

Automatic Liquid Filling Machine

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Abstract- Liquid filling machines are equipment used for packaging of various liquid products, mainly food and cold drinks. Depending on the different products, the different containers to be filled can either be a bottle or bag. These machines are usually found in manufacturing industry to promote quality and efficiency on the manufacturing process. In our proposed technology we suggest automatic liquid filling machine which will work on gear pump. Gear pump will be synchronized with encoder will give command to rotate particular rotation and hence pump will deliver particular volume. Pump will be connected with nozzle to transfer material into bottles. Volume setting from one size to another size will be done by changing command to gear pump. Once it is calibrated, volume setting will be done in seconds. So it will give more production and will save lot of manpower.

Keywords— Liquid filling machine, starter, encoder

INTRODUCTION

Filling machines are set to fill up the cartons, plastic bags or bottles with the exact amount of product designated to each of them with accurately and effortlessly. There are several types of liquid filling machine are used in various packaging industry. The types which are commonly utilized in the production of goods are liquid filling machine, paste filling machine, powder filling machine and granular filling machine. Liquid filling machine is applied in the production of the liquid-based products such as carbonated drink, perfume, alcoholic beverages, and shampoo etc. It is convenient to use and easy to hold for any kind of operator.[4]

There are many of liquid filling machine which work on the different working principal according to the requirement. Only one type of filling machine is not suitable for all kind of liquid because of the viscosity. Viscosity is different for every liquid so we should have to consider it while designing the machine.

Mostly liquid filling machine working on the positive displacement of piston arrangement, some time we used hopper mechanism to fill liquid or some time we used gravity force to fill the liquid in containers. There are so many type of liquid machine in the market we observed every type of liquid machine try to understand the behaviour of every liquid machine and try to understand the working principal and mechanism of it and try to design a liquid filling machine which is easy to use for everyone and compact in size and also economical.[1]

Mostly liquid filling machine are working on the piston cylinder. So we observed the most of liquid filling machine which are working

on the piston cylinder and try to understand the working mechanism.[1] Presently, they have liquid filling m/c working on piston-cylinder. It is a piston based machine working on suction and discharge principle. It is operated through cam arrangement which is connected with gear-motor. During suction stroke liquid is sucked in cylinder and during discharge stroke liquid is filled into container (bottle). They are packing containers from pack size of 50ml to 1000ml. So, it is required to do changeover as per the different packing size. As pack sizes are many, every time person has to set piston length in cylinder to adjust volume. For the changeover, it requires to change piston-cylinders as per the pack size of material. So, it is time and manpower consuming machine. Each machine has 4 to 6 cylinders and so all cylinder piston length is to be set to get desired volume. This gives inaccurate volume and requires lot of time. So company is losing production and manpower. It has also a spare consumption like piston seal, which worn out due to continuous use and chemical corrosion. It is also having a lack of variable filling speed of material according to convenience, which may cause a foaming problem or otherwise we have to compromise with machine speed. There may be a possibility of miss operation and spillage problems, which cannot be completely avoided due to its design.

I. SCOPE

In our proposed project we suggest automatic liquid filling machine which will work on gear pump. Motor will be connected inline between Encoder and Gear pump. Gear pump will be synchronized with encoder, it will give command to main panel and rotate motor for particular revolution and also give the feedback of rotation and hence pump will deliver accurate volume. Pump will be connected with nozzle to transfer material into bottles. Our primary objective behind this invention is to :

- Design and develop an automatic liquid filling machine that can fill the liquid desired by the user accurately with minimum error possible.
- Design and develop of conveyor system to be integrated with liquid filling machine to show that this machine can be used in beverage industries.

Volume setting and change over from one size to another size will be done by changing command to gear pump from HMI. Once it is calibrated, volume setting will be done in seconds. It has also some specific safety factors regarding the operation.[1]

It has in feed and out feed bottle/container sensors, which help to count the bottle/container. So, when there is no bottle on conveyor or bottle jam on conveyor, machine will not operate and that's why there is less chances of miss operation or spillage.

It can work on variable speed and we also can give delay to filling as per our requirement, so there will be no problem of foaming and machine speed.

We can individually operate the nozzle as per requirement, which is not possible for piston-cylinder type filling machine.

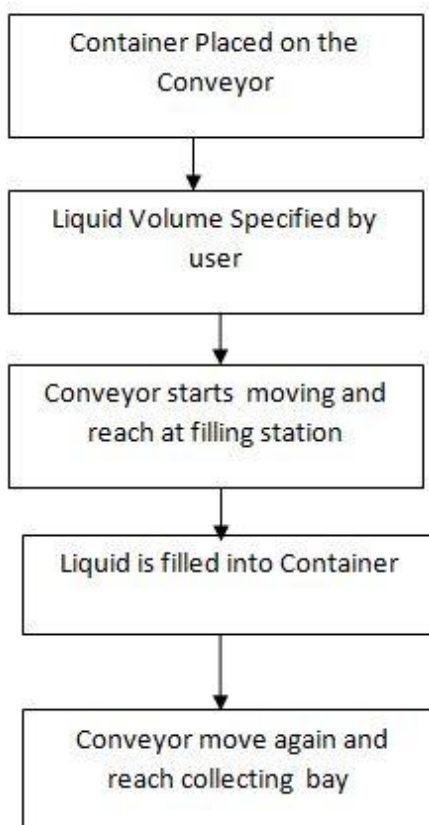
So company will get more production and will save lot of manpower with safety.

But our project is only useful for industries, we want everyone can use our machine easily and can afford it.

So we again design our project we replace encoder by starter and timer. To control the power of the motor.



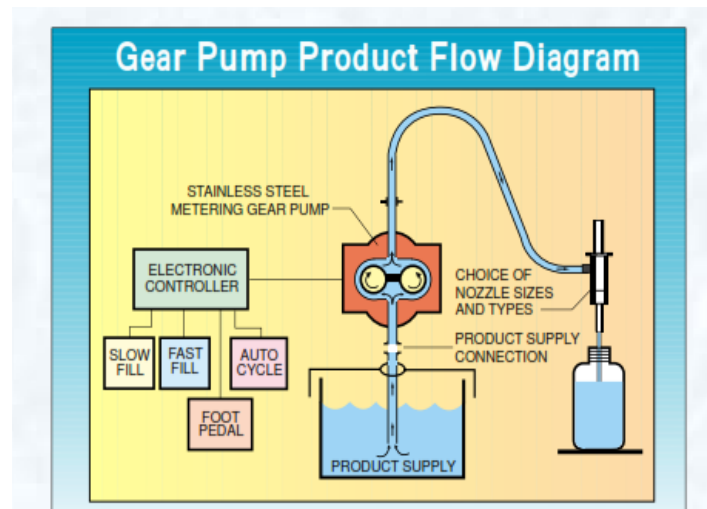
II. FLOW CHART



The working principle of the project is in few steps below. First step involves placing the container on conveyor. Then the second step is to set the liquid volume desired by user. Third step is the conveyor moves the container to the filling station. Once the conveyor stops, the liquid filled in to the container according to the user requirements which is the fourth step. Finally, once the container is full, the conveyor moves again carrying the filled container to the collecting bay. The block diagram below illustrates the whole liquid filling task process.

III. WORKING

In our automatic liquid filling we create automation with the help of gear pump, motor, starter, time and control vale. we used ac servo motor. It is working on three phase but make it convenient to everyone to use we convert it in to single phase. servo motor is connected with gear pump which is used to pressurised the liquid so we can fill it in the container. gear pump contain two connection one end is input and other one is output with the help of pipe. one end of pipe is connected with the tank in which we store our liquid which we want to fill in liquid and other one is connected with nozzle through which the liquid is filled in the containers.



As shown in figure the working principal of the gear pump is shown. [6] Big machine features containing in compact design. It is an ideal for wide range of product. It is easy to setup and changeover with calibrated setting. Material used stainless steel for construction. No tools required for fast and easy setup and cleaning. User friendly.

It is the core of the whole mechanism.

Now the other features of the machine we want to fill every type of container with different amount of liquid according to our requirement. To make this possible we used starter and timer to control the motor power and the speed of the motor. With the help of the starter we control the speed of the motor. [5]

We know that the working principal of the ac servo motor we can control the speed of motor with the help of variable frequency. So control the frequency we used starter so we can applied variable frequency to the motor and can change the speed of it according to the requirement. By controlling the speed of motor we control the flow of liquid by controlling the flow of liquid we can reduce the spillage problem and control the time period required for the filling containers.

Our second highlight is timer which we used to control the power of motor we can ON OFF the motor with the help of timer.

We also used the control valve to open close the nozzle our control valve work on air flow with the help of air flow we can open close the nozzle.

IV. Features

- It can work on variable speed and we also can give delay to filling as per our requirement, so there will be no problem of foaming and machine speed.
- We can individually operate the nozzle as per requirement, which is not possible for piston-cylinder type filling machine.
- So company will get more production and will save lot of manpower with safety.
- We can set volume easily from HMI instead of changing in cylinder which we are doing in old technology, so it is good as a safety point of view.
- Automatic Operation : It is automatic machine. User just has to set amount of liquid filled and select type of nozzle.
- High Quality : This product will provide high quality service by providing quick and accurate service.
- Less Down Time : It take less time to fill liquid and thus increases its efficiency.
- Safety : It is automatic machine. It is safe to use .
- Multiple filling : This machine has various types of nozzle to fill different type of liquid.
- Reduce Operation Time : This is an automatic machine. It reduce operation time compare to other technology used.
- Increase Production : As it is automatic machine and its electronic component provide quick operation. So as a result it will increase production of company.
- Reduce Man Power : It is an electronic automatic machine .So it will require less human operator to work upon it.
- Increase Accuracy : It uses timer and starter that will provide highest accuracy.

V. FUTURE SCOPE

We can also use conveyor belts for large production in industries to fill large amount of containers easily without creating any messy environment. We can use the proximity sensors to control the flow of containers on the conveyor belt

VI. CONCLUSION

In our proposed project we suggest automatic liquid filling machine which will work on gear pump. Gear pump is operated by encoder and motor. Encode control the main panel and rotation of motor and also give the feedback of rotation so pump will deliver accurate volume according to our requirement. It is able to work on variable speed as per our requirement, so no foaming problem occurs in operation.

Pump is connected with number of nozzle and able to deliver different amount of liquid in different nozzle

Volume setting and changeover from one size to another size will be done by changing command to gear pump from HMI. Once it is calibrated, volume setting will be done in seconds.

It contains in feed and out feed sensor so we can count the number of bottle or container moving on conveyor, if there is no bottle or container it create jam on conveyor and stop the operation of machine. It will increase the production rate of the product significantly

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