

# 11th D. L. SHAH Memorial Lecture “Quality First” to “Deming Prize” Journey at L&T’s ESP Business

## Organization profile

L&T Electrical & Automation (E&A) is a major business portfolio of USD 15 billion Larsen & Toubro (L&T), an Indian multinational engaged in technology, engineering, construction, manufacturing and financial services. The E&A business comprises two Strategic Business Groups (SBGs) – Products SBG and Projects SBG offering a wide range of low and medium voltage switchgear, electrical systems, marine switchgear, industrial and building automation solutions, energy management systems and metering solutions. Its products and solutions cater to a variety of segments like industries, utilities, infrastructure, building and agriculture. Products SBG comprises Electrical Standard Products (ESP) and Metering & Protection Systems SBUs.

This is the story of the ESP SBU's journey to Deming Prize. ESP SBU contributes 48% of the Sales and 74% of PBIT of E&A business. Its manufacturing facilities are located at Mahape (Navi Mumbai), Ahmednagar and Vadodara. All these Plants are 5S certified and zero liquid discharge.



## Pre 2011

ESP SBU is a market leader in LV Switchgear in India. It had already embarked on the Business Excellence Journey. As a testimony to its efforts, it received the Frost & Sullivan - IMEA Platinum award in 2008, RBNQA (Ramakrishna Bajaj National Quality Award) in 2009 and GPNQA (Golden Peacock National Quality Award) in 2010. Each experience enhanced internal processes within their Organization.

As an organization, they were facing fierce competition from MNCs, significant increase in Customer choices and Pressure on product quality. Their own internal evaluation revealed the following issues with their TQM model:

- Imbalanced PQCDMS with higher priority on Productivity
- Quality KPIs were not deployed across the full value chain
- Measurements were reported in %
- Monitoring and review not well structured.

To address the above deficiencies, the Business rewrote their Quality Mission to focus on reducing customer complaints and producing zero defects. **Management empowered them by saying that they were Customers' representatives within the business and should initiate programs to benefit all stakeholders.**



**Sandeep D. Mahajan**  
General Manager – Quality,  
Engineering, Strategic Sourcing,  
TQM

Larsen & Toubro Limited  
Electrical Standard Products,  
Electrical & Automation IC

## Phase 1 (2011-13)

Their journey to achieve their new quality mission began under the guidance of Mr. Basudev Banerjee. Some of the key initiatives during this phase were:

- Mapping of KPIs across full manufacturing Chain
  - Incoming rejection reduction
  - FTY, RTY Improvement
  - Customer DPM reduction
- Compliance to Procedures
- MET, APQP, CAPA
- Build capability through
  - Training
  - Hiring Experts
- Supplier Quality Programs
- Automation & Poka-yoke
- FMEA
- Innovations  
Standard Operating Procedures (SOPs).

To provide the next level of impetus to Quality improvement efforts, Mr Banerjee advised them to learn Daily Work Management (DWM), adopt structured TQM approach and prepare to challenge Deming Prize.

## Phase 2 (2013-15)

Their guide for Phase 2 was Mahindra Institute of Quality (MIQ). The focus now shifted to:

- Daily Work Management
- Management Points (MP)- Control Points (CP) Policy deployment
- Creating TQM Champions through PGDQM course of MIQ
- Implementing QC Story - the Japanese Way of Problem Solving
- Priority for Quality as a way of life on Shop Floor
- QC Circle start up
- Strategic Initiative - Roadmap for taking Field Quality Levels to 5 Sigma.

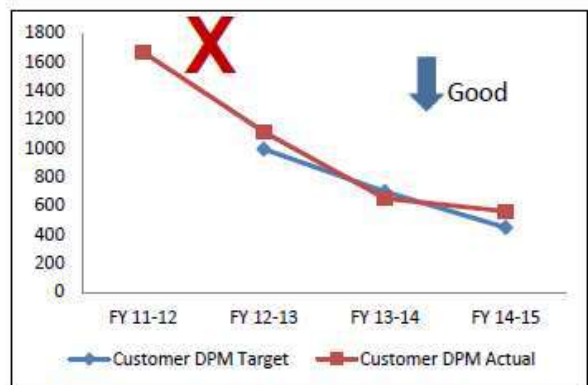
The SBU Head started participating in Monthly Quality reviews which **focused not only on review of performance but also on solving problems**. The Quality Function was reorganised for focused factory-specific QA and QC activities. Information Technology was utilised for timely and accurate reporting of On-Line Daily FTY (First Time Yield on production Line) and Parking of Pre-Delivery Inspection report by Suppliers along with Challan / Invoice in SAP Portal. SOPs were created for DWM implementation. QC Story, Low Cost automation and Poka-Yoke

implemented for getting In-Process Quality First Time Right.

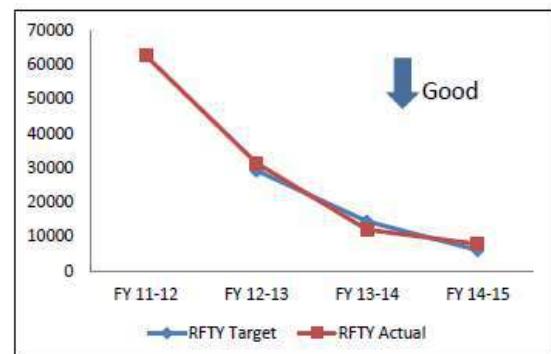
Field Complaints data were captured by Service Engineer in SAP CRM for analysis and prevention. Reliability of products was improved by introducing Robustness test and Electronics was brought under the reliability umbrella. **All known problems across Products were resolved.**

The results were impressive. Customer DPM reduced from 1200 to 600. Incoming Rejection DPM reduced from 30000 to less than 10000.

### INCOMING REJECTION



### CUSTOMER DPM



There were a few issues still to be ironed out:

- Voice of Customer not being captured
- Mechanism to validate products for robustness was inadequate
- Supply chain is not stable & reliable
- Variability in manufacturing.

The way forward was to engage a Japanese Sensei and focus on quality for 2 years and then challenge Deming Prize in 2017-18.

### Phase 3 (2015-17)

They started working under the guidance of Japanese Sensei. **Feedback loops were created across value chain functions to encourage teamwork and involvement.** The New Product Development team and Sales/ Marketing teams were involved. They started carrying out WIN/LOSS analysis and revamped the VOC process. MP-CP and PDCA were deployed organisation-wide to include HR, IT and Finance functions as well.

Complaint Stratification was carried out to define resolution mechanisms. Channel Partners were recognized as important stakeholders and Channel Partner Engagement program was implemented. Reliability testing and audits were further strengthened.

Product lines were graded based on In-process quality DPM to Red, Orange, Green, Green-Green.

### Four Student Model Applied To Deployment

|                    |                       | Target Achievement   |  |
|--------------------|-----------------------|--|--|
|                    |                       | Target Achieved  | Target Not Achieved  |
| Process Completion | Process Completed     | <b>Student A</b><br>Process Completed<br>Target Achieved     | <b>Student C</b><br>Process Completed<br>Target not Achieved     |
|                    | Process not Completed | <b>Student B</b><br>Process not Completed<br>Target Achieved | <b>Student D</b><br>Process not Completed<br>Target not Achieved |

The concept of T-matrix was introduced. **The objective of T-matrix is to push defect detection as close to where it is created.**

Widespread training was initiated to create awareness about PDCA and MP-CP. A unique feature of the training was Gurukul. **Gurukul was a dexterity school for Operators, especially contract employees, thereby engaging another key contributor to product quality.**



GURUKUL

TQM Diagnosis was carried out by JUSE in Nov 2017 and the report was received in Feb 2018. The next step was to act on the TQM Diagnosis Report with a view to challenge Deming Prize in 2019.

### Phase 4 (2018-19)

The policy deployment process was further strengthened by a complete alignment of the organization with business goals. The classic Four Student Model (FSM) was used to analyse weaknesses in policy deployment.

ESP believes that business is about **Win4 – win for Channel Partners, Suppliers, Customers and Employees.** Hence, satisfaction surveys of all these key stakeholders were initiated as part of the VOC process.

Total Productive Maintenance (TPM) was introduced within the TQM umbrella. Quality Circles were established at both permanent and contractual employee levels. This increased the employee participation from 51% in 2017 to 94% in 2018.

Organisation-wide SOPs were created and DWM was deployed across non-manufacturing activities as well. New Cost management technique Material Flow Cost Analysis (MCFA) was implemented. **The DWM process was improved by adding maturity levels. This was appreciated by the Japanese Sensei as a unique feature.**

**Channel Partner Engagement program was appreciated as a unique feature by the Japanese audit team.** This included Young Leaders Program where training was provided to the children and wife of Channel Partners to handle channel business.

### Results & Reward

Results were seen across Customer, Business Goals, New Products, Operations and Employee KPIs. **However, the crowning glory moment came when L&T's ESP business was awarded the Deming Prize in 2019.**

JUSE's key reasons for awarding L&T ESP business were **Improved Customer Satisfaction and Business Performance through Sound Business Planning, Company-wide Systematic Approach, Customer-Oriented Product Development and Participative Management.**

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# 11th D. L. Shah Memorial Lecture Learning Points

Compiled by Mr. B. Banerjee

Summary of learning points of 11th Shree D. L. Shah memorial lecture by Mr. S. D. Mahajan - GM, Quality Engineering, Strategic Sourcing and TQM at EAIC held at Hall of Harmony , Nehru Center, Worli-Mumbai on Saturday 22<sup>nd</sup> February 2020.

## 1. Introduction:

Mr. S. D. Mahajan narrated L&T's ESP division's Deming relentless journey over the past seven years leading them to acquiring prestigious Deming Prize. He titled his talk as “Quality First “to “Deming Prize”- Journey at L&T's ESP Business. He structured his talk in three phases.

First Phase was their acquiring IMC-RBNQA which is Indian equivalent of MBNQA of USA under the guidance of Mr. Basudev Banerjee. Decision to pursue Deming Prize towards building organization wide Total Quality Management (TQM) culture was subsequently taken.

It started with getting an overview of Deming Application Prize (DAP), trainings were imparted by Mr. Banerjee at various levels on 7 basic QC tools coupled with Root cause analysis, target oriented technical training (TOTT), 5S, SHE, JH & VM, SPC & FMEA, NGT and revitalization of Quality Circles and Kaizen activities.

Second phase during 2014 to 2016 comprised their TQM journey in collaboration with Mahindra Institute of Quality, Pune. This bolstered TQM philosophy at all locations of ESP.

Third phase during 2017 to 2019 focused on Deming journey in its letter as well as in spirits under the guidance of Japanese Sensei Dr. Shu Yamada which culminated in their receiving Deming Prize in 2019.

Currently they are working under another Japanese Sensei Dr. Kubota particularly in the areas of TPM and TPS.

## 2. Learning points:

Mr. Mahajan's 100 minutes structured talk was attended by 120 plus quality professionals. This was followed by 20 minutes Question/Answer session coupled with summary of learning points. Highlights on generic as well as company specific learning points are summarized hereunder:

2.1 Normally TPM protagonists advocate PQCDMSM (Productivity, Quality, Cost, Delivery, Safety, Morale or Motivation) theme with Productivity at the top of agenda. In contrast, Deming journey strongly believes in “Quality” first. According to them, once both Product and Service Quality are in place the rest is bound to follow.

2.2 Change of mindset from defect percentage to defects per million (DPM) was another challenge.

Since this was prerequisite of Deming Prize toward customer satisfaction, top management exhibits customer centricity by making it mandatory at all units of ESP.

2.3 As is well known, one of the basic drawbacks of Brain Storming (BS) which is age old popular root cause analysis is lack of quantification of various ideas. This hinders prioritization. In contrast, NGT (Nominal Group Technique), apart from intuition, judgment, feel & experience emphasizes more on quantification through back up data on actual trials, similar problem tackled elsewhere, Google search etc... Mr. Banerjee conducted number of sessions on NGT for various levels of personnel and personally guided technical groups in tackling number of chronic quality problems.

2.4 While NGT helped in prioritization of probable causes, real root cause(s) were found using Why—Verify—Why analysis.

Differential Diagnosis technique popularly known as Kepner—Tregoe or K—T method was another powerful tool which was used as RRCA (relentless root cause analysis) technique to trace root cause off certain major customer complaints.

2.5 Target Oriented Technical Training (TOTT) for fitters, operators, maintenance personnel and similar other operating people (actual doers) was another “Building Block” toward building quality into the product. These programs were conducted mostly by respective departmental heads. Towards standardization, course manuals & videos were developed for each trade.

2.6 Use of T-Matrix helped in detecting defects to their origin. This quick feed helped in defect prevention.

2.7 Training in seven QC tools such as Stratification, Check sheet or Data sheet, Pareto analysis, Ishikawa diagram, Histogram, Control charts and Scatter diagram were taught to supervisors and even to workers (in Hindi/Marathi). This helped in success of number of SGIAs (Small Group Improvement Activities) such as Quality Circles and Kaizen activities.

2.8 They were also exposed to 5S, SHE (safety, health and environment), JH (Jishu Hozen or Autonomous Maintenance) and VM (Visual Management).

Their religious implementation and periodic audit by Mr. Banerjee really helped them in drastic improvement of their Housekeeping. Now all their three ESP units are 5S certified. In fact, Mr. Banerjee's audit popularly known as GMP (Good Manufacturing Practices) Audit included ISO systems as well.

2.9 Mr. Mahajan proudly announced that they have been able to extend the application of seven QC tools and 5S & SGIA concepts to their 700 channel partners. In fact, this was well appreciated by JUSE Assessors.

2.10 Suppliers were graded in 5 fronts and radar chart was developed for all major suppliers. In addition, “Quality Award “was instituted for healthy competition amongst them.

2.11 To improve inherent quality of input materials and subassemblies, apart from guiding them in effective process controls, a Leadership program was organized for a group of 35 young generation of channel partners, who were sons/daughters of loyalists doing business with them for over 30 years. This helped in building long term cordial relationship as well.

2.12 “Gurukul” concept was even extended to “Green –Green” suppliers who willingly adopted “Zero Defect” philosophy.

2.13 Another feather in their cap was NPI% (new product intensity percent) which is percentage of sales from new products developed by their Indian Research Team without any foreign collaboration. This is commendable.

2.14 For in process control, control charts were maintained on all process CTQ (Critical to Quality) parameters which helped operators & supervisors to take appropriate action. This “first time right philosophy” pushed up FTY (First Time Yield) to over 95% for number of products.

2.15 Daily work management (DWM) through MP/CP (Managing points and Checking points) methodology along with structured reviews even at Business Head level provided real boost to productivity as well as quality.

2.16 Though initially the entire quality improvement journey started in Manufacturing, gradually with top management involvement it got extended to Design, Marketing, Sales, Logistics, HR, Administration and all other Service functions. Dr. Yamada's advice was “Follow-Follow-Follow” all validated Systems, SOPs (standard operating procedures) and SOCs (standard operating conditions) particularly on process CTQs like Temperature, Pressure etc.

2.17 Religious implementation of 5S and basics of Jishu Hozen namely Cleaning, Oiling, Tightening and Straightening (COTS) steps helped the organization achieve 85% OEE (overall equipment efficiency) on 7 A category machines.

Dr.Kobota, who is an expert in TPM area is personally spearheading this initiative now and wants ESP to shortly go for TPM Award from JIPM.

2.18 PDCA (Plan- Do-Check-Act) cycle was followed in tackling many improvement projects in QPCDSM areas. In certain cases, this cycle was rotated more than once.

2.19 Voice of Process (Process Capability = 6 Sigma) was compared with Voice of Customer (Tolerance  $T = U - L$ ) on important product quality characteristics which helped them in “Economic Centering” for efficient & effective process control.

2.20 Significant reduction in attrition & absenteeism and hundred percent employees participating in Kaizen or Quality Circles amply demonstrate high level of employee satisfaction.

2.21 Managers and senior supervisors were exposed to various advanced Statistical and Analytical tools like DoE (Design of Experiments), Six Sigma, Simple & Multiple Regression analysis, FMEA (Failure Mode and Effect Analysis),

Tests of Hypotheses, VSM, VE, BM etc. They were made use of by CFTs (Cross Functional Teams) comprising Design, Quality and Production engineers for solving major quality & productivity problems. Similarly, cross functional teams of Service functions like Marketing, HR, Accounts, SCM tackled their respective long pending issues.

2.22 Managers and Supervisors made extensive use of IT services which helped them in agility at their various decision-making process.

2.23 When asked about Cost—Benefit analysis of this noble venture, Mr. Mahajan clarified that their direct cost itself over past five years was about Rs 600 lakhs. Benefits accrued in various fronts. Tangible ones being:

- Drastic reduction in rejections and reworks.
- 90% reduction in customer complaints and product returns.
- Substantial improvement in productivity. As already pointed out OEE on critical machines crossed 85% mark which is the world standard.
- Accidents & incidents came down to one tenth of their previous average.
- Over 98% adherence to on time in full (OTIF) delivery.

Significant cost reduction in Inventory and in SCM (supply chain management) areas. The tangible benefits themselves far outweighed total costs.

Intangible benefits included:

- Improvement in team working
- Improved employee satisfaction level as already pointed out
- A neat and safe work environment
- Cordial relationship with channel partners
- Greater satisfaction level of customers and
- Spread of organization wide quality culture.

2.24 Mr.Mahajan concluded his talk by highlighting ESP's contribution to CSR activities in areas of Education. Environment and Health care sectors.

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# 11th D. L. Shah Memorial Lecture SNAPSHOTS



Mr. Santosh Khadagade, President, NCQM introducing the speaker



Mr. Mahesh Gandhi, Trustee, NCQM welcoming Mr. Sandeep Mahajan



Mr. H. K. Taneja, Trustee, D L Shah Trust and Mr. Sandeep Mahajan garlanding portrait of Shri D. L. Shah L-R Mr. Santosh Khadagade, Mr. Mahesh V. Gandhi and Mr. Khushroo Khambata



Mr. Mahesh V. Gandhi briefing NCQM's activities & achievements to the audience



Mr. H. K. Taneja briefing activities of D. L. Shah Trust to the audience



Mr. Sandeep Mahajan delivering his lecture



A section of the large audience



Question / Answer session in progress



Mr. Taneja presenting a silver plaque to Mr. Sandeep Mahajan L-R Mr. Mahesh Gandhi, Mr. B. Banerjee, Mr. Khushroo Khambata and Mr. Santosh Khadagade



Mr. Aravind Ghaisas, Hon. Secretary, NCQM proposing vote of thanks



Dignitaries on the dais L-R Mr. Santosh Khadagade, Mr. B. Banerjee, Mr. Navin Dedhia, Dr. H. M. Mehta, Mr. Mahesh V. Gandhi, Mr. Sandeep Mahajan, Mr. H. K. Taneja, Mr. Khushroo Khambata, Mr. Ashok Kurup, and Mr. Aravind Ghaisas