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Process Re validation For Grip Casting (HPDC)

BHARAT SHARMA

(Founder & Director, Steady Die Casting Solutions)

3/154 VIP COLONY , NEAR ASHTHA SCHOOL, ARAWALI VIHAR , BHIWADI , ALWAR ,

RAJASTHAN 301019

Abstract - Hello everyone, I am Bharat Sharma, founder of The Steady Die Casting Solutions. I always looking for die casting problem to give best solutions. By mean of these words I already give few solutions which has been published earlier, now here I come along with one more HPDC solutions for aesthetic part's. The example here I am taking of grip die. The methodology which we are going to discuss here, you can increase your die life, increase your plunger life, you can reduce die soldering, increase machine life and you can also reduce flow porosity.

***Key Words*:** Die life, plunger life, soldering, casting pressure, esthetic part and die casting machine.

1. INTRODUCTION

This part (Grip) casting since long time in die casting industry as per die casting standards yes exactly as per die casting norm. So here some of you are thinking so why you need to re-validate process if it is running as per standard. When we were facing die soldering, die chip off, die cracking, in every two hours die polishing required to remove catching and soldering, die flashing and low plunger life for that particular

part (grip). So we challenge to die casting standards and re-validate the process for grip die's. Here I would like to say is that nothing is standards or ideal or right or wrong until you are not making profit out of that process. That may be reference for you. The all you need to is that always validate or re-validate your process according to your environmental conditions, the facility available you have and what exactly you desired.

2. Body of Paper

- Process should be as per aesthetic part.
- Help to reduce soldering.
- Increase plunger life.
- Increase die life.
- Increase machine life.
- Reduce flow porosity.

How?

◆ As we know aesthetic casting doesn't need casting pressure up to 800 kg/cm^2 . Casting appearance should

be good with respect to non filling, crack, & flow porosity.

As per pq^2 diagram

$P=Ct*Vg^2$

Here,

P= pressure on the plunger face:,

Ct= composite discharge coefficient,

Vg= velocity of the liquid metal at the Cavity gate.

From above equation, we can say that, If reduce gate velocity then pressure on plunger face will reduce with

same ratio

ANALYSIS

Let's take an example:

Machine: 400T

Part: Grip KTR

Plunger dia: 70mm

Injection piston head dia: 101mm

Status: Aesthetic

N2 charging pressure in Intensification accumulator: 90kg/cm2(It should be 7 kg/cm2 less than minimum

Required intensification charging pressure.)

Pressure build up time:200ms

Now from above data,

We have to set casting pressure according to aesthetic part

Cp= Ip*(d/D)^2

Cp=Casting pressure

Ip= Intensification pressure

d= Plunger dia

D=Injection piston head dia

So from above eq'n

Cp=Cp*(d/D)^2

For same machine and die "d" & "D" constant

Now eq'n become

Cp à Ip (Casting pressure directly prepositional to intensification)

Means as I increase Ip, Cp will directly increase with same ratio

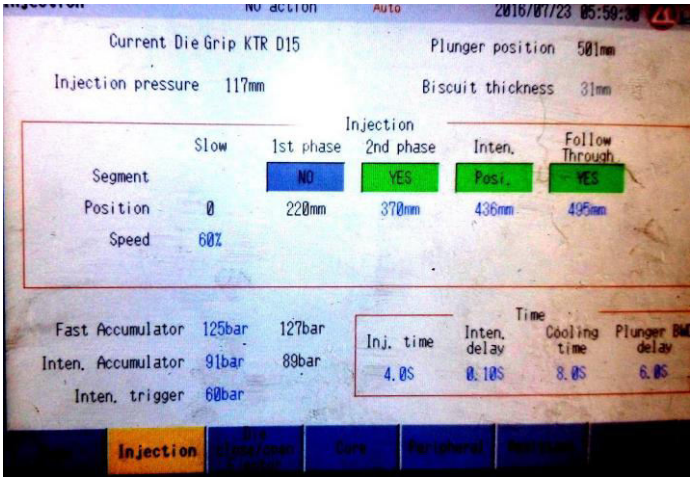
And

Ip increase when intensification charging pressure will increase

So now I conclude as we have to minimize intensification charging pressure as decrease to intensification

pressure as decrease casting pressure which is not required as much as technical parts.

Image-1: Sample Hpdc machine parameter screen shot



Pressure build up time

Let's talk about pressure build up time:

Pressure build up time is a time taken to achieve max intensification from intensification charging pressure.

To understand how its work lets take example:

pressure build up time control by a valve as shown in image on which no's of turn Available.

N=No's of turn

V=volume of oil

v= velocity of oil

A=area through which oil has to pass

t= time taken by volume of oil to flow.

Q=discharge

As we know, Q=V/t……(1)

Q=Av……(2)

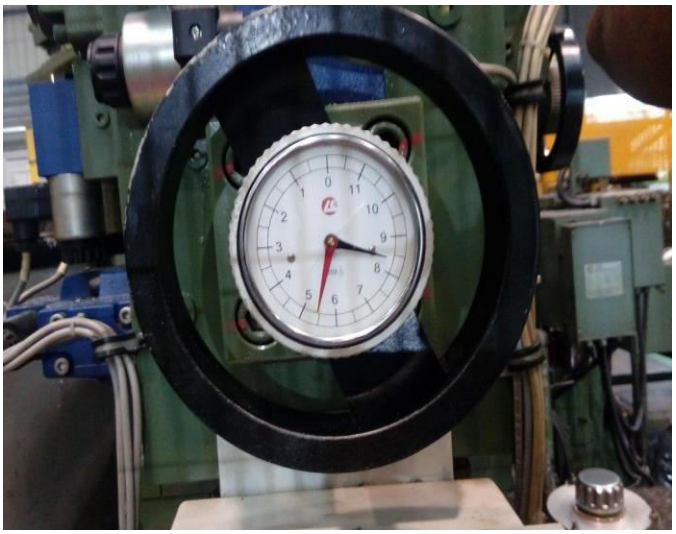
From 1 & 2

V/t=Av

(t= V/Av)

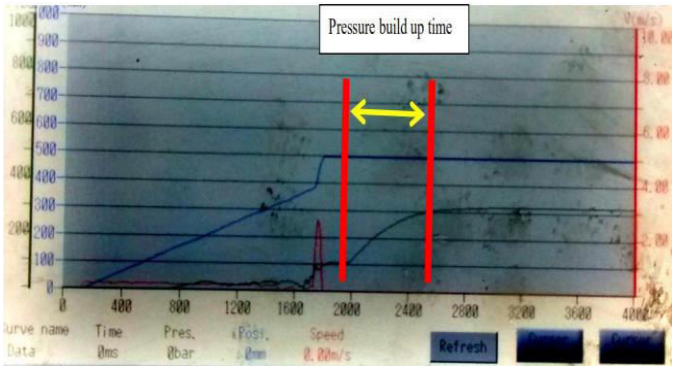
Now from above eq'n Pressure build up time will decrease as area of oil flow increase .This area will increase by opening this valve.

Image-2: Intensification valve

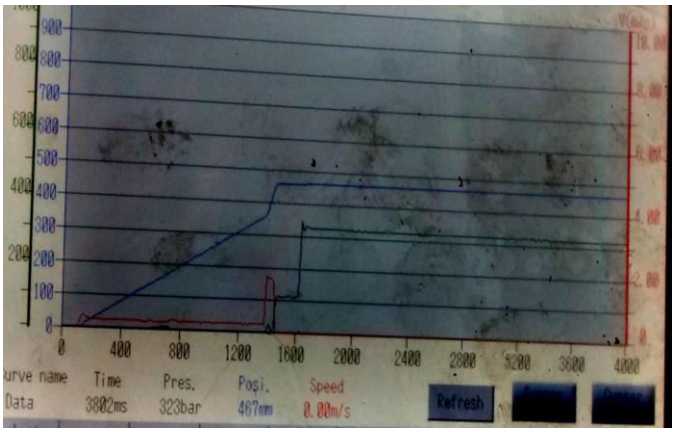


Pressure build up time curve (Before)

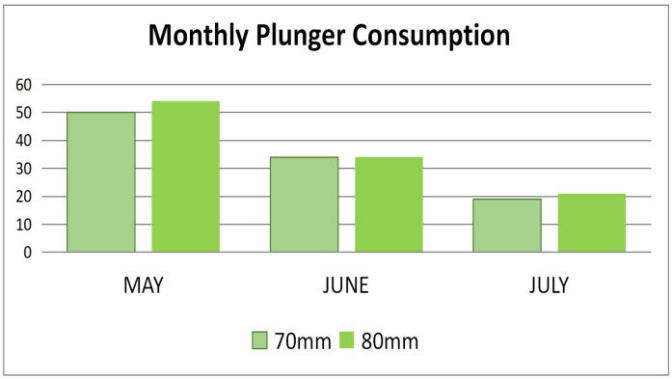
Image-2: Pressure build up curve screen shot from hpdc machine.



Pressure build up time curve (After)



RESULTS AND DISCUSSION



3. CONCLUSIONS

∟So we can reduce plunger velocity.

∟Reduce intensification charging pressure.

∟Increase intensification valve turn. And to avoid shrinkage we can increase intensification phase speed or

decrease pressure build up time & reduce Intensification charging pressure as shown in screen shot image 3

and Image 4. By doing this we minimize casting pressure and effective low casting pressure we will achieve by

decreasing pressure build up time.

BENEFIT TO ORGANIZATION

∟ Increase plunger life.

∟ Increase machine capability.

∟ Minimize injection unit leakage.

∟ Increase machine clamping capability.

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BIOGRAPHIES

Bharat Sharma, Director & Founder of Steady Die Casting Solutions. Mechanical Engineer.