

## Developing of Alcohol Bottle Washing Machine

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**Abstract** - This document shows the required format and appearance of a manuscript prepared for SPIE e-journals. The abstract should consist of a single paragraph containing no more than 200 words. It should be a summary of the paper and not an introduction. Because the abstract may be used in abstracting and indexing databases, it should be self-contained (i.e., no numerical references) and substantive in nature, presenting concisely the objectives, methodology used, results obtained, and their significance. A list of up to six keywords should immediately follow, with the keywords separated by commas and ending with a period.

**Key Words:** optics, photonics, light, lasers, templates, journals

### 1. INTRODUCTION

An alcohol bottle (Alcohol bottle) is a container that is used to hold water, liquids or other beverages for consumption. The use of an alcohol bottle allows an individual to drink and transport a beverage from one place to another.

An alcohol bottle is usually made of plastic, glass, or metal. Alcohol bottles are available in different shapes, colors, and sizes. In the past, alcohol bottles were sometimes made of wood, bark, or animal skins such as leather, hide and sheepskin. Alcohol bottles can be either disposable or reusable. Reusable alcohol bottles can also be used for liquids such as juice, iced tea, alcoholic beverages, or soft drinks. Reusable alcohol bottles reduce plastic waste and contribute to saving the environment. Easily portable, alcohol bottles make for convenient use. Disposable alcohol bottles often list nutrition facts.

Bottle washing machines are mainly used by a number of industries for quick and efficient use and for washing, bleaching and drying of bottles before filling it with solution, liquids, or powders. Because bottle washing is a job that permits not a single mistake in terms of hygiene and product safety. And at the same time, it demands economical utilisation of water as a valuable resource. So, the whole project is made using SS (stainless steel) frame. There is a water pump placed under the bottle stand which is used to force the water from the lower level (tank) to the rinse rod. When the button is pressed the pump gets on and the water forcefully flows inside the bottle through the rinse rod. And then water is then collected or thrown out by the pipe connection underneath the bottle.

### 2. Literature Review

Mr. Rizwanu Neyon, Nirjhar Das Sharma, Mr. Priom Chakraborty:- This paper in most of the primary packaging industries, bottle washing (rinsing) machines are one of the most widely used technologies which is developed for efficient washing, sanitizing and drying of bottles before they are ready

to be filled with liquid product or solution. Currently, there are some automatic bottle washing machines available in the packaging industries. Generally these machines are designed and manufactured from practical experiences of conventional machine designer. This design and development process often requires longer time and higher cost of fabrication. The simultaneous mechatronics system design methodology can serve the better opportunity to overcome these difficulties.

Ankur G. Gajalcohol bottle, Alpesh I. Patel, Raviprakash G. Singh :- In this paper the conventional bottle washer machines are suitable only for medium scale and large scale beverage industry due to their high bottle washing capacity and mechanical and control complexity. This paper proposes the design and automation of the economical bottle washer machine for the small scale beverage industry without compromising its control capabilities. The importance and requirement of the bottle washer machine in the beverage industry has been discussed. The design of the proposed bottle washer machine for RGBs (Returnable Glass Bottles) has been created in the Creo software. The different treatment zones and working of the bottle washer machine has been discussed. The bottle washer machine has been automatized using the Siemens S7-317-2-PN/DP PLC (Programmable Logic Controller) and programmed using a ladder diagram in the SIMATIC Manager. The level control for different treatment zones is achieved by means of limit switches and temperature control for different treatment zones is achieved by using Pt1000 RTD, SSR (Solid State Relay) and heater. The different control schemes for the temperature control has been discussed, implemented and compared. The results show that the PID temperature control is the most effective control scheme for the temperature control of the different treatment zones. The implementation of the PID temperature control and auto-tuning of the sample process has been shown. The holistic control of the bottle washer machine also has been discussed and assessed.

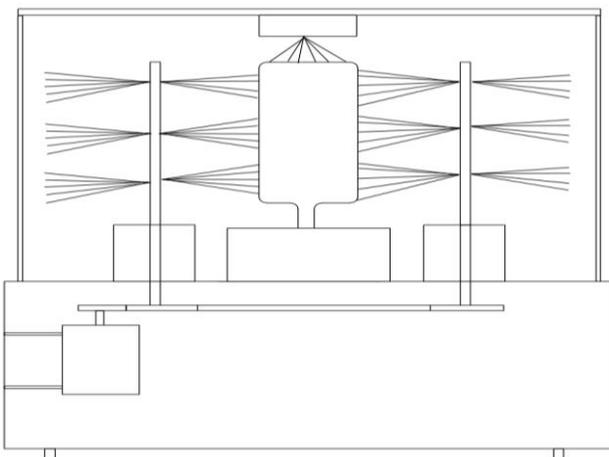
Anastasiia Fedotova:- In thesis explains the meaning of automation and automated machines used in water washing. It analyzes the operation principles of automation machine and technical specifications of the equipment using the example of the washing system in Fami Farm Oy. The productivity analysis is calculated. Also possible problems and mistakes which happen to the machine and the ways how to avoid or improve them are described. The following topics are discussed in the thesis: the ways how to reduce the damage and how to increase the productivity of the machine and of Fami Farm production, how to reduce time and money losses. Possible ways to automate manual work and improving machine efficiency operations are also described. All those aspects are contained in different parts of the thesis, main five of which are Theoretical inspection, Experimental part, Results of work, Marketing viewpoint, Practical usefulness. Also Introduction, Conclusion, table of Contents, References and Appendices are included.

Ujam, A. J, Ejeogo, G and Onyeneho, K. C.: - In this paper Manual washing of beverage bottles does not give the desired productivity requirement of industrial setting and in the effort to reduce the environmental impact of waste from industrial production, there is an increasing deeply felt need to recover empty glass and plastic containers. This paper therefore aims at developing a Rig (Geneva Mechanism) for bottle washing in a typical brewery or beverage industry. A test rig was designed, fabricated and employed for a performance evaluation. The rig operates on the intermittent rotary motion from a four slot external Geneva Mechanism and requires manual loading and unloading of bottles. The bottles are loaded on subsequent indexing part of the rotating table and are washed one after another. The analysis of design gave the following results: Centrifugal force on the driven pulley (FR) = 0.158N; Bearing reaction at an end, B, RB = 403.42N; Bearing reaction at an end, C, RC = -152.42N; Radial load due to inertia of driver, FR = 20.90N; Axial load due to weight of Pulley, Wa = 61.70N; Equivalent dynamic load on the bearing, We = 349.31N; Bearing load capacity, WC = 2306.80N. These forces were related to generate shear force and bending moment diagrams. This work presents a practical application of Geneva mechanism for worktable indexing and bottle washing.

**Literature Summary:-**

From the above literature review we conclude that, it is possible to design and manufacture an Automatic Alcohol bottle washing machine with manual feeding at lowest cost. For the lowest cost we can easily development of in washing machine as compare to higher cost machine.

**3. Experimental Setup**



Firstly the power supply to the electric motor, motor rotated with desired speed. Then this motor, the gear is attached to reduce the speed of the electric motor by using these gears. This gear is attach to a vertical shaft, those shaft are directly connected to the special brush. These brush is rotated at desired that speed we can required.

These alcohol bottles are manually feeding in to the machine then the brush can rotated at outer, inner, bottom as well as top surface of the alcohol bottle. So this alcohol bottle can easily clean. The water supplies though the vertical shaft, those the special brush is mounted on it. So brush can clean the alcohol bottle.

**4. Calculation  
ELECTRIC MOTOR:**

A electric motor is selected having following specifications.

Torque = 80N-cm Speed = 60 rpm Direction of rotation = reversible

$$Nq * Tq = Np * Tp$$

Where,

Nq = Speed of Gear

Tq = Teeth of Gear

Np = Speed of Pinion

Tp = Teeth of Pinion

$$Nq = (Tp \setminus Tq) * Np$$

$$Nq = (16/48) * 60$$

$$Nq = 20 \text{ rpm}$$

**DESIGN OF DISC SHAFT:**

$$\text{Torque on shaft} = Tq / Tp X$$

torque on pinion shaft

$$T = 3/1 X 8 T = 24 \text{ Kg-cm}$$

$$\text{Hence torque} = 24 x 9.81 x 10^{-2} \text{ N-m}$$

$$T = 2.3544 \text{ N-m}$$

Speed of shaft = 2 rpm

$$\text{Torsional shear stress developed} = 16 / (d^3) X T \quad (\text{Minmdia of shaft} = 10.5 \text{ mm})$$

Shaft material C30 steel having yield strength according to design data book 500 N/mm<sup>2</sup>

Taking factor of safety = 3

$$\text{Allowable yield stress} = 500/3 = 166.66 \text{ N/mm}^2$$

$$\text{Allowable shear stress} = 166.66/2 = 83.33 \text{ N/mm}^2$$

$$\text{Torsional shear stress developed at shaft} = 16 / (d^3) X T = 16 / (x 10.53) X 2354.4 = 10.36 \text{ N/mm}^2$$

Hence shear stress developed on a shaft is less than allowable strength of material, hence shaft is safe.

**Design Parameter:**

- a. **Motor:** The motor is single phase 12 volt DC motors, meaning that the speed is infinitely variable from 0-300 rpm. The motor is mounted on the machine frame and is connected to guider shaft and also linear blades through connecting links.
- b. **Inner Brush Shape:** inner brush shape most in bottle washing machine is ciecular but in case of our project we design a Spiral type. Because the Stating

site of 20 lit. alcohol bottle is small so no of brushes are required less as well as smooth operation required.

- c. **Chain Drive:** In case of alcohol bottle washing the most important alcohol bottle can automatically rotate. So we first belt drive selected but chance of slip are very high so change that and replace by the chain drive because chain drive is positive drive.
- d. **Drive and Driven Sprocket:** Drive and driven sprocket made up of SS material which has properties like light in weight, sufficient strength etc. on which conveyor Chain is moving due to motor motion.
- e. **Centrifugal Pump with Nozzle:** We can both materials is directly purchase from the market. Because the pump are only water supplier and with the help of nozzle water a directly on alcohol bottle.
- f. **Bearing:** We select ball bearing on which radial load is act. The shaft and drive and driven pulleys are held in ball bearing mounted in bearing housing and rotates freely in it.
- g. **Frame:** It is made up of mild steel material (M.S.). The entire assembly is mounted on frame which is inner and outer brush, bearings, chain drives, Pump and Nozzle.

## 5. Advantages, Disadvantages and Application

### Advantages:

1. The Bottle can be easily washed.
2. Two or Three Bottle are Cleaned at a time.
3. Handling is easy
4. Less Manual power
5. Time Saving and High Production System.
6. Replacement of parts are easy

### Disadvantages:

1. Cost of the equipment is high.
2. This system requires high maintenances care.
3. Care must be taken for the handling the equipment such as proper wiring connection, etc.

## Applications

1. Mineral Water Plant Industries
2. Cool Drinks Industries
3. Factory, etc.

## 6. Conclusion

Our project is alcohol bottle washing machine, anyone can't manufacture a this large size washing machine, this is innovative project so we are design and develop an actual working model.

From this project we are concluding that, we can reduce the time as well as cost of the alcohol bottle washing can reduce. As the space required for the other machine can reduces. This project which can help the small scale industry those are not offered a large size alcohol bottle washing machine.

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