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Quality Circle To Improve Productivity

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ABSTRACT

This paper deals with various aspects of Quality Circle and how improvements can be made by adopting practices of Quality Circle in chemical industries. The paper also presents a comparative discussion of various features of Quality Circle, Quality Improvement Group and Work Group/Project Team. The paper describes a case study of QC concept in a chemical industry which illustrates the effectiveness of QC approach.

Keywords

Quality Circle, chemical Industry, Quality Improvement Group, Work Group/Project Teams, Centrifuge, Maintenance Management, Deming Wheel, Fishbone Diagram, Pareto Chart, Activity Flow Diagram

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1. INTRODUCTION

Maintenance is undertaken to preserve the proper functioning of a physical system so that it will continue to do what it was designated to do. Its function and performance characteristics not only take account of output, unit cost and effectiveness of using energy, but also such factors as end product quality, process control, comfort enhancement and protection of the employed personnel, compliance with environment protection regulations, structural integrity and even physical appearance of the productive system. Maintenance is often wrongly regarded as a cost centre, since the costs are visible, while the benefits are difficult to estimate.

2. DEFIINITION

Quality Circle is a small group of 6 to 12 employee doing similar work who voluntarily meet together on a regular basis to identify improvements in their respective work areas.

3. PHIILOSOPHY

Quality Circle is a people – building philosophy, which provides self motivation and improves work environment. It represents a philosophy of managing people specially those at the grass root level

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4. CONCEPT

The concept of Quality Circle is primarily based upon recognition of value of the worker as a human being, as someone who willingly put efforts to improve the job, his wisdom, intelligence, experience, attitude and feelings.

5. OBJECTIVE

The objectives of Quality Circles are multi-faced – Change in attitude; self development; development of team spirit, improvement in organizational culture.

6. ORGANISATIONAL *STRUCTURE*

The basic structure of a Quality Circle is depicted in figure. 1.

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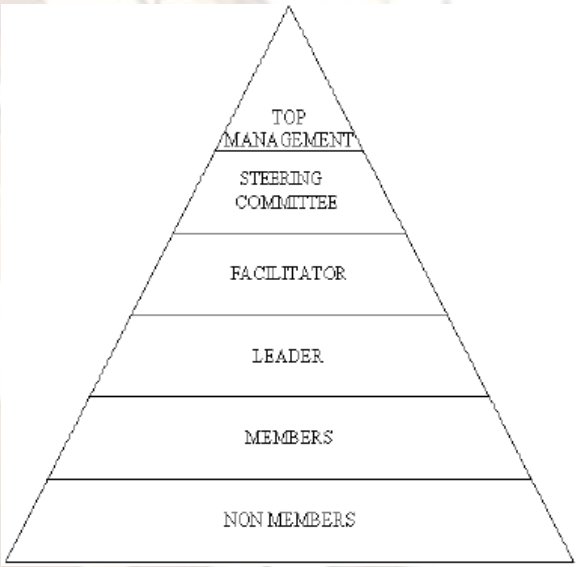


Figure 1: Organizational Structure of Quality Circle

7. LAUNCHINGQUALITYCIRCLES

The launching of Quality Circles involves the following steps:

- Expose middle level executives to the concept.
- Explain the concept to the employees and invite them to volunteer as members of Quality Circles.
- Nominate senior officers as facilitators.
- Form a steering committee.
- Arrange trainings
- A meeting should be fixed preferably one hour a week for the Quality Circle to meet.
- Formally inaugurate the circle.
- Arrange necessary facilities for the Quality Circle meeting and its operation.

8. TRAINING

Appropriate training for different sections of employees needs to be imparted.

9. PROCESS OF OPERATION

Figure 2 exhibits the operation of quality circles:

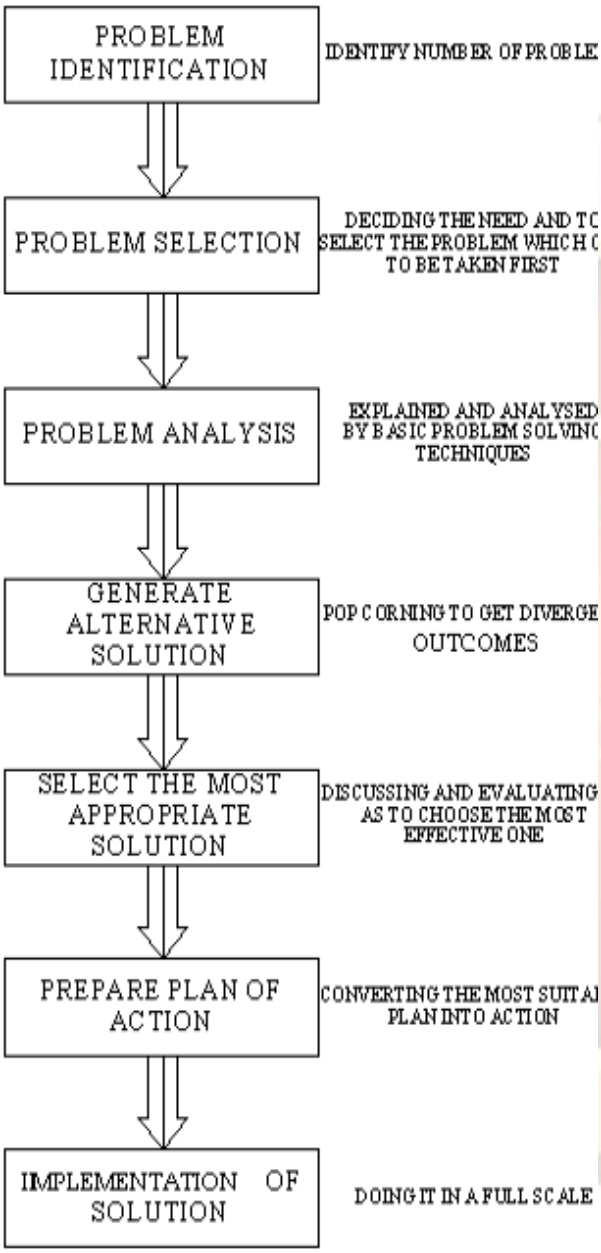


Figure 2: Operation of Quality Circle

10. CHARACTERS OF QC

- Circle membership: It is more or less homogeneous group of people usually from the same work areas. However, whenever required experts may be invited for guidance or advice.
- Circle size: Usually a group of 6 to 12 members seems quite effective; however, it depends upon the people employed in a particular section.
- Voluntary participation: The main objective of QC is attendance and participation in meetings voluntarily without any compulsion.
- QC meetings*:* An hour's duration is usually quite adequate for a meeting. Whatever may be the frequency, regular meetings should be ensured.
- Autonomy: An important ingredient of a QC is the sense of autonomy experienced by its members.

11. PHASES IN QC DEVELOPMENT

Once a QC is formed, it has to pass through the following distinct phases of development:

- Problem to be identified analyzed and solved.
- Solutions to be implemented in due time.
- Monitoring to be carried out.
- Higher management to encourage QCs to innovate Problem solving methods.

12. BASIC PROBLEM SOLVING TECHNIQUES

The following techniques are most commonly used to analyze and solve work related problems.

- Brain storming.
- Pareto Diagrams.
- Ishikawa diagram (Fishbone diagram).
- Cause & Effect Analysis.
- Data Collection.
- Data Analysis.

The tools used for data analysis are:

- Tables.
- Bar Charts.
- Histograms.
- Circle graphs.
- Line graphs.
- Scatter grams.
- Control Charts.

13. CAUSES FOR FAILURE OF QC

Some of the common causes for failure are:

- Low morale of employees due to autocratic management and lack of trust.
- Lack of training.
- Incompetent leadership.
- Lack of management support.

Quality circle concept succeeded in Japan, South Korea and a few other Asian countries, but it was a different kind of experience in Europe and USA. In Europe and USA, it became very popular from middle of 70s to middle of 80s,and subsequently, started its journey of declining from there onwards. The reasons can be attributed to:

- In Japan, it was mainly considered as a development process of grass-root employees, and organizational improvement was given secondary importance, where as in Europe and USA, the focus was given to organizational improvement and no proper attention was paid to improvement of people.
- Work associated to QC is totally carried out as an internal process in Japan, whereas in Europe

and USA, it was left to the external consulting agency.

In India too, these reasons are equally valid and applicable.

14. COMPARISON AMONG QUALITY CIRCLE,QUALITY IMPROVEMENT GROUP ANDWORK GROUP/PROJECT TEAM

Table 1 presents the comparison among Quality Circle ,Quality Improvement Group and Work Group/Project Team:

Table 1: Comparison among Quality Circle, Quality Improvement Group and Work Group/Project Team

Feature/Criteria	Quality Circle	Quality Improvement Group	Work Group/Project Teams
Orientation	Performance-oriented	Problem-oriented	Problem/project-oriented
Time-frame	Decided by circle members	Decided by management	Decided by management, specific duration is assigned
Nature of group	Homogeneous	Homogeneous	Heterogeneous
Communication	Bottom to top	Top to bottom	Top to bottom
Scope	Usually restricted to work and mostly to low intellect problems	Machine/process specific	Depends on objectives given by senior management
Expertise required	Practical and limited	Predetermined by nature of quality problem	Work or project dependent
Technical approach	Innovative and experimental	Traditional and technically established	Project dependent but mostly traditional and established
Dependence on management function	Independent	Partially dependent	Part of management function
Size of group	Small, usually 7-9	Small, usually less than 7	Varies, project/work-dependent
Decisions	By consensus followed by presentation before executives	By leader, no presentation is needed	By leader/in charge, presentation is situation-dependent
Formal Training	Formal training is a must, which must be systematic	Discipline specific training/work experience	As such, no specific training is required

15. QC SUCCESS STORY IN INDIA

QC took birth in India in 1982 and some of the industries to launch QC first were Bharat Electronics Limited, Bangalore and Bharat Heavy Electricals Limited, Trichy. However, with the progress of time, QC achieved success in a number of industries in India. To name a few are TATA, TELCO, Reliance Industries Limited, Kirloskar Brothers Limited and so.

16. QUALITY CIRCLE IN PRACTICE: A CASE STUDY AT ALKA INDUSTRIES

15.1.1 Alka Industries: Brief Background

Alka Industries is a powder coating and anodizing plant situated at MIDC Nagpur. The schematic below (Exhibit 1) explains the process flow at Alka Industries. Anodizing of aluminum products and powder coating of GI and CI sheets is carried out following a demand push approach. The company caters to the supply needs of aluminum window panes and other applications requiring anodized surface finish. Alka industry has prominent customer base viz: Johnson lifts and Mahindra and Mahindra to name a few. Alka industry also supplies powder coating parts to MSEB and other small scale power units.

- Name of the organization: Alka Industry.
- Type of Industry: Manufacturing, Powder coating Plant, Anodizing plant.
- Finished products: Anodizing of aluminum products and powder coating of GI and CI sheets
- Number of quality circle meetings held: 16
- Members for quality circle: 8.

We had a one to one discussion with the top management of the Alka Industries and have decided to implement the quality circle in the unit. We had so far held 16 quality circle meetings and have formed a team of 8 members for the QC.

15.1.2 Our approach to problem solving through QC

We have decided to follow the PDCA (Plan Do Check Act) or the problem identification, problem analysis, problem solution and implementation process for our Quality circle approach. We have formed a group of 8 members for our QC with 1 manager as steering member and have kept the Plant head into loop. We have come up with the fish bone diagram to improve the overall productivity/quality of the plant.

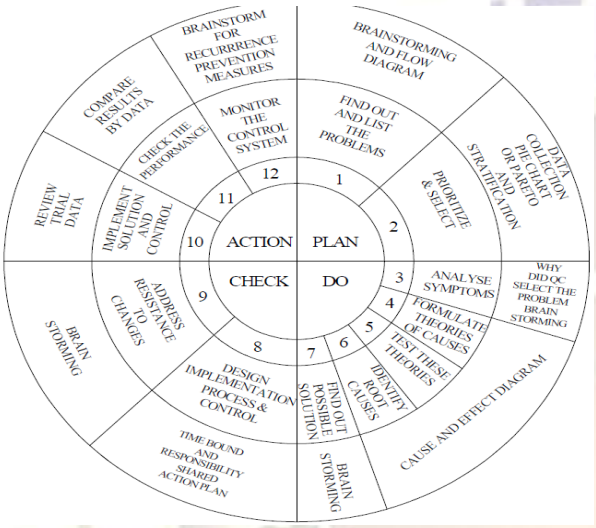


Figure 3: PDCA cycle (Deming Wheel).

15.1.3 Problem Identification: Fish Bone for our Quality circle

After discussion with the plant head and after brainstorming meeting with the team members we have come up with the Cause and effect diagram with the problem statement as productivity improvement.

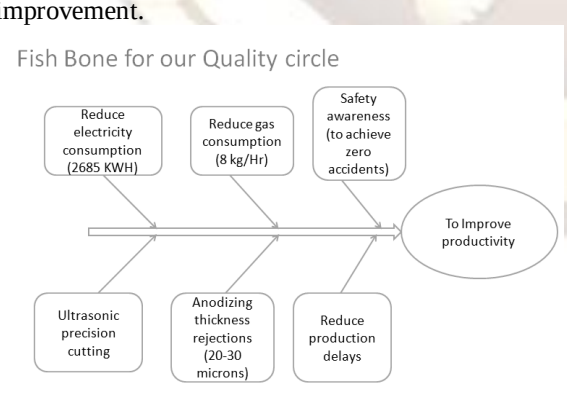


Figure 4: Fish bone diagram for productivity improvement

As the Ishikawa diagram suggests amongst various problems we have zeroed Gas consumption reduction case as individual case study in this paper with an independent PDCA approach.

Objective: To reduce gas consumption
Current level of consumption:8 kg/hr
Target level of consumption (After QC implementation):

In powder coating/Anodizing LPG gas is use for pretreatment and etching processes. Dilute sulfuric acid is heated at 50 to 600C and consumes gas at 5-6kgs/hr. The figure below shows the cross section of the pretreatment heater consuming the gas.

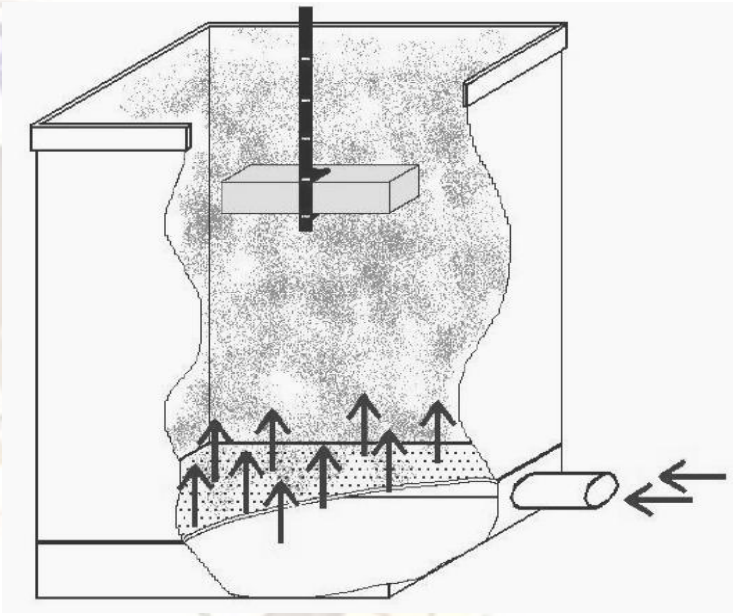


Figure 4: Cross-section of the heater.

15.1.4 Identification of root cause and brainstorming

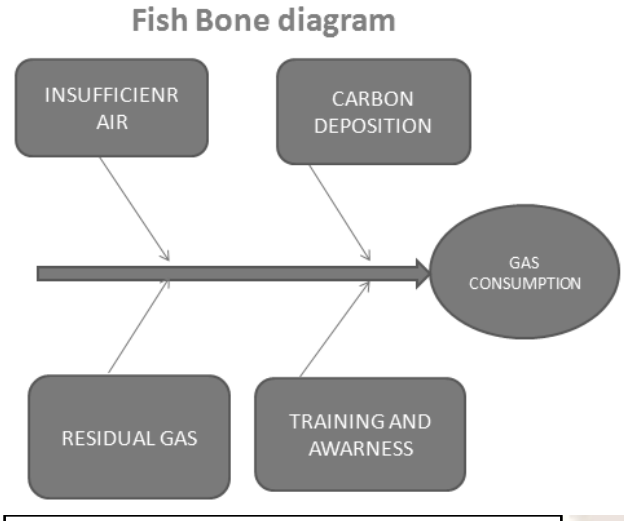
Following the PDCA approach we have conducted the first brainstorming session in order to find out the possible root causes of excess gas consumption. We have come up with the following barnstorming results:

Brainstorming results:

- Carbon deposition at the burner.
- Insufficient air at the burner
- Residual gas left in the cylinder
- Proper training and awareness to control the gas consumption.
- Maintenance of the burner and furnace.
- Proper loading of the job in the furnace

We have formulated the above brainstorming points into a fish bone diagram and a Pareto diagram to find out the significant factors which can be targeted to achieve the desired reduction in the gas consumption.

Fish Bone diagram and Pareto Chart:



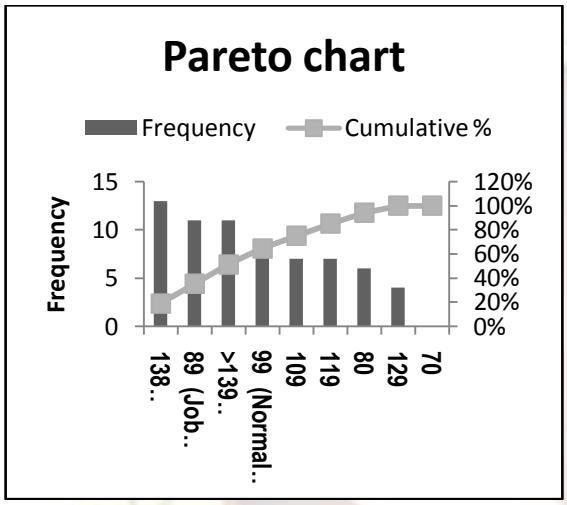


Figure 5: Fishbone/Ishikawa diagram and Pareto chart for the Gas consumption problem.

The table below indicates the frequency of the gas consumption rates at different bins. The table uses the last 5 years of the data.

Table2: Current level of gas consumption (Kg/Day):

Gas consumption (Kg/Day)	*Frequency*	*Cumulative %*
138	13	19%
90	11	35%
>139	11	51%
99	9	65%
109	7	75%
119	7	85%
80	6	94%
129	4	100%
70	0	100%

16. After implementation:

- Gas consumption is reduced.
- Down time is decreased.

17. Costs benefit Analysis**:**

Table3: Costs-benefit Analysis

Problem	**Rate**	**Brainstorming points to reduce gas consumption**	**Solution**	**Capital cost/Expense (Rs)**	**Saving rate kg/ Day**	**Savings/ month (Rs)**
Gas consumption	6 kg /hr	Residual gas left in the cylinder	Install pump	8,000	19	25,080
		Insufficient air at the burner	Maintain proper air to gas ratio	3,450	3.6	2,052
		Carbon deposition at the burner.	Proper maintenance			
		Proper training and awareness to control the gas consumption.	Impart training to operators			
		Maintenance of the burner and furnace.	Log the details			
		Proper loading of the job in the furnace	Loading according to furnace capacit			

			y			
			Total	**11,450**		**27,132**
			Margin	**28%**		

Existing cost		**Target**
Gas consumption rate	6 kg/hr	5% reduction
Consp/month (Kg)	2,160	
Gas Cost/ (Rs/kg)	44	
Total cost (Rs)	95,495	
Target cost (Rs)	90,947	
Per month saving (Rs)	4,547	

18. RESULTS AND DISCUSSIONS:

Implementation of Quality Circle led to identification of excessive gas consumption in the furnaces due to reasons attributed to deficiency in man, material, method and machine. Each deficiency was handled separately and corrective measures are implemented to optimize the gas Consumption in the plant. CONCLUSION

Quality Circle technique proved to be very effective for the problem selected by the quality circle members for the powder coating industry. Optimization of gas consumption in the furnaces led to reduction in maintenance costs, enhancement in reliability and availability of the equipment ,enhancement in morale and development of a sense of team dynamics among the employees, which proved to be beneficial to the employees and the organization as a whole.

19. ACKNOWLEDGMENTS

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