

Instrumentation and Control for Paper Machines

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ABSTRACT

In the present paper, it is shown how a simple strategy can be used very effectively to develop a low cost control system for paper machine. Consistency Control, GSM Control, pH control in Head Box, Level and Pressure Control in Head Box and guiding systems for machine clothing moisture control is explained. Individual control loops for paper machine is good choice for small paper machine who cannot afford complete QSC system or Scanner system.

INTRODUCTION

With the opening of 'Global Economy' and liberal Import policies, Indian Paper Industries need to compete with international players who maintain high quality standard through complete QSC control system for machines. Therefore, it is the need of the time to go for machine control as much as affordable and possible. With the recent trend for strict quality norms existence of small machine between 20 TPD to 80

TPD is becoming more and more difficult. This present paper describes a way to control machines by using individual control loops.

Machine Chest Consistency Control Loop

Machine Chest Consistency is normally fluctuated between 3% to 4% due to pulp mill variation. It effects fluctuation in paper gsm, moisture and caliper of paper.

This control loop needs following instruments :-

1. On-Line Consistency Transmitter

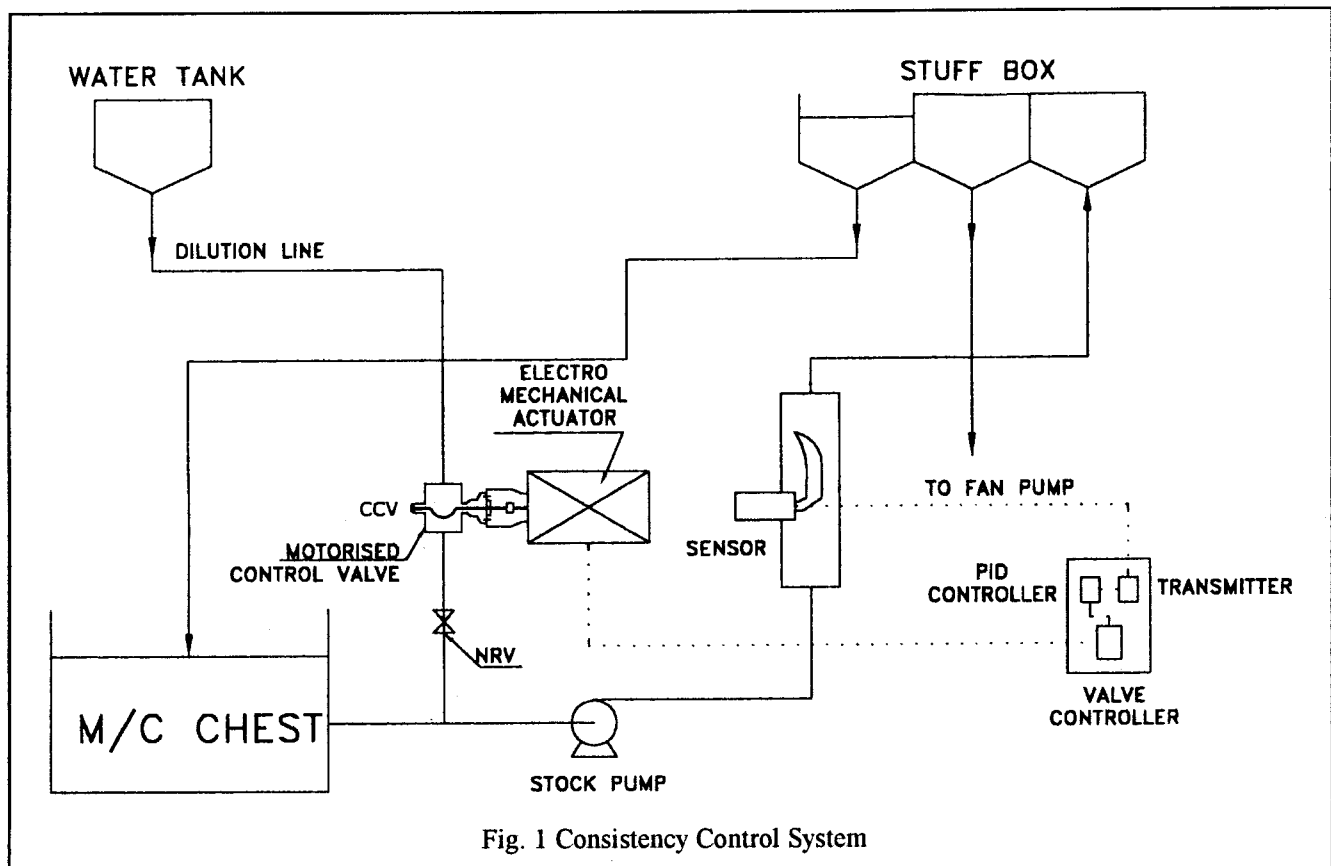


Fig. 1 Consistency Control System

2. PID Controller

3. Dilution Valve accepting 4-20 mA signal.

Consistency transmitter gives signal to PID Controller which compares the set value with measured value and accordingly valve is opened for maintaining the consistency (Fig. 1). The drawback in system is that if measured consistency is lower than set consistency then consistency is not maintained. Thus, operator should take care for giving set value higher than measured values.

pH Control Loop

The pH of Head Box is generally maintained at 4.5 to 5.5. The higher or lower pH makes trouble during paper drying in dryer section and some time may lead for frequent paper breakage (Fig. 2).

pH Control Loops Consist

1. pH Sensor
2. PID Controller
3. Chemical Dosing Valve

By making pH it has been observed that alum consumption is reduced by 15% to 20% and less paper breakage happened in dryer section.

The main precaution is to keep continuous cleaning of pH sensor as pulp is stuck on the sensor which results in

false reading of pH value.

GSM Control Loop

The most important parameter for paper maker is GSM control of paper. GSM is maintained by Basis Weight Valve either manually or remote controlling or computerized QCS system depending upon the investment and machine capacity and kind of paper. Remote Control Loop consists Motorised Basis Weight Control Valve (Fig. 3A). The remote controller is installed near pope reel, from where Paper Maker controls the GSM by setting the Valve opening. This control is generally suitable for paper machine of capacity between 20 TPD to 60 TPD as investment is low.

The mills which are making good quality paper and having capacity more than 60 TPD can opt for scanner system which is to be installed before pope reel as the cost for scanner is high and need skilled staff to run the same. So choice is limited for higher speed machine and making value added paper. Sensor consists krypton 85 source and send signal to computer, computer send pulses to the Basis weight Control Valve (Fig. 3B) for opening and closing valve to maintain the GSM of paper.

Head Box Control Loop

Head Box Control is required where jet speed of pulp is lower then wire speed. So, Head is maintained in Head

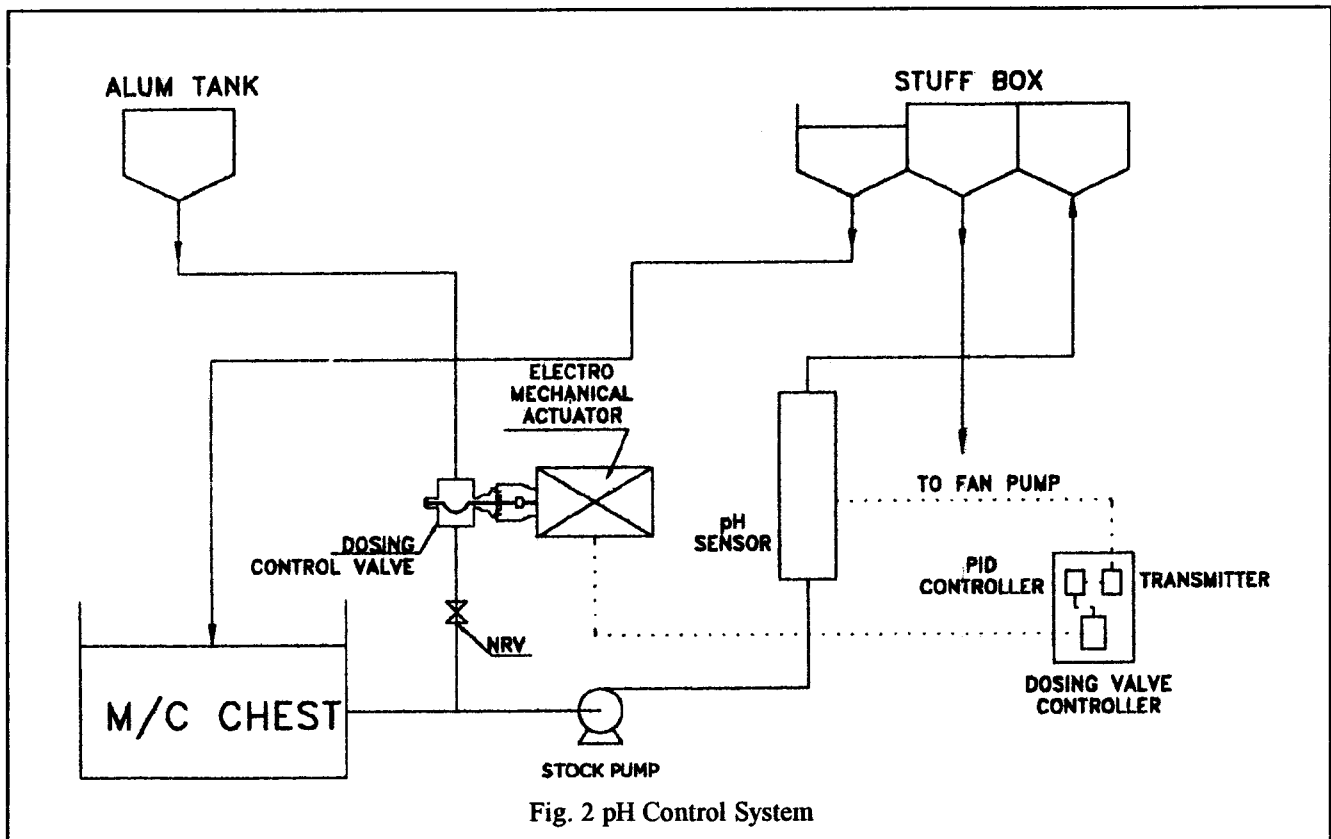


Fig. 2 pH Control System

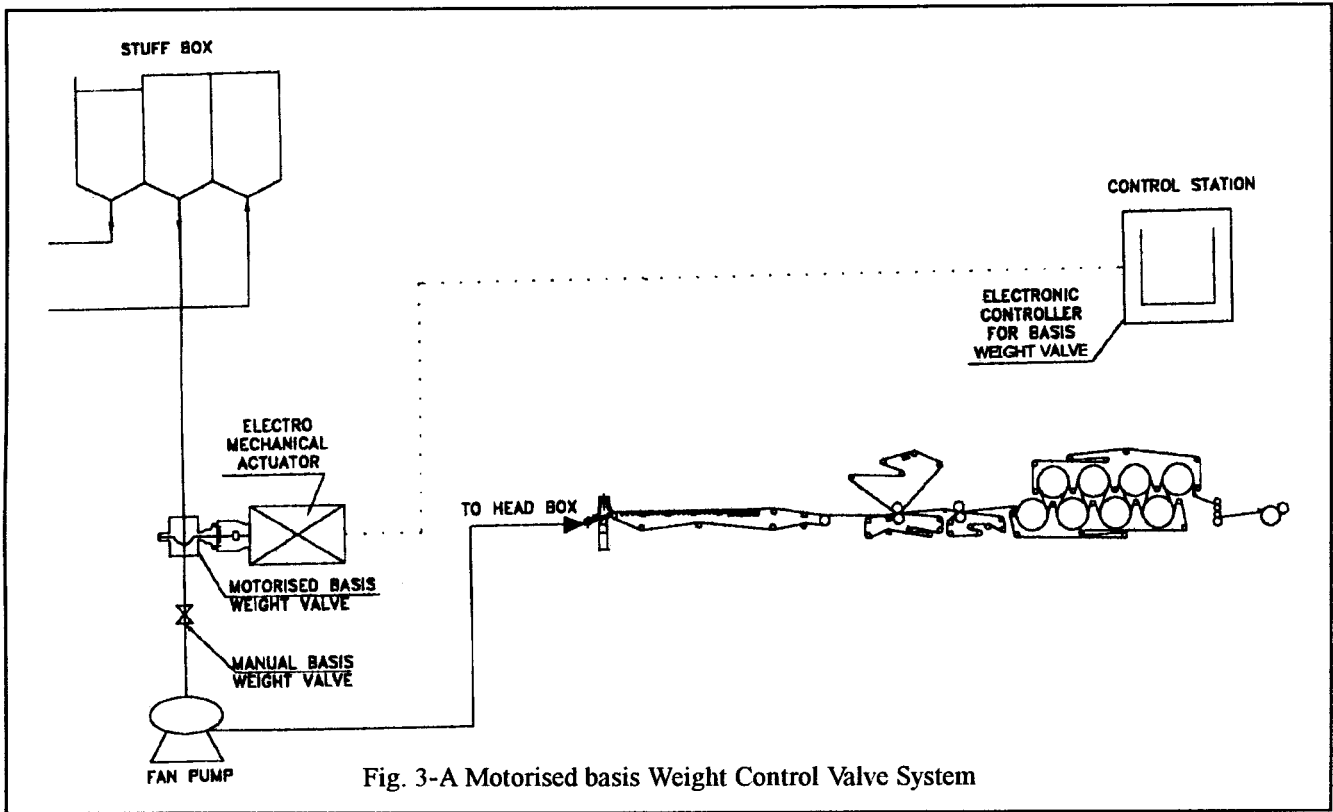


Fig. 3-A Motorised basis Weight Control Valve System

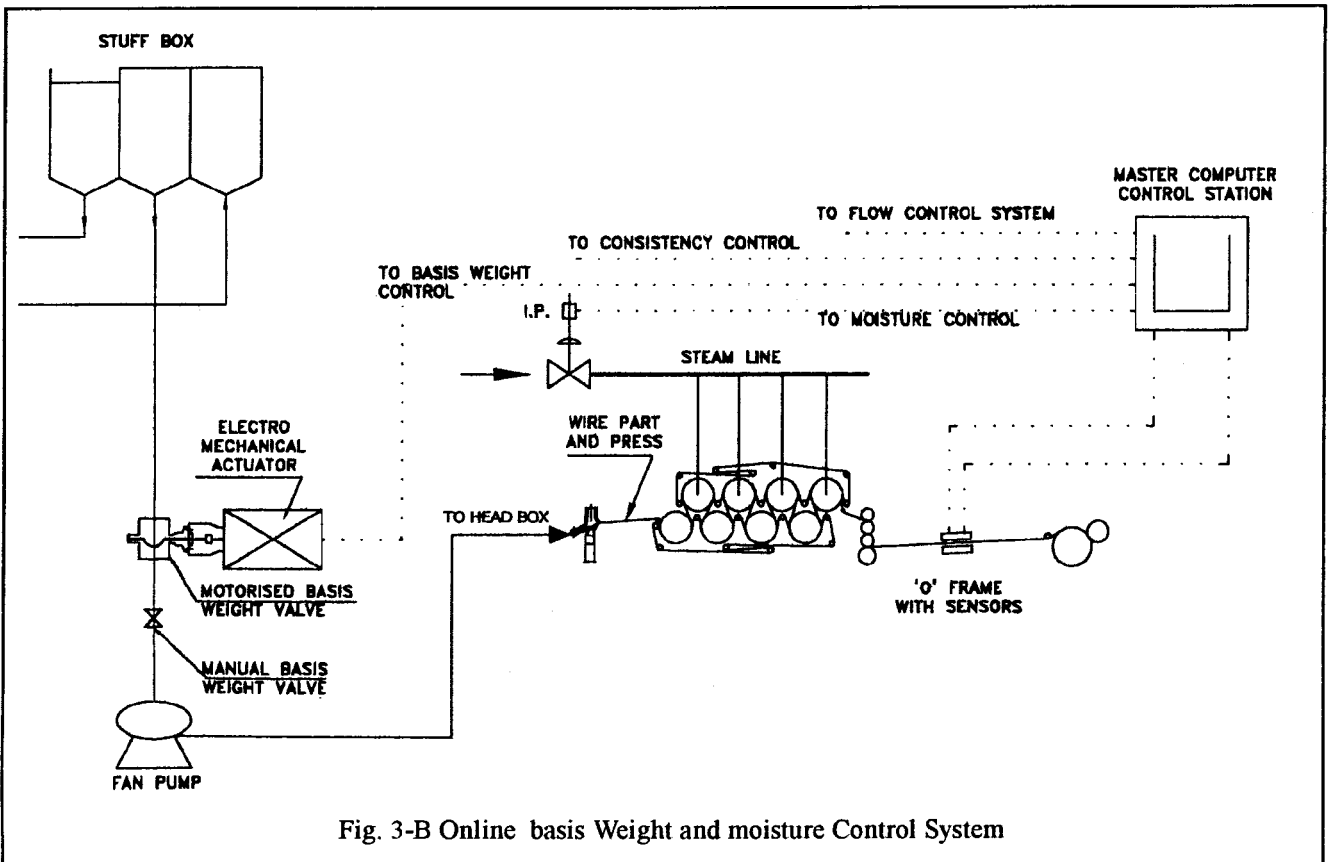
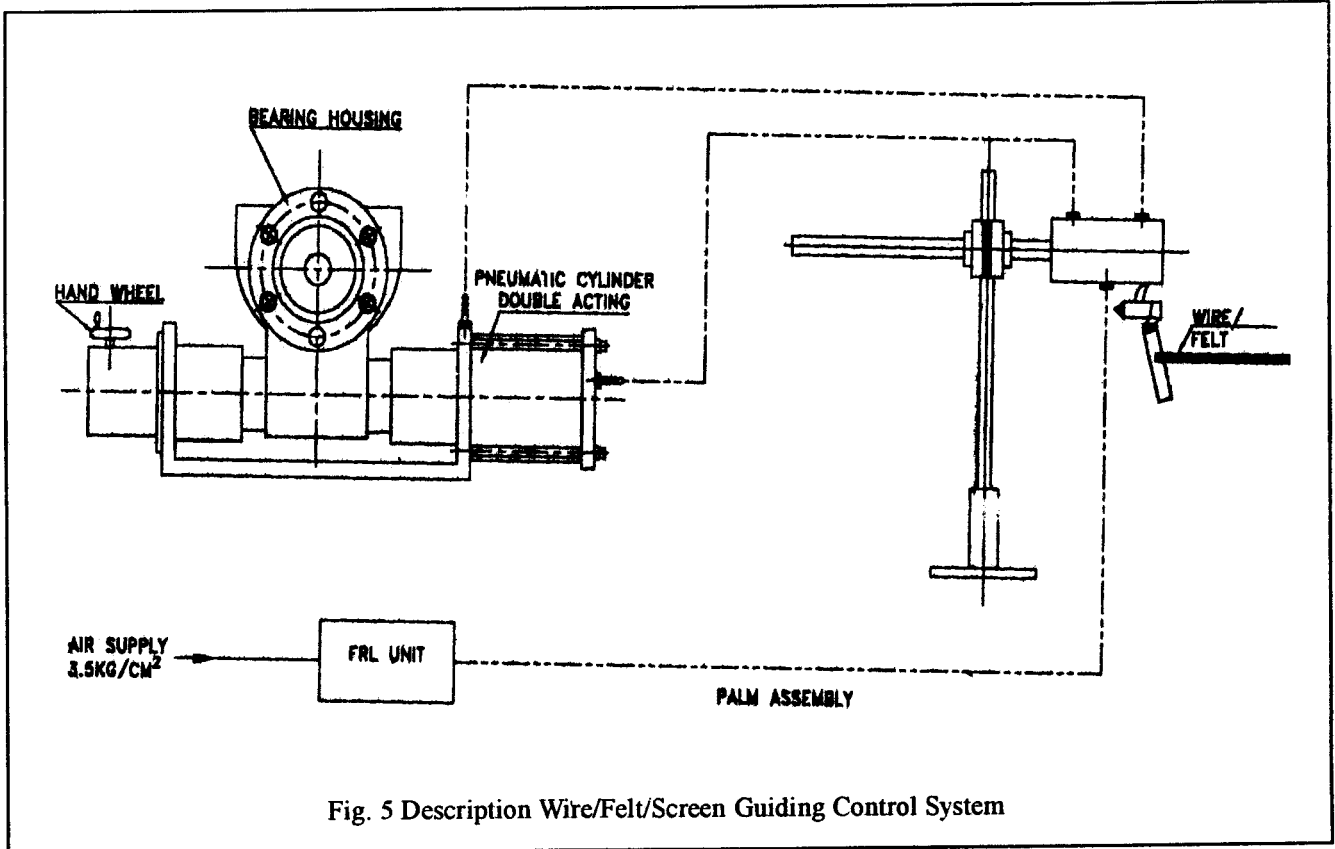
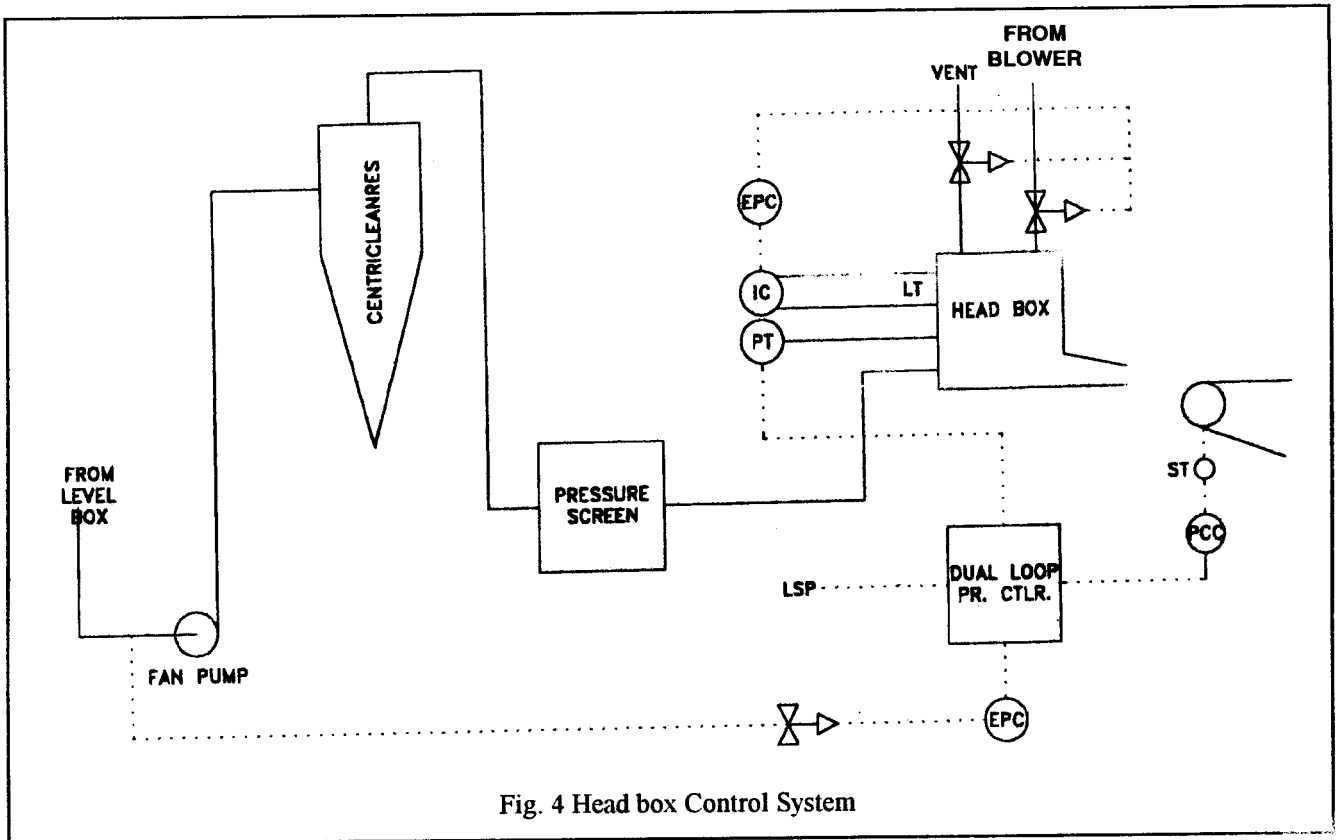


Fig. 3-B Online basis Weight and moisture Control System



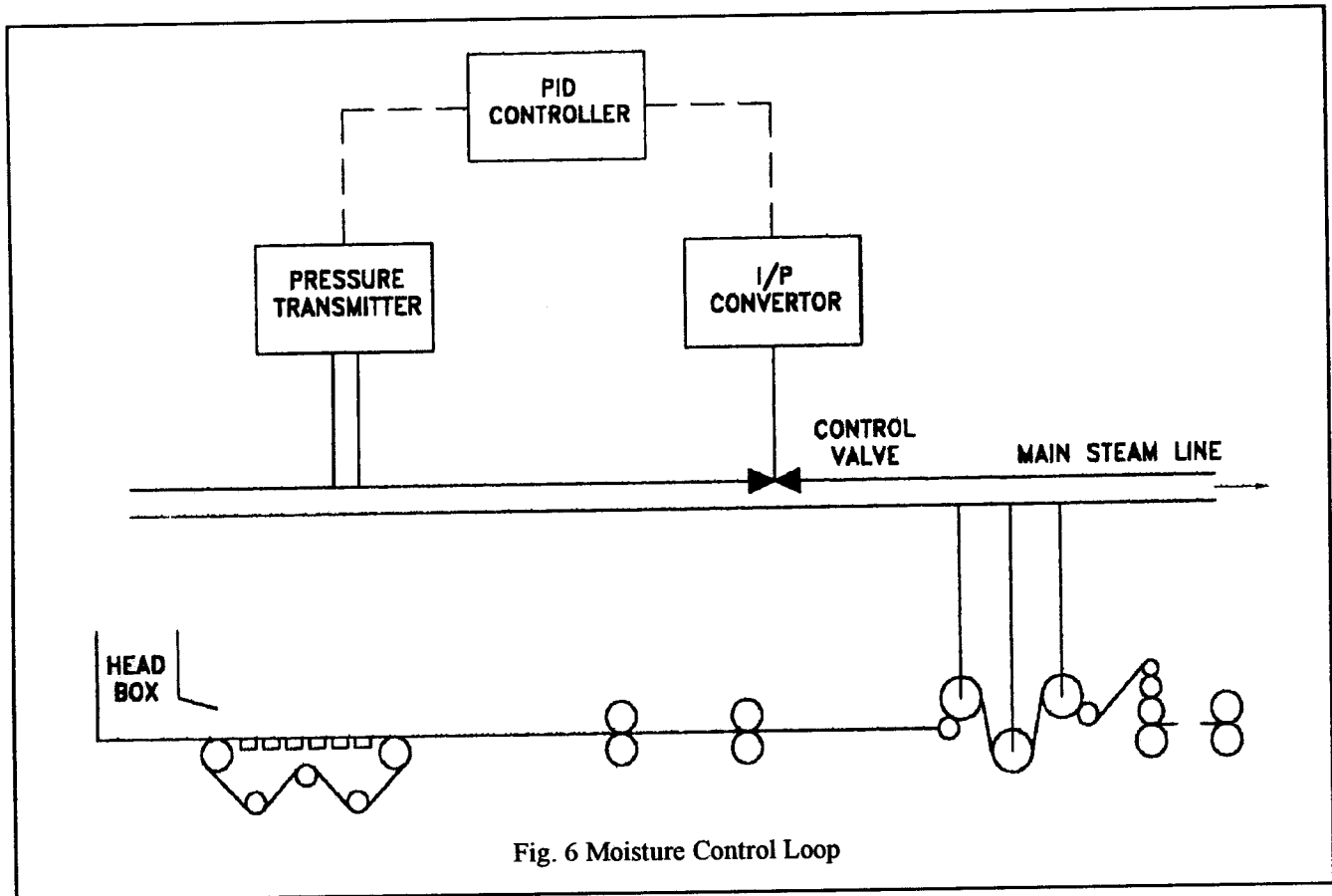


Fig. 6 Moisture Control Loop

Box to synchronized m/c. speed and jet speed. Head Box control loop (Fig. 4) consists of level control and presence control.

1. Level Transmitter
2. Dual Loop Controller
3. Pressure Transmitter
4. Speed Transmitter

Head Box Control system is generally beneficial for machine speed having speed for more than 250 m/min. and making quality paper.

Wire / Felt / Screen Guiding Control System

Paper machine after Head Box consists of lot of clothing. Clothing includes wire, felts and dryer screen. Clothing cost for 60 TPD machine may be Rs. 40 lacs. The clothing alignment is controlled manually by guide roll or automatically by autoguide. Higher speed machine consists (Fig. 5) non contact type sensor which aligns the clothing but in our Indian Machine for 20 TPD to 100 TPD can opt contact type palm sensor.

Moisture Control Loop

Moisture of paper is generally kept 5.5 to 7.0 as per the

paper grade and quality. Lower moisture makes higher manufacturing cost of paper and higher moisture makes complaint in market. In continuous control loop an infra red sensor moves across the deckle of paper and sends signal to CPU Unit, CPU Unit controls the steam pressure in last dryer group. The infrared sensor is costly and affordable for 60 TPD to 500 TPD capacity. A small machine of 20 TPD 60 TPD can opt simple Pressure Control Loop (Fig. 6) in last dryer group. Pressure is adjusted manually by PID Control, to suit optimum moisture in paper.

CONCLUSION

Paper Machine having capacity of 20 TPD to 80 TPD can install individual control loops with approx. investment between 10-15 lacs. The Paper Machine of 80 TPD to 300 TPD may choose Complete Rs. 1 Crore for QCS Control System. Individual control loops have been able to control approx. 90% of fluctuation in GSM, Moisture and Paper breakage. Manufacturing cost will come down approx. 5% to 8% by reducing finishing losses and less consumption of chemicals etc. by opting individual control loops for small machines.