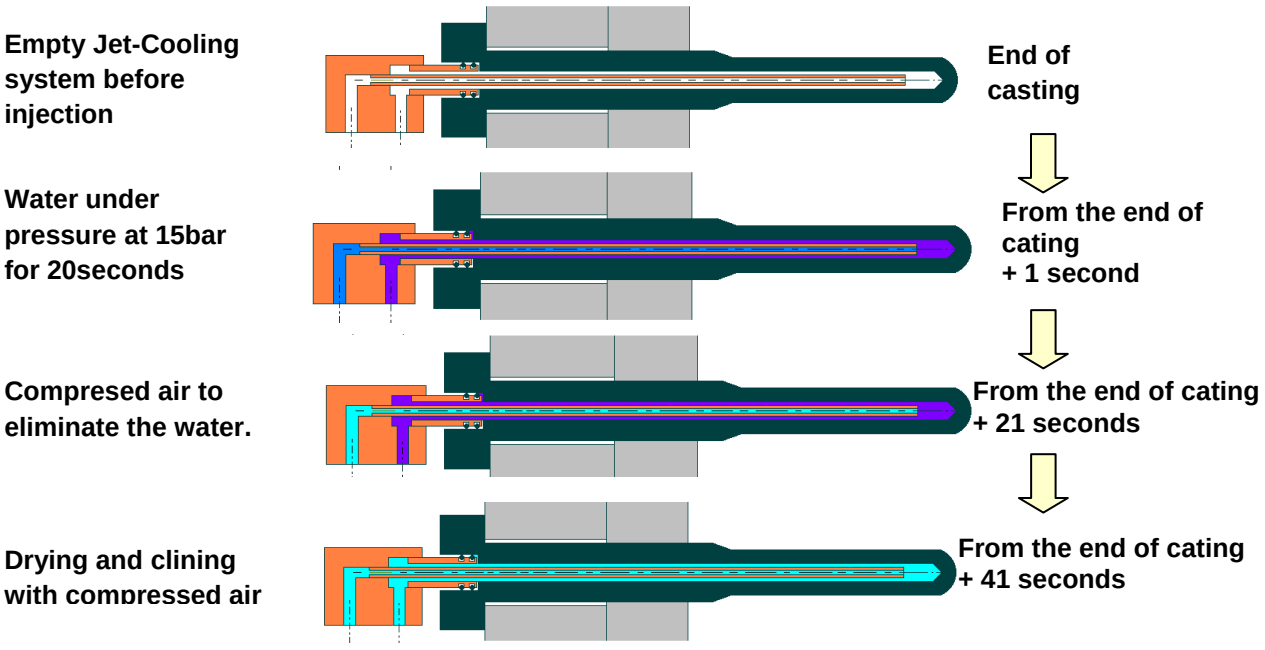


Figure 3.5 Functioning of JET-COOLING system

4. EXTERIOR COOLING SYSTEMS

After one cycle of casting is over the mold must remain in a proper thermal state for the next cycle of casting. The mold must work at 190º-220ºC, for this reason if the mold after one cycle of casting has areas whit higher temperatures, because the inner thermoregulation circuits can not extract the necessary quantity of heat. It is necessary to

extract the extra heat with a “cooling-lubricating” head (Figure 4.2), which enters in the mold when it is opened and pulverize on the mold cavities refrigeration-lubricating fluid.

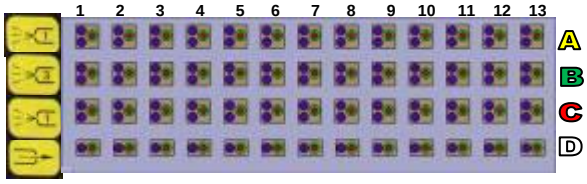
Mobile part of the mold before spraing

Mobile part of the mold after spraing

Figure 4.1 Temperatures in the mobile part of the steering housing mold

Mobile part Steering Housing

Operator side Robot side



Air presure: 1,2 BAR
Liquid presure: 4,5 BAR

Mobile part Steering Housing

Robot side Operator side

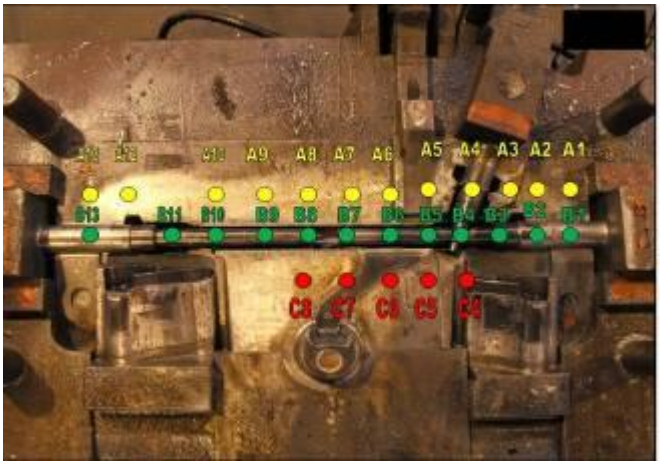


Figure 4.2 Cooling-lubricating head for steering housing mold

5. CONCLUSIONS

To have control over the mold temperature is vital for the process of die casting, for the life of the mold, and for the quality of the cast part. For this reason a lot of innovative work is done and is needed in this area of die casting process.

References:

[1] - Company documentation. Desarrollo de moldes: CIE C. Vilanova, 2003
[2] - Company documentation. Tecnicas de Fundicion a Presion_Nivel I: CIE C. Vilanova, 2010
[3] - Company documentation. Bühler, Bühler AG, 2010 Buhler documentation.
[4] - http://auto.howstuffworks.com