

# TQM is a key element of any manufacturing industry: A case at TATA MOTORS

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**Abstract:** - With the increase in globalization, companies are relying on the principles of TQM to meet the current market demands. Quality can simply be defined as the degree upto which a product satisfies the needs of the potential customers. The seven basic tools of quality improvement are cause and effect diagram, pareto charts, process mapping, histogram, run and control charts, scatter plots and flow charts.. The aim of this paper is to study the role of Total Quality Management in increasing the productivity of an organization. The organization under study is Tata Motors which is known for its values and quality assurance practices. The process of preparation of Export vehicles, Military vehicles and Tilt Cab vehicles under Vehicle Dispatch section were studied and its various quality management and auditing processes are accessed.

**Keywords:** TQM, Tata Motors, Tools of Quality, World Class Quality, PIT, VPVD.

## I. INTRODUCTION

Total Quality Management (TQM) is the art of managing the whole in order to achieve excellence. It can be referred both as a philosophy and a set of guiding principles for a continuously improving organization. TQM requires a committed and involved management to provide long term top-to-bottom organizational support. Total Quality Management ensures quality products to the consumer. This helps in increasing the productivity and lowering the cost of the service. Thus the organization can achieve its target profit and growth is ensured. The key concepts of TQM are as follows: 1. Quality is defined by customers requirement. 2. Top Management has direct responsibility for quality improvement. 3. Increased quality comes from systematic analysis and improvement of work process. 4. Quality improvement is a continuous effort and conducted throughout the organization.

In manufacturing, quality is a measure of excellence or a state of being free from defects, deficiencies and significant variations. From a manufacturer's point of view, quality is the ability to delight the voice of customers. ISO 8402-1986 standard defines quality as "the totality of features and characteristics of a product or service that bears its ability to satisfy stated or implied needs." (Refer Fig 1)

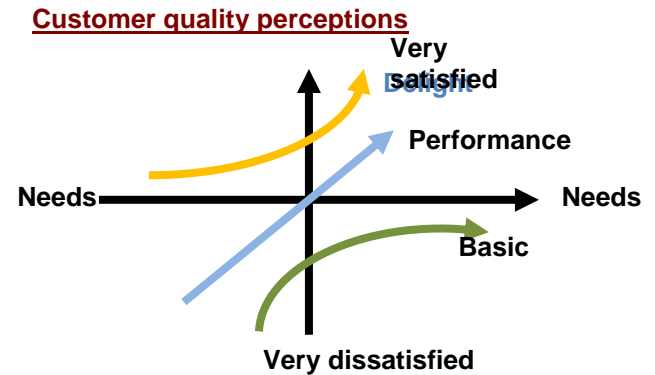


Fig 1: customer quality perceptions (Source:Tata Motors Manual 2010)

The seven basic tools of quality control are shown below



Fig 2: Tools for quality control(Source: Tata Motors Manual 2010)

Fishbone diagram also called as Ishikawa diagram was invented by Dr. Kaoru Ishikawa, a Japanese quality control statistician. It is a tool which analyses the causes and effects of a process. Hence it is also called as cause-and-effect diagram. The structure of the diagram looks like the skeleton of a fish. The uses of fishbone diagram are quality defect prevention, product design, etc. The major categories of the causes in a fishbone analysis are:

- People
- Methods
- Machines

- Materials
- Measurements
- Environment

- Promotion
- People
- Process
- Physical Evidence
- Publicity

Fishbone diagram shows the relationship between various variables and provides an insight into the process behavior. Causes can be derived from the brainstorming sessions. They can be traced back to the root causes by means of the 5 whys technique. Typical categories under this are:

*The 5 Ms*

- Machine (technology)
- Method (process)
- Material
- Man Power
- Measurement (Inspection)

*The 8 Ps*

- Product/Service
- Price
- Place

*The 5 Ss*

- Surroundings
- Suppliers
- Systems
- Skills
- Safety

**II. LITERATURE REVIEW**

Numerous literatures have been reviewed to assess the role of Total Quality Management in an organization. According to American National Standards Institute (ANSI) and the American Society for Quality (ASQ), Quality refers to: “The totality of features and characteristics of a product or service that bears on its ability to satisfy given needs.”

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3.Thomas C. Powell, (1995)	Total Quality Management as competitive advantage
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5.Anshul Gangele, Mohammad Israr(2014)	Comparative Analysis between manufacturing companies through TQM
6.Tarun Kanti Bose,et al(2012)	Application of Fishbone Analysis for evaluating supply chain
7.H. James Harrington, Frank Voehl, Hal Wiggan	Applying TQM to construction industries
8. Asiya Gul, Syed Aamir Saeed Jafery	Improving employee performance through Total Quality Management
9. Maria Leticia Santos, Luis I. Alvarez	Total Quality Management and firms’ performance
10. Faisal Talib, Zillur Rahman, M.N. Qureshi	Analysis of Total Quality Management in service industries
11. Therese A. Joiner(2006)	Role of organizational support in Total Quality Management performance

III. PROBLEM STATEMENT

The products from Automobile industries face a very stiff competition from national and international markets. The innovation and performance of the products are of vital importance for the survival and sustainability of the industries. The new generation of the products gives higher performance, quality and reliability at lower prices. Hence it becomes necessary to maintain high levels of excellence to compete with the growing demands of the national and international markets. The organization should be capable of delivering World class quality.

Quality is a difficult subject to deal with and in fact it is even difficult to define. Quality is a driver of customer loyalty and significant cost is key to the success of the company. Quality is a time dependent conformance of a product or service to rational expectations. A World Class Quality delivering organization has a sustainable competitive advantage. The dimensions of quality are the following:-

- Perceived Quality
- Performance
- Reliability
- Durability

Tata Motors manufactures over 60 models of trucks in Jamshedpur plant. The trucks are assembled on three assembly lines – Assembly Lines I, II & III. Assembly Line III which belongs to Vehicle Factory III (World Truck) is the most modern line of the plant. The line is subdivided into three sections and a total of 42 stations. The line starts with frame dropping. Then the chassis moves along the line and at each station some value addition occurs to the chassis in the form of addition of different parts. On one side of the line is store which feed the line with inventory from time to time and on the other side of the line is the sub assemblies of major parts.

The vehicles built on the assembly lines do not reach the end consumers as it is. After it is rolled out of the last station the vehicle is sent to Vehicle Preparation & Vehicle Despatch (VPVD). There the vehicle is tested in the test track and the major defects arising are noted. These defects are fixed and some fitments are added in VPVD before the vehicle is sent for final despatch.

World Class Quality (WCQ) Level 1 has been implemented in Vehicle Factory III (World Truck). The task assigned to me is to implement WCQ Level 1 in Vehicle Preparation and Vehicle Despatch (VPVD). WCQ Level 1 requires the installation of certain elements like nerve centre, ladders, quality gate, quality buy off gate and layered audit boards in each of the work areas.

The installation of these quality systems benefits the company in various ways. The advantages of WCQ implementation are:

1. Improvement of safety standards

2. Reduction in customer issues
3. Reduction in breakdown time
4. Improvement in production output
5. Reduction in rework
6. Awareness about policies and core values
7. Reduction in hazardous waste generation
8. Awareness about environmental issues

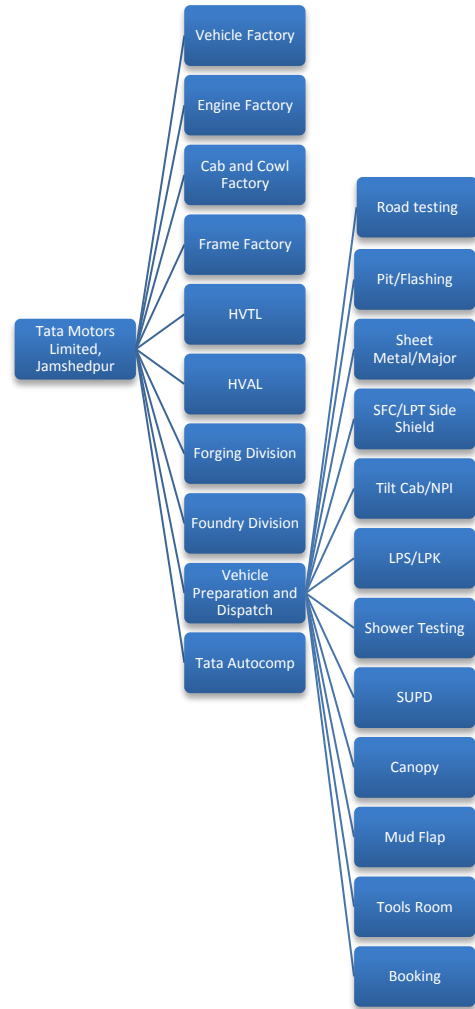


Fig 3: Layout showing different divisions of Tata Motors Ltd. (source: Tata Motors Manual 2010)

A. Vehicle Preparation and Vehicle Despatch Area

After the vehicles roll out from the Assembly Line, they reach the Dynamometer Testing Area for dynamo test which is followed by a Road Test. The Road Test is done in the circuit next to Vehicle Preparation and Vehicle Despatch (VPVD) Area. This circuit is specially designed with various hurdles which a vehicle faces on road condition. The drivers of road

testing are specifically trained for testing because not only do they have to drive but they also have to keep a track of problems which occur while testing the vehicle.

When the vehicle come to VPVD, it enters the PIT where self-inspection takes place and the checklist prepared for the PIT Area is evaluated. From the PIT, vehicles of different models are sent to their respective sheds where all the final inspection, rectification, replacement and respective models value addition works take place.

The Vehicle Despatch Area is quite chaotic because in the Vehicle Despatch Area more of multi skilled workers are appointed who knows about the vehicle very well and are thorough with their parts in & out.

VPVD is divided into various areas depending upon their functions (Refer Fig. 4). The areas are Road testing, Shower test, Pit, Sheet Metal, Export, Aggregate, Army, Side Shield, LPS/LPK, Tilt Cab, Coupling, Booking, SUPD, Spray Suppressor Area, Canopy, Hydra Kit Area.

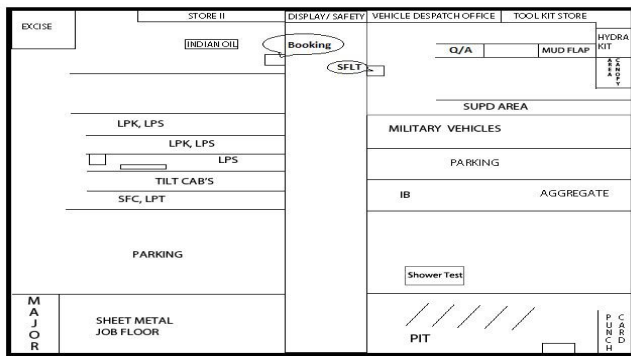


Fig.4: layout of vehicle preparation and vehicle despatch (source: tata motors manual)

A sample audit checklist for the vehicles is shown below:-

- Safety details are posted at SQDCM board and reflects accurately all of the PPE required in that area. Check for the display and operator understanding of the Emergency Evacuation route; storage condition of emergency devices like Fire Hydrant.
- People inside line are wearing required PPE and mutilated protection requirements.
- List all hazardous material, MSDS available and displayed. All hazardous materials labelled and protected.
- The operator performs TPM/JH check correctly and regularly.
- Check all critical operation performed in team by operator are correct, recorded in QCOS sheet and no quality spill to next process.
- Check WIS element for that operations (2 cycles) and ensure operator performs that operations as per standards.

- Operators work following quality standards and perform quality check and record it.
- All required tools are calibrated (check tool calibration date, no tool which has passed the expiration date should be found in the work area). Calibration status of the tools used on the station to be displayed.
- List of all error proofing devices available and method to check is functioning properly, check the checksheet.
- Supervisor review and update team board/Action plan for the previous day- safety, quality, etc issues.
- Materials are properly labelled and timely moved to the rejection area and rejection records are updated in sheets.
- Operators work in FPS (or cycles) and use ANDON to communicate problems.
- Check for grease/oil/water spillage in area and if found, correct it.
- Area should be arranged, maintained, clean, properly labelled, things kept at right places without any major concerns.

After studying the quality control processes at the vehicle dispatch section, Fishbone diagrams was prepared for the military, tilt cab and export vehicles showing their various auditing systems.

For the Military trucks at the vehicle dispatch, the process was studied and steps were taken to reduce the repetitive steps of auditing and hence simplify the process. The proposed modifications are that the Pit audit may be conducted only once, QA should be checked only once, Quality check and rectification should be done side by side, Repetion of audits should be reduced. The Fishbone diagram for the Military vehicles is shown below (Figure 5).

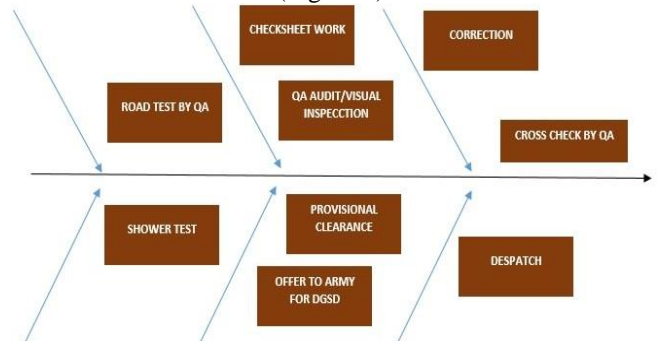


Fig 5: Fishbone Diagram for Military Vehicles at Vehicle Dispatch Section.

For the Export Vehicles at Vehicle dispatch, the process of vehicle preparation was studied and steps were taken to reduce the repetitive steps of auditing and hence simplify the process. The proposed modifications are that Pit audit may be conducted only once, QA should be checked only once, Quality check and rectification should be done side by side, Repetion of audits should be reduced. The Fishbone diagram for the Export vehicles is shown below (Figure 6).

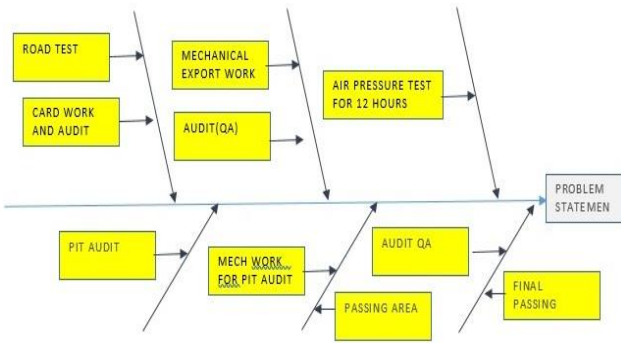


Fig 6: Fishbone Diagram for Export vehicles at Vehicle Dispatch Section.

For the Tilt Cab Vehicles at Vehicle dispatch, the process of vehicle preparation was studied and steps were taken to reduce the repetitive steps of auditing and hence simplify the process. The proposed modifications are that Pit audit may be conducted only once, QA should check only once, Quality check and rectification should be done side by side, Repetition of audits should be reduced. The Fishbone diagram for the Tilt Cab vehicles is shown below (Figure 7).

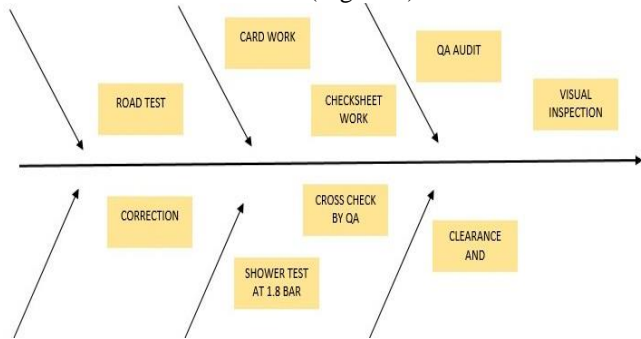


Fig 7: Fishbone diagram for Tilt Cab Vehicles at Vehicle Dispatch Section.

**PROPOSED CHECKSHEET FOR TILT CABS:-**

1	RHS turning circle less.
2	Exhaust gas leakage from silencer first pipe joint.
3	Extra clamp on RHS long member near radiator dumbbell to be removed.
4	Additional footrest to be fitted.
5	Decal to be pasted.
6	Radiator bottom hose fouling with fan shroud ring.
7	Hydraulic pipe clamp loose near 2nd cross member.
8	Clutch pipe fouling with rear cab mtg bkt.
9	Dovetail not aligned with cab locating hole.
10	Gear lift lever base plate not sealed properly.
11	TC to IC pipe-less gap with bottom channel.
12	Wiring harness tail fouling with its mtg bkt.
13	Clutch booster pipe fouling with its mtg bkt.
14	Air pressure gauge pipe above the brake pedal to be tied.
15	Hydraulic tilt cab pipe fouling with air intake pipe.
16	Air filter snorkel misaligned.
17	fail safe brake elbow to be fitted to prevent kink formation.
18	Less oil in hydraulic tilt pump.
19	Less gap between damper and fan ring mtg bolt.
20	Electric cable hanging over propeller shaft near 3rd cross member.
21	Exhaust pipe fouling with 2nd cross member.
22	Make up pipe fouling with intercooler.

**PROPOSED CHECKSHEET FOR MILITARY VEHICLES:-**

1	Steering wheel alignment to be checked
2	Air pressure leakage point to be checked.
3	Hydraulic tank oil level to be checked.
4	Accelerator Pedal high.
5	Engine brake not functioning.
6	Coolant rubber hose fouling with steering box
7	Rear brake hose fouling with RHS shock absorber
8	Rear 6 dia brake fluid pipe very close to RHS absorber.
9	Gear box speedo drive shaft not fitted.
10	Clutch and brake free play and reaction weak to be checked.
11	Clutch fork rubber boot not seated.
12	Rear shock absorber fouling with axle tube.
13	PTO functioning to be checked.
14	Both side door mismatch.
15	Middle seat hinge bolt loose.
16	Co-driver seat and mat not provided.
17	Engine hood wrong.
18	Wiring diagram and lubrication chart not provided.
19	Mud flap rubber not fitted.
20	Main Cable to be clamped on bkt. Near fuse box.
21	Black out systems to be checked.
22	All gauge should be of same make

**PROPOSED CHECKSHEET FOR EXPORT VEHICLE:-**

1	Air drain valve at correct location.
2	Inner air tank drian plug centre out.
3	silencer muffler joint not seated and shifted at stopper point.
4	coolent leakage-heater motor bottom hose clip lose
5	Headlamp setting wrong/ mtg screw loose.
6	RUPD support bkt bolt missing.
7	Rust in various locations.
8	B/S front mud guard mtg stayrod rubber cap missing
9	Gear lever check nut loose.
10	Cabin supporting rod top side pin missing.
11	Intercooler to inlet manifold hose clip missing and hose dislodged.
12	Electrical wiring open/cable hanging.
13	Power steering pipe fouling with air intake pipe
14	Instrument panel mtg.screw lose
15	magazine pocket rack
16	Search tank bottom hose/vent tube hose leakage
17	Tail lamp cover crack/ door pad crack
18	Mad flap nut bolt missing/ nylon nut to be fitted.
19	Clutch container cover missing.
20	Auxillary tank chain missing
21	Auxillary tank rubber strap dislodged.

These proposed checksheets were made after extensive study of the vehicle preparation process. The Vehicle Despatch Area is quite chaotic because in the Vehicle Despatch Area more of multi skilled workers are appointed who knows about the vehicle very well and are thorough with their parts in & out. When the vehicle come to VPVD ( Vehicle Preparation and Vehicle Dispatch) , it enters the PIT where self-inspection takes place and the checklist prepared for the PIT Area is evaluated. From the PIT, vehicles of different models are sent to their respective sheds where all the final inspection, rectification, replacement and respective models value addition works take place.

**V. CONCLUSION**

Tata Motors has always been known for its values and its commitment to quality. Tata Motors has undertaken the project of implementing World Class Quality in its manufacturing system inspite of the already present quality control practices. With increasing globalization, companies are relying on the principles of TQM to meet the current market demands. Quality can simply be defined as the degree upto which a product satisfies the needs of the potential customers. Total Quality Management helps to increase the productivity of an organization. The organization under study is Tata Motors which is known for its values and quality assurance practices. The process of preparation of Export vehicles, Military vehicles and Tilt Cab vehicles under

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Vehicle Dispatch section were studied and its various quality management and auditing processes are accessed. Tata Motors is committed to improving the quality of life of communities by working on four thrust areas - employability, education, health and environment. The Total Quality Management practices were studied in the industry and few checksheet modifications were proposed.



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