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AUTOMATIC LOADING OF LLDPE PARTICLES TO THE GRINDING MILL USING CONVEYOR

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ABSTRACT

Every industry profit depends upon the production rate. We visited the **LEO POLYMER,** In that industry they manufacture water tanks. In water tank manufacturing process they prepare powderized material for processing. They produce 20 bags of powdered material (each bag have 25 KG) per day with the man power. Totally 500kg of powder is grinded per day with the workers. We improve the overall productivity of that industry through the replacement of bucket conveyors for the workers. It can produce more material at the same production t ime. It results 20 bags of powder material into 25 bags of powder material per day. So we introduce the **AUTOMATIC LOADING OF LLDPE PARTICLES TO THE GRINDING MILL USING CONVEYOR.**

Key Words: water tanks, bucket conveyor, powder material.

INTRODUCTION

LEO POLYMER founded by Mr. A. DURAI RAJ during the year 1996 in the plastic hub of Madurai, TamilNadu, India. Now the company runs in SIDCO Industrial Estate, kappalur, Thirumangalam, Madurai. The company has established an plastic injection moulding manufacturing facility which has successfully passed through challenges of maintaining competitive pricing, high standards of quality and timely supply.

In order to give good quality products, they have setup an advanced manufacturing unit, producing good quality products. They have testing unit equipped with various instruments required for testing the products. They manufactures pipes, water tanks, chairs, and household products like basket, dustbin, drum, buckets etc.

The company have R&D department the products are designed by the experts. The products are available in required size. The workers have valuable industry experience and much knowledge in their respective domain.

In water tank manufacturing process the Linear Low Density polyethylene (LLDPE) raw material is mixed with Generalised Low Density polyethylene (GLD) and master patch brand pigment (colouring element). The mixer is feed to the plastic injection moulding machine with workers. The material is heated upto 200 ^{o} C temperature. The mixer is melted and flow through a mould with the help of screw inside the machine then the materials are drawn as a rope and it was cutted into a small particles with a cutter machine

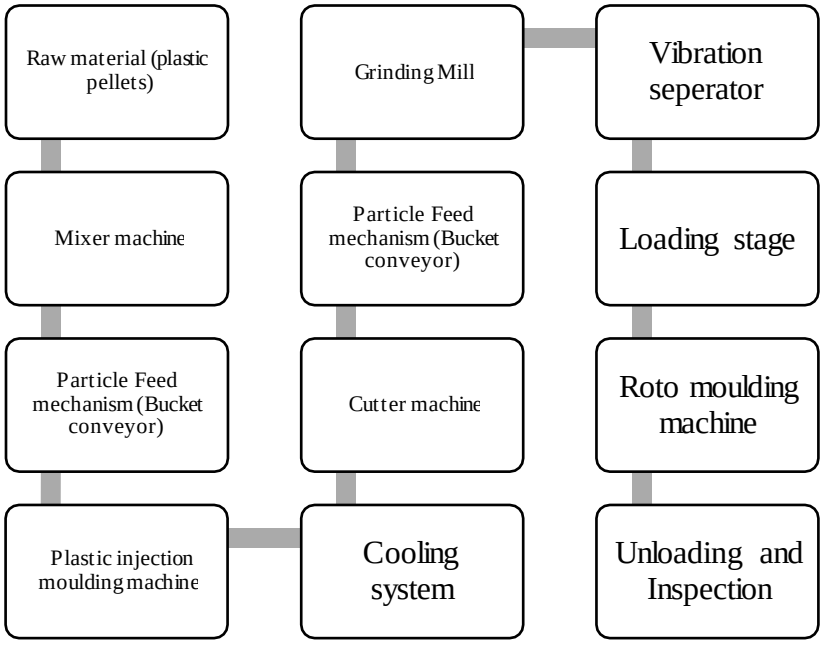
The workers is used for loading the work materials to the injection moulding machine and grinding mill. It consume more time and cost of worker. It will reduce the total revenue of the industry.

The production of work material per day is 20 bags of powder (each bag has 25 kg) with the human power. Totally 500kg of powder is grinded per day with the workers.

MANUFACTURING PROCESS

PLASTIC INJECTION MOULDING

In water tank manufacturing process the first step is mixing the raw materials with the colouring pigment with the required ratio



needed colour. The raw materials are mixed with the help of mixer. Then the mixed raw materials are feed to the plastic injection moulding machine by the workers.

The feeded raw material is flow through the plunger the heating coils are place around the injection moulding machine. The raw materials are heated upto 200^{o} C. The raw materials are heated and converted into a liquid form. Then the liquid materials are feed to the circular mould cavity. The molten material is flow through the mould cavity.

CUTTING PROCESS

In this process of cutter machine the molten material came from the mould cavity is directly flow to the water it is rapidly cooldown the molten material and solidify to a rope. It is feed to the cutter machine with the help of rollers. Then the cutter machine cut the long plastic rope into a

small plastic particles. The particles are cut the plastic rope into a required shape and size.

GRINDING PROCESS

The small particles are loaded to the grinding mill hopper with help of worker. Inside the mill, there are typically grinding media such as balls or rods. These media are responsible for breaking down the feed material into smaller particles through impact, attrition, or abrasion.

The mill is powered by a motor that rotates the grinding chamber or the grinding media inside it. This rotation creates a cascading motion of the grinding media, leading to the crushing and grinding of the feed material. Throughout the grinding process, various parameters such as the feed rate, mill speed, grinding media size and composition, and particle size distribution may be monitored and adjusted to optimize the efficiency and performance of the mill.

Once the grinding process is complete, the ground product is discharged from the mill. This can be done through various means, such as through a discharge chute or conveyor belt.

SEPERATION PROCESS

The material to be separated is introduced into the vibroseparator. This can be done manually or through a feeding mechanism such as a conveyor belt or hopper. The heart of a vibroseparator is its vibratory motor, which generates vibrations that are transmitted to the screening assembly. These vibrations cause the material to move across the screening surface.

As the material moves across the vibrating screens, particles smaller than the mesh openings pass through the screen, while larger particles are retained on the surface. This separation process is based on the size and shape of the particles. The amplitude and frequency of the vibrations can often be adjusted to optimize the separation process for different types of materials and desired particle sizes.

Once the separation process is complete, the separated fractions are discharged from the vibroseparator. This can be done through multiple discharge ports or outlets located at different levels of the machine.

ROTO-MOULDING PROCESS

The process begins with the preparation of a mold. The mold is typically made of metal (usually aluminum or steel) and is designed to produce the desired shape of the final product. The mold consists of two or more halves that can be opened and closed. A measured amount of plastic resin, usually in the form of powdered or granular polymer, is loaded into the mold cavity. The type of resin

used depends on the specific properties required for the final product.

The mold is then heated in an oven or a heating chamber. Heating the mold softens the plastic resin and allows it to coat the interior surfaces of the mold evenly. Once the mold is heated and the resin is evenly distributed, the mold is rotated slowly around two perpendicular axes. This rotation causes the molten resin to spread and adhere to the inner surfaces of the mold, gradually forming a hollow part with uniform thickness.

After the desired thickness of the part is achieved, the mold is cooled. Cooling can be done by circulating air or water around the mold or by using cooling fans or sprays. Cooling solidifies the plastic resin and allows the part to retain its shape. Once the part has cooled sufficiently, the mold halves are opened, and the finished part is removed. Any excess material or flash around the edges of the part may be trimmed or removed.

Finally, the finished parts undergo quality control inspections to ensure that they meet the specified dimensions, surface finish, and other requirements.

SELECTION OF CONVEYOR

Replace the workers by using conveyors in water tank industry

In that industry they manufacture water tanks. They produce 20 bags of powdered work material (each bag has 25 KG) total of 500 KG of powdered material per shift with man power. We improve the overall productivity of that industry through the reduction of cycle time with the help of replace the conveyor for the workers.

It can produce more powdered material at the same production time. Here we replace the bucket conveyors for the workers. It will reduce the time taken for the processing

of the work material. It will increase the production of the product. we replace the conveyor for workers it will increase the production of work material upto 25 bags per day. And also reduce the expenses of the workers.

Bucket conveyor is a material handling equipment. It is used to load the work materials from the loading area to the injection moulding machine it is rise the material to the hopper. Then the material is processed and cut into a small particles. The another bucket conveyor is placed next to the cutter machine. Then the small particles are feed to the grinding mill using bucket conveyor. The conveyor is driven by the Geneva mechanism it gives the periodic interval between each move.

Geneva mechanism is a gear mechanism that transfer a continuous rotary movement into intermittent rotary motion. The driver wheel usually have a pin that reached into a slot that will rotate the driven wheel one step at a time. The drive wheel also have a cam in centre of the wheel that blocks the rotation of driven wheel in position between steps. It will provide periodic interval between each move.

CALCULATION

Expenses with workers

Total expenses = 2*(salary of worker + other expenses)

= 2*(400 + 50) = 2*450

Total expenses = Rs.900 for 2 workers / day
Day

Expenses using conveyor

Electricity consumed per year = 3565 units

Electricity consumed per day = electricity consumed per year / total working days

= 3565/310

= 11.5 units / day

charges applied per day = 11.5 * 11

= Rs.126.5 for one conveyor / day

REVENUE MADE BY CONVEYOR

Charges applied for 2 conveyors = Rs.255/day

Total expenses for 2 workers = Rs.900/day

Profit from using conveyors per day = Total expenses for 2 workers - Charges for 2 conveyors

= 900 – 255 = 645

Profit from using conveyors per day = Rs.645

Profit from using conveyors per month = 24*645

= Rs.15,480

Profit from using conveyors per year = 12*15,480

= Rs.185,760

RESULT

The overall production of water tanks will be improved through the reduction of cycle time with the help of bucket conveyor. It can produce the more products at the same

production time. The bucket conveyor is replaced, the production of water tank is increases, it results 500 KG of powder material into 625 KG of powder material per shift.

CONCLUSION

After completing the major project on replacing conveyor water tank industry. Using conveyor, the productivity can be increased much be beyond the stated results.

1. The overall production of water tank is improved and the cost of electricity is very low.
2. When we reduce the cycle time, time is saving more than the man power.
3. The bucket conveyor is helps to produce the more products at the same production time.
4. The overall revenue is increased upto **Rs. 185,760** by using conveyor.

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