

Automation -

Design of Automatic Bottle Packing Machine

¹Arshad Ashak Atar; ²Vishal Abasaheb Misal ; ³Umesh Dattatray Hajare

^{1&2}Mech. Engg. ; ³Electrical Engg. Department

¹Yadavrao Tasgaonkar College of Engineering & Management, A/P-Chandhai, Karjat, Dist-Raigad,410201

^{2&3}Yadavrao Tasgaonkar Institute of Engineering & Technology, A/P-Chandhai, Karjat, Dist-Raigad,410201

E-mail : arshad.atar2@gmail.com; misalvishal1991@gmail.com, umeshhajare7445@gmail.com,

Abstract – In our project we are going to focus on bottle packing process, which must complete in only 2 steps. In present application machine there are three steps for completion of bottle packing process.

So less time is required as compared to present application machine. In our project gripper are used to tight the cap. In new design the cap is put on the bottle neck and at next stage cap is rotate and tight.

Gripper has two motion translator and rotary motion at a time.

In this machine cap is rotate and bottle is hold, so the load applied on the machine is less as compared to present application machine. So we reduce the maintenance of the machine and increase the efficiency of the machine, and also increase the production rate.

It based on only mechanical properties. Such mechanism is designed for especially to increase the efficiency of the machine and reduce the maintenance

I. INTRODUCTION

Generally now a day, in bottle packing industries the machine is used that required 3 steps to complete the process. That causes to loss the time in production. This loss time is also affect on profit of the company, which causes less production per day, and efficiency of the machine is also less.

In old mechanism bottle is rotated and cap is hold on it, bottle is heavy as compared to cap so that causes the load apply on the machine. That causes the high maintenance cost.

So we focus on production rate and time loss, we design the new machine which helps to increase the production rate and also to reduce the time loss for that 3 steps process.

We are going to focus on bottle packing process, which must complete in only 2 steps. in present

application machine there are three steps for completion of bottle packing process.

So less time is required as compared to old machine. In our project gripper are used to tight the cap. In new design the cap is put on the bottle neck and at next stage cap is rotate and tight. Gripper has two motions such as translatory and rotary motion at a time.

In this machine cap rotates and bottle is hold stationary, so the load applied on the machine is less as compared to present application machine. So we reduce the maintenance of the machine and increase the efficiency of the machine, and also increase the production rate.

In present application machine there are used sensors to detect the bottle and pass information to next step for complete the process. But in new design machine sensors are not used, instead of that we have used the time setting mechanism to inform the next step to complete the process.

II. FORMULATION

- Consider same power supply to both machines.
- In new application machine there are three steps require completing the process.
- Production rate of that machine is 70-75 bpm.
- We consider production rate is 72 bpm.
- So we calculated that,

Each bottle required time= $60/72$

$$=0.8333 \text{ micro sec.}$$

One bottle has three steps,

Each steps required time = $0.8333/3$

$$=0.27778 \text{ micro sec.}$$

- In new design machine there are only two steps require to complete the process.

Each bottle required time= 0.27778×2

=0.5556 micro sec.

Production rate per min. is,

= $60/0.5556$

=108 nos. bottle

Production rate of new design machine is 108 bpm.

III. WATER FILLING:

- Leak proof tank:-
- 230 ac supply to coil.
- Pneumatic system apply
- Light saving and time reduced

In water filling mechanism we use a leak proof tank which is made up of fiber. To store the water and fill the bottle sequentially

On leak proof water tank pneumatic pressure is applied continuously it causes more supply of water and reduces time to fill the water in bottle. By using pneumatic pressure mechanism, we save the light for fill the bottle.

Flow control valve is operated on solenoid coil. 230 ac powers is supply to solenoid coil.

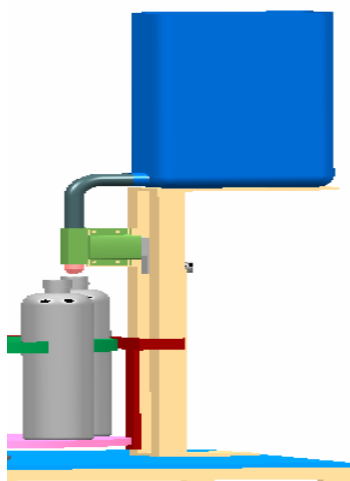


Fig1.1- water filling tank

IV. CAP LOADER MECHANISM

Hooper for loading cap:

Caps are stored in hopper. they are passing one by one by getting signal of sensor. it is placed in between water filling tank and gripper mechanism.

Job track for flow of cap:

There are systematically arranging job track, for flowing the cap. it has joint to hopper. That carries the cap.

Sensor:

For detecting the cap we used sensor which is fixed in job track. if the cap passed in wrong position it detect by using sensor, and it pass the signal to damper system.

Recycle bin:

The damper system is provided to that job track, after the sensor. It works as to remove the cap which is in wrong position. When the upcoming cap is in wrong position sensor is detect it and pass the signal to damper system. That time damper is activated and does that work. Recycle bin is provided to collect the wrong position cap. When damper is activated removed cap is collect in recycle bin.

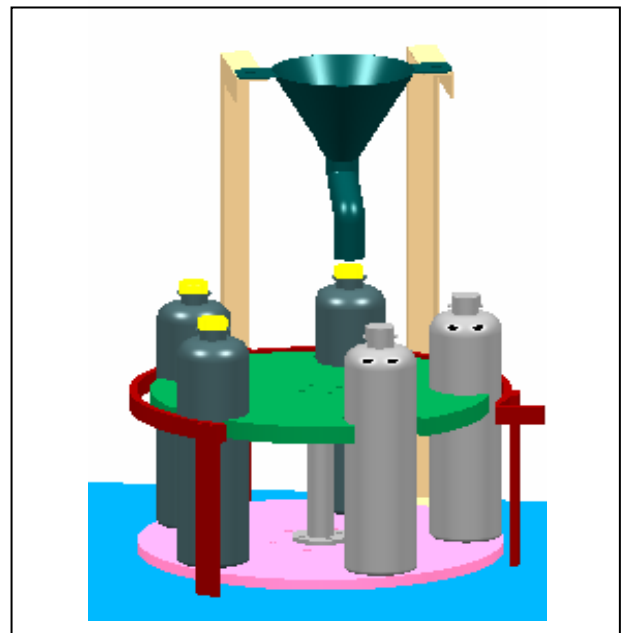


Fig1.2 - Cap Loader Mechanism.

V. GRIPPER MECHANISM

Cylinder:

Solid cylinder is used to provide the reciprocating motion to sliding mounting plate. That guide by frame of model.

Sliding mounting plate:

Sliding mounting plate is attached to cylinder. it carries the four guide rod.

Guide bar:

Guide rod is transmitting the reciprocating motion to gripper. Bushes are used to guiding the guide rod.

Limit switch:

When the extra load is applied by the cylinder on the limit switch, that time limit switch is on and controls the rotation of gripper. When load is removed on limit switch it stops working. That's why here which save light energy and also increase the speed of gripper.

Spring loaded stopper:

The spring is used to control the load on gripper by the cylinder, which control the translatory motion of the gripper, that cause we maintain head of gripper travelling



Fig1.3 – gripper mechanism

VI. GRIPPER:

Kinematic link:

Kinematic link mechanism is used to making the new design of gripper. it has four arms to hold the cap. When the force is applied on the gripper it releases the

cap and when the force is removed the gripper is hold the cap.

Thrust bearing:

Linear load is applied on thrust bearing. it follows only reciprocating motion. it only used for translator motion.

Ball bearing:

Axial load is applied on the ball bearing. it is used for rotary motion. it gives rotary motion to gripper.

Main used of this gripper, is to tight the cap on bottle. When the bottle is coming below the gripper, it starts working. it first takes translator motion, and then holds the cap which is already on the bottle neck. And then ball bearing start works, it rotates about it. The rotation of the gripper is control by plc controller.

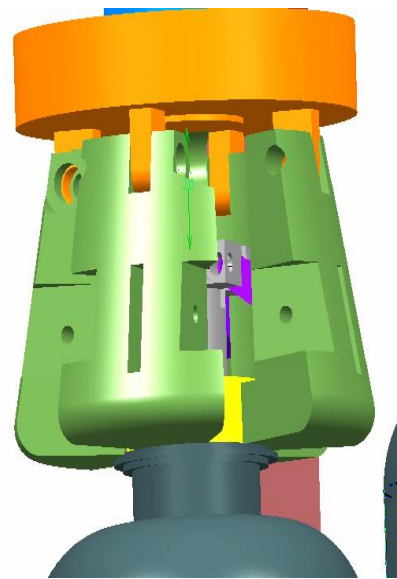


Fig1.4 – kinematic link

VII. INDEXING MECHANISM:

Indexing:

- Mechanical stopper
- Pneumatic actuator
- Solenoid coil
- Plc (programming logical control) and controller

Free wheel mechanism:

- Indexing mechanism

- Ratchet mechanism
- Low cost

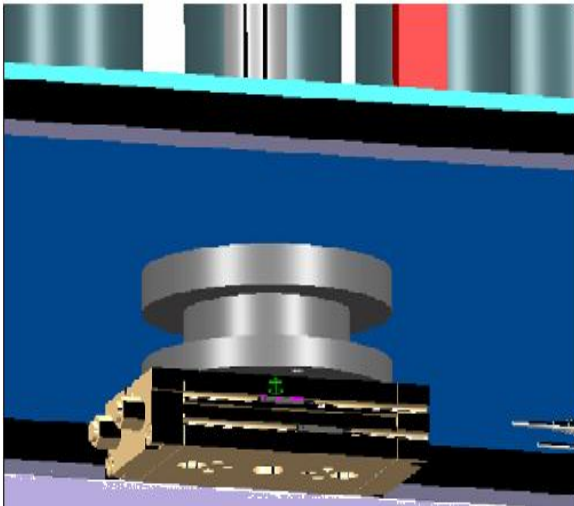


Fig1.5 – indexing mechanism

VIII. NEW MACHINE DESIGN:

- Two steps
- Easy to design & manufacturing
- Reduce time for production
- Maintenance cost is low
- Increases product

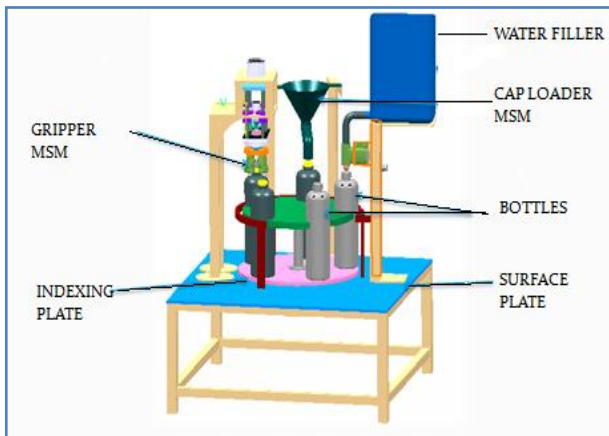


Fig1.6 – New Machine Design

IX. CONCLUSION

In this way we have designed an Automatic Bottle Packing Machine. It is different from old mechanism, because the working principle is totally different. This machine efficiently reduces the production time because of the use of only two stages with Gripper mechanism. Due to use of two stage mechanism maintenance cost of plant will also reduces. The main advantage of this machine is that it is easy to design and manufacture.

X. ACKNOWLEDGEMENT

We thank to all our professors to make us able to research on such topic

XI. REFERENCES

1. Workshop technology– Hazara Choudhary
2. Electrical machine design – A. K. Sawhney
3. Machine design – R. S. Khurmi, Bhandari
4. Production technology – Banga and Sharma
5. Production planning and control – Banga and Sharma
6. Metrology & quality control –R. K. Jain
7. Theory of machine – Tata Mcgraw Hill
8. www.google.com
9. www.wikipedia.com

