

# Automatic Rollcap Crackers Packaging Machine For Fireworks Industry

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**Abstract-** Packaging is the science, art and technology of enclosing or protecting products for distribution, sales, storage and use. Now a days in industries, packaging is the stage that is important because, to make a product safe and good in condition when delivering to customer as well as to both suppliers and customers of the products. The problems of packing come when company has a demand of the product higher than ordinary. So, the operators that work at packing section must finish before the due date. Therefore, the aim of this project will try to help and improve the packing system to make the process run systematic and also reduce time consumption as well as human drudgery. This project will use two sliding rollers which is used to holding the paper perfectly which is especially for rollcap crackers.

**Keywords-** Machine, Rollcap Crackers, Packaging, Paper, Firework Industries.

## I. INTRODUCTION

India is known for leading fire crackers manufacturing industries and play major role of importance in employment at rural area of our country. About 90% of India's fireworks industries are located in an around villages of Sivakasi taluk at Virudhunagar district of TamilNadu state. This district is famous for fireworks and printing industries. In these industries, packing of rollcap crackers is done by manually. As its manual unsafe packaging process in fireworks industries are inclined to high magnitude of chemical pollution and human health illness.

The main purpose of this project is to eliminate the regular manual unsafe packaging process in fireworks industries and to reduce the time consumption as well as human effort. The packing of rollcap crackers is done automatically by using sliding rollers. An automatic rollcap packaging machine has most unpretentious operation in the processing of packaging. Now a day in the villages, rollcap crackers are packed manually. A skilled labor carryout the ten

small rollcap pieces on the prearranged paper and holding it by using glue.

A mechanized system of packaging usually appears in the form of simple sliding rollers which can be ride on the paper by using single acting cylinders. In this system, for packaging of rollcap crackers there is minimum amount of stress is applied by sliding roller. Because the stress applied by the roller should not affect the rollcap crackers. The most important item used in this system is no direct contact between electrical source and the rollcap crackers. And only minimum amount of electric voltage should be used for the stroke of single acting cylinder. So the unavoidable explosive can be prevented from the electrical power supply.

As has been stated earlier, traditionally rollcap crackers are packed manually. The worker sits in a small room while packing the rollcap and this brings discomfort due to sitting posture as well as this operation is danger to workers because the rollcap crackers are flammable materials. Also, a supervisor is essential for checking the packaging process by the worker is done appropriately.

Thus the discomfort promotes the need for innovations and improvements to ease the problems encountered by these workers.

## II. OBJECTIVES

An automatic process of rollcap packaging machine that will achieve the following.

1. Produce packed product in commercial quantity at a faster rate.
2. Reduce human effort and increasing productivity.
3. Be an environmental and economic friendly machine.

The rest of the paper is organized as follows. Section 2 provides a comprehensive review of previous developments in packaging machines. Section 3 introduces the machine

description and technical specifications of the machine. Section 4 and 5 the proposed methodology and an analysis of result is presented. Finally section 6 and 7 present discussions and concluding remarks.

### III. IDENTIFY, RESEARCH AND COLLECT DATA

Packaging is the science and technology of enclosing or protecting products for distribution, storage, sales and use. Packaging also refers to the process of design and evaluation. Packaging contains, protects, preserves, transports, informs and sells. It is fully integrated into government, business, Institutional, Industry and personal use. Most commercial packaging serves two basic functions which are protecting the product from damage during shipping and promoting the product to the ultimate consumer.

#### 3.1. MANUAL METHOD

Traditionally, Rollcap crackers are packed manually. A skilled labor carryout the ten small rollcap pieces on the prearranged paper and holding it by using the glue. The worker sits in a small room while packing the roll cap and this brings discomfort due to sitting posture of the worker have been of concern to researchers.

#### 3.2. MECHANIZED METHOD

##### 3.2.1. Automatic Packaging Machine by using Programmable Logic Controller

Products are passed on conveyor. They are sensed by the first proximity sensor and the counter is set to '1'. As soon as the product completely passes through the sensor. Sensor 1 switches off. When the sensor switches off, timer (previously set to certain delay) starts. After certain delay, cylinder extends and seals the film. The extended cylinder rod is detected by the sensor 2 and the counter is reset to '0'. This process is repeated for the required duration.

The product obtained with this model was not very much acceptable to the consumers of fireworks industry. Because this model is not especially for roll cap crackers.

##### 3.2.2. Vertical Packaging Machine

The machine can be equipped with the necessary accessories to produce all types of tubular, gusseted and flat bottom sachets. All current types of heat sealable and thermoplastic wrapping materials can be handled. From the wrapping material reel the machine forms the sachet, fills

it by means of the corresponding dosing unit, closes it and cuts off. A photochemical unit centers the print.

The packaging machine is suited for the packaging of powdered products, and granular products. This model is not suited for firework industries.

### IV. MACHINE DESCRIPTION

There are several elements which are used in design of a packing assembly. These are responsible for the motion of each part at each station. This is arranged orderly and fabricated to obtain final assembly.

There are two kinds of unit used in this project are transportation unit and holding unit. Transportation unit consists of conveyor setup and Two-High Rolling Mills. Similarly the holding unit consists of two sliding rollers where the primary roller is used to paste the glue and the secondary roller can be applied stress for perfect packing. As well as the holding unit has four flat surface cube section which is use to hold left and right side of the paper.

The paper using for packaging the rollcap crackers which is having specified dimensions. The length and breadth of the paper is 142mm and 110mm. The specified diameter of a small rollcap cracker is 25mm. The machine is especially for this specified dimension.

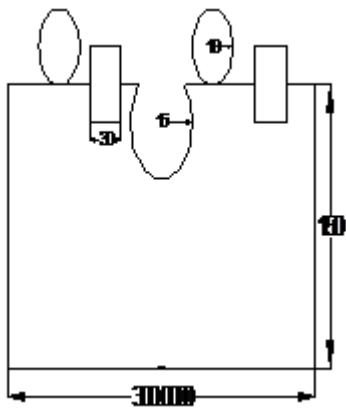
### TECHNICAL SPECIFICATION

#### 1. Transportation Unit

Length of rolling mill = 142mm  
Diameter of rolling mill = 20mm

#### 2. Holding Unit

Length of sliding roller = 145mm  
Diameter of sliding roller = 20mm  
Side of flat surface cube section=30mm



Front view of Automatic Rollcap Packaging Machine

An identified paper is placed on the semicircular unit by using two-high rolling mill. After the paper placed on the semi- circular unit, the ten small rollcap cracker pieces are settle down on the paper by using conveyor. Then primary roller should apply the glue by using single acting cylinder. At the same time, the secondary roller should apply the stress for proper packing. Similarly the flat surface cube sections should apply the glue as well as stress for the side packaging. Finally all sides of the rollcap crackers are packaged automatically with the help of rollers and the packaging product is sent to the available box by using conveyor.

**V. METHODOLOGY**

The Process Planning methodology is used for an Automatic Rollcap Packaging Machine for firework industries.

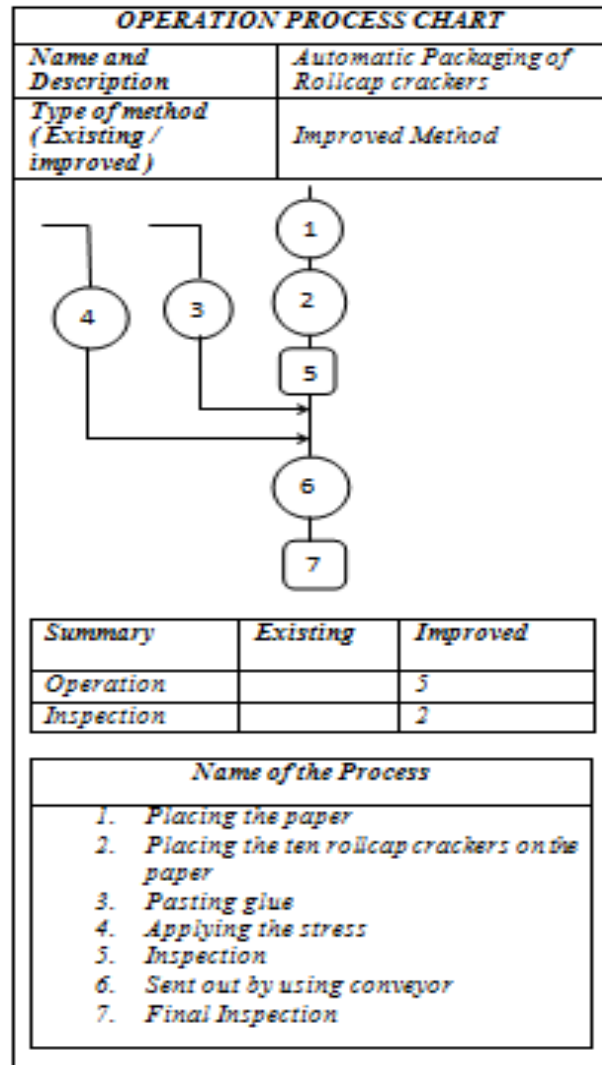
The work is studied by using method study and work measurement, which are used in the examination of human work in all its contexts and which lead systematically to the investigation of all the factors which affect the efficiency and economy.

In this Process Planning activity, the OUTLINE PROCESS CHART is used. An outline process chart is a process chart given an overall picture by recording in sequence only the main operations and inspections. It is also known as OPERATION PROCESS CHART, gives a ‘bird’s-eye’ view i.e., the overall view of the whole process.

The outline process chart is useful:

1. To improve the plant layout
2. For specifying the basic manufacturing system
3. For determining the sequence of assembly.
4. To introduce manufacturing system to new technical personnel.

The method study of Automatic Packaging of Rollcap Crackers is following



**V. RESULT**

The experiment demo consists of rollers which are used to hold the paper by using single acting cylinder. This result in the efficiency and productivity of the packaging process should increase. In manual handling, the packaging is operated by human and there is discomfort should be happened. But this automatic packaging machine reduces human drudgery and also reduces the time consumption for packaging the rollcap crackers. This automation system will have high precession and repeatability.

**VI. DISCUSSIONS**

This automatic rollcap packaging machine for fireworks industry has productivity when compared to manual methods and modern packaging machines like an automatic

packaging machine by using PLC and vertical packaging machine, etc. This rollcap packaging is best suited for packaging of rollcap crackers, when compared to other mechanized models.

## VII. CONCLUSIONS

An Automatic Rollcap Packaging Machine is an arduous and intricate operation which is not a straightforward packaging operation but that needs good understanding of the factors that affect the quality of the final product. The best quality of packaging of rollcap crackers up till date is obtained by the manual technique but it is time consuming and leads itself to unsafe for the worker.

Therefore an automatic packaging machine for fireworks industry is needed. There will be reduced manufacturing lead time due to less idle time. This can be achieved by implementing automation to the existing systems. Finally a firm can achieve higher production rates and product quality with greater precision and repeatability. This will be done by automation machines.

## VIII. ACKNOWLEDGMENT

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