CONTROL SYSTEM MANUFACTURERS

The complete control systems for paper machine are being manufactured and supplied by a lot of engineering firms and some of them are listed below:

Accuray International, S.A.	Belgium
Baile (Controle)	France
Sentrol	Canada
Measurex International Corporation	U K
Foxboro	U K , United States
Lippke	West Germany
Digimatics	U K
Muller Barlieri AG	Switzerland
Taylor Instrument Companies (U K) Ltd	U K
Boyle Industrial Gauging Systems Limited	U K

CONCLUSION

Computer control in paper industry is well established in advanced countries like USA, Canada, UK, and Scandinavia. The controls described in this paper are of proven design and of practical interest to Paper Makers. The delay in the introduction of computer control in India has been probably due to the non-availability of dependable control equipments and shortage of trained manpower. At the present higher level of labour and input costs, installation of computer control systems, particularly in paper machines, is definitely advantageous to Indian Paper Mills. It may be pointed out here that even old machines can be easily modified to have computer control systems. It is hence suggested that speedy action may be taken by Paper Mills in India to derive economic benefits of computer control.

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Quality Control at West Coast Paper Mills

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SUMMARY

This paper deals with the working of the Quality Control (Q.C.) programme in West Coast Paper Mills. Quality Control objectives, set up and functioning are described. Gains from Q.C. work have been better dissemination of quality information, development of quality consciousness at all levels, development of standards for operation and products, improvement in quality and its uniformity. Q.C. cuts across all the lines of company activity and has assumed a dynamic role in achieving the corporate goals.

INTRODUCTION

Quality Control is an accepted and one of the most effective management aids of industry in general and more so of a chemical process industry such as pulp and paper. It is an effective system for integrating the quality development, quality maintenance and quality improvement efforts of the various groups in an organisation so as to enable production and service at the most economical levels which allow for full customer satisfaction. The

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main objective of any business enterprise is to produce products of acceptable quality and at the same time reduce the over-all costs. Quality Control system has established that it can accomplish this objective by its various tools, provided it is planned on a sound basis and placed properly in the organisation.

West Coast has an established quality control programme which it has been carrying out for the last 16 years. With limited staff a modest beginning was made in April 1963. A few persons were trained in the methodology of Quality Control and efforts to introduce the concept of quality control in the mill were initiated. When a few problems of our mill were referred to the Indian Society for Quality Control and their work started, it provided a boost to our endeavour. This gave to some extent, an opportunity for appreciation of the tools and techniques of quality control in practice and their application to the problems. First area of application was in the Paper Machine and later in Pulp Mill. Gradually, the methods were developed and Quality Control is now accepted as essential part of our production activity.

QUALITY CONTROL , OBJECTIVES AND SET-UP

The main objectives of Q.C. in our organisation are :

1. Development of quality consciousness among the production personnel.
2. Setting and maintaining product quality standards.
3. Prevention of rejects.
4. Segregation and salvaging the defective products in the most economic manner.
5. Control of process.
6. Dissemination of quality information in the organisation.
7. Rating of personnel regarding quality performance.
8. Product complaint analysis and customer service.

The Q.C. Programme of the mill is administered by Q.C. department which is placed directly under the Technical Chief to provide independence necessary for carrying out the Q.C. objectives. While Q.C. tests are done round the clock, the various defects which appeared during the production of previous day though for short duration are reviewed with production personnel next day so that the defects are eliminated in future. After analysing the problems, decision is taken to salvage portion of the paper which is free from any defect. While deciding about salvaging paper in sheet form Q.C. Supervisor keeps a vigilant watch that the defective sheets are removed either at cutter or at the finishing house. Piles of defective sheets are marked and finishers are cautioned about the defects to be carefully removed. The same care is taken for salvaging reels also.

Q.C. department has two sections, one for Chemical Plant—Pulp Mill and Recovery and another for Paper Mill, each equipped with a testing laboratory. The Paper Mill section extends its quality control activity right through paper machines to converting and finishing house.

QUALITY CONTROL WORKING IN CHEMICAL PLANT

Pulp Mill being essentially a chemical process, the controls are neither simple nor well established. The extremely variable nature of the raw material demands dynamic control methods. Here there are many assignable causes which defy identification and those which are identified, are very often beyond elimination. A dynamic control can offset their effects by making compensating changes in controlable variables.

The basic questions of controlling quality are :

1. Does the process need adjustment ?
2. When, what and how far the adjustment is to be made ?

The answers are not to be found easily. Several factors are to be tackled simultaneously. In such situations, techniques of multiple regression are of great help.

The quality control section in Pulp Mill is staffed with a Shift Incharge and two Testers in each shift. The Shift Incharge keeps in close touch with the Shift Incharge of Pulp Mill operation and Stock Preparation Shift Incharge. Samples are collected as per sampling schedule for various materials. Tests are carried out and the results are communicated to the Shift Incharge operation as per time schedule to enable corrective action. Table-I gives the sampling schedule of materials, frequency and tests carried out.

The Shift Incharge of Q.C. inspects the various operations in digester house, washing and screening areas and the bleach plant, records his findings and draws the attention of the operation Shift Incharge, if any action is needed. The standards for various characteristics of materials and process parameters are prepared from the past performance data and are revised, if essential. Table-II gives standards in respect of a few characteristics and average performance during 1978.

One of the most critical factors affecting quality of pulp is the quality of incoming fibrous raw material. The key to an effective control of the quality of pulp is to ensure supply of uniform quality fibrous raw material. This being highly non-uniform commodity, proper segregation and uniform blending can ease the situation to a great extent. Attempts, in this direction have given good results.

QUALITY CONTROL WORKING IN PAPER MILL

Quality control in Paper Mill assumes greater responsibility as the losses due to process variations and product defects have greater economic bearing on the manufacturing company in terms of money as

well as reputation. Further, the outgoing product quality effects the customer, his operations of conversion and the user. Major quality losses occur in the following classes :

1. Broke.
2. Odd lot.
3. Cost of customer dissatisfaction.
4. Down time of converting machines.

These losses would not occur or would be minimum if there was no defective paper and no fluctuations in process conditions. Experience indicates that no manufacture of paper is possible without process variations. This calls for the need of a close check on process conditions to keep the variations within tolerance limits and an early detection of defects for prompt corrective action. Q.C. system rightly applied, accomplishes this.

Q.C. in Paper Mill is equipped with a paper testing laboratory, a testing bench in stock preparation and is staffed with a Shift Incharge, two paper testers, one supervisor in converting section, in each shift. Experienced finishers work as Q.C. Checkers in the Finishing House.

Samples of stock and paper are drawn as per the sampling schedule from each of the three machines. Tests are carried out and the results are communicated to the Shift Incharges of Stock Preparation and Paper Machines. Table-III gives sampling schedule frequency and tests carried out. Shift Incharge of Q.C. keeps in close touch with the Shift Incharges of Stock Preparation and Paper Machines. He checks the paper web on machine and at pope reel for visible surface defects, and roll condition and also keeps track of the process parameters. Information regarding any deviation is brought to the notice of Shift Incharges of Paper Machine. If the anomaly persists

TABLE—I. SAMPLING AND TESTING SCHEDULE OF MATERIALS IN PULP MILL

Sl. No.	Material	Frequency	Tests
1	Chips charged to digester	Every cook	Moisture
2	White liquor charged to digester	Every batch of W.L. tank	TTA, AA, Causticity, and Sulphidity
3	B.S.W. Pulp	Every cook	Kappa Nos.
		Once a day	Chemical loss
4	W.B.L.	Once a shift	R.A.A., T.T.A.
		Two hourly	Twaddle
5	Decker pulp	Once a shift	Kappa No., Viscosity
		Two hourly	pH
		Once a day	Pulp evaluation
6	Bleach plant H.B.	Two hourly	Consistency
7	Chlorine Tower overflow	Two hourly	Temperature, pH, R. chlorine
8	Alkali Tower overflow	Two hourly	Temperature, pH, Consistency
9	Alkali mat pulp	4 hourly	Kappa No.
10	Hypo Tower I inlet	2 hourly	Temperature
11	Hypo washer I Vat pulp	2 hourly	pH, R. chlorine
12	Mat pulp	2 hourly	Brightness
13	Hypo Tower II inlet pulp	2 hourly	Temperature
14	Hypo washer vat pulp	2 hourly	pH, R. chlorine
	Mat pulp	2 hourly	Brightness %, specks count.
		4 hourly	Viscosity
15	Bleached chest pulp	2 hourly	Consistency, pH, R. chlorine, Brightness %, specks
		4 hourly	Viscosity
		Once a day	Pulp evaluation
16	Unbleached chest pulp	4 hourly	Consistency
		2 hourly	pH, shade
17	Bleach liquor from bleach plant	4 hourly	Available chlorine, Sludge %, Temp., pH
	From bleach liquor preparation plant	4 hourly	Available chlorine, free alkali
18	White liquor from feed box overflow	4 hourly	TTA, AA, Causticity and Sulphidity
19	White liquor from clarifier overflow	Once a shift	—do—
20	Green liquor from green liquor clarifier overflow	Once a shift	T.T.A.

TABLE—II. STANDARDS IN RESPECT OF A FEW CHARACTERISTICS IN PULP MILL AND AVERAGE PERFORMANCE IN 1978

Material	Characteristics	Standard	Average performance
(1)	(2)	(3)	(4)
	White liquor, Causticity	33±2	82.5
	White liquor, Sulphidity	20±2	21.6
	Unbleached pulp Kappa No.	28±3	26.7
	Bleached pulp Brightness %	80±1	79.1
	" Viscosity (CED), cp.	9 Min.	8.1
	" Specks count, PPM	15 Max.	9

TABLE—III. SAMPLING AND TESTING SCHEDULE IN PAPER MILL

Material	Frequency	Tests
Stock from Kalle Flow Box	2 hourly 4 hourly	pH Freeness
Back Water	2 hourly	pH, acidity
Paper	1/2 hourly	Basis weight, caliper, defects.
	2 hourly	Strength properties, ash and special tests as per the quality of paper, defects.
Reels at Rewinder	Setwise/reelwise	Basis weight and caliper, defects.
Sheets at Cutter	While cutting/each stack	Size and defects.
Finished Paper at Finishing House	Random reams	Defects, sheet counting, labelling and certification marking.

for more than half an hour, he informs higher officers and even, General Manager, if others are not available. This right of directly contacting higher authorities is given to Q.C. to hasten up the process of corrective action and to reduce losses as well as keep everyone continuously conscious of the fact that quality standards can not be compromised under any circumstances.

PAPER QUALITY STANDARD

Paper qualtiy standards or specifications, are developed from past data of the mill, customer requirements and Indian Standards. Quality Control maintains paper standards data as well as machine conditions and stock furnish data, for different grades of paper produced. When manufacturing order is to be taken on machine these data provide guidance and desired quality is obtained early in the run with minimum production loss.

PAPER SEGREGATION AND QUALITY INDEXING

At the pope reel the parent rolls are numbered and graded as per the quality obtained. If any defect is observed it is recorded and the information is passed on to the rewinding section for care and segregation of such paper.

A system of Quality Indexing has been developed based on past experience by which parent rolls are graded as under :

Grade:	A_1	A_2	B_1	B_2	C
Points:	10	8	6	4	2
Characteristics:	No defect	One minor defect	One minor and one major defect	More than one major defects	Defects critical

As per the above gradation, production percentage under each grade on total production is multiplied by the points of the respective grades which gives quality score. When total production is 100% A_1 grade, quality score equals 1000. Quality Index is a percenatge of total quality score obtained based on quality score of 1000. Our quality index for 1978 was 75.3, which compares well with past performance and other norms.

QUALITY CONTROL IN CONVERTING AND FINISHING HOUSE

Guided by the information furnished from paper machine, Q.C. Supervisor inspects the parent roll, checks for the defects during the rewinding operation. In case of reel orders, this becomes the final stage and hence check is made for reel characteristics and defects. On every set of reels, basis weight and caliper etc. is checked. Defective reels are segregated and its salvaging is decided in the Q.C. Committee Meeting. If substantial recovery from defective reel is possible, a small size rewinder is used to rewind the reel.

In the case of sheet orders, similar checks are made and cutter section is advised for mixed cutting or separate cutting as per the degree of defects present. The quality of cut sheets is checked by Supervisor for size. Apprentice Finishers are engaged to remove defective sheets from the stacks if the proportion of defective sheets is more and sheet finishing is essential. The stacks are marked OK or defective as the case may be, to guide the Finishers.

In Finishing House, Q.C. checkers inform the finishers on the quality of stacks and check the finished paper reams at random for defectives and number of sheets. The discrepancies are brought to the notice of concerned finishers for improvement and monthly performance report of each finisher is prepared to maintain a satisfactory outgoing quality level. The checker keeps a strict vigilence in finishing and counting and packing operation by frequent sampling and checking.

COMPLAINT ANALYSIS AND CUSTOMER SERVICE

Complaints received from the customers are analysed by Q.C. department by referring to the data of the particular production. Sales Dept. is informed about the findings regarding the complaints. If the complaint is of a serious nature, a representative visits the customer premises and studies the problem. The records of quality and machine data maintained by Q.C. are very helpful in the analysis of complaints and the customer also tries to rectify the defects in his machines when he is convinced after going through all the records of Q.C. maintained for each operation at our end.

MARKET QUALITY CONSCIOUSNESS

In keeping with one of the Q.C. functions of informing the management of market quality vis-a-vis market price for the quality, periodic quality evaluation is carried out on samples of paper collected from market by our Sales Department. This knowledge enables us to know where we stand and helps in our efforts to maintain quality.

GAINS FROM QUALITY CONTROL PROGRAMME

An account on Q.C. programme remains incomplete without mentioning the results and gains it has brought to the company. While considering the results from Quality Control, we must carefully distinguish between the function of Q.C. of indicating *"a need for action"* and the function of operation of *"taking the action"* on the process or product. The function of Q.C., is something like a newspaper; it collects, reports, and interprets the facts but it does not make them. On this basis, Q.C. must be evaluated by whether it has made the facts available. Good result depends on both bringing the facts to light and proper utilisation of the facts.

Our Q.C. programme has produced the following results :

1. It has brought an awareness of quality among the working team.
2. It has developed specifications for pulp and paper manufactured in our mill.
3. It has developed standards for operations in Pulp Mill and Paper Machines.
4. It reports the level of quality round the clock.
5. The uniformity of quality has improved.
6. It has indicated cost-saving process changes.
7. Company's quality control programme allows us to face the customer's complaint with utmost confidence.

We are not complacent with this. Q.C. is a field of continuous growth and development to meet the challenging needs of changing situations. We are ever ready for this.

It is not easy to calculate in rupees the gains from Q.C. work. What value can be placed for a good reputation of the company, customer confidence in the products and the satisfaction and harmony the manufacturing team enjoys ? It is just this and something more that our company has gained from Quality Control.