



**BANGALDESH INDUSTRIAL TECHNICAL ASSISTANCE CENTER  
(BITAC)**



## **Research Report**

**on**

# **Development of Hydraulic Opening and Closing System for Gravity Die Casting**

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## **Summary**

This report discusses the process of local development of Hydraulic Opening and Closing System for Gravity Die Casting with its application and benefits.

The main goal of this study is to minimize the time and labor required for conventional Gravity Die Casting method frequently used in foundries. The production rate can also be increased.

## **Introduction**

Casting of different types of parts has been done frequently in BITAC foundry. These are labor intensive job. A considerable part of this casting has been done through gravity die casting. It takes at least 2 people just to operate each die; every time during casting multiple die have been used to meet customized production demand. Sometimes after pouring of molten metal the cop and drag of die gets stuck to each other; extra time and manpower are consumed to separate them; which in turn leads to reduced production. More over during opening and closing of die, several minutes have been spent each time before pouring of metals. Hence the time consumption for the readiness of die becomes more than the actual casting time. To overcome these issues, Hydraulic Opening and Closing System for Gravity Die Casting could be very handy.

## **Review of Literature**

Hydraulic systems use pressurized fluid to move mechanical loads and perform tasks. The power transmitted through this pressurized fluid is significant; hence extensively used all parts of the world ranging from construction machinery to laboratory equipment. It's robustness makes it suitable even for precision engineering field like airplane construction and operation.

Hydraulic Opening and Closing Systems for die are widely used in big industries with massive "batch" type production capacity, which have complex design. But those setups are not suitable for small industries. In this study the goal is to manufacture a simplest type of Hydraulic system for opening and closing die, which is cheap, easy to maintain and requires minimum skill to operate so that this system can be easily adopted in small industries.

## **Methodology**

In this research, various types of hydraulic systems have been studied. Simplicity was one of the priorities at the design stage. Before getting into manufacturing the whole system has been conceptualized in SolidWorks 2016/2020. The components of this system are divided in to following category-

### **Main Components:**

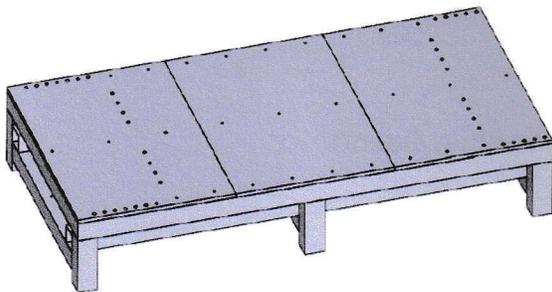
- Base Plate
- Main Frame
- Main Double Acting Hydraulic Cylinder

- Guide Shafts
- Hydraulic Lever
- Angle Plates
- Mid Plate for forward and backward movement
- Small Double Acting Hydraulic Cylinder for provision for ejection plate.
- Pressure release valve (optional)

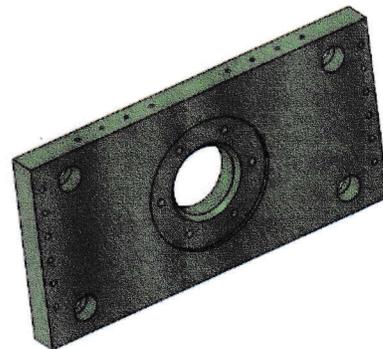
**Auxiliary Components:**

- Electric Pump
- Hydraulic oil tank

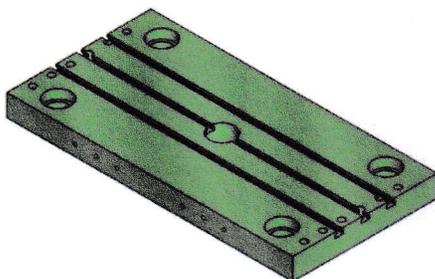
**Drawings of Components & Assembly:**



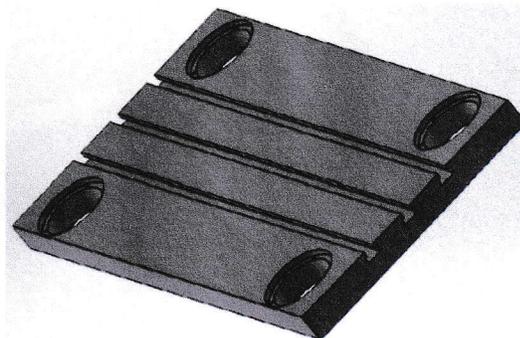
**Base Plate**



**Side Plate**

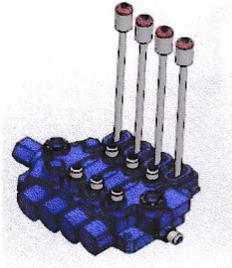


**Side Plate**



**Mid Plate for movement**

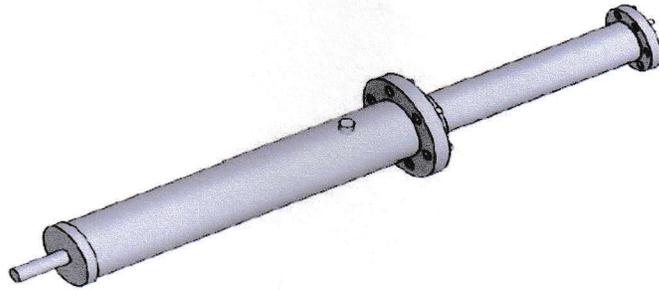
*Rich*



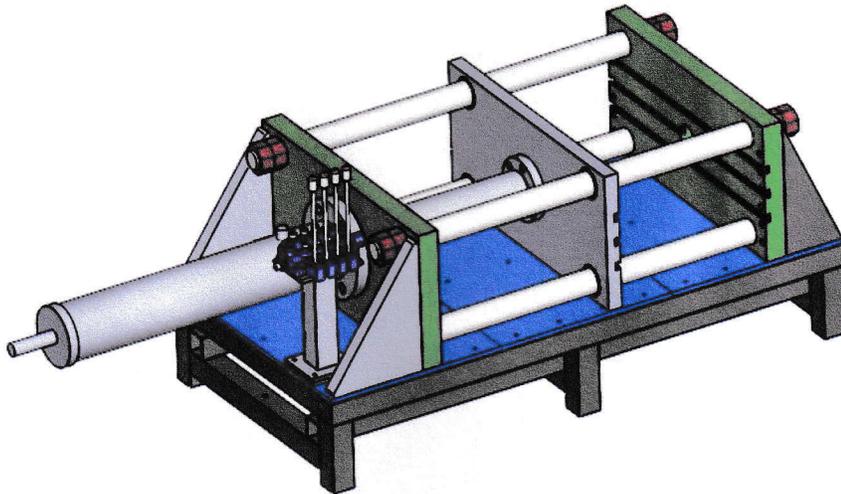
**Hydraulic Lever**



**Guide Shaft**



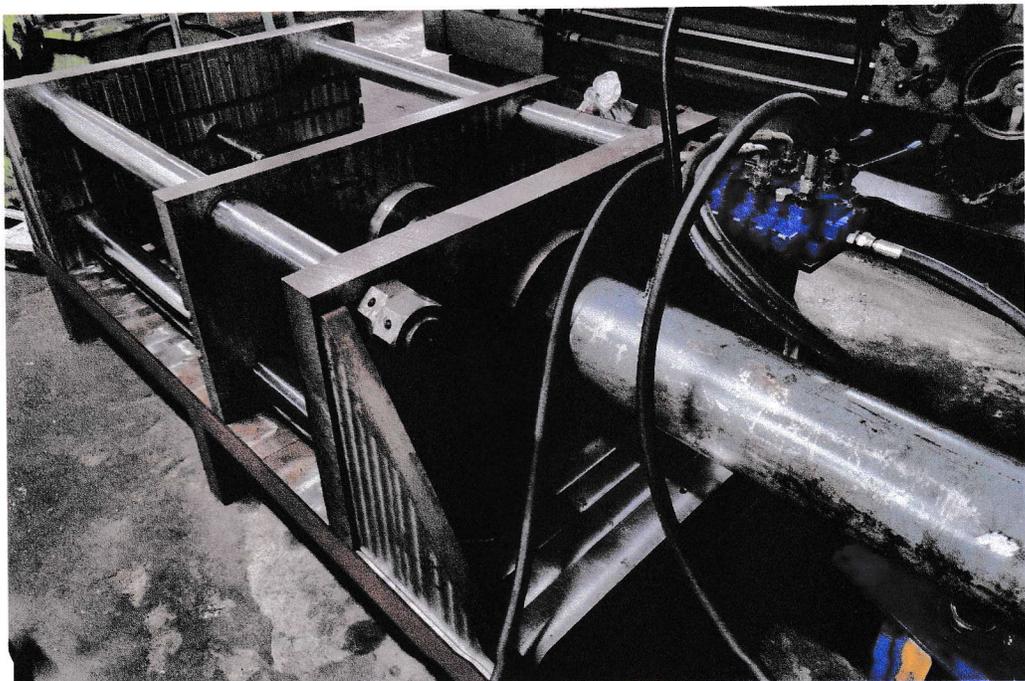
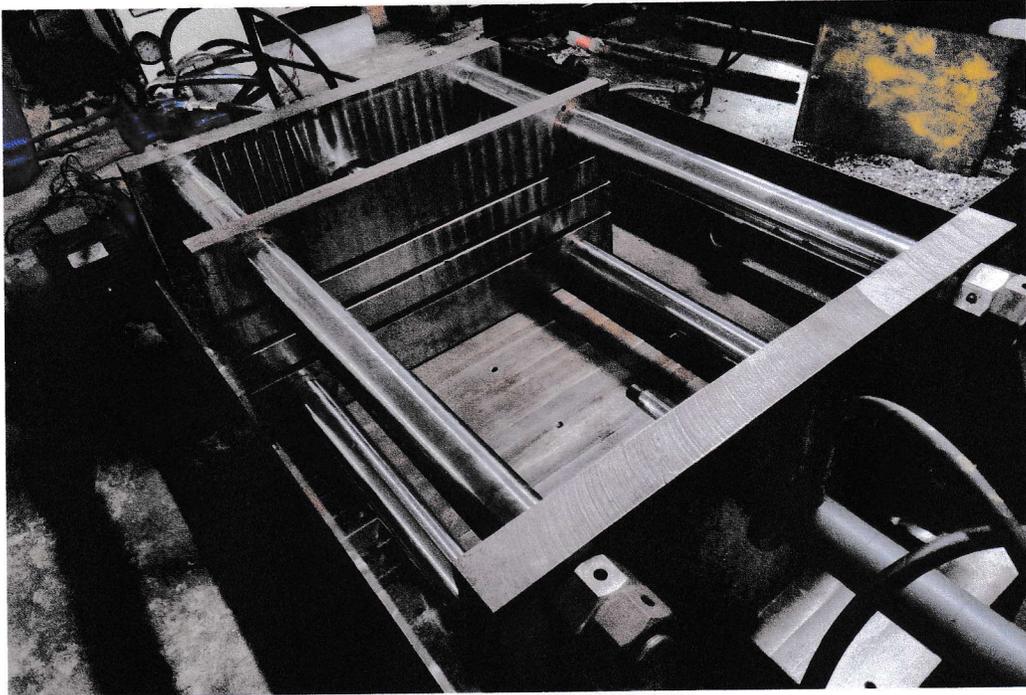
**Double Acting Hydraulic Cylinder**



**Complete Assembly**

*Rich*

**After Manufacturing & Assembly:**



Materials used in this system are readily available Carbon steel. Bush for the guide shafts are made of phosphor bronze. Most of the parts are manufactured in BITAC CNC shop other than the motor, cylinder and lever.

## Result

During initial trial, there were some vibration and overheating issues at the inlet of the hydraulic line; but later mitigated by using a pressure release valve. It has been observed that for every piece of casting around 2 (two) minutes haven been saved. The labor to be engaged in die opening closing becomes one third. This feature would improve further productivity. Since no hammering is required for die opening, the die life would also be increased.

## Conclusion

This study yields positive outcome. This system is functioning and easy to operate. Since no extra skill is required; existing manpower are sufficient to utilize this system. As a result, this system would improve productivity. There are still provisions for further improvement including design and mobility. With every improvement this system is expected to deliver better productivity.

## References

1. Mr. Chirag Sanghavi, Mr. Soham Patil, Prof. SM Narayankar, Design and Fabrication of Semi Automatic Gravity Die Casting Machine, International Journal for Scientific Research And Development, 2018, Vol 6, Issue 04
2. <https://www.indiamart.com/proddetail/gravity-die-casting-machine-13693823133.html>

  
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