

# SEGREGATION OF RUNNER AND THE PRODUCT IN INJECTION MOULDING MACHINE

# P SIVASANKARAN<sup>\*</sup>, NIRMMAL KUMARR M<sup>\*</sup>, SANJIVIRAYAN P<sup>\*</sup>, NAGARAJ B<sup>\*</sup>

# ABSTRACT

In today's scenario, everything is moving towards automation in order to increase the production rate and to reduce the manpower fatigue, Injection Moulding is the one of the most common methods in producing plastic products for many purposes ranging from a daily product to high-tech equipments. In this paper attempt has been made to segregate the runner and product coming out from the machine directly with the help of gravity separator this increases the productivity by reducing the time in the manual separation of product and riser. To eliminate the labour for segregating both product and runner.

**KEYWORDS:** Product, Runner, Elimination Of Time, Reduction Of Labour.

# INTRODUCTION

In today's scenario, everything is moving towards automation in order to increase the production rate and to reduce the manpower fatigue, Injection Moulding is the one of the most common methods in producing plastic products for many purposes ranging from a daily product to high-tech equipments. This work is concerned with the design of parts from of design, manufacturing analysis and production in Plastic materials from a long time, it was found that injection moulding system using of permanent die was taking more time for exchange .The Experimental work is mainly concentrate on to reduce the manual effort the employee by automatic separation of product and runner. This reduces the time of segregation and also improves the human body motion with respect to ergonomics.

# **METHODOLOGY FROM LITERATURES**

# INTRODUCTION

There are various types of methodologies being followed in companies to optimize the quality of the product produced and also the maintenance in the industry. Some of the tools or methodologies which are to be used in the industry are

- 1. 5S Methodology
- 2. FIFO
- 3. Gemba kaizen
- 4. Total production maintenance
- 5. Total quality management
- 6. Value stream mapping

<sup>\*</sup>Manakula Vinayagar Institute of Technology, Pondicherry, India. *Correspondence E-mail Id:* editor@eurekajournals.com

#### **5S METHODOLOGY**

The 5S Method is a standardized process that when properly implemented creates and maintains an organized, safe, clean and efficient workplace. Improved visual controls are implemented as part of 5S to make any process non-conformance obvious and easily detectable. 5S is often one element of a larger Lean initiative and promotes continuous improvement. The 5S list is as follows:

Seiri / Sort: Separating of the essential from the nonessential items

Seiton/ Straighten: Organizing the essential materials where everything has its place

Seiso/ Shine: Cleaning the work area

Seiketsu/ Standardize: Establishing a system to maintain and make 5S a habit

Shitsuke/ Sustain: Establishing a safe and sanitary work environment (Safety)

The 5S Principles are recognized in many industries as effective tools for improving workplace organization, reducing waste and increasing efficiency. Organizations should be careful to not allow the 5S Principles to become viewed as the whole of the company's improvement efforts. Otherwise it could become the end goal of your company's improvement process instead of a key part of a larger continuous improvement journey. The greatest benefit from using 5S is realized when it is part of a larger initiative and the entire organization has adopted its principles. 5S is more than a system; it is a business philosophy and should be integrated into the organization's culture. Make work easier by eliminating obstacles.

# FIRST IN, FIRST OUT (FIFO)

First in, first out (FIFO) is an asset-management

and valuation method in which the assets produced or acquired first are sold, used or disposed of first and may be used by a individual or a corporation. For taxation purposes, FIFO assumes that the assets that are remaining in inventory are matched to the assets that are most recently purchased or produced.

FIFO is used for cost flow assumption purposes. As items being manufactured progress to later development stages and as finished inventory items get sold, the associated costs with that product must be recognized as an expense. The dollar value of total inventory decreases as this occurs because inventory has been removed from the company's ownership. The costs associated with the inventory may be calculated in numerous ways-one being the FIFO method.

As inventory items are prepared for sale, they are assigned costs. This may occur through the purchase of the inventory of production costs through the purchase of materials and utilization of labor. These assigned costs are based on the order in which the product was used, and for FIFO, it is based on what arrived first. For example, if 100 items were purchased for \$10 and 100 more items were purchased the next for \$15, FIFO would assign the cost of the first item resold of \$10. After 100 items were sold, the new cost of the item would become \$15, regardless of any additional inventory purchases made.

The FIFO method follows the logic that to avoid obsolescence, a company would sell the oldest inventory items first and maintain the newest items in inventory. Although the actual inventory valuation method used does not need to follow the actual flow of inventory through a company, an entity must be able to support why it selected the use of a particular inventory valuation method.

#### **GEMBA KAIZEN**

#### **GEMBA - SHORT VERSION**

The real place or the specific place. Usually means the shop floor and other areas where work is done.

#### **GEMBA - LONG VERSION**

Gemba is a Japanese term meaning "the actual place" or "the real place". Japanese detectives call the crime scene Gemba, and Japanese TV reporters may refer to themselves as reporting from Gemba. In business, Gemba refers to the place where value is created; in manufacturing the Gemba is the factory floor. It can be any "site" such as a construction site, sales floor or where the service provider interacts directly with the customer.

Gemba Kaizen is a Japanese concept of continuous improvement designed for enhancing processes and reducing waste.

Within a lean context, Gemba simply refers to the location where value is created, while Kaizen relates to improvements. However, the concept of Gemba Kaizen holds many more meanings than its literal translation.

According to the Kaizen Institute, an organization which has embraced the concept is constantly striving to improve its processes, promotes discipline and standardization, and believes the processes in place for solving problems are more valuable than the solutions themselves.

Masaaki Imai, founder of the institute, explained "Kaizen is a mindset. Although many lean practitioners have Kaizen in their toolbox, those who strive to live it each day are the people who are making a difference in people's lives."

Gemba Kaizen embraces the skills of a whole organization, inviting and rewarding employee

contributions and understanding even the smallest improvements will create greater value over time. The concept focuses on achieving continuous improvement through activities on the work floor.

In lean manufacturing, the idea of Gemba is that the problems are visible and the best improvement ideas will come from going to the Gemba. The Gemba walk, much like MBWA or Management by Walking Around, is an activity that takes management to the front lines to look for waste and opportunities to practice Gemba kaizen, or practical shop floor improvement.

In quality management, Gemba means the manufacturing floor and the idea is that if a problem occurs, the engineers must go there to understand the full impact of the problem, gathering data from all sources. Unlike focus groups and surveys, Gemba visits are not scripted or bound by what one wants to ask.

Glenn Mazur introduced this term in the Quality Function Deployment (QFD, a quality system for new products where manufacturing has not begun) to mean the customer's place of business or lifestyle. The idea is that to be customer-driven, one must go to the customer's gemba to understand his problems and opportunities, using all one's senses to gather and process data.

The PDCA process supports both the principles and practice of continuous improvement and Kaizen. Kaizen focuses on applying small, daily changes that result in major improvements over time. The PDCA Cycle provides a framework and structure for identifying improvement opportunities and evaluating them objectively.

Using PDCA, an organization undergoing continuous improvement can create a culture of problem solvers and critical thinkers. Improvement ideas can be rigorously tested on a small scale. Using data, the team can make adjustments to the solution and reassess the hypothesis. After an idea has been shown to be effective, it can be standardized and implemented companywide. The iterative process of the PDCA cycle enables ideas to be continuously tested and promotes a continuous improvement and continuous learning culture.

### TOTAL PRODUCTION MAINTENANCE

In industry, total productive maintenance (TPM) is a system of maintaining and improving the integrity of production and quality systems through the machines, equipment, processes, and employees that add business value to an organization.

### OBJECTIVE

One of the main objectives of TPM is to increase the productivity of a factory and its equipment with a modest investment in maintenance. Total quality management (TQM) and total productive maintenance (TPM) are considered as the key operational activities of the quality management system. In order for TPM to be effective, the full support of the total workforce is required. This should result in accomplishing the goal of TPM: "Enhance the volume of the production, employee morale and job satisfaction."

The main objective of TPM is to increase the Overall Equipment Effectiveness (OEE) of plant equipment. TPM addresses the causes for accelerated deterioration while creating the correct environment between operators and equipment to create ownership.

OEE has three factors which are multiplied to give one measure called OEE

Performance x Availability x Quality = OEE

Each factor has two associated losses making 6 in total, these 6 losses are as follows:

Performance = (1) running at reduced speed - (2) Minor Stops

Availability = (3) Breakdowns - (4) Product changeover

Quality = (5) Startup rejects - (6) Running rejects

The objective finally is to identify then prioritize and eliminate the causes of the losses. This is done by self-managing teams that solve problem. Employing consultants to create this culture is common practice.

#### **PILLARS OF TPM**

The pillars of TPM are mostly focused on proactive and preventive techniques for improving equipment reliability:

- 1. Autonomous Maintenance
- 2. Focused Improvement
- 3. Planned Maintenance
- 4. Quality Maintenance
- 5. Training
- 6. Office TPM
- 7. Safety Health Environment

#### TOTAL QUALITY MANAGEMENT

Industry believes that quality begins and ends with the customer. This means identifying customer needs and comprehensively meeting them. For the company, quality is not just conformance to drawings or specifications but ensuring customer satisfaction and further Customer satisfaction and further Customer Delight. This belief forms the basis of its approach to Total Quality Management (TQM). Quality Assurance methods like Advanced Product Quality Planning, Statistical Process Control Techniques, and Effective Tool Management System, Process capability Improvements, Preventive Maintenance, Producer Control and Small Group Activities form the backbone of the system approach adopted.

In its continuous pursuit of both technological as well as methodological excellence, ASHOK LEYLAND had Oscripted yet another new dimension to manufacturing by not only adopting the Cellular Manufacturing System/ JIT but also extending the same to its Suppliers. By the implementation of this system components from its suppliers are delivered on a pull basis with First-I First-Out concept supported by simple visual controls and supplied to the line on an hourly basis with GEMBA system.

To be successful implementing TQM, an Organization must concentrate on the eight key elements:

- Ethics
- Integrity

- Trust
- Training
- Teamwork
- Leadership
- Recognition
- communication

# **OBSERVATION OF PROBLEM**

- We observed that the product coming out from injection moulding machine with the runner.
- After the product coming out from machine, the product and the runner is separated by the labour.
- Due to this segregation work through the labour, the production time is enlarged
- And the product is getting delayed for the next operation



Figure 1.Product and runner in same tub

# **OBJECTIVE OF THE PROBLEM**

- To reduce the time taken for the product to going to the next process.
- To eliminate the labour for the segregation work.
- To decrease the production time

# **IDENTIFICATION OF THE PROBLEM**

#### LABOUR SEGREGATION

• Improper product is going to the next

operation due to the careless work of the labour.

- The product may be braked due to the over stuff of the labour.
- The runner should removed from the product carefully otherwise, due to wrong separation the shape of the product may change.
- The labour should break the runner in the appropriate place.
- Due to the defects coming from this segregation, the next process is affected.

### MATERIAL HANDLING OF THE PRODUCT

- Box is kept at the downside of the machine, where the product and runner collect in the same box.
- If one box is full that box should replaced with the another box.

After the filling of one box only the entire

### TIME STUDY

#### TIME STUDY BASED ON THE SPECIFIC AREA

product is taking into segregation work.

Draft tube is a conduit which separates the product and the runner and made to lie on the box which is on downside of the machine, through the process the runner and the product collected in a separate box. In that tube its elbow tube having its circular cross section at is inlet and rectangular cross section at is outlet.

Time taken for raw material feeder:	3min	48sec
After loading till reaching Nozzle:		26sec
After plastic reaching mould:		19sec
Releasing time for the product:		(3+3)sec
Product and Runner reaching tub:		1.5sec
Product & Runner segregation time:		1.8sec
Allocating on the tray:		2.7sec
Time taken for the total segregation per shift:	40 min	
For single cycle (2peice) segregation time:		3.6sec
For allocating of the product in tray	51 min	
Actual time consumed for the process is	1hour 32min 4sec	
For each shift total products produced is about :	2300 piece	
After implementing the project time reduced to	51min (1hour 32min 4sec-41min)	

Time conservation: From		То
	1 hour 32 min 4 secs	51 min

#### CONCLUSION

- Manpower is the basement of industry, so if we look after them we can be able to shine in this society.
- Material handling technique reduces the strain of the employee in loading and unloading the job in the tray.
- By this method, we can be able to eliminate the employee bending fatigue while turning and it also reduces the over-energy consumption of the employee during, operating the machine does not affect the which makes them active in the workplace

- This method increases the production time of each component.
- Productivity can be improved because the work is carried out, without any segregation process, which results in saving time for subsequent process.
- The additional work carried out by the worker is optimized.
- The application of the draft tube design makes the work standardization.
- Finally, this process of making a manual process into a semi-automatic process has been done considering the time involved.

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