Application of Computerised Process Control System in MPM Newsprint Machine for Improving Production Quality and Efficiency

ARA, F.R.*

I INTRODUCTION

The MPM Newsprint machine was commissioned in July 1981 and reached the rated capacity of 75,000 TPA in 1984-85. However, the management wanted to increase the production, quality and efficiency still further. Various studies were undertaken to find ways and means of achieving this objective.

The computerisation of Process Control System was found to be the most effective alternative. Almost all the high speed/high capacity machines around the world are on computerised process controls. Computerisation not only increases productivity, but also reduces cost of production due to increases machine efficiency.

Newsprint mills generally face the problems of uneven Basis Weight and Moisture levels, due to the inherent limitations in approach flow systems. Poor roll buildup is another major problem area which affects rewinder runnability, Uniform caliper is an important requirement of the present day high speed printing presses.

Hence the paper makers of today feel the need of opening a window into the heart of the machine, to see, analyse and take corrective action instantaneously. This need is fulfilled by the computer control system. MPM has procured a fairly comprehensive system for control of Basis Weight, Moisture and Caliper. Given below is a brief description of the system.

II SYSTEM DESCRIPTION

The computerised display and control system is classified into five headings as below :

A. Measurement and controls
B. Video Displays
C. M. I. S. reports
D. Software features
E. Hardware and accessories

A. Measurement and Controls :

1. Basis Weight
   i) Measurement in both CD & MD
   ii) Control in Machine direction.
2. Moisture
   i) Measurement in both CD & MD
   ii) Control in Machine direction.
3. Caliper
   i) Measurement in both CD & MD
   ii) Control in cross direction.
4. Head Box Rush/Drag control.
5. Dry stock consistency correction.
6. Dryer start up/shut down control.
7. Coordinated speed change facility.

B. Video Displays :

1. System overview : Gives an overall picture of the system.
2. Operation Status : Shows the process alarms and selected data
3. Composite profiles : Display front to back across machine variations of
   i) Basis Weight
   ii) Moisture
   iii) Caliper
   iv) Bone dry weight
4. Trend averages : Shows ehanges for previous 1 hour in m/o. direction of
   i) Basis Weight
   ii) Moisture
   iii) Caliper
   iv) Bone dry weight

* The Mysore Paper Mills Ltd., BHADRAVATI

Process Summary	:	It gives targets and actual values of process parameters like Basis Wt, Moisture, Caliper, Rush/Drag, etc.
6. Production Summary	:	It gives reel wise/shift wise/day wise production figures like Tonnage, Thruput, Runtime, Lost-time, Machine speed, etc.
7. Control select	:	It shows the status of all the control loops, set points, actual values, etc. and enables the operator to change set points and control the system either in Computer Mode or Remote Manual.
8. Alarm Messages	:	This page displays the hardware related alarm conditions existing, with the time of occurrence.
9. Profile Manager Status	:	Exhibits cross machine caliper controller status Remote manual control of individual cold air shower nozzles.
10. Numeric/Graphic Trend	:	Enables collection and both numberic as well as graphic display of upto nine individual parameters which have to be studied for trouble shooting etc.
11. Roll/Set Analysis	:	Helps paper makers decide the setting up of rewinder rolls based on the moisture and basis weight averages for each section (upto 10 Max.) of the parent roll.
12. Micrograph	:	Gives customers the facility to create upto 10 special video pages.

C. M.I.S. REPORTS :

1. Reel reports	:	This report is generated on the turnup of each parent roll. It contains the production and quality figures pertaining to this reel.
2. Shift/Day report	:	This is triggered once every day, in the morning. This prints the shift wise production and control uptime figures.
3. Grade report	:	It summarizes production summary and quality analysis data obtained during a grade or any desired unit of production within a grade and is generated when a grade change is initiated.
4. Semi-Annual Performance review report	:	This is a two sets report which stores data upto six months normal running and prints out at prespecified time intervals. This report gives reel wise production as well as quality data in a consolidated fashion.
5. Standardize report	:	All the scanning sensors standardize once every 30 minutes, during which all important connected parameters are monitered. This data is printed on request and used for trouble shooting.
6. Sample check report	:	Printsout measured values of standard check samples or customer samples when required.
7. Calibrate sample report	:	Whenever sensor verification is being done, this report smmarizes 20 secs. measurements taken in single point mode.

8. Process Mointor routine : Helps in trouble shooting by collecting data of 8 variables at five secs. intervals and print on request.

D. SOFTWARE FEATURES :

1. Data save : Data save feature saves all previous machine data in the event of power failure. On power resumption the system restarts itself and the only entry to be made is the present time and data.

2. Product Code File : This contains all data pertaining to several grades of paper which will be run on the machine and can be recalled/loaded instantaneously.

3. Advanced Interactive Diagnostics (AID) : Enables trouble shooting to pin point fault location in the system hardware. This is available on diskette and printsout results on system printer.

4. Flexible Extender software (FLEX) : Helps create and edit programmes in the background and also execute these new programmes in foreground. All these are done with system on line.

5. Others : There are several other features such as file and diskette copying, using the personal computer and its dedicated printer to cater to many other applications which are not necessarily connected with the system. All these are possible with the system on line.

E. Hardware and Accessories :

All the above functions are accomplished with the aid of the following hardware :

1. Honeywell, Level 6, Minicomputer,
2. Programmable Microcomputers.
3. Honeywell, Personal computer with dedicated printer.
4. Dual $5\frac{1}{4}''$ diskette drives.
5. High resulution graphic printer plotter.
6. Operator station with colour mointor and joystick control.

III QUANTIFIABLE GAINS :

There are several advantages in using a computerised process control system, all of which cannot be quantified. Some tangible benefits are as below :

A. Production increase
B. Quality improvement
C. Product cost reduction

A. PRODUCTION INCRASE :

The production increase is attributable to the following :

1. Higher Basis Weight nearing the +ve tolerance limit of 4% as per IS : 11688-86 can be maintained on the machine on a sustained basis.
2. Reduction in paper breaks occur because of better controllability of Basis Weight, Moisture and Caliper.
3. Increase in machine speed is achieved because of better runnability.
4. Reduction in rejects due to above reasons.

B. QUALITY IMPROVEMENT :

Goes a long way in satisfying the customers and building the reputation as a quality supplier. Quality will be improved on account of

1. Unifrom basis weight in both CD & MD.
2. Reduction in moisture variations.
3. Constant caliper of entire sheet.

C. COST REDUCTION :

A rupee saved is a rupee earned. This is more true in the present day circumstances when most of the paper industries are facing severe financial depression. Computerisation cuts down production costs on following heads :

1. Prevents over drying of paper which further results in
   a) Reduction in steam consumption.
   b) Lower raw material usage.
2. Reduced recycling of broke.
3. Increased production efficiency.

IV CONCLUSION :

The erection of the 1180 Micro process control system, procured from M/s. Accuray Corporation, started in Nov. '87 and was commissioned the very same month. The control tuning was scheduled for Dec. '87 and we wanted to share with you the data collected in the short duration of control run. But the samc could not be done as the blind run data was to be collected with the best possible machine running conditions. However, with only the visibility of the process over the video mointor, considerable improvements have already been made. With controls being commissioned in this month we strive to achieve further benefits.

The payback period of the computerised system is expected to be around one year. Depending upon the future process requirements and also subject to the availabiliy of resources, MPM has plans to add.

1. Basis weight cross direction control.
2. Moisture cross direction control
3. Speed optimisation
4. Refiner controls
5. Energy module
6. Ash measurement Etc.