Implementation of Total Quality Management for Managing Sewer Construction Using Quality Tools. Case Study of Pune Municipal Corporation (PMC), Pune, India.

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Abstract— **In Construction literature, the effects of Total Quality Management has been appreciated by many researchers. The key objective of this study is to give emphasis on Total Quality Management in Sewer Construction. Whereas, Sewer Construction is followed by lack of Management, System Improvement plans, Customer Satisfactions. In this Research, a study was carried out under "Pune Municipal Corporation" (PMC) Pune, India. Here basic Quality Tools were used to analyze the collected Data, to solve problems faced by Engineers during Construction, Which has the ability to adds some Management Fundamentals to Sewer Construction. Almost every person in the organization is involved in developing the quality of the process, services, product or culture.**

Keywords— *Sewer management, process planning, 7 quality tools, quality improvement*

I.   INTRODUCTION

Sanitation is one of the important branch which can help the development of India. Proper sanitation can be achieved by simply modifying the processes relating to people's health, especially the systems that supply water and deal with the human waste. Solid wastes, industrial and other special/hazardous wastes and storm water drainage will be logically covered in the above process. However, sewage is considered the most potent of these pollutants. Sewer construction in India has started exploring by modifying the planning as well as executing the construction process. Planning the construction process for sewer helps in many ways such as saving time, cost as well as a structured process is manipulated. Problems occurred during construction for sewer are being taken into consideration giving some suggestions to avoid the problems in future.

Project management concepts: Applying tools, techniques, skills, and knowledge to project activities to meet the project requirements. Identifying the requirements, addressing the stakeholders need to make a project plan are one of the tasks are conducted during project management.

Total quality management can also be called as the backbone for a successful constructions process. Every activity related to man, machine, the materials are monitored by the quality person. The core reason for quality management is for the customer satisfaction. Almost every person is involved in developing the quality of a process, services, product or culture. My purpose is to remind the construction industry to analyze the sewer structure for upcoming years which can help in the development process for the sewer industry.

D.Ashokkumar 1 (2014): the first thing I noticed was the need for quality management in the construction industry. Quality considering as one of the critical factors on site. A quality product is always reviewed with respect in the industry. Fulfilling the expectation of the customers is the core wish of a successful company. Savita sangle, M.C. Aher (2017): This paper focuses on the Implementation of total quality management in the construction industry and their suitable applications in different phases of projects. Theories like six sigma principles, methodology and various tools are discussed in this paper. Saumyaranjan Sahoo, Sudhir Yadhav (2007): This Research paper focus on the relationship between quality management dimensions and firm performance, considering manufacturing SMEs as focal point of research. Kriengsak Panuwatwanich, Thanh Tung Nguyen (2016): The key objective of this research paper is to examine the relationship between Organizational Culture(OC) and Total Quality Management, and the influence of TQM implementation on Organizational Performance improvement within vietnamese construction industries context. Vavaliya Jaladhi (2015): A key challenge in the urban water supply and sanitation sector in India is the lack of adequate and reliable information. This paper describes the journeys of 400 plus cities in two western states of India from a rudimentary paper-based system to an online performance assessment system.

II.   OBJECTIVES

- The purpose of this work is to make give emphasis on Total Quality management in Sewer Construction.

- To find appropriate solutions for project delays.

- Customer satisfaction feedbacks using quality tools.

III.   METHODOLOGY:

Manufacturing and other services industries have started considering the use of total quality management widely because of the significant improvement in the quality in their field. The objective of my research paper is to structure some construction process in such a way to form a feasible and accident-free process. A case study of Pune Municipal

Corporation (PMC) is taken into consideration in which 7 quality control tools are used for different problems solving activity. The study shows that minor changes in the process can lead to improvement in the quality of a product as well as the customer satisfaction is considered.

Five systematical methodology steps are used in order to solve the problem. Starting from the objective identification, literature study, data collection and research, data analysis, and conclusion. Every step is described in detail below to show exactly how the research is carried out. As seen in the diagram below.
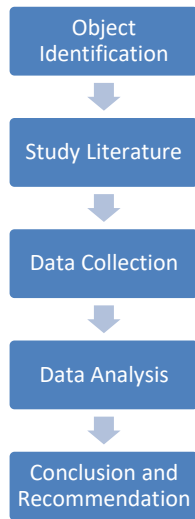

Fig 1. Methodology Flowchart

Qualitative method is being used in this thesis. Classification of actions are needed in this research paper thus the qualitative research has been carried out. qualitative method is needed for the character of the problem. It means the data collection referring to un structural interview, the researcher did not directly participate in the activity to collect the data which means the researcher just meet the informant to collect the data.

A. Object Identification :-
The core objective is to spread the awareness about the lack of focus in the development of sewer management. The second objective is to prepare a structured data to start a new sewer construction activity. Study of the literature is shown above.

B. Study Literature:-
Any body of written works which are related to this Research is considered. Like various authors with a topic related to total quality management and sewer construction are included in this research.

C. Data Collection:-
a) Primary Data
Systematic information collected directly from the first-hand person is known as the primary data. In this research, primary data was collected from the people on a working site and a questioner survey conducted on-site shown below.

Fig 2. Feedback form

b) Secondary Data

The information that was already published and is available to use is known as the secondary data. For this research, secondary data were book literature, Internet, Historical data and documents from the contractor.

D. Data Analysis:-

Data Analysis is the process of analyzing the data in qualitative research and can be done mainly by three steps, Analyzing data, Codification of data, Serving the data. The data gathered by the researcher needed to be sorted as not every data was necessary, thus separating important data from the whole was the first this researcher did.

E. Conclusions:-

The conclusions that are found during the Analysis of the data collected are elaborated in this Research paper.

IV. CASE STUDY OF PUNE MUNICIPAL CORPORATION (PMC), PUNE, INDIA :-

- The very first Sewerage system for Pune city was designed in 1928. Systems in PMC are under development stage. Data of the Site chosen for the study of this work is given below.

- Site Location:- Laxmi Nagar, Swargate, Pune.

- Project Start date:-01/10/2017

- Project Expected End date:-09/11/2017

- Project Actual End date:-21/11/2017

The project was delayed by 12 days. The analysis was carried out on the collected information, using the seven quality tools. Problems that made the project got delayed are identified and specific conclusions are made.

- *Problems that need to resolve:*

- Delay in completion of a project.

- Customer Satisfaction.

- Process Analysis(Installation).

- Dealer Comparison.

- Process Analysis(Excavation).

I. Delay in completion of a project.

Using fishbone diagram (Quality tool) for the analysis of delay in completion of the project. With the help of data collected personally on site following conclusions were made.
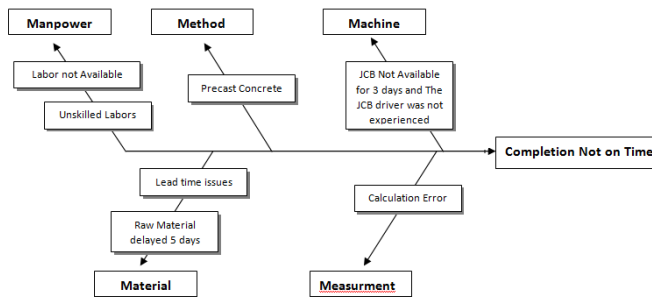
Fig 3. Fishbone diagram of the construction site

Analyzing results from the tool used, problems that affected the duration of construction are listed in the table below:-

Resources	Problem
1. Man:-	Labour not available for 5 Days
2.Method:-	Precast Concrete.
3.Machine:-	JCB not available.
4. Material:-	Lead time issues. Material not available.

Table no 1. Problems identified during construction

II. Customer Satisfaction:-

Pareto chart, one of the tool is used for the analysis of customer feedback form. Traffic due to construction, Environmental pollution, Safety precautions, Labor behavior among people are the factors included in this questioner shown above. Collected data is analyzed with the help of the Pareto chart as follows, Before you begin to format your paper, first write and save the content as a separate text file. Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.
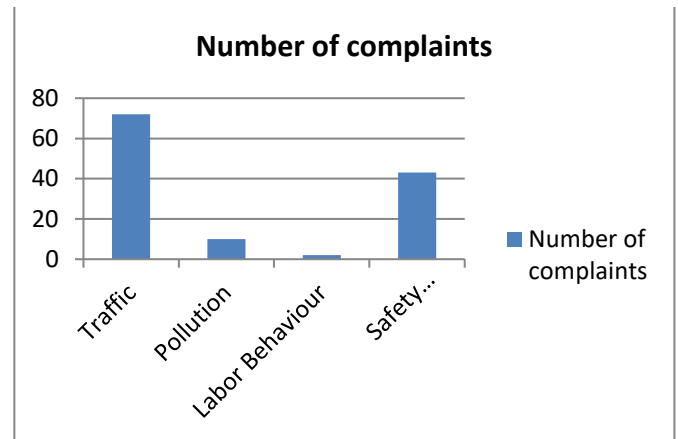
Fig. 4 Number of complaints

Almost 80% of the people were not happy about the traffic. As looking from customers view, 1person should be appointed to help to avoid traffic issues. Around 30% complained about the safety, thus using a different tool to analyze safety issue.

III. Process Analysis(Installation).

Histogram, One of the tools is used for the process analysis. The time required for installing 5meters of the pipeline is shown below:-
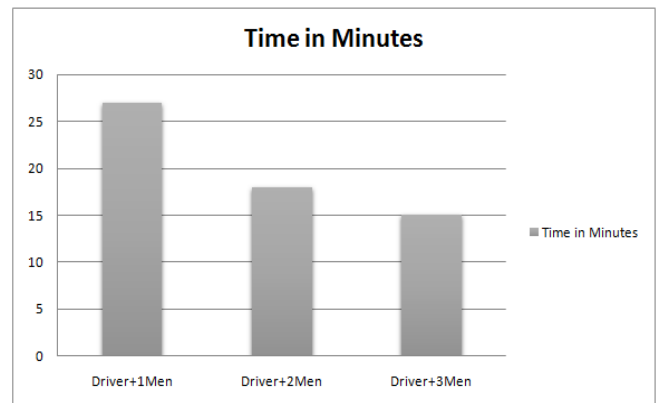
Fig 5. Process Modification

Statistics show that adding a person for an activity like installation of sewer pipe can result in completing the activity in less time. Not neglecting the fact that, Extra person= Increasing project cost. I conclude that minimum 2 Person should be available with the driver to complete the task within an appropriate time.

IV. Dealer Comparison:-

Using Stratification to compare the different number of material suppliers. Data collected from the contractor about the dealers was merged into the stratification graph as follows.3 different dealers as Shraddha cement, Poona concrete, Dhere & Sons are being compared with respect to Time taken to deliver the material on site.
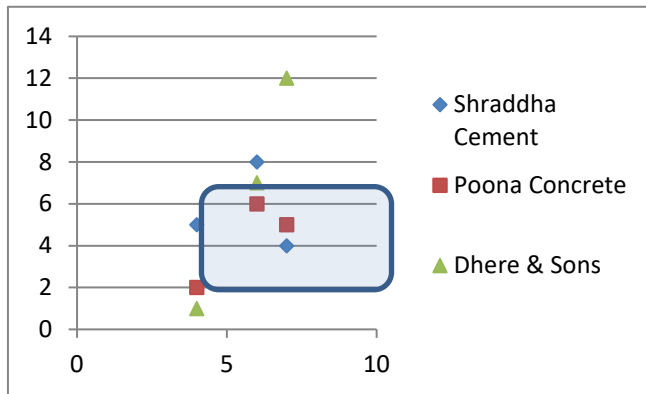
Fig 6: Stratification

Each dealer was personally called for a specific amount of Cement bags, Sand, RCC pipes. the time required for fulfilling the order is shown above. As the result shows that Poona concrete was the dealer who was chosen as the first priority dealer.

V.   CONCLUSION:

- Total Quality Management must be followed for the Development in the Construction Management structure.

- Project delays can be avoided permanently with some dedication for improvement and Quality tool analysis.

- Process Development should be carried out to maximize the productivity of Construction activity.

- A special person should be appointed to manage the traffic which will lead to customer Satisfaction.

- Future scope of this study will be interesting as Sewer construction have the capability to be one of the main focus for the infrastructure industry.

VI.   REFERENCES:

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