Scientific Journal of Impact Factor (SJIF): 5.71

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

A National Conference On Spectrum Of Opportunities In Science & Engineering Technology
Volume 5, Special Issue 06, April-2018 (UGC Approved)

PRODUCT EJECTOR

Mechnical Ejector Pins Of Pressure Die Casting Machine

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Abstract —*Current era is an era of continuous production. Everybody wants maximum production from his company and this required automation in machines. So we work on Pressure die casting machine and make this machine semi-automatic by using ejector mechanics which is mechanical operated i.e. mechanical power operated. We general see hydraulic or pneumatic operated ejector pins but they required Separate setup to perform their operation. In state of this we introduce mechanical ejector, it is compact is structure and does not required any type of separate setup. We use spring force to eject the product from machine and mount this unit beyond the movable jaw. When the moveable jaw comes in backward, the pin applies force in forward direction to remove the product due to restriction provided to pin. To perform the next operation movable die moves in forward direction the compress spring released its pressure and the pins comes its original position. In this way by using spring mechanism we convert manual machine into semi-automatic.*

Keywords*-Pressure die casting machine, mechanical ejector, spring force, pins etc*

I. INTRODUCTION

This case study justified the working of pressure die casting machine with implementation of mechanical spring ejector. In this report removal of product form dies of pressure die casting machine with quick return spring ejector is explain. The focus of report is given to ejector.

Nowadays every company wants maximum work in less time as well as reduces cost on labors. So we think on this requirement of company and work on this, we visit the shivam engineering works where we saw the pressure die casting machine. To operate this machine two labors are required one is pouring a molten metal in mould cavity and another one is remove it with the help of pair of tongue and after that spray the lubricant oil in die.

So we think that there is a need of one automatic product removal component instate of man power operated pair of tongues. The product ejector is that component which removes the product from machine without any type of man power required with only a simple spring mechanism.

This component increases the productivity of company as well as reduces the cost of that labor who removes the product by the pair of tongue. While removing the product some time the product may get damage as well as can cause crashes etc. Thus the mechanism which we have implemented in the machine can reduce all the possible destruction in the product.

So that the industry can form more and more product with fewer defects and thus the quality are directly increases. Also the requirement of worker per machine will also reduce it save the time and money of industry.

II. LITERATURE REVIEW

The shivam is a solid works company which work to form product with the molten metal. Where they done various types of working process to manufacturing of finish product like manufacturing processes, forging processes, casting drilling cutting and finishing etc.

The requirements of this company are we should increases there production rate, save time, improve quality as well as reduce their worker and cast of production. On the basis of all above factor we have done a successful project in Shiva engineer works.

When we went there we saw that the two worker working on a single machine. The one of the worker was putting the molten metal and other person was removing the final solidify product from the machine. Thus, the time is getting waste and we decide to work on that.

The ejector pin namely DIN1530 is a standard by the German institute for standardization for ejector pins used in injection molding machine. In those years ejector pins are generally used to eject plastic or alloyed from the mould after solidification.

III. PRESSURE DIE CASTING

3.1 Die Casting

Die casting is a metal casting '"process"' that is characterized by forcing molten metal under high pressure into a mold cavity. The mold cavity is created using two hardened tool steel dies which have been machined into shape and work similarly to an injection mold during the process. Most die castings are made from non-ferrous metals.

specifically zinc, copper, aluminium, magnesium, lead, pewter and tin-based alloys. Depending on the type of metal being cast, a hot- or cold-chamber machine is used.

The casting equipment and the metal dies represent large capital costs and this tends to limit the process to high-volume production. Manufacture of parts using die casting is relatively simple, involving only four main steps, which keeps the incremental cost per item low. It is especially suited for a large quantity of small- to medium-sized castings, which is why die casting produces more castings than any other casting process.[1] Die castings are characterized by a very good surface finish (by casting standards) and dimensional consistency.

Two variants are pore-free die casting, which is used to eliminate gas porosity defects; and direct injection die casting, which is used with zinc castings to reduce scrap and increase yield.

3.2 Casting Metal

Fig 3.2: - Casting products

The main die casting alloys are: zinc, aluminum, magnesium, copper, lead, and tin; although uncommon, ferrous die casting is also possible. Specific die casting alloys include: zinc aluminum; aluminum.

- Zinc: the easiest metal to cast; high ductility; high impact strength; easily plated; economical for small parts; promotes long die life.
- Aluminum: lightweight; high dimensional stability for complex shapes and thin walls; good corrosion resistance; good mechanical properties; high thermal and electrical conductivity; retains strength at high temperatures.
- Magnesium: the easiest metal to machine; excellent strength-to-weight ratio; lightest alloy commonly die cast.
- Copper: high hardness; high corrosion resistance; highest mechanical properties of alloys die cast; excellent wear resistance; excellent dimensional stability; strength approaching that of steel parts.
- Silicon tombac: high-strength alloy made of copper, zinc and silicon. Often used as an alternative for investment casted steel parts.
- Lead and tin: high density; extremely close dimensional accuracy; used for special forms of corrosion resistance. Such alloys are not used in foodservice applications for public health reasons. Type metal, an alloy of lead, tin and antimony (with sometimes traces of copper) is used for casting hand-set type in letterpress printing and hot foil blocking. Traditionally cast in hand jerk moulds now predominantly die cast after the industrialization of the type

foundries. Around 1900 the slug casting machines came onto the market and added further automation, with sometimes dozens of casting machines at one newspaper office.

3.3 Casting Machine

Fig 3.3: - Pressure Die Casting

The high-pressure die casting process is the fastest and most cost-effective manufacturing process available for producing precise, high-integrity, net-shape aluminum components. Shivam have a long experience in producing high quality aluminum die castings requiring close tolerances, pressure tightness, good surface finish, and various secondary operations. Shivam technical expertise, thoughtfully designed processes and leading edge technology enables us to offer you high quality & cost effective solutions.

IV. EJECTOR

Many designers and purchasers of aluminum die casting may not be familiar with ejector pins that leave a round seam line of flash on the die casting after it is produced from molding. It is very important and sometimes critical to discuss ejector pins up front in the design and launch process of a new aluminum die cast product. Omitting this discussion can lead to die revision can the fact that could be costly to perform?

Now what is an ejector pins? The ejector pins are a necessary part of the mold and the molding process. They serve to “push out” the aluminum casting from the ejector side of the mold after the molten metal is solidified and the mold opens.

After the mold opens in the machine the casting stays on the ejector side of the die since the part and drafts have been design for this purpose. With the mold open there is a mechanism that will push a plate inside the ejector half on which all the ejector pins are attach. Once this plate moves forward, the ejector pins move forward simultaneously in one swift push. This action will push the solid casting out of the mold. Once out of the mold the casting can stay on the ends of the ejector pins and is picked off by a robot and removed from the inside of casting machine and the cycle of making another casting will start.

4.1 Location of ejector pins

Ejector pins locations should be at the option of the die caster, subject to the customer’s agreement. Where consideration of cast surface cosmetics are important, ejector pins location should always discussed in advance of die design. The number, size and location of ejector pins and bosses required will vary with the size and complexity of the die casting, as well as with other factor.

4.2 Ejector pins mark

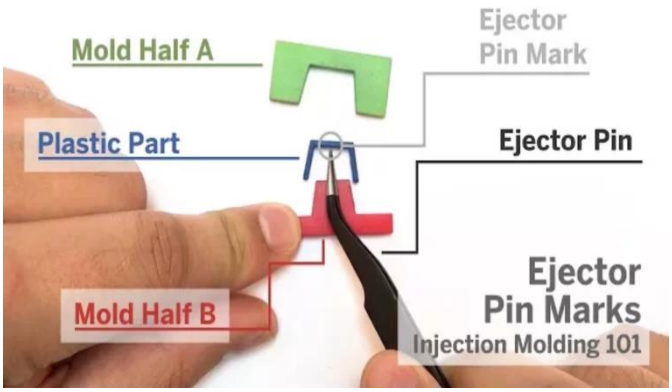

Fig 5.2:- Ejector pin mark

The movable ejector pins must be used to eject the die casting from the die casting die as previously describe and will result in a residual ejector pin mark on the die cast part. In addition to automatically pushing the casting from the die after part solidification, ejector pins also serve to keep the casting from bending. The sequential illustrations demonstrate the action of the ejector pins in a die casting cycle.

4.3 The purpose of ejector pins

- In order to remove a part from the die, movable ejector pins may be used. This will result in a residual ejector pin mark on the part.
- In addition to automatically pushing the part from the tool after part solidification, ejector pins keep the part from bending.

4.4 Dimension of ejector pins

Length of ejector shaft: 350mm
Tail diameter of shaft: 40mm
Head diameter of shaft: 60mm
Thickness of head: 30mm
Material use: tool steel SKD61
Temperature working range 900^0C to 1050^0C

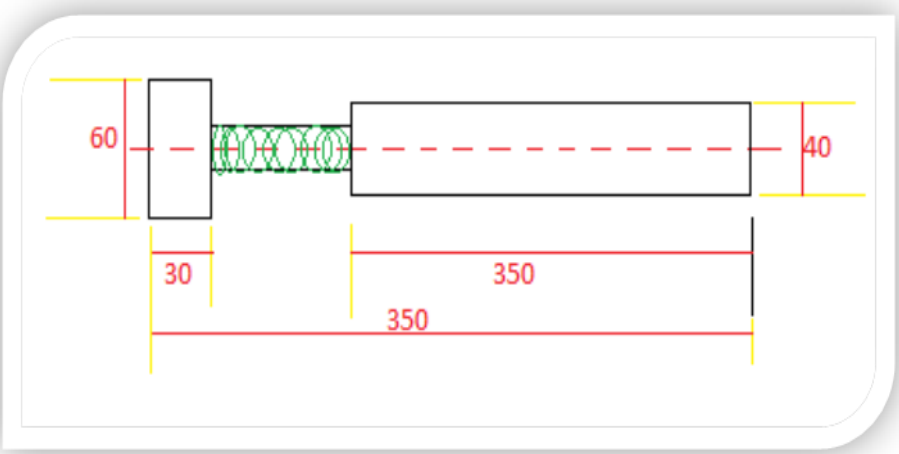

Fig 4.3:- Dimension of ejector

V. WORKING OF EJECTOR

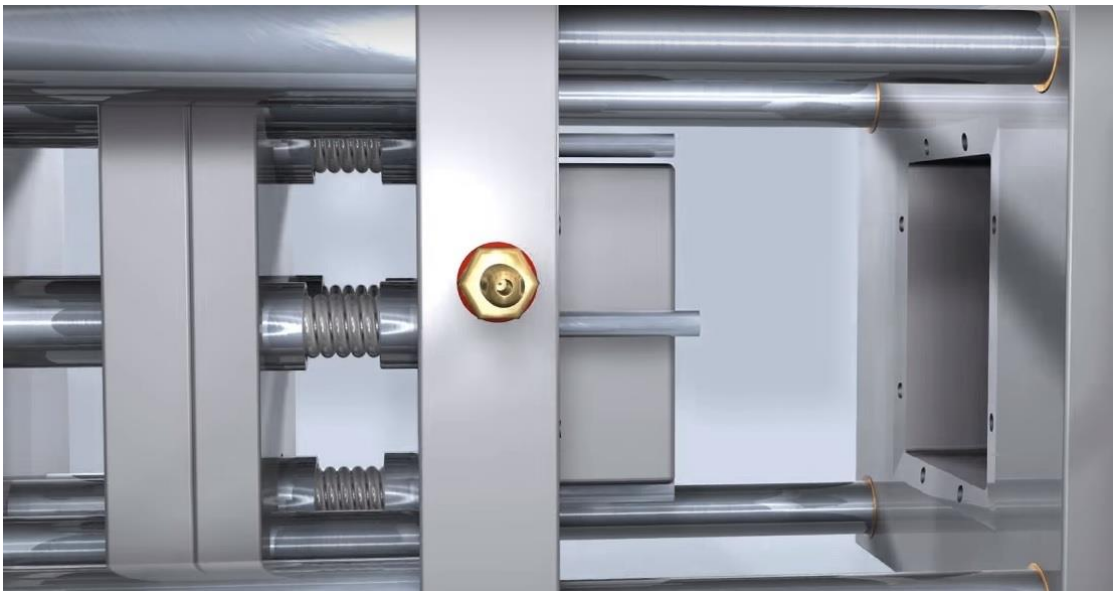

Fig 5.1:- Working of ejector pins

Construction:-

The above figure shows the simple construction of the ejector mechanism. It consist of one ejector, spring and a hallow pipe etc. There are two dies as shown in figure. The dies consist of product shape one side. The die on the right side is a fixed die. The molten metal was pour from this side through a pipe.

The other side die is movable and it was attach with four rod which is further control by a hydraulic system i.e. the movement of rod is control by these system. The ejector mechanism was attached to the die. The die consists of hole and the ejector was fitted inside it. Then the spring is joined to it and the other end is attached to the hollow pipe.

Working:-

Firstly the die was closed compactly. Now the molten metal was pour into it. Then it was kept for tow minute for cooling. As the molten metal get cool and the product get harder than the dies are seriated. The fixed die moves from right to left. Now the worker needs to remove the product through the pair of tong. And thus the product gets damage or there corner get break.

So that we apply this mechanism to the pressure die casting machine. According to this mechanism the product removal automatically. As the die moves the spring get compressed and the ejector push the product. Thus the product removes from the die and falls down into a bag.

VI. MAINTANANCE

Lubricating ejector pins is essential to preserve the life of an injection moldings tool. The wrong procedure and the wrong lubricant can cause problems and even damage a tool. Problems, such as bleed out onto the tool surface, can cause defective plastic parts. Thermal and viscosity breakdown can cause galling, seizing, and pitting. All these issues can be resolved utilizing the proper procedure and the right lubricants.

Lubricate the back 85% of the ejector pins with a high load bearing, high temperature grease, such as Slide Super Grease. Then lubricate the remaining front 15% of the pin with a clear, non-marking lubricant, such as Slide Heavy Duty Pin Lube. Spray additional non-marking, clear lubricant in the sleeve of the pin. Now install the pin.

Periodically, additional lubrication must be applied to the front section of the pins. Set your ejector pin selection to manual and move the pins to the out or eject mode. Spray the front of the pins with lubricant, and then turn your machine back to auto and continue to make parts. This lubrication will need to be performed at least once a week. High-speed moulds may require lubrication before every shift.

Maintenance of spring also carried out once in week i.e. checking of tension, load carrying capacity etc.

VII. ADVANTAGES AND DISADVANTAGES

- **Advantages**

1. Its design is quite simple.
2. Its cost is less as compare to hydraulic and pneumatic.
3. Maintenances of ejector are easy.
4. Robust in construction.
5. Less corrosive.
6. No external or separate energy required for ejector.
7. This mechanism also can use in various casting machine.
8. Less noise.

- **Disadvantages**

1. More wear and tear.
2. High quality of material required.
3. Periodic maintenance is required.
4. Some amount of material goes in runner.

VIII. CONCLUSION

1. Product ejector reduces the cost of one labor per machine.
2. It increases the productivity of company.
3. It is unique type of ejector than the hydraulic and pneumatic, because it used simple spring mechanism for the operation.
4. It is convenient for use in machine.
5. This mechanism also can use for various product casting

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