

# Reduction in Man-hours/Kit through Improvement in internal logistic system from Main Stores to Main Mould

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## ABSTRACT

This case study illustrates the application of six sigma process improvement to productivity improvement in manufacturing process. To ensure sustainable profitable growth in a highly price-sensitive appliance market Cost reduction through operational excellence is the key imperative. However, in a Six Sigma organization, the DMAIC Method & host of tools can be used to improve productivity through process improvements

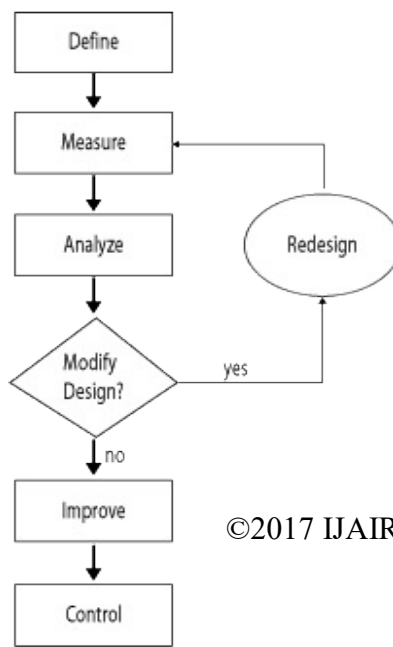
## 1. INTRODUCTION

Define, Measure, Analyze, Improve and Control (DMAIC) involve the significant periods of a procedure change venture. Each stage comprises of an arrangement of apparatuses and expectations. In the past area of this book, DMAIC was represented with regards to Kaizen and Lean groups. Ever, DMAIC is only one of an assortment of proposed approaches. In review school, most understudies take in the logical technique in view of watch, figure a theory, gather information and frame a conclusion. Shewhart, a central figure ever, proposed the outstanding Plan, Do, Check and Act (PDCA) cycle for development. Despite the fact that DMAIC appears to be unique than these strategies, it truly envelops both methodologies. It concentrates on utilizing information to settle on choices and after that checking those choices previously conferring business assets

## 2. Experimental Procedure

2.1 DMAIC is process:

an acronym for the five phases that make up the



## Define

The motivation behind this progression is to plainly verbalize the business issue, objective, potential assets, venture degree and abnormal state venture timetable. This data is regularly caught inside task sanction report. Record what you right now know. Try to clear up certainties, set goals and frame the venture group. Characterize the accompanying

- A issue
- The customer(s)
- Voice of the client (VOC) and Critical to Quality (CTQs) — what are the basic procedure yields?

## Measure

The motivation behind this progression is to equitably build up current baselines as the reason for development. This is an information gathering step, the motivation behind which is to set up process execution baselines. The execution metric baseline(s) from the Measure stage will be contrasted with the execution metric at the finish of the venture to decide equitably whether noteworthy change has been made. The group chooses what ought to be measured and how to gauge it. It is regular for groups to put a ton of exertion into surveying the reasonableness of the proposed estimation frameworks. Great information is at the core of the DMAIC procedure:

## Analyze

The reason for this progression is to recognize, approve and select main driver for end. An extensive number of potential main drivers (process inputs, X) of the venture issue are distinguished by means of underlying driver examination (for instance a fishbone chart). The best 3-4 potential main drivers are chosen utilizing multi-voting or different accord device for encourage approval. An information gathering design is made and information are gathered to set up the relative commitment of each underlying drivers to the undertaking metric, Y. This procedure is rehashed until "substantial" main drivers can be distinguished. Inside Six Sigma, regularly complex investigation devices are utilized. Be that as it may, it is worthy to utilize fundamental apparatuses if these are suitable. Of the "approved" main drivers, all or some can be

- List and organize potential reasons for the issue
- Prioritize the underlying drivers (key process contributions) to seek after in the Improve step
- Identify how the procedure inputs (Xs) influence the procedure yields (Ys). Information are examined to comprehend the extent of commitment of each underlying driver, X, to the undertaking metric, Y. Factual tests utilizing p-values joined by Histograms, Pareto graphs, and line plots are regularly used.
- Detailed process maps can be made to enable stick to point where in the process the main drivers dwell, and what may add to the event.

### Improve

The purpose of this step is to identify, test and implement a solution to the problem; in part or in whole. This depends on the situation. Identify creative solutions to eliminate the key root causes in order to fix and prevent process problems. Use brainstorming or techniques like Six Thinking Hats and Random Word. Some projects can utilize complex analysis tools like DOE (Design of Experiments), but try to focus on obvious solutions if these are apparent. However, the purpose of this step can also be to find solutions without implementing them.

- Create
- Focus on the simplest and easiest solutions
- Test solutions using Plan-Do-Check-Act (PDCA) cycle
- Based on PDCA results, attempt to anticipate any avoidable risks associated with the “Improvement” using the Failure mode and effects analysis(FMEA)
- Create a detailed implementation plan
- Deploy improvements

### Control

The reason for this progression is to maintain the increases. Screen the upgrades to guarantee proceeded and practical achievement. Make a control design. Refresh records as required.

A Control outline can be valuable amid the Control stage to survey the solidness of the upgrades after some time by filling in as 1. a manual for keep observing the procedure and 2. Give a reaction want to each of the measures being checked in the event that the procedure winds up noticeably insecure.

## 3. Results and Discussion

The experimental Improvements and results are presented in this chapter and influence of Sigma DMAIC Tool on Improvement parameters are analyzed systematically.

The Improvements Steps and RPN No Re calculated after the improvements for Showing System and the Process is Stable.

### 3.1 Improvement and Estimated Benefit

QIP									
Description:		Improvements and Estimated Benefits						QIP ID:	
Solution Evaluation Form									
Operation (Driver)	RPN Frequency	List Root Cause(s)	List Solutions	Major Actions	% Cumulative Effect	Estimated Cost	Complexity	Estimated Benefit	Risk *
Lectra machine Operating at Low Speed (40-50%)	256	Less manpower for rolling while operating	Deputed 2 more technicians and Increased	Deputed 2 Technicians	9.98	120 INR per Blade	Took Decision along with management	671904.012	High

efficiency)		g with 4 technicians	Operating Speed to 70-80%						
Forklift not available at the required time, resulting in Waiting time	192	Only one diesel forklift to cater to the need	1) Made Operating of Battery Operated Forklift 2) Found 30% of free time in forklift Movement analysis	Batteries Made to Operating Condition	17.46	70000 INR	2 months to complete	503757.2039	Medium
Lectra Frequent Breakdown ( 8 hrs. / Lectra every week )	168	Lack Of Planned Preventive and Autonomous maintenance of Lectra machine	Started Autonomous and Planned Maintenance by Training the Technicians	Changed All the Troubleshooting Equipments with new one	24.01	-	Trained all Technicians about Lectra Maintenance	440787.5534	Medium
Roll Length Shortage in Glass matt Rolls mainly in Green mesh and 800 gsm glass matt	168	Materials Being Used and kept without any Identification	Identification has Made for Used materials and kept aside		30.55	-	One Week	440787.5534	Low

Shortage of Paper core for Rolling of Glass matt, resulting in waiting time	168	Proper Retrieval system from END Users (Mainly from Main Mould and Prefab )	Allotted time At Shift End to collect Paper core and to keep at allocated Place	-	36.40	-	Took one Month to stabilize	393560.3155	Medium
Poor Planning and Execution of Work	150	Daily planning based on Manpower and Stock Availability ,not as per company requirement	Maid Planning According to Management Target		42.01	-	Done immediately	377817.9029	Low
Under Utilised Man-hours and Idle Time	144	Effectively Utilising only 6.5 hours /Shift	Operators been Motivated and bought Seriousness about the management Targets		47.62	-	Took One Month to stabilize and to increase the Man Hour Utilization to 7 hrs. shift	377817.9029	High
Absenteeism of Skilled and Semi Skilled Manpower	144	No effective tracking and control system of Absentee	Set Clear Attendance expectation		53.23	-	Done immediately	377817.9029	High

		eism, Half Leave, Gate Pass and Leave .							
Only One Old Templat e used ,should be Modifie d and Verified	144	Not looked upon and not felt the need	Prepare d two more Templa tes		58.8 5	15000IN R	Took 15 days	377817.9 029	Low
Setting Process in PVC Foam Prefab to be eliminat e	144	Undevel oped templat es	Modifie d Templa tes as per the require ment		65.3 9	7500INr	Took 2 Months	440787.5 534	Med ium
Insufficie nt Number of Mofex grinder (Require ment :12 No's ,Availabl e :5 No's(in Working conditio n) for cutting 6 layers at a time instead of 4	144	Standar d Equipm ent List Was Same	Increas ed Qty no in Equipm ent List	Bayed 8 Mofex Grinders which cost 80k	71.0 1	80000IN R	Took 2 Months	377817.9 029	Med ium

Less Number of Trolleys for Glass matt roll Loading (Available :4 No's ,Required : 8 No's )	144	Standard Equipment List Was Same	Developed 4 more Trolleys	Fabricated 4 more Trolleys	76.62	24000INR	Completed in one month	377817.9029	Medium
Nesting Plan to be checked and Revised	120	Not looked upon and not felt the need	Small Parts Added in Nesting Plan		81.29	-	Done immediately	314848.2524	Medium
Establish objective & goal here								6732505.131	

### 3.2 PFMEA to Evaluate Solutions With Failure Modes Through RPN

PFMEA to evaluate solutions with failure modes through RPN								
QIP Description:								
Process Description:			Product Description:					
Solution (Operation) Description	Potential Failure mode	Potential Effect(s) of failure	Severity	Class	Potential Cause(s) / Mechanism(s) of Failure	Occurrence	Detection	RPN
Deputed 2 more technicians and Increased Operating Speed to 70-80%	Lectra Operation Speed will be Reduced 40%-50%	Output Of Machine will be reduced	8	SC	Less Man Power and Fear Of tool Breaking	2	2	32

1) Made Operating of Battery Operated Forklift 2) Found 30% of free time in forklift Movement analysis	Battery Operated Forklift won't Work	Glass Mat Loading And Unloading will be delayed and intern output will be reduced	7	8	Only one diesel forklift to cater to the need	2	2	28
Started Autonomous and Planned Maintenance by Training the Technicians	Breakdown of the Machine	Output Of Machine will be reduced	6	8	Lack Of Planned Preventive and Autonomous maintenance of Lectra machine	2	2	24
Identification has Made for Used materials and kept aside	Shortage of in Length while Cutting	Time Waste	6	8	Roll Length Shortage in Glass matt Rolls mainly in Green mesh and 800 gsm glass matt	1	2	12
Allotted time At Shift End to collect Paper core and to keep at allocated Place	Paper Core Shortage	Machine and Man will be Idle or waiting intern Output will be Reduced	7	8	Shortage of Paper core for Rolling of Glass matt , resulting in waiting time	2	2	28
Maid Planning According to Management Target	Un utilized man power and machine	Output will be reduced	6	8	Poor Planning and Execution of Work	2	2	24
Operators been Motivated and bought Seriousness about the management Targets	Under-utilized Efficiency	Output will be Reduced	6	8	Under Utilised Man-hours and Idle Time	2	2	24
Set Clear Attendance expectation	Un utilized man Hours	Output will be Reduced	6	8	Absenteeism of Skilled and Semi Skilled Manpower	2	2	24
Prepared two more Templates	Man Waiting	Output will be Reduced	6	8	Only One Old Template used ,should be Modified and Verified	2	2	24
Modified Templates as per the requirement	Re-works	Out put will be Reduced	6	8	Setting Process in PVC Foam Prefab to be eliminated	2	2	24



Increased Machine Qty no in Equipment List	Man Waiting	Output will be Reduced	6	00	Insufficient Number of Mofex grinder (Requirement :12 No's ,Available :5 No's(in Working condition) for cutting 6 layers at a time instead of 4	2	2	24
Developed 4 more Trolleys	Man Waiting	Output will be Reduced	6	00	Less Number of Trolleys for Glass matt roll Loading (Available :4 No's ,Required : 8 No's )	2	2	24
Small Parts Added in Nesting Plan	Extra man Hours consumption	Output will be Reduced	6	00	Manual cut Small Parts	2	2	24

- 1) Lectra machine Operating at Low Speed (40-50% efficiency ) RPN reduced from 256 to 32
- 2) Forklift not available at the required time, resulting in Waiting time RPN reduced from 192 to 24
- 3) Lectra Frequent Breakdown ( 8 hrs. / Lectra every week ) RPN reduced from 168 to 22
- 4) Shortage of Paper core for Rolling of Glass matt , resulting in waiting time RPN reduced from 168 to 24
- 5) Under Utilised Man-hours and Idle Time RPN reduced from 168 to 24
- 6) Absenteeism of Skilled and Semi Skilled Manpower RPN reduced from 150 to 24
- 7) Only One Old Template used ,should be Modified and Verified RPN reduced from 144 to 24
- 8) Setting Process in PVC Foam Prefab to be eliminated RPN reduced from 144 to 24
- 9) Insufficient Number of Mofex grinder RPN reduced from 144 to 24
- 10) Less Number of Trolleys for Glass matt roll Loading RPN reduced from 144 to 24
- 11) Nesting Plan Revised and RPN reduced from 120 to 24

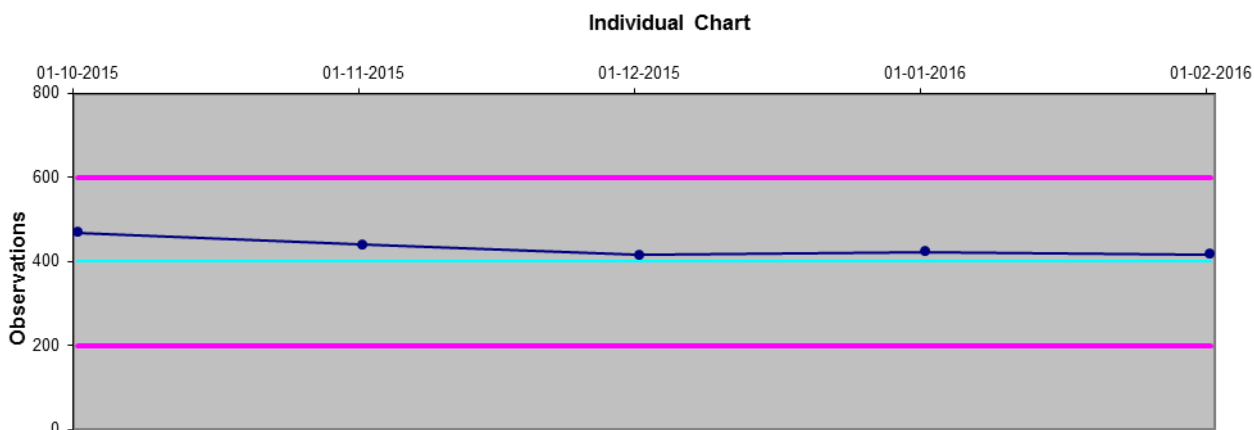
### 3.3 Control

I- MR Chart to Determine the Process is Improved and Stable

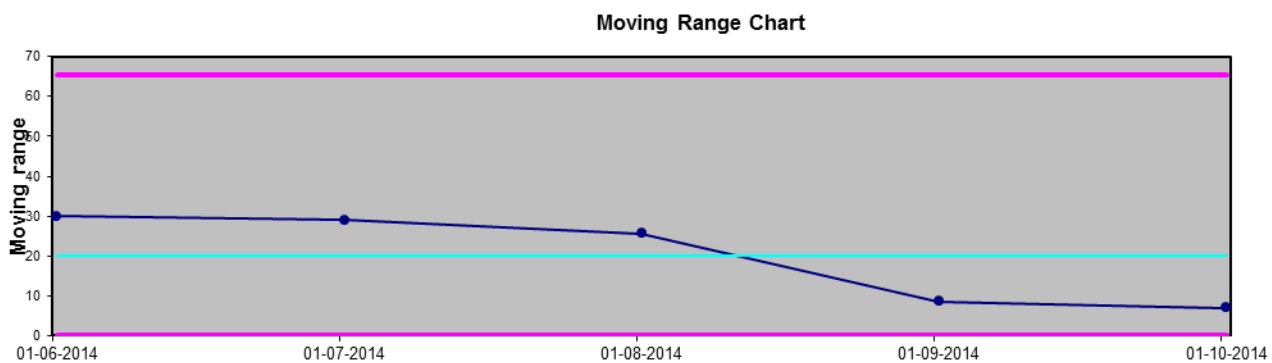
Month	OBSERVATIONS	Moving range (MR)	I Mean	MR Mean	I Chart Bounds		MR Chart Bounds	
					Lower	Upper	Lower	Upper
Oct-15	470	30	400	20.046154	200.00000	600	0	65.510831
Nov-15	440.96	29.04	400	20.046154	200.00000	600	0	65.510831
Dec-15	415.3846	25.575385	400	20.046154	200.00000	600	0	65.510831
Jan-16	424	8.6153846	400	20.046154	200.00000	600	0	65.510831

Feb-16	417	7	400	20.046154	200.00000	600	0	65.510831
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**I Chart –Shows the Process Reaching the Targets**



**Moving Range Chart – Shows the Process is Stable and Variation is Moving Towards “ZERO”**



**4 CONCLUSIONS**

The result of current Project specified that all the investigated factors like Machine, Manpower and Material play an important role in controlling the Man Hours Consumption Per Kit

- ❖ In Month Of October/21015 there is Drastic Change of Man Power per kit to 470Man/Hours at Improvement Stage of the Project
- ❖ In Month Of November /21015 there is Drastic Change of Man Power per kit to 440Man/Hours at Control Stage of the Project
- ❖ In Month Of November /21015 there is Drastic Change of Man Power per kit to 415Man/Hours at Monitoring Stage of the Project
- ❖ The I Charts Shows that Process Reaching Towards the Target of 400 Man/Hours per Kit

- ❖ The MR- Moving Range Chart Indicates that variation in Results are Stable and Variation is Moving Towards “ZERO”
- ❖ Risk Priority No of all the Route Causes has been came down and Shows the failure Mode of the Projects has come down

## **BIBLIOGRAPHY**

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