

A STUDY ON CARGO TRANSPORTATION DAMAGE REDUCTION AT SHIPPING COMPANY, TUTICORIN

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ABSTRACT

World trades are most precisely done by the sea way rather than compare to other transportation. More or less 90% of the international trade volumes are usually done by ocean way logistics. As an economically developing country like India, its 95% of merchant trade volumes are based on the maritime logistics. Logistics simply means transporting or moving goods or product from one place to another places. While transporting there is also some cons like goods or product could get damage due to many reasons. Eliminating damage could increase profitability, royalty and bring more customer satisfaction to their product or services. Applying the application of six sigma statistical tool, we can reduce the waste from the organization. So, identify the causes and executing solution for the problem will helps to reach the goal of 3.4 defects per million opportunities. This study is precisely conducted in a shipping industry which is located in Tuticorin, state of Tamil Nadu, India. It is a manufacturing, exporting, 3PL and 5PL service provider company. This study talks about the reduce the damage by using proper solutions in a transportation of shipping company by applying six sigma statistical tool calculation.

Keywords: Logistics, Six Sigma, Transportation, Cargo Damage, Shipping.

I. INTRODUCTION

Shipping industry has an essential part in the Indian economic development, especially in India's worldwide merchanting. It likewise plays a critical part in achieving resources like petroleum gas, unrefined petroleum, coal, for the drenching need for nations are moved via ocean logistics. India ports are taking care of 95% of merchant trade exchange of the country. This study concentrates exactly in cargo transportation damage reduction at manufacturing and export company which is located in one top 12 major port city of Tuticorin and it's a developed industrial city. Producer of Tissue Paper, Detergent Powder, Detergent Liquid, Floor washing Liquid, Toilet cleaner, Sanitizer, Dish wash and sending out that to nations like Maldives, Sri Lanka, Malaysia, U.A.E and Europe nations.

1.1. NEED FOR STUDY

Every movement of logistics might make a harm the freights during transits, there are many purposes behind that as well, by utilizing six sigma in an organization can accomplish 3.4 defects per million opportunities. In this case all things are to be considered to identify the main driver for the damage and giving solutions also important.

II. REVIEW OF LITERATURE

Yugowati Praharsi, Mohammad Abu Jami'in, Gaguk Suhardjito, Hui Ming Wee, (2021) "The application of Lean Six Sigma and supply chain resilience in maritime industry during the era of COVID-19" in this review, results were displayed as the applying DMAIC approach of lean six sigma to shipbuilding, coordinations and delivery to accomplish production network strength. Strength for organizations to boost the presentation during the Coronavirus time frame.

Anna Wronka (2016), "LEAN LOGISTICS". in this study talks about Six Sigma or Agile approach with other Tools and techniques utilized in modern business management, finding of the examination plainly demonstrates that main self-learning association can ready to discriminate issues and settle their issues in the briefest timeframe possible

Mário Lobo¹, Tiago Pinho, (2019) "LEAN TOOLS APPLIED IN TRANSPORT AND LOGISTICS SERVICES" In this research, the utilization of Lean instruments in calculated and transport services permitted the increment

of productivity, increase in load limit (both on the vehicle and the stockrooms), work arranging, The worldwide activity benefits and less regular mistakes.

Jose Arturo Garza-Reyes, Sarita Tangkeow, Vikas Kumar, Simon Peter Nadeem (2018) "Lean Manufacturing Adoption in the Transport and Logistics Sector of Thailand - An Exploratory Study" this study conducted by the questionnaire survey between the supply chain and logistics management role employees of Thailand. Results shows the absence of sustainment of lean culture and the principal challenge to execution of lean, though benefits were interrelated to LM's capacity to distinguish and decrease squander, increment usefulness. A few organizations intense on embracing JIT, Kaizen and Six Sigma later in future.

A. Reis, G. Stender Related information, U. Maruyama (2017) "Internal logistics management: Brazilian warehouse best practices based on lean methodology" this paper validate, how best practices and instruments dependent on lean manufacturing procedure can build productivity by diminishing expenses and waste in an organization of Oil and Gas industry. The outcome proposes results with low expenses, adjusting waste execution to production improvement.

Leopoldo Gutierrez-Gutierrez, Sander de Leeuw, Ruud Dubbers, (2016) "Logistics services and Lean Six Sigma implementation: a case study" it talks about the execution of LSS in logistics system. LSS has been applied for an installment cycle and a solicitation to-transport measure for this situation study.

Urs Buehlmann, Chair David E. Kline Janice K. Wiedenbeck Iris B. Montague Larry N. Killough (2014) "LEAN IMPLEMENTATION AND THE ROLE OF LEAN ACCOUNTING IN THE TRANSPORTATION EQUIPMENT MANUFACTURING INDUSTRY" this research focused on three significant things to assess transportation equipment manufacturing in regard to functional and financial performance, results and performance of lean implementation, third is analyze, how the companies aligned with lean systems.

Prattana Punnakitikashem, Nattapan Buavaraporn, Lin Chen, (2013) "An Investigation of Factors Affecting Lean Implementation Success of Thai Logistics Companies" this paper revised and recognized unsafe elements permitting to the achievement of lean implementation in service tasks. basic achievement factors were distinguished including authoritative culture, abilities and skill, initiative and the board, correspondence and fiscal capacity.

Roman BEDNÁR, Natália HORŇÁKOVÁ, Helena VIDOVÁ (2013) "IMPLEMENTATION PROCEDURE OF LEAN METHODS IN LOGISTICS PROCESSES" this paper was focused on the sequence of Teamwork, 5S, KAIZEN, TPM, KANBAN and VSM methods implementation steps. Results shows that implementation the lean is not as simple and it based on the company.

Joanna Nowakowska-Grunt, (2008) "IMPACT OF LEAN MANAGEMENT ON LOGISTICS INFRASTRUCTURE IN ENTERPRISES" this paper features the chances of utilization of lean management to accomplish the objective to get the commercial center of the organization. Results shows lean strategies are fabulous in many organizations around the world.

III. OBJECTIVES OF STUDY

3.1. Primary objective

Applying six sigma statistical tool to analysis and giving suggestion to reduce the transportation damage in cargo containers at Macro logistics, Tuticorin.

3.2. Secondary objective

To study on current logistics working process and analyzing the cardboard boxes and improve the spaces while in the container. Find out the root cause with the fish bone diagram to give proper solution to implement in the organization and overcome the problem with zero damage per transactions.

IV. RESEARCH METHODOLOGY

Secondary Data were collected by the both documentation and interviewing the respective staffs in the organization and the problem identified was also the existing one based on the past data collected research methodology technique was used is six sigma. Six sigma is systematic problem-solving tool, which using data and analyzing those using statistical methods.

4.1. Problem identification

The problem identified in the company was cargo transit damage in the shipping. It is a very serious issue in logistics, because of the volume of transportations is more than while compare to other industries. From stuffing, loading, unloading, inland transportation, loading containers in vessel at transit any part of mishandling of the cargo will cause the damage to the product. It's the most important issue in this company cargo (FCL, LCL and Break Bulk) are movements are from Tuticorin to Maldives, Malaysia, Sri Lanka, Saudi Arabia and many countries. In every transportation 2% - 4% percentage of the cargos get damaged. It makes the loses to company. This problem will affect the profit and consignee relationship of the firm.

4.1.1. Tuticorin to Maldives

There are many liners shipping is going between Tuticorin to Maldives. Maldives is an import-based country, and its nearest countries are India and Sri Lanka. Ships are not directly going to Maldives from VOC port, ships going from Tuticorin to Maldives first reaching Colombo port for mother vessel. Because Colombo port has more depth ocean comparative to Tuticorin VOC port. (i.e.) like ship named EVER AGE which is called world largest container ships can directly board at terminal berth of Colombo ports. Low capacity TEU containers is only can get in Tuticorin port. Feeder vessel are going to Colombo to exchange their container to mother vessels. Normally 20' foot containers called single TEU, one forty-foot container is two TEU.

FCL & LCL is the two methods of loading the freights in the containers, when the volume of shipment is high company adopts the full container load method. If the shipment product or machinery is small otherwise or cannot fully occupy the containers, while no other shipments are in the same date, they go with freight forwarders to sort out this issue. Mostly full container load is only taken place in shipping, unless that will cause the financial loss.

Break bulk cargo shipping is most often taken place taken between directly Tuticorin to Maldives, because of running voyage time is within 30 hours. Product like eggs, vegetables like which will expire in short span of time are also shipped by the local shipping companies from Tuticorin to Maldives.

V. ANALYTICS

5.1. What is six sigma

Six sigma is a statistical tool which is utilized to discover the deviation or deformities from the overall product and service. It has been applied in numerous enterprises to work on their business by lessening the deformities. Six sigma was created by Motorola in 1986. One sigma level shows that there is high deformity, If the organizational methodology has six sigma, the deviation or imperfection will be most extreme less. Six Sigma implies just a technique for powerful taking care of an issue. Utilizing six sigma can lessen the deformities, increment of income and Increase consumer loyalty.

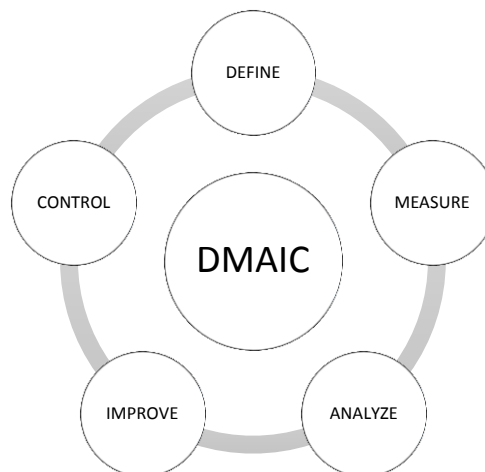


Figure 1: DMAIC smart art

In define stage information were gathered by the organization from voice of the customers (VOC) for documentation reason.

In Measure stage, the past information is gathered and the process capability is determined applying sigma scale.

In analyze stage, the main drivers for transportation harm was analyzed with last six months data of damaged goods. Doing analyze it could assisted with discovering the unique few underlying drivers, which is causing significant harms in transportation.

In improve stage, discovered answers for the a portion of the underlying drivers and excuted them like train them and improvising the storing space in the container by reduce the size of carboard boxes.

Finally, in Control stage, discovered strategies to keep up with the advances by continually doing the method regularization, training and measuring and checking of transportation damages.

5.1.1. Define phase

This Study has been done in the one of the fast-developing shipping organization in the shipping industry. One of the major players in the Tuticorin port, and its motive to get exceptionally high consumer loyalty levels by their service. One of the pain areas of the organization is the client disappointment, because of freight got damage during transportation. The data gathered for January to June, shows that the transportations damage is consistently escalating. Though the level of transportation damage is 3.03%, the quantity of damage good was 303, with a monetary deficit of 1.02 crore rupees. In the define stage, put forward an objective of 98% damage free transport first time.

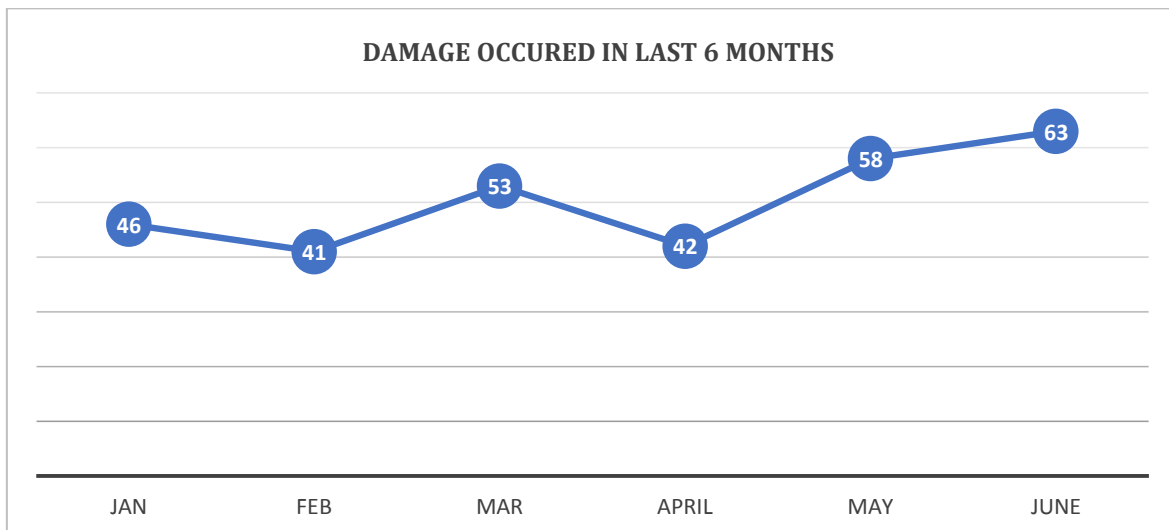


Figure 2: January to June damage occurred chart

5.1.2. Measure phase

In the measure stage, especially gathered industry wise information utilized for to ascertain the cycle ability in the sigma scale.

Table 1. sigma calculation table

INFORMATION	COLLECTED	Jan-June (2021)	August (2021)
Number of defects per unit	O	5	5
Number of units	N	2000	350
Number of actual defects	D	303	30
Defects per oppportunity	$DPO = D/(N*O)$	0.0303	0.018
Yield	$Yield = \{1 - DPO\} * 100$	96.97%	98.28%

Table 2. sigma conversion table

DPMO	Sigma Level	Defect Rate	Yield (Accuracy Rate)
3.4	6.00	0.0003	99.9997

5	5.92	0.0005	99.9995
8	5.81	0.0008	99.9992
10	5.76	0.0010	99.9990
20	5.61	0.0020	99.9980
30	5.51	0.0030	99.9970
40	5.44	0.0040	99.9960
70	5.31	0.0070	99.9930
100	5.22	0.0100	99.9900
150	5.12	0.0150	99.9850
230	5.00	0.0230	99.9770
330	4.91	0.0330	99.9670
480	4.80	0.0480	99.9520
680	4.70	0.0680	99.9320
960	4.60	0.0960	99.9040
1350	4.50	0.1350	99.8650
1860	4.40	0.1860	99.8140
2550	4.30	0.2550	99.7450
3460	4.20	0.3460	99.6540
4660	4.10	0.4660	99.5340
6210	4.00	0.6210	99.3790
8190	3.90	0.8190	99.1810
10700	3.80	1.0700	98.9300
13900	3.70	1.3900	98.6100
17800	3.60	1.7800	98.2200
22700	3.50	2.2700	97.7300
28700	3.40	2.8700	97.1300
35900	3.30	3.5900	96.4100

Before training, Process six sigma value for Jan – June is 3.38.

After training, process six sigma level has been increased to 3.62

5.1.3. Analyze phase

In analyze stage, discovered the causes applying cause and effect diagram graph and gathered information on of assumptions. The beneath fishbone diagram show the listed causes after information assortment.

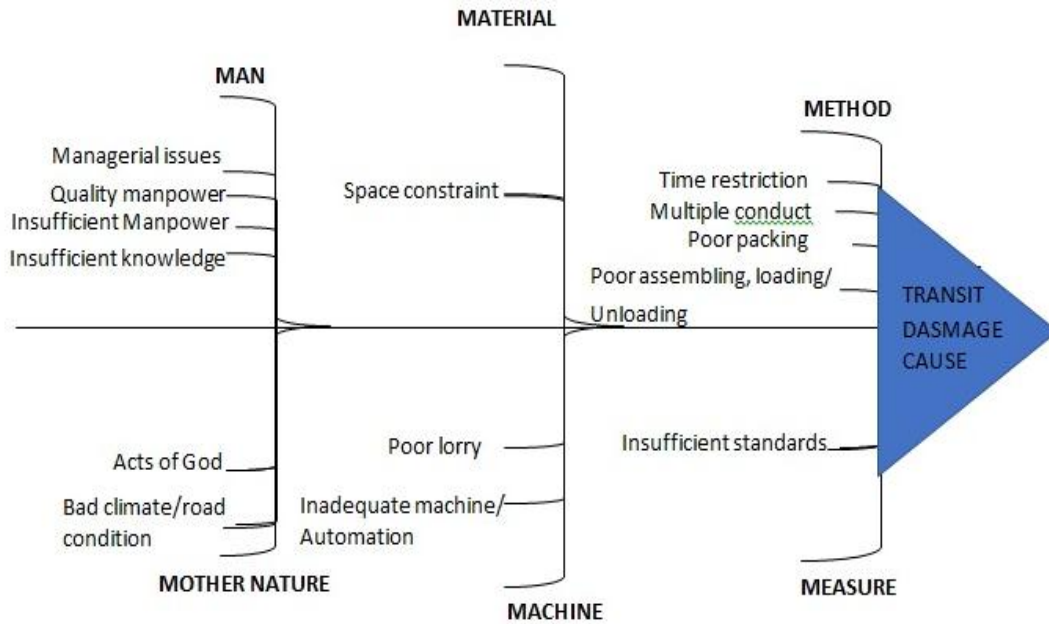


Figure : Fish bone diagram.

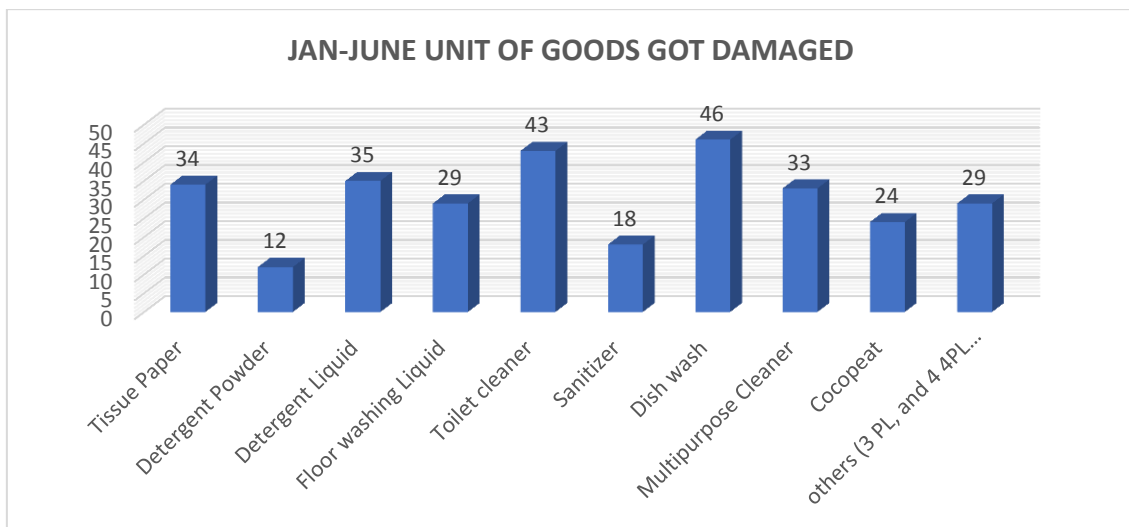


Figure 3: Product wise units of goods damaged

5.1.4. Improve phase

In Improve stage, identified the set of answers for each one of the main drivers distinguished and carries out something very similar. The below table and picture show some of the solutions carried out.

Table 3. Solution and outcome table

ESSENTIAL ROOT CAUSE ROOT CAUSE	PROPOSED SOLLUTIONS	ANTICIPATED OUTCOME
(METHOD) Inadequate information about dealing with cargos	Intensive preparing on preventive of loss and hand on preparing of stacking, stuffing, bundling, stacking and dumping, numerous taking care of in interlock block strategy and conveys significant burden freight at base and lower at the top.	Proper arrangement and treatment of shipments
(MAN)	Awareness with industry explicit banners on right procedures	Correct treatment of shipments in by the manner in which it is mean to be



Figure 4: Before training



Figure 5: After training

5.1.4.1. Analyzing the cardboard boxes and improve the spaces while stuffing



Dimension of standard 20' foot container's inner height is maximum 2.38 meters= 238 cm, here we can stuff 8 row per containers with these followed size of cardboard box 29*8= 232

Figure 6: 20-foot container picture



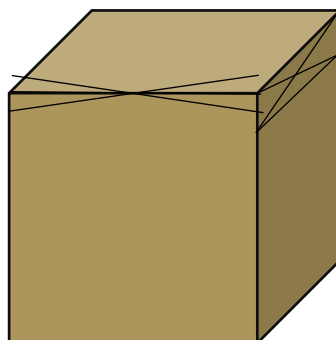
height of the cardboard box is 29 cm with this we can stuff 8 rows only

Figure 7: Before altered cardboard boxes



height of the bottle is 24.5 cm

Figure 8: Sample bottle pictures



By reducing 3 cm extra height of the box, we can stuff one more row in the container,

Maximum height of container = 238 cm

Altered box height = 26 cm

Before 29*8 = 232 cm

After 26*9 = 234 cm

So, there will be efficient space to add another one row in containers while stuffing

Figure 9:3D picture of oversized box



height of the cardboard box 26 cm, after alteration of the boxes we could stuff another row in the container

Figure 10: Altered cardboard boxes

5.1.5. Control phase

In control stage, to creating SOPs – standard operating procedures, strategies containing of trains individuals and sets up an estimation and checking frameworks alongside dashboards to guarantee that the enhancements are maintained. Assuming the association accomplished the put forward objective, it would go past the last objective and to make new SOPs for new objective.

VI. FINDINGS

Procedure utilized in the issue had accomplished its goal, there is a notable decrease in transportation damage, aside the outside factors continuing as before. Through a clear-cut preparing, methodology, investigating and readiness creation, organization could accomplish appropriate enhancements of arriving at 98.28% damage free delivery in a short span of time and not forgot to sustain the customers loyalty.

VII. CONCLUSION

Applying The application six sigma in a transportation has condensed the damage in shipping company. The study identifies the use of six sigma has improved the efficiency and reduce the damage while transporting the cargos. In short period of time, it has an effect of to increase the damage free transportation. Results displays that we can improve any process of logistics transportation to achieve its ultimate set of goals as zero damage transportation. Though if there are numerous external factors, there should be solutions for it.

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