Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

Bitunjal Bora, Dr. Tridib R. Sarma

Abstract

To sustain in today's increasingly competitive world, it is very important for manufacturing industry to constantly improve its productivity by using different industrial engineering tools. Productivity improvement can be achieved in the form of elimination/correction (repair) of ineffective processes, simplifying the process, optimizing the system and reducing wastage etc. In this paper, productivity improvement is assessed in terms of wastage reduction of a packing material in a FMCG unit (of India, with pan-India market presence). To be more specific, a significant volume of wastage was observed for a packing material i.e. a type of laminate item at the particular FMCG unit. The DMAIC model has been applied to implement the six sigma management philosophy where tools of TQM like Pareto analysis, Fish bone diagram etc. have been used in different phases of the DMAIC model. In the selected FMCG unit, the application of six sigma concept is absent at the time of this study and there is a huge scope for improving productivity and company's benefit in terms of cost saving by reducing wastage. The goal of this paper is to suggest various possibilities to eliminate/reduce wastage of the identified packing material, which thereby contributes towards productivity improvement. This is a pioneering work in the geographical location of North East India from practical application point of view for improving productivity by wastage reduction through the application of DMAIC methodology.

Keywords: Productivity, Six Sigma, DMAIC Model, TQM, Wastage, Root Cause.

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

1.0 Introduction

To achieve manufacturing excellence, productivity improvement is one of the important strategies which enhances customer satisfaction and reduces cost to deliver required products. Productivity improvement can be achieved in the form of elimination/correction (repair) of ineffective processes, simplifying the process, optimizing the system, maximizing throughput, improving quality and reducing wastage etc. The concept of Six Sigma plays an important role to improve productivity of an industry by achieving process excellence. Six Sigma is a management philosophy or business strategy which helps in the following ways:

- It reduces cost of production by minimizing the waste.
- It adds value to the existing system to improve yield.
- It helps in good quality products each time and every time.
- It leads to Process Excellence.
- It eliminates waste, re-work and mistakes.
- It helps in increasing customer satisfaction.
- It helps to increases the bottom-line of organizations.
- It improves the productivity of the organization.

This paper talks about DMAIC model which involves following five phases:

- Define (D): CTQ (Critical to Quality) is determined and a business case is selected in this phase.
- Measure (M): Data are collected for the CTQ determined in the define phase and present sigma rating is calculated for the existing process.
- Analyse (A): Cause and Effect Analysis is done for the CTQ to determine the root causes.
- Improve (I): Solutions are generated for eliminating/reducing the root causes and these are implemented to realize the actual benefit.
- Control (C): It is ensured that the results achieved in improve phase are continuously sustained.

In today’s modern competitive market, process performance is being measured in terms of defect level per million opportunities (DPMO) of production, with a current level of 3.4 DPMO being considered to indicate achievement of the highest level of Six Sigma.

Kumar S (2014) in his work tried to identify barriers of implementing six sigma DMAIC approach in manufacturing industry and benefits achieved after successful implementation of the same. Jirasukprasert P, Garza-Reyes J A, Garza-Reyes H, Rocha-Lona L (2012) in their work applied six sigma lean concepts to reduce product defects in a rubber gloves manufacturing organization. Ganguly K (2012) in his research work showed how the DMAIC six sigma approach can be utilized for improving process of a rolling mill.

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

Chakrabortty R K, Biswas T K, Ahmed I (2013) in their work demonstrated how the DMAIC model can be used to reduce process variability of a food processing industry. Gupta N (2013) in her work showed the application of six sigma lean methodology for increasing the yarn quality in textile industry.

In this paper, the lean management concepts of six sigma are discussed through DMAIC model for a FMCG unit of India to reduce wastage of a packing material. Data analysis for DMAIC model has been discussed in this paper and in the end, some recommendations are provided to reduce wastage and thereby improving the productivity of the selected FMCG unit.

2.0 Objectives of the Study

The study proceeds with the following seven objectives:

i) To identify the packing material (PM) that contributed the maximum amount of wastage in a year among all PM items.
ii) To find out the vital few reasons that cause majority of wastage for the above PM item.
iii) Collection of wastage data for the above PM item and calculation of sigma rating for the existing process.
iv) To find out the root causes for the above identified broad reasons.
v) To study individual contribution of these root causes towards the broad reasons identified in objective no: (iii).
vi) To study production opportunity loss for the root causes identified in objective no: (iv).
vii) To provide recommendations for eliminating/reducing the major root causes.

3.0 Limitation of the Study

Efforts have been made to carry-out this study as precise as possible, however certain limitations have sneaked into this study. This study has to be carried out with following limitations:

i. Fragmented data availability because of the confidential nature of the FMCG industry.
ii. Due to production scheduling constrain, the recommended improvement steps could not be physically verified for actual benefit at production process. Hence the Improve phase and Control phase of DMAIC model could not be realised during this study.

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

4.0 Research Methodology

In this paper, productivity improvement is assessed in terms of wastage reduction of a packing material and to be more specific, a type of laminate item at the particular FMCG unit. The research work of this paper is mainly conducted on the production process of a particular laminate pouch at two machines i.e. Machine-1 and Machine-2. Data are collected after interacting with the machine operators and their supervisors.

The primary data for this study were collected by:

- Consultation with the production manager, production supervisor, the machine operators and the production line leaders etc.
- Observed data collection from machine on various self- designed formats.

The secondary data for this study were collected from:

- Production log books.
- Journals and books.
- ERP system of the selected FMCG unit.

The collected data have been processed and analysed with the help of MINITAB software and some graphical methods like – Line Diagrams, Bar Diagrams etc. are used for convenience in understanding the results and their interpretations. The collected data are represented in tables, simple graphs and analysed according to the predetermined objectives.

At the end of this research paper, Improve phase for “laminate reel change over” shows how productivity can be improved through wastage reduction and its expected benefit is represented through Line Diagram. The expected annual productivity improvement from the proposed improvement steps is also represented through Bar Diagram. For maintaining confidentiality, certain information are made available in pre-formatted form.

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

5.0 Data Analysis and Interpretation

5.1 Define Phase

The data have been collected for the total wastage booked against all the packing materials (PM) utilized in the selected FMCG unit during one year. The top 5 PM items which contributed maximum material wastage in a year are placed in Table 1.

Table 1: Maximum material waste Packing Materials

SN	PM Code	PM Description	Unit	Rejection per Annum	
				Quantity	Amount** (INR, Mn)
1	150011934	PML-6ML SPOUT LAMINATE	KG#	6,105.43	16.61
2	150004910	PML-6ML SPOUT WHITE WITH VOILET CAP	PC*	31,78,428.00	8.50
3	150010892	PML-1ML F/WRAP 8/20 NEW STRUCTURE	KG	2,683.78	5.23
4	150006487	PML-1.1/1.0ML PLS CONT-DIBBI TOP	PC	12,43,251.00	3.26
5	150011933	PML-6ML FLOW WRAP	KG	1,343.63	2.76

#Kilogram *Piece **In INR, Million

5.1.1 Interpretation

From Table 1, it is evident that the packing material (PM) that contributed the maximum amount of annual wastage among all PM items is "PML-6ML SPOUT LAMINATE (PM Code: 150011934)". Hence it is the most critical PM item which is Critical to Quality (CTQ). The CTQ information is provided in Table 2.

Table 2: CTQ Specification

CTQ	Unit of Measurement	Definition of Defect
6 ml Spout Laminate	Kg	Laminate which cannot be converted to 6 ml pouch (as per customer satisfaction)

5.2 Measure Phase

Primary data, in respect to above identified CTQ, are collected for the laminate pouch making process in two machines Machine-1 and Machine-2. These data were collected during the period for total 14 working days. Each working day contains data for 8 hours from 07:00 hours to 15:00 hours. Data for wastage/rejection against total production are collected for "6 ml Spout Laminate" along with their rejection category.

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

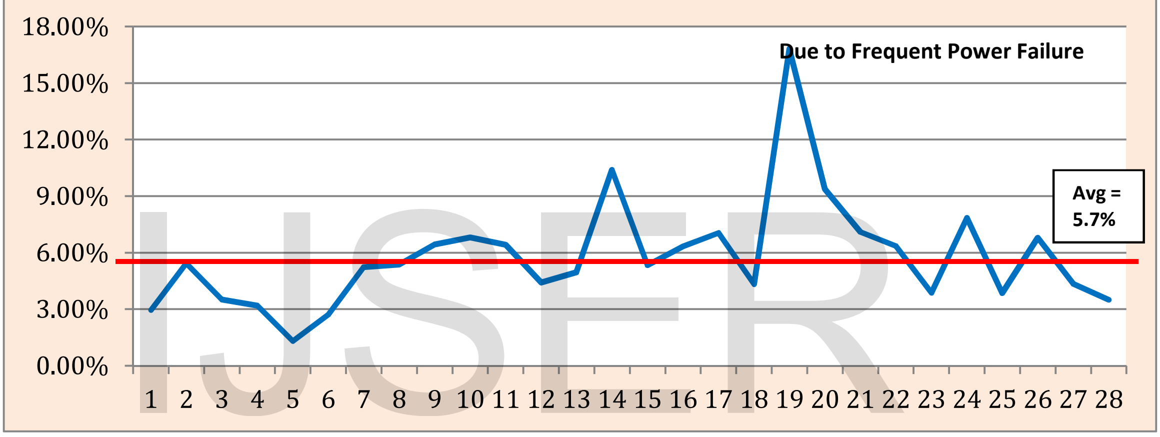
5.2.1 Data Analysis and Interpretation for Machine-1

Percentage of Rejection/Wastage against Production (during data collection period) for Machine-1 is tabulated in Table 3 and rejection trend is shown in Figure 1.

Table 3: Wastage Percentage for Machine-1

Actual Production of acceptable items (in Nos)	Total Rejection (in Nos)	Opportunity items (in Nos)	% of Rejection
7,94,079	47,986	8,42,065	5.70%

Figure 1: Percentage of Rejection



Category wise wastage during the period of study for Machine-1 is tabulated in Table 4.

Table 4: Category wise Wastage Analysis for Machine-1

SN	Reasons of Rejection	Nos of rejected Pouch	Rejection in terms of weight (in kg)	% of Rejection (out of total Rejection)
1	Empty Pouches generated at machine due to machine stoppages	41098	41.51	85.65%
2	Cap Fitness	2942	2.97	6.13%
3	Wrinkle	2026	2.05	4.22%
4	Cutting	917	0.93	1.91%
5	Without Spout	677	0.68	1.41%
6	Sealing	125	0.13	0.26%
7	Leakage	127	0.13	0.26%
8	Weight Less	74	0.07	0.15%
Total		47986	48.47	100.00%

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

The information of Table 4 is subjected to Pareto Analysis, and that is displayed in Figure 2. As evident from the percentage column of Table 4, all other reasons except SN: 1 are clubbed together.

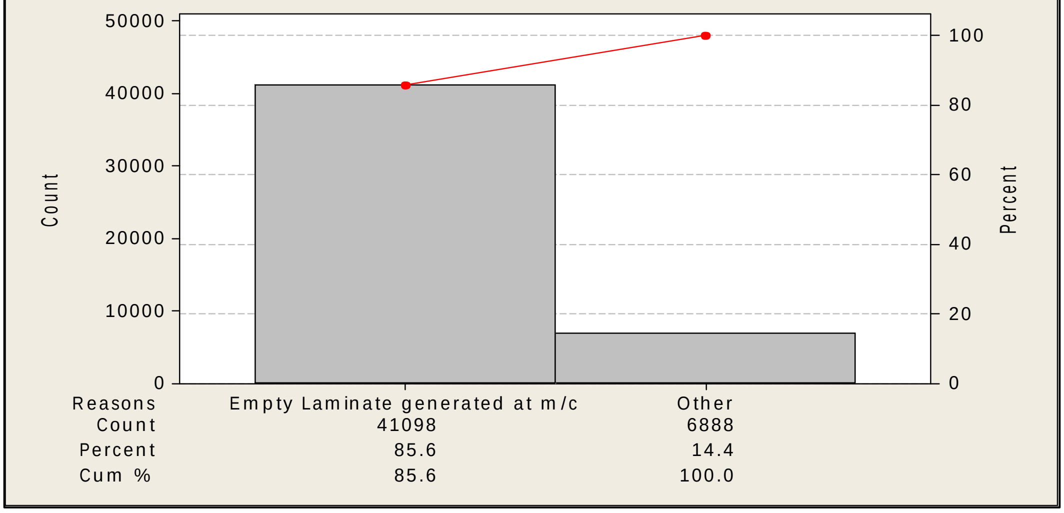


Figure 2: Pareto Chart of Reasons

5.2.2 Interpretation

85.6% of total Laminate wastage at Machine-1 is only because of Empty Pouches generated at machine due to **machine stoppages**. Similarly, we study wastage information for Machine 2.

5.2.3 Data Analysis and Interpretation for Machine-2

Percentage of Rejection/Wastage against Production (during data collection period) for Machine-2 is tabulated in Table 5 and rejection trend is shown in Figure 3.

Table 5: Wastage Percentage for Machine-2

Actual Production of acceptable items (in Nos)	Total Rejection (in Nos)	Opportunity items (in Nos)	% of Rejection
7,81,403	44,137	8,25,540	5.35%

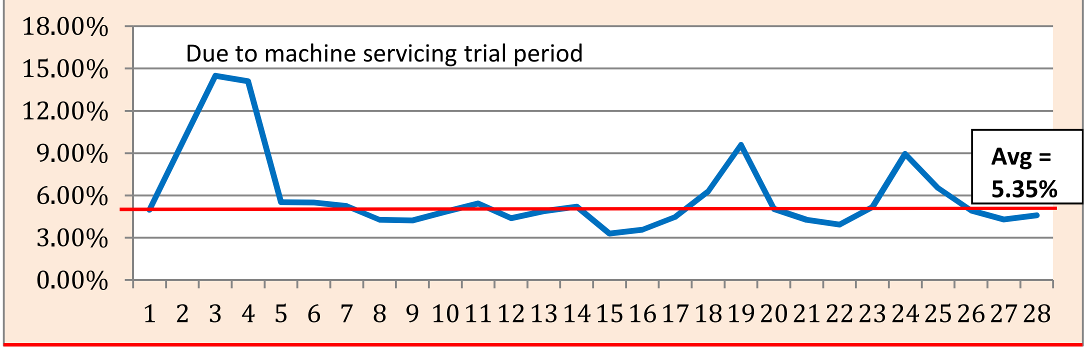


Figure 3: Percentage of Rejection

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

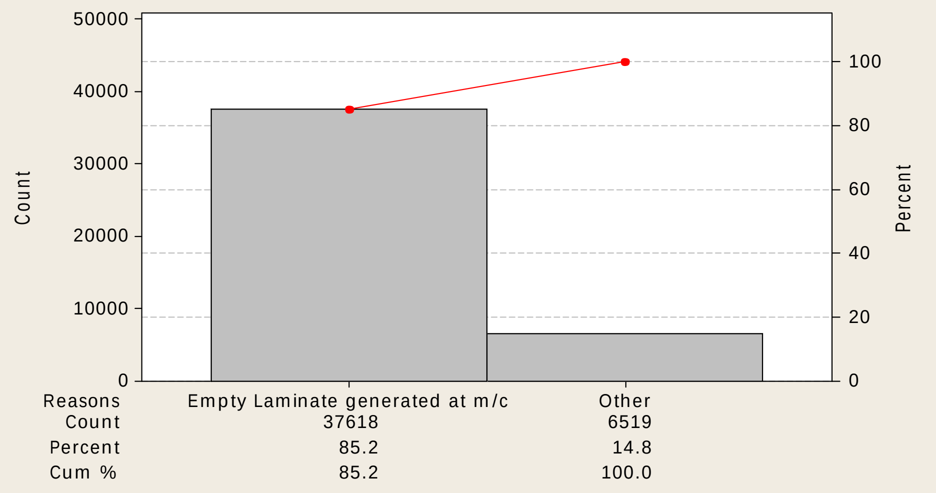
Category wise Wastage during data collection period for Machine-2 is tabulated in Table 6.

Table 6: Category wise Wastage Analysis for Machine-2

SN	Reasons of Rejection	Nos of rejected Pouch	Rejection in terms of weight (in kg)	% of Rejection (out of total Rejection)
1	Empty Pouches generated at machine due to machine stoppages	37618	37.99	85.23%
2	Cap Fitness	2753	2.78	6.24%
3	Wrinkle	2011	2.03	4.56%
4	Cutting	881	0.89	2.00%
5	Without Spout	613	0.62	1.39%
6	Sealing	100	0.10	0.23%
7	Leakage	86	0.09	0.19%
8	Weight Less	75	0.08	0.17%
Total		44137	44.58	100.00%

Pareto Analysis of reasons for Machine-2 is given as Figure 4 after clubbing all other reasons except the obvious one.

Figure 4: Pareto Chart of Reasons



Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

5.2.4 Interpretation

In the same way as in case of Machine-1, it is found that **85.23%** of total Laminate wastage at Machine-2 is also because of Empty Pouches generated at machine due to **machine stoppages**.

In conclusion, we can interpret that almost **85% of Rejection** is due to empty pouch generated at machines **on account of machine stoppage** for both Machine-1 and Machine-2.

At this juncture, we calculate Sigma rating for the existing process based on our collected data and the same is placed as Table 7.

Table 7: Present Sigma Level of the Existing Process

Total Production opportunity items	1,667,605
Total numbers of rejected items	92,123
DPMO	55,242.70
Present Ϭ (Sigma) Level	3.096

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

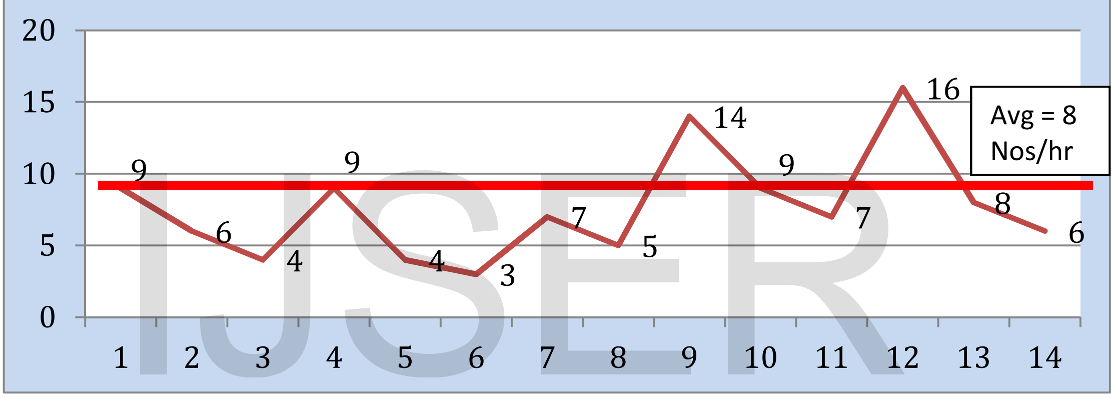
5.3 Analyse Phase

5.3.1 Cause and Effect Analysis for Machine Stoppage

In earlier Measure phase, it is found that almost **85% of Rejection** is due to empty pouch generated at machines **on account of machine stoppage**. Primary data are collected for machine stoppages at two machines Machine-1 and Machine-2. These data are collected for total 5 working days. Each working day contains data for 6 hours daily.

The Machine Stoppage Pattern for Machine-1 is given in Figure 5, with primary axis as Hour.

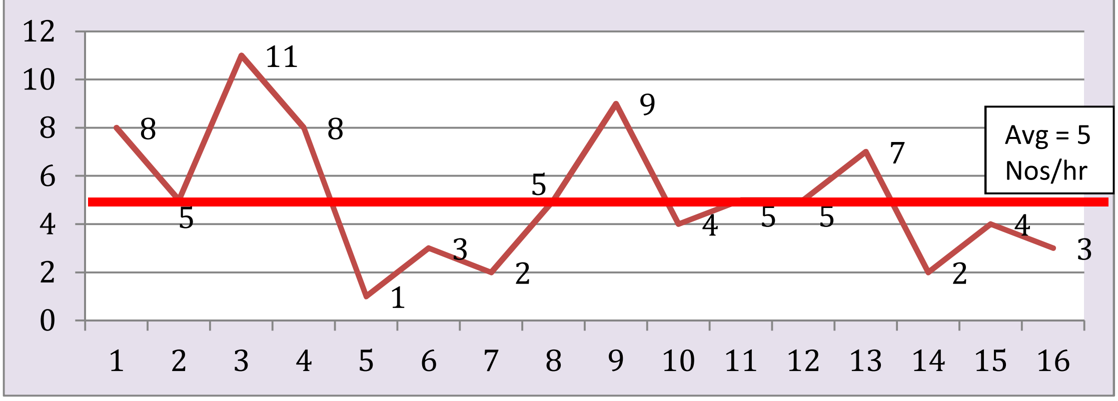
Figure 5: No of Stoppages, Machine-1



On an average, there are 8 stoppages per hour on Machine-1.

In the similar way, the Machine Stoppage Pattern for Machine-2 is given in Figure 6, with primary axis as Hour.

Figure 6: No of Stoppages, Machine-2

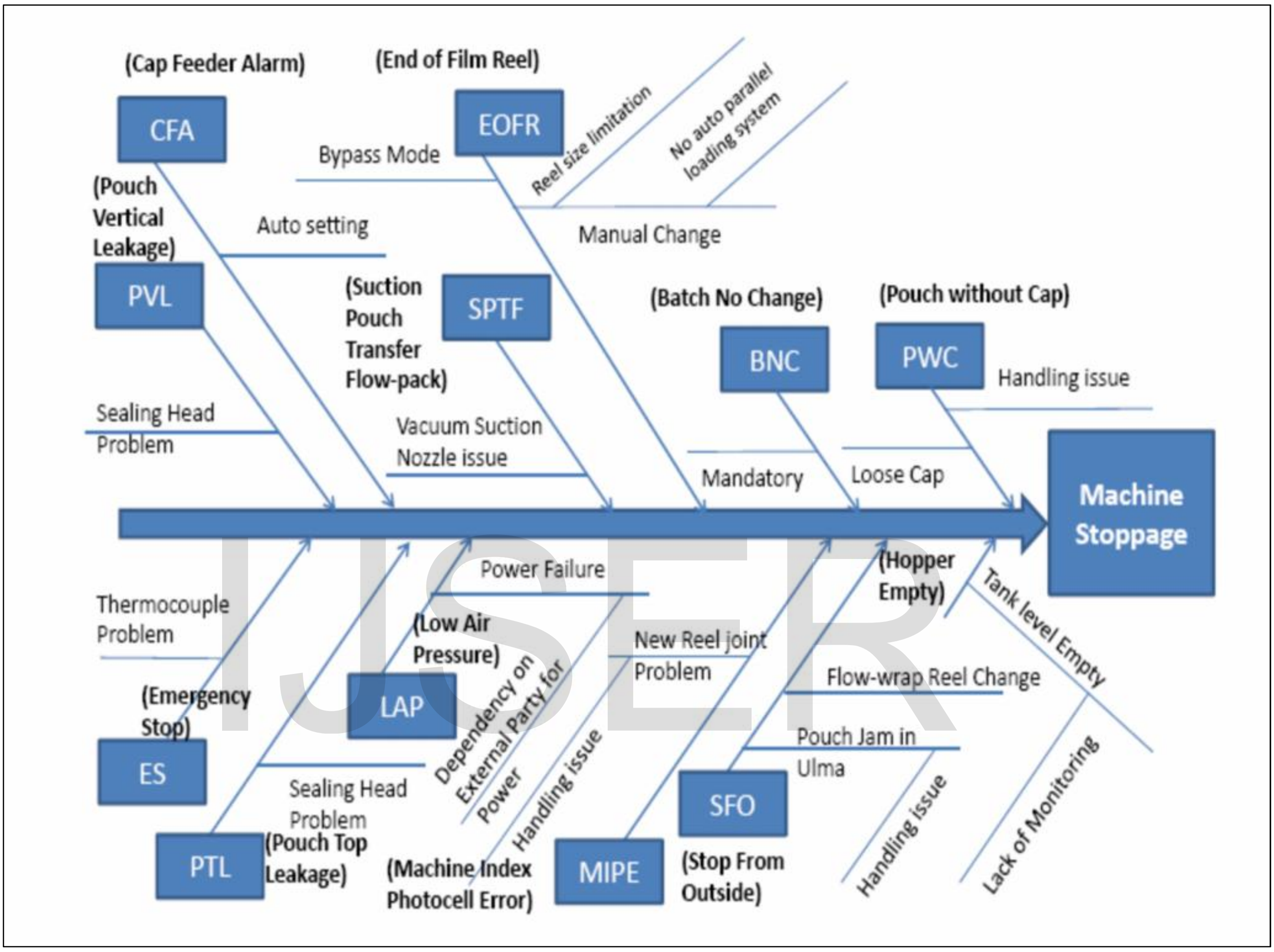


It shows an average of 5 stoppages per hour on Machine-2.

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

Next the reasons of stoppage for the two machines are identified and a common Fish-Bone Diagram, as Figure 7, is made for all the causes that resulted in stoppages.

Figure 7: Fish-Bone Diagram for Machine Stoppages (for both Machine-1 & Machine-2)



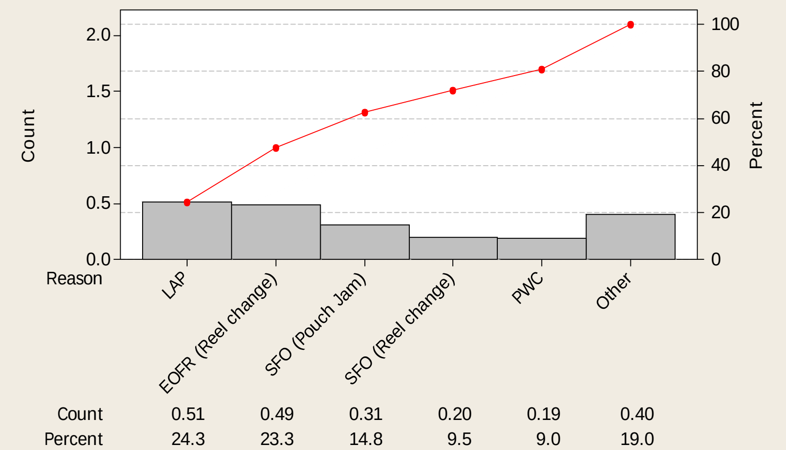
Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

The Percentage Contribution of reasons for stoppage of Machine-1 is given in Table 8 and Pareto Analysis for the same is shown as Figure 8.

Table 8: Reasons of stoppage, Machine-1

SN	Reason for stoppage	Code for Reason	Total No of Stoppages	Avg Empty pouch generated per stoppage	Total Empty pouches generated (in Nos)	% of Total Empty pouches generated
1	Low air pressure	LAP	9	56	504	24%
2	End of film reel (Manually changed)	EOFR (Reel change)	11	44	484	23%
3	Stop from Outside (Pouch jam in Ulma)	SFO (Pouch Jam)	18	17	306	15%
4	Stop from outside (Flowwrap reel change)	SFO (Reel change)	8	25	200	10%
5	Pouch without cap	PWC	8	23	184	9%
6	Suction pouch transfer flowpack	SPTF	16	6	96	5%
7	Batch No change	BNC	1	64	64	3%
8	Stop from Outside (Synchronization Problem)	SFO (Synch Prob)	13	4	52	3%
9	Cap feeder 2 alarm	CFA	10	4	40	2%
10	End of film reel (Bypass mode)	EOFR (Bypass mode)	9	5	45	2%
11	Machine index photocell error	MIPE	1	32	32	2%
12	Emergency Stop	ES	1	28	28	1%
13	Pouch top leakage	PTL	1	20	20	1%
14	Pouch vertical leakage	PVL	1	16	16	1%
Total			**107**		**2071**	**100%**

Figure 8: Pareto Chart of Stoppage Reasons, Machine-1



LAP – Low air pressure (24.3%)

EOFR – End of film reel
SFO – Stop from outside

EOFR (Reel change) – Laminate reel change (23.3%)

SFO (Pouch Jam) – Pouch jam in Ulma (14.8%)

SFO (Reel change) – Flow-wrap reel change (9.5%)

PWC – Pouch without cap (9%)

International Journal of Scientific & Engineering Research Volume 9, Issue 4, April-2018
ISSN 2229-5518

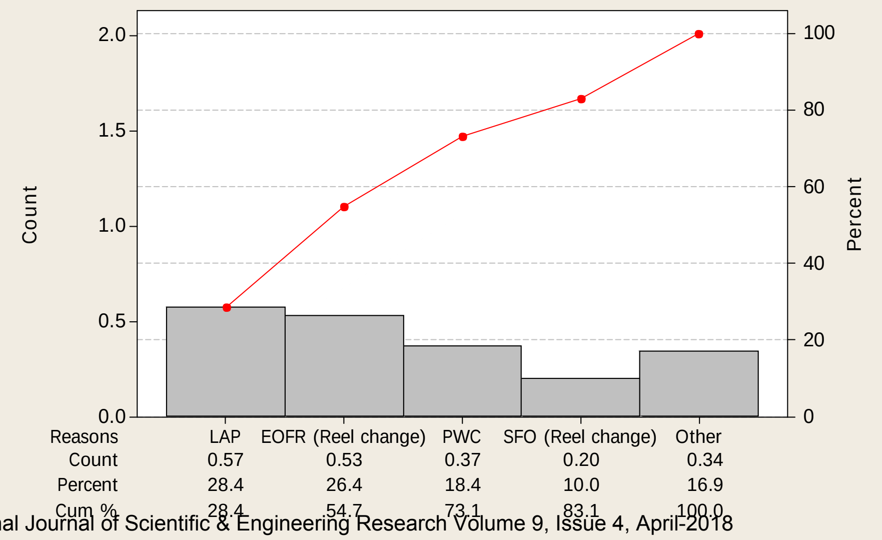
Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

The Percentage Contribution of reasons for stoppage of Machine-2 is given in Table 9 and Pareto Analysis for the same is shown as Figure 9.

Table 9: Reasons of stoppage, Machine-2

SN	Reason for stoppage	Code for Reason	Total No of Stoppages	Avg Empty pouch generated per stoppage	Total Empty pouches generated (in Nos)	% of Total Empty pouches generated
1	Low air pressure	LAP	10	56	560	28%
2	End of film reel (Manually changed)	EOFR (Reel change)	12	44	528	26%
3	Pouch without cap	PWC	16	23	368	18%
4	Stop from outside (Flowwrap reel change)	SFO (Reel change)	8	25	200	10%
5	Stop from Outside (Pouch jam in Ulma)	SFO (Pouch Jam)	9	17	153	8%
6	Cap feeder 2 alarm	CFA	16	4	64	3%
7	Machine index photocell error	MIPE	2	32	64	3%
8	End of film reel (Bypass mode)	EOFR (Bypass mode)	3	5	15	1%
9	Hopper Empty	HE	2	10	20	1%
10	Manual stop due to cap fitness problem	MSCF	1	24	24	1%
11	Stop from Outside (Synchronization Problem)	SFO (Synch Prob)	2	4	8	0%
12	Unwinder index photocell	UIP	1	4	4	0%
Total			**82**		**2008**	**100%**

Figure 9: Pareto Chart of Stoppage Reasons, Machine-2



LAP – Low air pressure (28.4%)

EOFR – End of film reel

SFO – Stop from outside

EOFR (Reel change) – Laminate reel change (26.4%)

PWC – Pouch without cap (18.4%)

SFO (Reel change) – Flow-wrap reel change (10%)

International Journal of Scientific & Engineering Research Volume 9, Issue 4, April-2018
ISSN 2229-5518

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

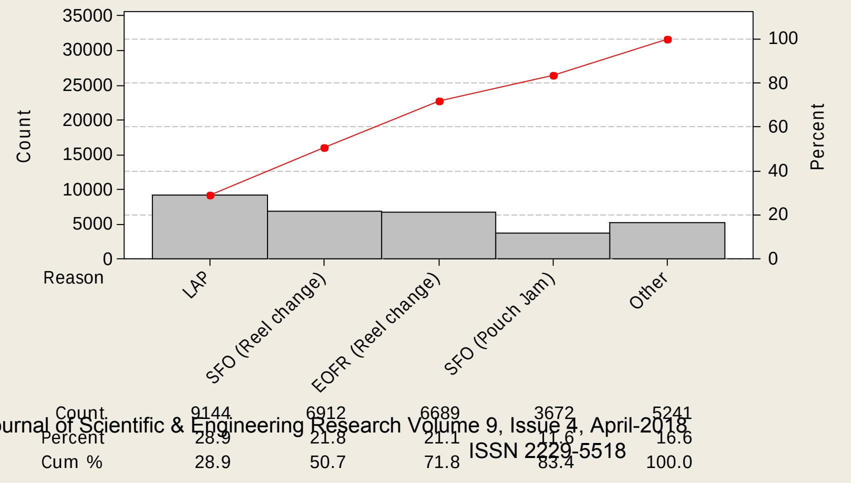
Next we analyse the Production Opportunity Loss at the two machines.

The Percentage Contribution of reasons towards production opportunity loss for Machine-1 is given in Table 10 and Pareto Analysis for the same is shown as Figure 10.

Table 10: Production Opportunity Loss for Machine-1

SN	Reason for stoppage	Code for Reason	Total No of Stopp-age	Avg Stopp-age time	Total Loss Time (in mint)	Opportu-nity Loss of Producti-vity	% of Total Opportu-nity Loss
1	Low air pressure	LAP	9	00:04:14	38.1	9144	28.88%
2	Stop from outside (Flowwrap reel change)	SFO (Reel change)	8	00:03:36	28.8	6912	21.83%
3	End of film reel (Manually changed)	EOFR (Reel change)	11	00:02:32	27.87	6689	21.13%
4	Stop from Outside (Pouch jam in Ulma)	SFO (Pouch Jam)	18	00:00:51	15.3	3672	11.60%
5	Emergency Stop	ES	1	00:05:00	5	1200	3.79%
6	Suction pouch transfer flowpack	SPTF	16	00:00:14	3.73	895	2.83%
7	Pouch vertical leakage	PVL	1	00:03:00	3	720	2.27%
8	End of film reel (Bypass mode)	EOFR (Bypass mode)	9	00:00:16	2.4	576	1.82%
9	Batch No change	BNC	1	00:02:00	2	480	1.52%
10	Pouch top leakage	PTL	1	00:02:00	2	480	1.52%
11	Stop from Outside (Synchronization Problem)	SFO (Synch Prob)	13	00:00:06	1.3	312	0.99%
12	Cap feeder 2 alarm	CFA	10	00:00:06	1	240	0.76%
13	Pouch without cap	PWC	8	00:00:07	0.93	223	0.71%
14	Machine index photocell error	MIPE	1	00:00:29	0.48	115	0.36%
	Total		**107**		**131.91**	**31658**	**100.00%**

Figure 10: Pareto Chart of Reasons, Production Opportunity Loss, Machine-1



LAP – Low air pressure (28.9%)

EOFR – End of film reel

SFO – Stop from outside

SFO (Reel change) – Flow-wrap reel change (21.8%)

EOFR (Reel change) – Laminate reel change (21.1%)

SFO (Pouch Jam) – Pouch jam in Ulma (11.6%)

International Journal of Scientific & Engineering Research Volume 9, Issue 4, April-2018
ISSN 2229-5518

International Journal of Scientific & Engineering Research Volume 9, Issue 4, April-2018
ISSN 2229-5518

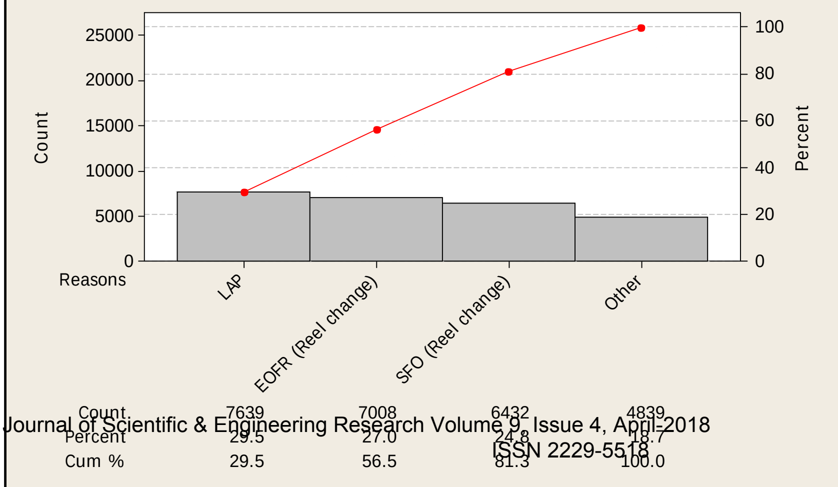
Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

The Percentage Contribution of reasons towards production opportunity loss for Machine-2 is given in Table 11 and Pareto Analysis for the same is shown as Figure 11.

Table 11: Production Opportunity Loss for Machine-2

SN	Reason for stoppage	Code for Reason	Total No of Stoppages	Avg Stoppage time	Total Loss Time (in mint)	Opportunity Loss of Productivity	% of Total Opportunity Loss
1	Low air pressure	LAP	10	00:03:11	31.83	7639	29.47%
2	End of film reel (Manually changed)	EOFR (Reel change)	12	00:02:26	29.2	7008	27.04%
3	Stop from outside (Flow-wrap reel change)	SFO (Reel change)	8	00:03:21	26.8	6432	24.82%
4	Stop from Outside (Pouch jam in Ulma)	SFO (Pouch Jam)	9	00:01:10	10.5	2520	9.72%
5	Pouch without cap	PWC	16	00:00:11	2.93	703	2.71%
6	End of film reel (Bypass mode)	EOFR (Bypass mode)	3	00:00:51	2.55	612	2.36%
7	Cap feeder 2 alarm	CFA	16	00:00:09	2.4	576	2.22%
8	Manual stop due to cap fitness problem	MSCF	1	00:01:00	1	240	0.93%
9	Machine index photocell error	MIPE	2	00:00:10	0.33	80	0.31%
10	Stop from Outside (Synchronization Problem)	SFO (Synch Prob)	2	00:00:07	0.23	56	0.22%
11	Hopper Empty	HE	2	00:00:06	0.2	48	0.19%
12	Unwinder index photocell	UIP	1	00:00:01	0.02	4	0.02%
Total			**82**		**107.99**	**25918**	**100.00%**

Figure 11: Pareto Chart of Reasons, Production Opportunity Loss, Machine-2



LAP – Low air pressure (29.5%)

EOFR – End of film reel

SFO – Stop from outside

EOFR (Reel change) – Laminate reel change (27%)

SFO (Reel change) – Flow-wrap reel change (24.8%)

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

6.0 Recommendations

Improvement steps are to be taken for eliminating/reducing root causes which contribute 80% of total empty pouches generation in Machine-1 and in Machine-2 (As per Pareto Analysis) on the following proved factors:

- Low air pressure
- End of film reel (Laminate Reel change over)
- Stop from outside (Flow-wrap Reel change over)
- Stop from outside (Pouch jam in Ulma)
- Pouch without cap

6.1 Improve Phase for Low Air Pressure

- Dedicated individual air compressor for each Machine with UPS back-up.
- Auto DG back-up to Air Compressor on Power Failure.

6.2 Improve Phase for End of Film Reel (Laminate Reel Change Over)

A. Short term Strategy:

- Reduction of Laminate reel change requirement by
  - Increasing the present reel size from 13 kg to 30 kg with supplier integration.
  - Reel change over period will improve from 45 minute to 110 minute.

- Average empty pouch generation reduction from 44 to 32 by
  - Improvement of working efficiency of operators by peer group training.

B. Long term Strategy:

- Machine modification for **parallel auto-loading provision** for Laminate Reel change-over, without Machine stoppage.
- We can eliminate this Root Cause 100%.

6.3 Improve Phase for Stop from outside (Flow-wrap Reel Change Over)

A. Short term Strategy (For Machine-2):

- Parallel auto loading provision for Flow-wrap reel change-over is already in place, but some of the operators are not utilizing this possibility every time.

- Awareness level of all operators is to be increased through training.

- We can eliminate this root cause 100%.

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

B. Long term Strategy (For Machine-1):

- Parallel auto loading provision for Flow-wrap reel change over without any interruption in Machine.
- We can eliminate this root cause 100% by this proposed machine modification.

6.4 Improve Phase for Stop from outside (Pouch jam)

Improvement Strategy:

- Due to non-alignment of pouches in the conveyor.
- This handling issue can be reduced by
  - ✓ on the job training for workers
  - ✓ awareness development among workers
  - ✓ Short time allotment of worker to avoid fatigues
- We can reduce the occurrence of this root cause with workmen's sincerity.

6.5 **Improve Phase for Pouch without Cap**

A. Short term Strategy:

- We can avoid this situation by continuous monitoring.
- We can eliminate this problem 100%.

B. Long term Strategy:

- Suppliers may be asked to ensure non-supply of loose caps during their supplies.
- Suppliers may be required to put more emphasis on pre-despatch inspection in their end with proper consultation with the selected FMCG unit.

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

7.0 Productivity Analysis and Expected Benefit during Improve Phase for Laminate Reel Change Over

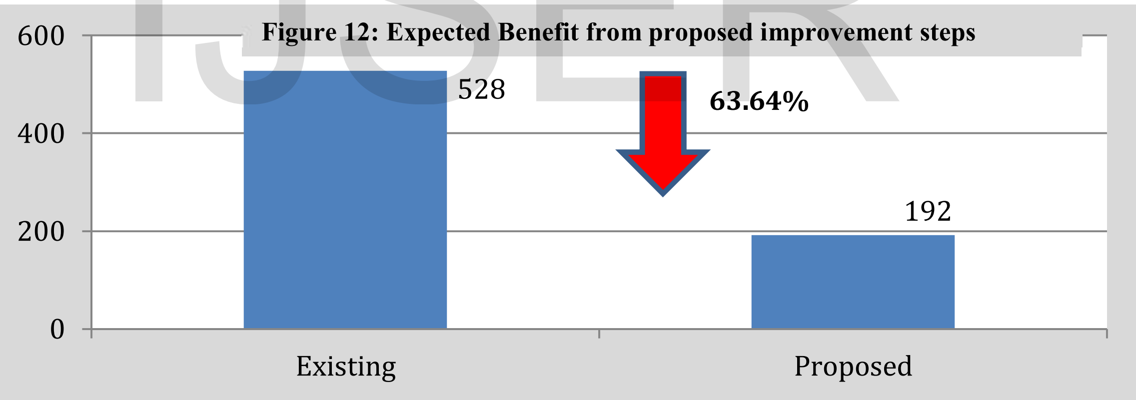
- Laminate reel change over requirement can be reduced by increasing the present reel size from 13 kg to 30 kg and it will improve the laminate change over period from 45 minute to 110 minute.
- Also the average empty pouch generation per stoppage of the machine can be reduced from 44 to 32 by improving the working efficiency of the operators by peer group training.

The expected benefit from the above improvement steps is shown in Table 12 and the same is represented as Figure 12.

Table 12: Expected Benefit from proposed improvement steps

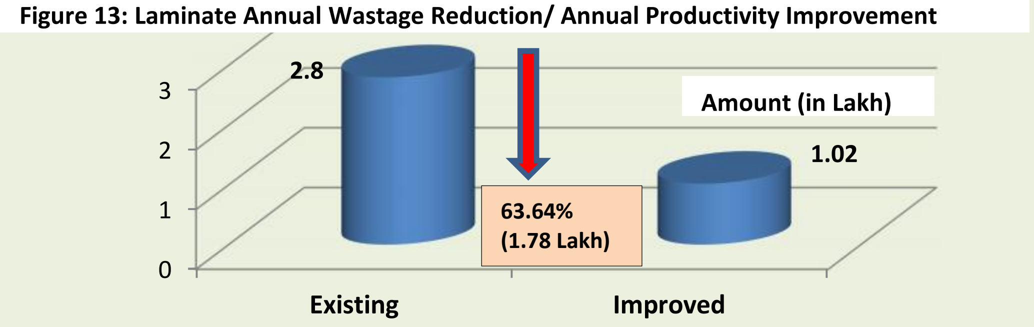
Existing for 16 hours			Proposed for 16 hours			Benefit
Reel change requirement	Avg empty pouch generation	Total	Reel change requirement	Avg empty pouch generation	Total	**Reduction**
12	44	528	6	32	192	**63.64%**

Figure 12: Expected Benefit from proposed improvement steps



The expected annual saving in terms of wastage reduction of laminate reel from the proposed improvement steps and thereby improvement in the annual productivity of the selected FMCG unit is represented in Figure 13.

Figure 13: Laminate Annual Wastage Reduction/ Annual Productivity Improvement



Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

8.0 Future Scope of Study

In this present study, we have proposed certain recommendations based on past experience and success stories elsewhere. The recommended improvement steps may be physically verified for actual benefit at production process. This would augment this study by appending the I and C stages of DMAIC methodology. This type of study can be expanded to all the production lines of the plant which would help to improve the overall productivity of the plant. Subsequently, the change in sigma level can be found out and the productivity improvement can be evaluated.

9.0 Conclusion

This study is related to the productivity improvement through wastage reduction of a packing material using Six Sigma problem solving approach. As an initial step towards lean manufacturing in the selected FMCG unit, the study is carried out only for one particular packing material i.e. a laminate item.

The required data for this study are obtained through consultation with the production manager, production supervisor, the machine operators and the production line leaders etc. Data are collected systematically from machine display panel and from production log books on various self-designed formats. These data were analysed using various analytical tools, software to sum up the study and based on the findings the recommendations are made.

Overall analysis of the data shows that the existing production process for the laminate item is undergoing with sigma rating 3.096 and there is a huge scope to improve this sigma rating through practicing Six Sigma lean concepts. Step by step improvements will lead to better sigma rating and it will finally help to improve the productivity of the selected FMCG unit of India.

Declaration

For academic reason, name of the FMCG unit of India as well as any other indications thereof are being kept confidential.

Application of DMAIC Methodology for Wastage Reduction to Improve Productivity in a FMCG unit

References

1. Ganguly, K. (2012). Improvement process for rolling mill through the DMAIC six sigma approach. International Journal for Quality research, Vol 6, No. 3, 2012, 221-231

2. Chakrabortty, R. K., Biswas, T. K., Ahmed, I. (2013). Reducing process variability by using DMAIC model: A Case Study in Bangladesh. International Journal for Quality Research, 7(1), 127–140

3. Kumar, S. (2014). Impact of Six Sigma DMAIC approach on Manufacturing Industries. International Journal of Innovative Research in Science, Engineering and Technology, Vol. 3, Issue 5, May 2014, 12652-12657

4. Jirasukprasert, P., Garza-Reyes, J. A., Garza-Reyes, H., Rocha-Lona, L. (2012). A Case Study of Defects Reduction in a Rubber Gloves Manufacturing Process by Applying Six Sigma Principles and DMAIC Problem Solving Methodology. Proceedings of the 2012 International Conference on Industrial Engineering and Operations Management Istanbul, Turkey, July 3 – 6, 2012, 472-481

5. Gupta, N. (2013). An Application of DMAIC Methodology for Increasing the Yarn Quality in Textile Industry. IOSR Journal of Mechanical and Civil Engineering, Volume 6, Issue 1, (Mar. - Apr. 2013), PP 50-65

6. Shaikh, S. A., Kazi, J. (2015). A Review on Six Sigma (DMAIC) Methodology. International Journal of Modern Engineering Research (IJMER), Volume 5, Issue 2, (Feb. 2015), PP 11-16