



Design and Analysis of Pick and Place Robot Arm Unit to Transfer Brake Drum Casting to Fettleing Process

Omprakas.M.A¹, Jainulabudeen.M², Naveen.S², Navin Prasant.A.C², Viswanath. M²

¹Assistant professor, ²UG Scholar

Department of mechanical engineering, Nandha Engineering College, Erode-52

¹omprakas@nandhaengg.org, ²navinprasant@gmail.com

Abstract—Casting is one of the oldest techniques for producing break drum of complex shape and size which is difficult to produce in other methods. In casting there are different stages to produce a break drum from a mould, by using molten metal with pattern, as a replica. In this paper we are not focus on the defect which is made by casting while its production stages, we have focused on the defect of casting due to the rough handling of casting products in the foundry industry where we made this analysis in that leading foundry industry the product are thrown by the workers after the casting are made to the fettling section due to this there are many problems occurs like a breakage of casting product, injure of workers lie hit the worker when it is thrown, loss of productivity, decrease in profit for reducing this by economically and as safety factor we are going to implement the robotic arm unit for carrying the break drum after casting to the fettling section. By this all the mentioned factors can be reduced and economically we can also benefited. We made a design of grippers and made an analysis of gripper in this project.

I. INTRODUCTION

1.1 FOUNDRY

A Foundry is a factory that produces metal castings .metals are cast into shapes by melting them into liquid pouring the metal in a mold and removing the mold material or casting after the metals melt has solidified as it cools. The most common metals processed are aluminum and cast iron However

other metals such as bronze brass steel magnesium and zinc are also used to produce castings in foundries .in this process part of desired shapes and size can be formed. Even if you have never been to a foundry, or even know what one looks like, you are surrounded by the metal castings they produce. There is a good chance that you are reading this less than 10 feet away from one.

Foundries don't just produce metal products for engine, railroad, or pipe components. They also form components for machines that are required to make many of the essential consumer products we depend on. 90 percent of all manufactured goods rely on metal castings.

1.2 ROBOTICS

Robotics is the branch of engineering science & Technology related to robots, and their design, manufacture, application, and structural disposition. Robotics is related to electronics, mechanics, and software. One of the major and most commonly performed works is picking and placing of jobs from source to destination. Present day industry is increasingly turning towards computer-based automation mainly due to the need for increased productivity and delivery of end products with uniform quality. The use of Industrial Robots characterizes some of contemporary trends in automation of the manufacturing process.

However, present day industrial robots also exhibit a monolithic mechanical structure and closed-system software architecture. They are concentrated on simple repetitive tasks, which tend not to require high precision. The pick and place robot is a microcontroller based mechatronic system that detects the object, picks that object from source location and places at desired location. For detection of object, infrared sensors are used which detect presence of object as the transmitter to receiver path for infrared sensor is interrupted by placed object. Robotics research today is focused on developing systems that exhibit modularity, flexibility, redundancy, fault-tolerance, a general and extensible software environment and seamless connectivity to other machines, some researchers focus on completely automating a manufacturing process or a task, by providing sensor based intelligence to the robot arm, while others try to solidify the analytical foundations on which many of the basic concepts in robotics are built. In this highly developing society time and man power are critical constrains for completion of task in large scales. The automation is playing important role to save human efforts in most of the regular and frequently carried.

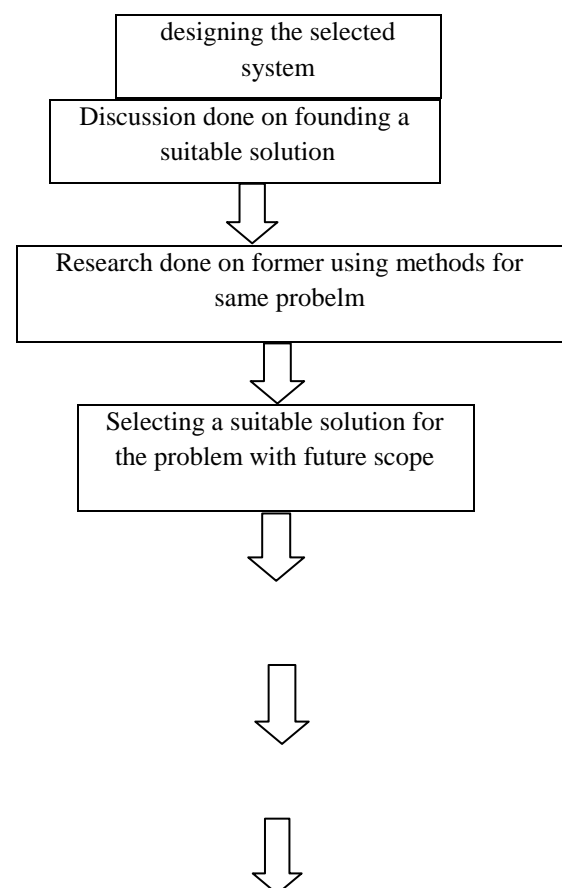
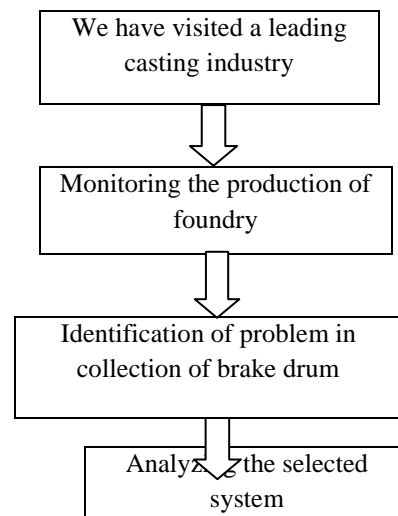
1.3 LAW OF ROBOTICS

Isaac Asimov conceived the robots as humanoids, devoid of feelings, and used them in a number of stories. His robots were well-designed, fail-safe machines, whose brains were programmed by human beings. Anticipating the dangers and havoc such a device could cause, he postulated rules for their ethical conduct. Robots were required to perform according to three principles known as “Three laws of Robotics” which are as valid for real robots as they were for Asimov’s robots and they are:

1. A robot should not injure a human being or, through inaction, allow a human to be harmed.
2. A robot must obey orders given by humans except when that conflicts with the First Law.
3. A robot must protect its own existence unless that conflicts with the First or Second law.

These are very general laws and apply even to other machines and appliances. They are always taken care of in any robot design.

II. METHODOLOGY



We have visited a leading foundry industry. While monitoring the casting process of brake drum there is no proper unit for collecting the brake drum casting which is transferred to further fettling process to fettling unit. Already the process is done manually by two workers by throwing the brake drum casting. This causes defect in the surface and edge of the casting products and lead some casting defect to failure. Industrial person are in a need of a new flexible and multi product handling system for transferring the brake drum casting to fettling unit. We are interested to take it as a project to solve. According to our research on handling casting product in foundry we have found a suitable solution which may used for brake drum casting and with a future scope of handing other casting products of automotive. By using a robotic manipulator in the production line of brake drum casting with four finger robotic manipulator gripper we can find a suitable solution.

III. ROBOT GRIPPERS

A robotic gripper is an essential component of a robotic manipulator. It serves as the robot and allows the robot to manipulate objects. Recently robotic gripper is widely used for different tasks in various fields. Variety of robotic grippers is developed in high flexibility and multi-function. Particularly humanoid robot technology.

3.1 TYPES OF GRIPPER

- 1) **Pressure Gripper:** This kind of gripper is used for pieces that can be pressed by the gripper without being deformed.
- 2) **Coupling gripper:** This kind of gripper is used for pieces of big dimensions that can't be pressed by the gripper.
- 3) **Vacuum gripper:** Vacuum grippers are used in the robots for grasping the non – ferrous objects. It uses vacuum cups as the gripping device, which is also commonly known as suction cups. This type of grippers will provide good handling if the objects are smooth, flat, and clean. It has

only conclusion one
for surface
gripping
the objects. Most importantly, it is not best
suitable for handling the objects with
pores

- 4) **Electromagnetic gripper:** Magnetic grippers are most commonly used in a robot as an end effector for grasping the ferrous materials. Because we want to build a cheap gripper and the type of pieces which normally we will take (pieces that we can press and non ferromagnetic), I selected the first kind of gripper.
- 5) **The Mechanical Gripper:** It is an end effector that uses mechanical fingers actuated by a mechanism to grasp an object. The finger sometimes called jaws as the appendages of the gripper that actually make contact with the object. The fingers are either attached to the mechanism or are an integral part of the mechanism.
- 6) **Dual Grippers:** Mechanical gripper with two gripping devices in one end effector for machine loading and unloading. Reduces cycle time per part by gripping two work parts at the same time.
- 7) **Roller Gripper:** Roller gripper is a customized version of the basic gripper. Basically, this gripper is the same as the normal gripper except for the roller.

IV. DESIGN

By implementing available grippers for the problem we found a suitable gripper and best flexible multipurpose mechanism for grasping the products. We designed a four finger adjustable gripper for brake drum with future scope of handling other products.

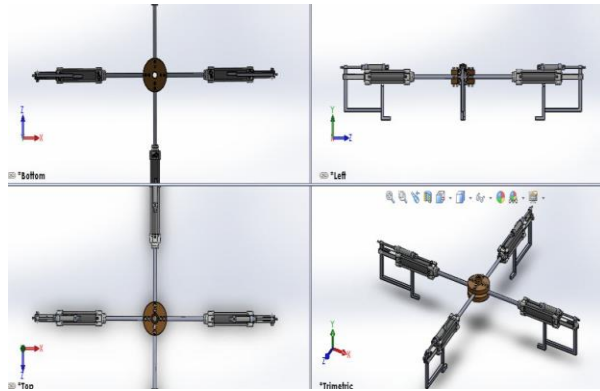


Fig. 1 Four finger adjustable gripper in 3D diagram

V.CONCLUSION

Robotics research today is focused on developing systems that exhibit modularity, flexibility, redundancy, fault-tolerance, a general and extensible software environment and seamless connectivity to other machines, some researchers focus on completely automating a manufacturing process or a task, by providing sensor based intelligence to the robot arm, while others try to solidify the analytical foundations on which many of the basic concepts in robotics are built. In this highly developing society time and man power are critical constrains for completion of task in large scales. The automation is playing important role to save human efforts in most of the regular and frequently carried.

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