

TQM in Technology and Engineering Developments in Pulp and Paper Industries : Research and Testing

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ABSTRACT

The widespread quality concepts culminating to Total Quality Management (TQM) in the international scene and commencement of efforts for achieving ISO-9000 series of Certificates in Indian industries, have been highlighted. The concepts of Quality and TQM from the literature have been cited. Measurement as yardstick, appropriate decision making, effects of motivation and demotivation, quality vaccines, quality Improvement programme for accomplishment of TQM in industries are explained.

Appropriate TQM techniques for R and D, testing and calibration have been discussed^{1,2}. Performance impression on R & D organizations in the country and corresponding remedial measures are discussed. General requirements and some tips to achieve accreditation in testing and calibration, have been given.

Introduction :

It is forecasted that by the end of 2000 AD, all the major pulp and paper Industries in USA, Japan and Europe will obtain ISO-9000 Certificates through adaptation of TQM or equivalent systems^{3,4}. The waves of TQM and ISO-9000 Certificate are bound to appear in Indian pulp and paper industries sooner or later^{5,8}. The concept of Total Quality Management system was evolved initially (1950s and 1960s) in Japan⁹ and then in USA for overall benefit of industries,^{9,13} but it has become a prerequisite today for attaining ISO-9000 Certificate.^{4,14} While notion of TQM is spreading fast; improvisations and modifications are also taking place.^{15,23}

After analysing reasons for success for a number of international concerns,³⁵ the concept of "Total Quality Improvement Programmes (TQI)" has been recently evoked. This programme conceives the Quality System not only to be concerning the Management but "something that involves everybody all of the time".

Concepts of Total Quality Management (TQM) and Quality :

Quality

Quality is the totality of features and characteristics of a product or a service that bears its ability to satisfy a given necessity.

- “Doing the right thing
Doing in right the first time
Doing it in time
Meeting customer's expectations and needs”

TQM

- “It is a dynamic process involving all levels in an organization to promote never ending improvement in effectiveness and efficiency of all elements of a business”.
- “It is not only products, processes or customers but the whole gamut of organizational activities. It is the system for long term continuous improvement”
- “TQM system aims at managing processes for long term continuous improvement, rather than short term gains”.

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Measurement as yardstick for TQM

Its implementation requires customer—focussed understanding with new roles of :

Measurement
Team work
Leadership and
Processes.

The organization remaining the same, it calls for a cultural change. The key to continuous quality improvement is managing processes for which the yardstick is Measurement. Measurement is the foundation of a successful quality system both technical and human aspects of the organization

The two ways for developing measurements are (1) Informal approach and (2) Formal approach.

In the informal approach, the question to be put to oneself is "How do I know that we are doing a good job?". In the formal method, it can be accompanied following to : (1) Selecting one process to be measured, (2) Identifying the customer for the measurement, (3) Defining the target characteristics, (4) Finding a usable indicator and (5) Doing a quality check. (Fig 1)

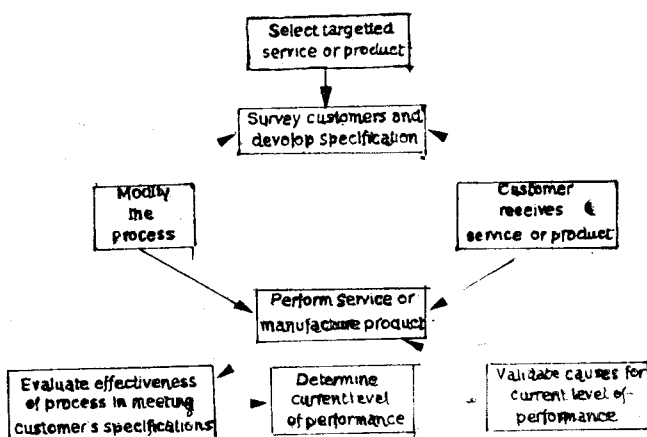


Fig. 1 Model of key activities

In the manufacturing process, it can be : Equipment, Count of errors—activity or output and rating based on defined criteria.

Same can be applied to services including technical divisions.

Appropriate Decisions for TQM :

Decisions made on consensus is reported to be very effective in quality management system. A formula is given as :

Effective Consensus Process X Skills & Knowledge
X Motivation = Effective decisions

Creation of a Natural Management Team is considered to avoid confusion and keeps boundaries for each department which smoothens running of TQM system.

Demotivation- A negative approach for TQM :

Inoculating Quality requires firstly elimination of elements of "Demotivation"—sayings such as :

- Don't make waves
- No one knows what is going on
- You don't know anything
- There is no one bothered about quality.

Quality Vaccine — Quality Improvement Programmes

Quality Vaccine is to be injected so as to produce effect of Determination, Education and Implementation. The determination should be "it is better to be rich and healthy rather than poor and sick".

TQM for R & D Testing and Calibration :

TQM system for Research and Testing Laboratories has been existing in a passive way with Quality Control but

1. It lacks in having a formal Quality Manual and
2. System to which the organization is rigidly adhered.

Indian laboratories can meet the expectations and satisfaction of industries more efficiently by following to TQM systems.

Unlike Universities, industrially oriented laboratories need to have systems so as to generate works which should be :

14 steps of Quality Improvement Programme has been indicated (Table 1).

The cause and effect diagram should be framed for initiating and TQM system along with pareto-diagrams.

Table 1:14 steps of Quality Improvement :

1. Management commitment
2. Quality improvement team
3. Measurement
4. Cost of Quality
5. Quality awareness
6. Corrective action
7. ZD planning
8. Employee education
9. ZD day
10. Goal setting
11. Error-cause removal
12. Recognition
13. Quality councils
14. Do it over again.

- 1 Time-bound
- 2 Result-oriented and
- 3 As per specifications of National or International Standards.

TQM for Research :

The innovation Investment Curve for R & D is shown in Fig 2. The different stages for an original research project are :

- (I) Basic Research (II) Applied Research (III) Development (IV) Production start-up.

Structuring of technovation problem³⁴ can be in various ways such as :

- Morphological Matrix Analysis
- Rlevance Tree Analysis
- Problem State Space Method
- Knowledge Classification Matrix
- Network of Information and
- Sequence Specification Procedure.

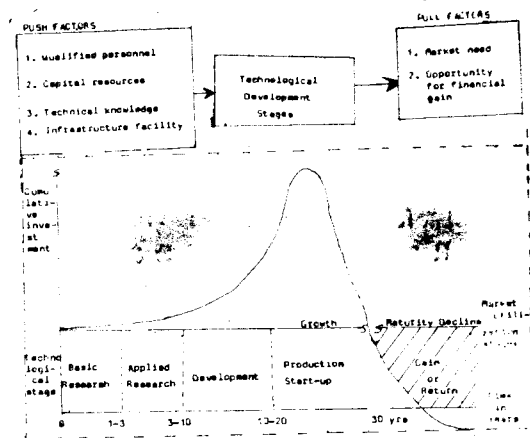


Fig. 2 The Innovation Investment Curve.

In India, specially in industrially oriented research establishments, rarely stage I and sometime even II are carried out while in Universities and some CSIR laboratories, Stage III and IV rarely take place as a result of which India has failed to generate original technologies.

The TQM system, applicable to laboratories in India, therefore has to be not only different from that in an industry but it requires to be reframed.

- a) Interproficiency testing
- b) Interlaboratory R & D collaboration
- c) Interactions with laboratories of industries, other than the pulp and paper
- d) International exchange with laboratories of other countries, such as PAPRICAN, APPM, PIRA, PAPRO etc.

The various steps taken to remove these hurdles to measurable extent are :

- 1 Flat-type organizational structure rather than pyramidal type.
- 2 Intensive training programmes.
- 3 Motivation lectures.
- 4 Strict supervision.
- 5 Proper utilisation of budget.
- 6 Close coordination with industry.
- 7 Collaboration with national laboratories.
- 8 Interaction with international laboratories.

9 Interaction with industries other than pulp and paper.

R&D Imperatives :

Formulatives of well defined R & D imperatives is an absolute prerequisite for planning of R & D. Technological forecasting is an efficient tool for defining the R & D imperatives R & D on engineering technology developments relevant to Indian pulp and paper mills can be decided after.

- a) extensive literature survey with reference to technologies available abroad.
- b) analysis of existing technologies in the country
- c) technoeconomical feasibility
- d) R & D status of the country
- e) management policy on R & D
- f) resource availability
- g) possibility of absorption of technologies in industry.
- h) level of TQM system.

A formal approach to select research imperatives should start from the information system based on literature abstract service. Fig. 3-5 show the number of publications made in various fields of pulp and paper (collected from Journals) while Table 2 indicates the no. of publications in IPPTA journal. It can be seen that the number of publications in 1981-1992 (Fig. 3-5) in decreasing order is as follows :

1. Process and Quality Control
2. Pollution Control
3. Forestry
4. Energy
5. Management
6. Raw materials—Pulping—Bleaching
7. Engineering.

Performance Impression of R & D Organizations:

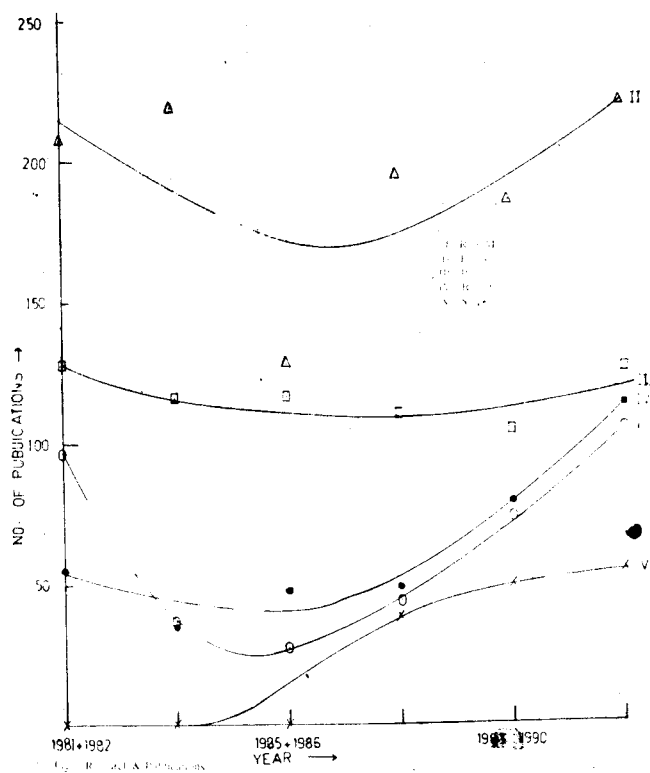
R & D organizations in the country have been the targets of criticism since a decade or more. Many national policies on Science and Technology have been

formulated to heal the organizational syndromes of research laboratories. Some of the common criticisms from various sides are schematised in Fig. 6.

TABLE 2
Total publications from 1981-1992

Sl. No	Subject	*International	**National
1.	Raw materials	384	62
2.	Forestry	1167	27
3.	Pulping	700	95
4.	Bleaching	378	28
5.	Stock preparation	144	30
6.	Paper making	916	32
7.	Recovery	252	67
8.	Finishing	547	14
9.	Quality control and process	1992	168
10.	Printing	62	9
11.	Pulp and paper manufacturing machine. & allied	69	40
12.	Management	1565	110
13.	Pollution control	2166	48
14.	Engineering	712	46
15.	Energy	2615	41

*Collected from 20 Journals including IPPTA Journal.
**Collected only from IPPTA Journal.



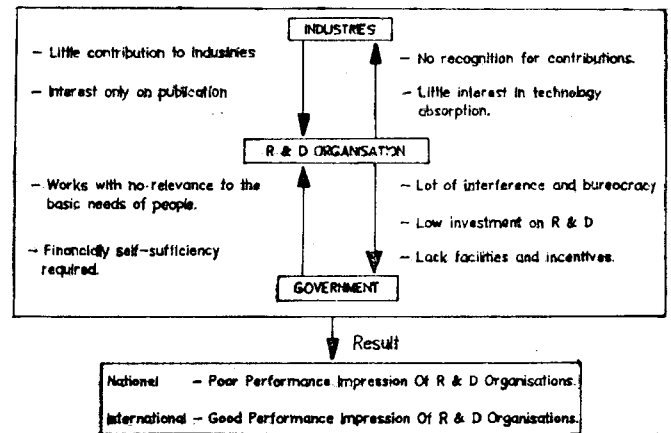
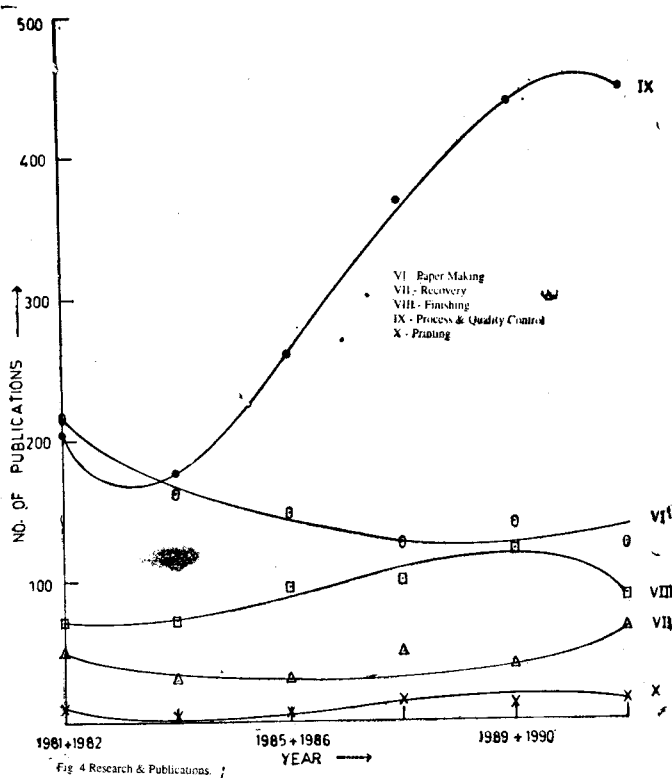


Fig 6 : Performance Impression Of R & D Organisations.

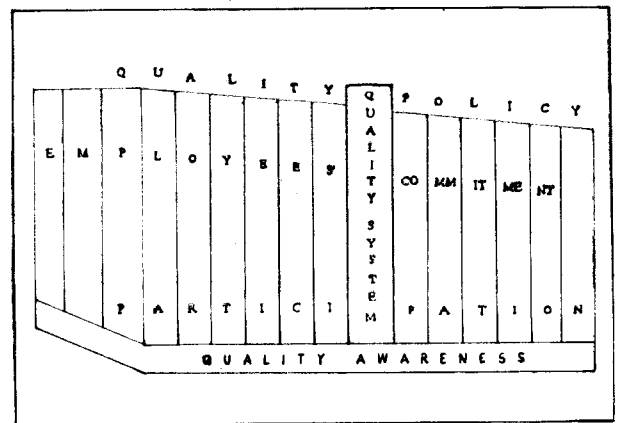
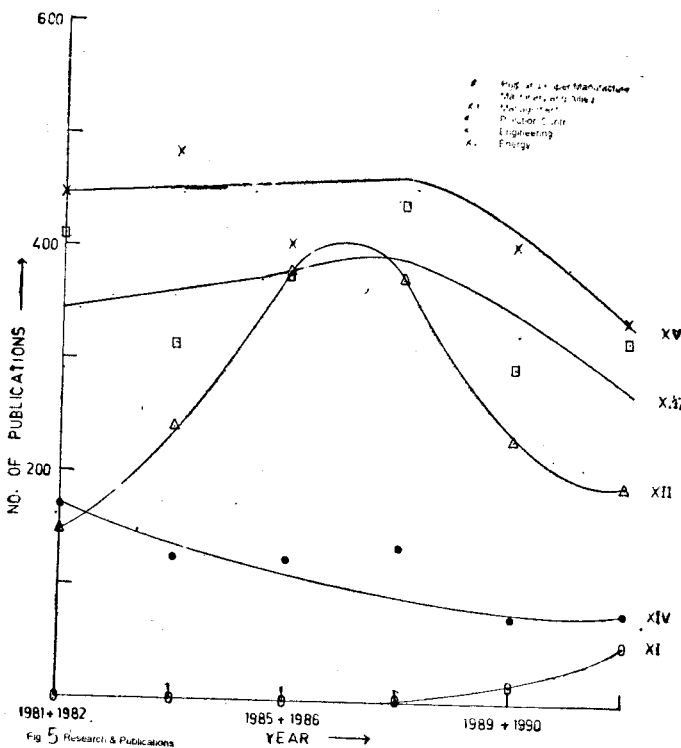


Fig 7 Elements of Total Quality Management



Appropriate TQM concept in R & D :

Considering the scheme in Fig. 2 and general concepts on TQM, TQM for R & D necessitates to be reframed. The system management calls for similar elements as in TQM to be imperative for R & D also (Fig. 7). The Quality Improvement Programme (QIP) can easily be commenced but difficult to be sustained and made progress further leading to excellence. The stages of QIP have been earmarked in Fig 8.

Motivation vaccines and informal approaches described previously are also equally applicable in R & D.

The scientists and overall management are to keep pace with the overall developments taking place in industries including manufacturing processes,

environment and general notion of quality. A general commitment philosophy for R & D organizations is shown in Fig. 9

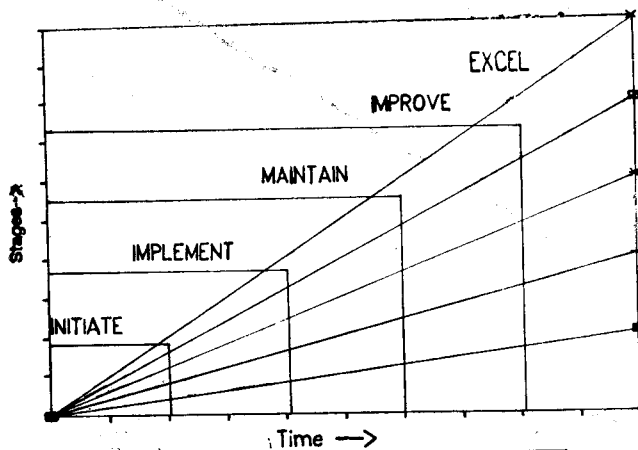


Fig.8 : Quality Improvement Programme (QIP)

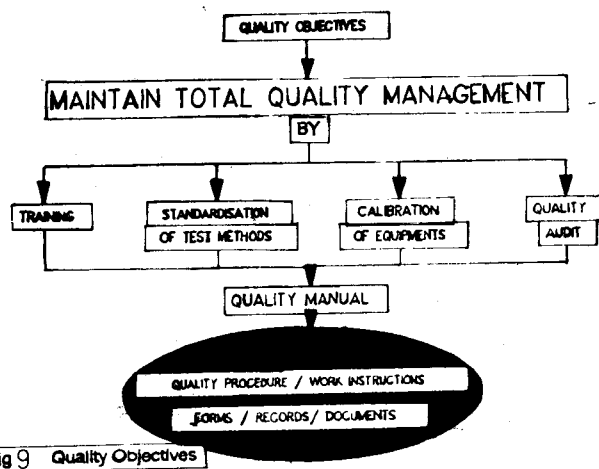


Fig 9 Quality Objectives

In view of the rapid progresses taking place around it is imperative that no effort should go astray; only result oriented projects should be undertaken with time bound programmes and having commercial viability. Each small result of the organization should be utilised either for internal report, publication, patent or a process leading to commercialisation. Such efforts can fulfil more than one objective for both scientists and industries as well. The potentiality of the existing scientists, inhouse facilities available and marketing opportunities of processes under development will bring in overall success in TQM for R & D organizations.

TQM for Testing and calibration :

All the quality concepts in industries revolve around Testing and Calibration. It is gradually being felt that introduction of ISO-9000 series has brought down rigorousness of these functions lacking in :

- technical competence and
- rigid adherence to quality systems.

An International Laboratory Organization, has recently come into existence to focus on above aspect and obliging introduction of separate accreditation systems for Testing and Calibration Laboratories.

NCTCF (National Co-Ordination for Testing and Calibration Facilities), Government of India had introduced an accreditation system which can be upgraded to the international accreditation through NABL (National Accreditation Board for Testing and Calibration Laboratories) equivalent to ISO Guide 25 and 38 (EN 45001). The obligation made in the later accreditation is preparation of a Quality Manual. This Quality Manual may not be far off from the manuals for ISO 9000 series required for industries.

The quality documents should contain elements as shown in Fig. In fact, before attempting to opt for Accreditation and commencing preparation of Quality Manual (Q.M), the various aspects which should have suitable levels are summarized in table-3. The typical R&D organizations having different functions (Fig 10, 11) can work more efficiently by following to TQM systems. The various stages required in preparation of Q M. are shown in Fig.12. With the industries orienting more and more towards quality systems, R&D as well testing and calibration functions will receive more and more focus in the coming years. TQM will be talked more on these inseparable elements of industries in the next decade along with the inherent Quality notions culminating to rigorous Quality Control of products.

TABLE-3
Minimum requirements for TQM and Quality Manual for Testing

Aspect	Level
1. Institute	: Legally identifiable.
2. Technical competence	: High.
3. Equipments	: Precise (National/International standard).
4. Testing Methods	: Traceability to National/Inter-national
5. Management	: Well defined policy, objectives and commitments
6. Organization	: Structure dispensing required responsibilities and authorities at all levels.
7. Calibration	: Systematised.
8. Review and Auditing	: Regularly made.
9. Records, Reports etc	Having standard procedures,
10. Involvement	: All departments including finance, administration, materials etc.
11. Customers	: Satisfaction to be met.

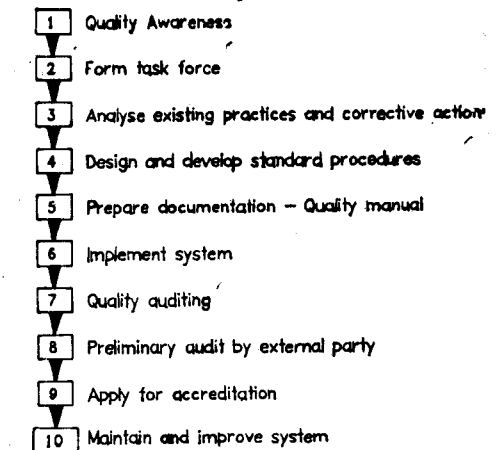
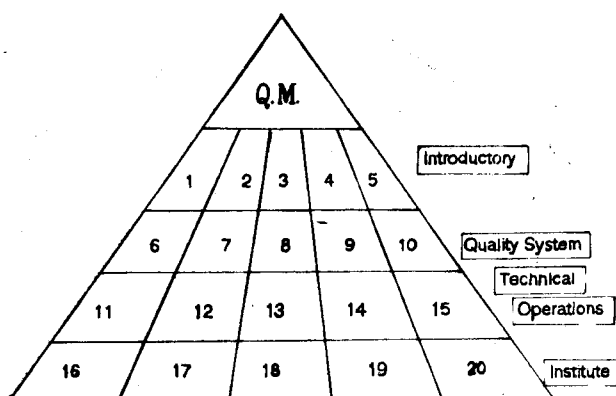
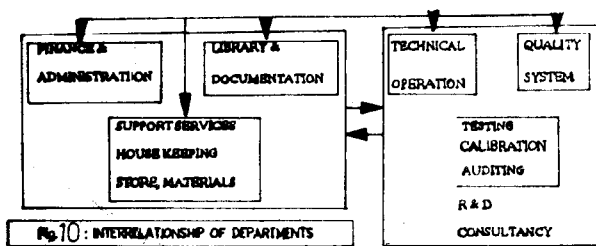


Fig 12 Stages for achieving accreditation

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