On Line Measurement And Control System For Stock Flow & Consistency On The Paper Machine

Rajiv Goel / Arvind Kumar Jindal and Amit Kumar Gupta

With the opening of global economy and liberal import policies of the Government of India, we have to give up manual operation. That is waste. Instrument technology must be adopted as much as affordable and possible to produce product - mix of uniform quality with profit. Local Instrument manufactures and suppliers should be encouraged, keeping close links with them and working together as a team, not considering them as an outsider. Then only the real progress in the industry can come and real research will come out to provide better and cheaper product. Basis weight control valve and consistency control systems are the prime requirements to produce paper and paper board of uniform basis weight and trouble free run of the paper machine.

INTRODUCTION

Pulp and Paper industry is an intensive industry, intensive in every sense. It is capital intensive, energy intensive, lab - -our intensive, raw material intensive, water intensive, even pollution intensi - -ve. Still, this industry is a core industry for a developing country like India. With the fast increase in the literacy rate and high pace of industrialization, overall demand of papers, paperboard and newsprint together is bound to increase in the country from the present level of 5.5 million Tons to 14.5 million Tons by 2020. Demand of good quality papers of all varieties is growing day by day, prices are souring, but the paper of consistent quality is not available. Still, the overall financial health of the paper industry seems brighter in the days to come, which has also been projected by a Global Economic Analyst. According to him, India will be third largest economy in the world in the next 50 years.

Because of rapid depletion of forests, due to encroachment of forest land for agriculture and urbanization, transport routes, industrial sites and for other needs of increasing population, coupled with huge requirement of forest wood by the large paper mills, Indian entrepreneurs were rightly encouraged during seventies to install small and medium size paper mills based on waste-paper and agricultural residues. It is heartening to note that to- day these paper mills account for almost 60% of paper production in the country. What has received lesser attention so far in this sector is the quality control aspect of the end product, which is the prime source to give attractive returns / profits to the industry.

Ghaziabad Technocraft Consultants (P) Ltd., Punjab Expellor Compound, Meerut Road, Gazaiabad (U.P.)

It has been observed that at the time of installing the industry, some of the prime requirements of the project like implementation of safety measures, security of the plant and machineries, pollution control, preventive maintena - -nce of machines and equipments and most desirable aspect of quality control get second priority, which continue to be ignored for one reason or the other, till they become very much necessary. This practice time to time creates problems in the smooth functioning of the industry, so much so that in some of the cases, it becomes difficult for them to achieve even break- even point during the stipulated period.

With the opening of global economy and liberal import policies, now Indian paper industry has to struggle hard to compete with the international players, who maintain high quality standards of their end product by installing complete quality control systems on their machines. Therefore, it is high time and an urgent need of the hour to install a complete quality control system on paper machines, as much as affordable and possible to produce product-mix of consistent quality with profit.

Basis weight of paper:

Basis weight is the weight of the paper per unit area, expressed in g/m^2. The entire process of paper making, right from handling the raw material upto the production of paper, has been designed as such so that the paper of uniform basis weight could be produced on the paper machine. The entire techno-economic viability of the paper industry, therefore, depends on the uniformity of the basis weight of the paper, which, if not maintained consistent for any reason, creates several problems for the industry.
Factors that influence the basis weight distribution in the paper are

1. Stock supply
2. Pipe system of the short circulation
3. Machine head box

Basis Weight variation occurs essentially due to the stock supply for the reasons as given below:-

(i) Variation in the volume of the flow of stock and back water to the fan pump.

(ii) Variation in the Consistency of the stock fed to the Basis weight valve.

(iii) Variation in the amount of back-water and fresh water used in the short circulation.

(iv) Variation in the amount of rejects from cleaning devices, usually consisting of open or closed screens and centricleaners.

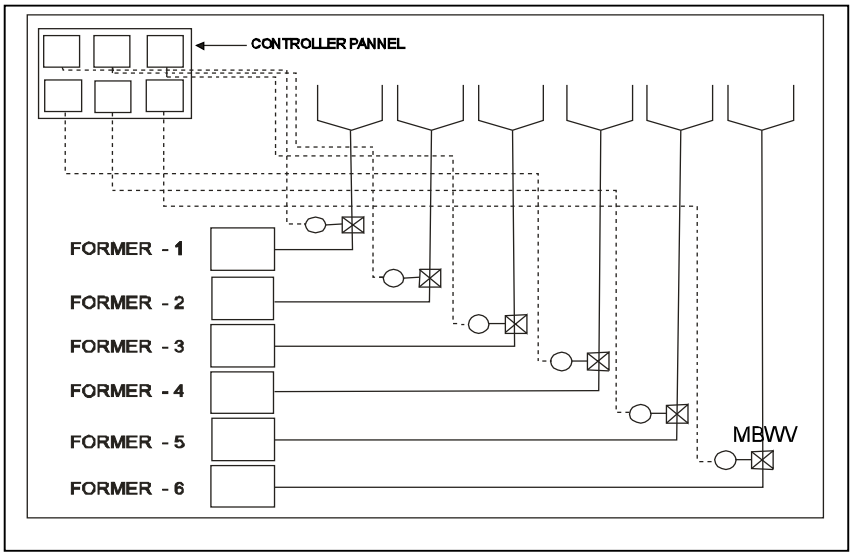
(v) Variation in the flow of back-water to the wire pit.

(vi) Variation of fiber retention on the wire.

(vii) Variation in the volume of flow through head- box slice.

Generally, one or two type of pulps and machine broke are mixed together to make the stock furnish. It is necessary that the consistency of individual

BASIS WEIGHT CONTROL VALVE FOR DUPLEX PLANT



CASE STUDY
WE INSTALLED THESE VALVES IN
DEV PRIYA INDUSTRIES LTD. (MEERUT)

PICTURE:- 1

PICTURE:- 2

ingredients should be consistent in order to get a furnish of uniform quantities of different pulps. Even in the case of single pulp, fiber content of the stock suspension in the machine chest must be same throughout the operation in order to maintain uniform basis weight of paper and trouble free operation of the paper machine.

Consistency of the stock finally going to the paper machine for conversion into paper:

Let us understand first of all, as to what happens to the stock on the paper machine and how the paper is produced on it? Paper machine removes water from the diluted fibre suspension through four principal operations,

(1) & (2)- by free drainage and suction on its wire part
(3) & (4)-by pressing the wet web to consolidate fibres and to dry the wet sheet to contain maximum 10% moisture.

Thus, a cellulosic fibre mat with optimum moisture content, called paper is produced, in which fibres are uniformly and ir-regularly interlocked. Around 98% of the total water, coming over the wire through the head-box slice, is removed on the wire-part itself, called back -water or white water. This water is recycled to dilute main stream of the stock coming from the machine chest and going to the paper machine for conversion into paper.

If mechanically everything is O.K. on the paper machine, which normally happens, consistency of the fiber suspension in the machine chest must, therefore, be regularly controlled to provide uniform consistency of the stock through out the entire run of the paper machine. Even slight fluctuation in the consistency of the fiber suspension in the machine chest may lead to the variation in the basis weight of the paper, which is being produced on the paper machine. Not only this, it will affect overall production adversely, besides affecting all other properties of the paper. Equally, the stock supply to the fan pump must necessarily be consistent through out.

If the consistency of the stock and supply to the paper machine, both are controlled, all other flows at various places in the short loop will

automatically be controlled and smooth. Thus, uniform basis weight of paper as desired could be produced with no problem.

Basis Weight Control Valve System

GTCL first time in India introduced Motorized Basis Weight Control Valve, which is available comparatively at a very low price, around 10 times cheaper than a valve of BTG and Neles Jameswere. So far GTCL have installed more than 1000 such units in India and abroad in 12 countries during the last three years.

The installation of GTCL Motorized Basis Weight Control Valves on a Duplex board manufacturing machine is shown

Benefits of Motorized Basis Weight Control Valves:-

1. Not required to go near the Fan Pump to correct the Basis Weight of the paper.
2. Finishing losses reduce by 2 to 3% because of uniform basis weight throughout the run of the paper machine, thus minimizing breakage of

paper on the machine.
3. Better GSM control from the pope reel and smooth runability of the paper machine.

Consistency Control System

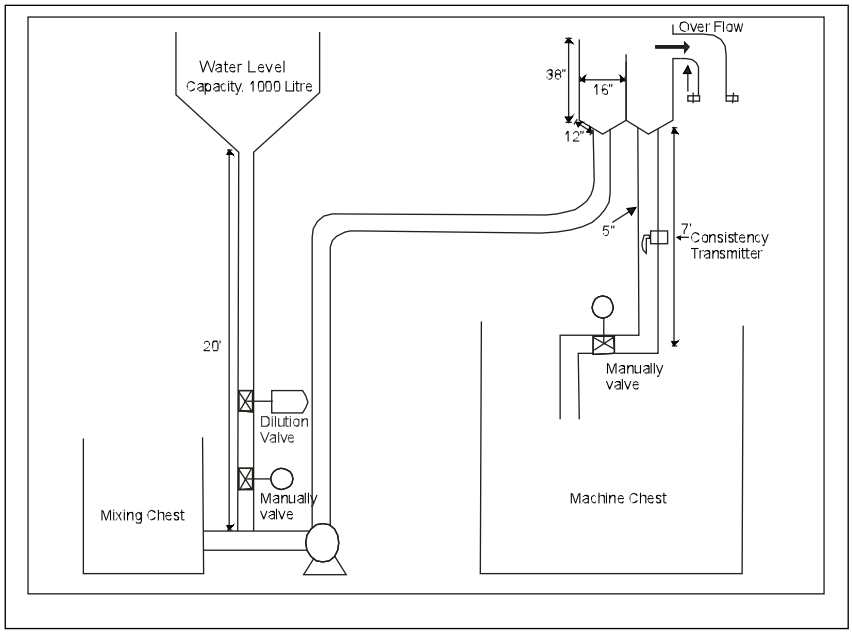
GTCL modified its Consistency Control System by removing following defects first time in the country and have installed more than 100 Consistency Regulator Systems, exporting to 14 countries.

1. Pneumatic problems.
2. Flow problems
3. Furnish problems

If two stage Consistency Regulator system is installed, the payback period would be around two to three months.

GTCL Consistency Control System as has been installed is shown below.

If a comparison inbetween the Consistency Control Systems of GTCL and Valmet / other imported companies is made, following advantages may be observed,



CASE STUDY OF SRI BHRIKUTI PULP AND PAPERS LTD. (NEPAL)

FINE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	50%	3008.00	3000.00	3004.00
2	51%	3084.00	3075.30	3079.65
3	52%	3158.00	3152.20	3155.10
4	53%	3233.00	3225.40	3229.20
5	54%	3310.00	3302.50	3306.25
6	55%	3385.00	3376.80	3380.90
7	56%	3461.00	3454.60	3457-80
8	57%	3535.00	3528.30	3531-65
9	58%	3611.00	3603.90	3607.45
10	59%	3686.00	3677.90	3681.95

FINE TEST:(In Reverse Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	59%	3686.00	3677.90	3681.95
2	58%	3610.00	3601.50	3605.75
3	57%	3536.00	3530.70	3533.35
4	56%	3460.00	3454.50	3457.25
5	55%	3382.00	3376.00	3379.00
6	54%	3312.00	3305.10	3308.55
7	53%	3236.00	3229.60	3232.80
8	52%	3156.00	3151.30	3153.65
9	51%	3081.00	3072.00	3076.50
10	50%	3006.00	2998.80	3002.40

COURSE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	20%	938.30	931.00	934.65
2	30%	1739.80	1732.80	1736.30
3	40%	2519.30	2510.90	2515.10
4	50%	3329.50	3323.10	3326.30
5	60%	4114.70	4109.20	4111.95
6	70%	4917.60	4908.70	4913.15
7	80%	5712.30	5705.50	5708.90

FINE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	50%	3068.00	3060.00	3064.00
2	51%	3144.00	3135.30	3139.65
3	52%	3218.00	3212.20	3215.10
4	53%	3293.00	3285.40	3289.20
5	54%	3370.00	3362.50	3366.25
6	55%	3445.00	3436.80	3440.90
7	56%	3521.00	3514.60	3517.80
8	57%	3595.00	3588.30	3591.65
9	58%	3671.00	3663.90	3667.45
10	59%	3746.00	3737.90	3741.95

COURSE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	20%	998.30	991.00	994.65
2	30%	1799.80	1792.80	1796.30
3	40%	2579.30	2570.90	2575.10
4	50%	3389.50	3383.10	3386.30
5	60%	4174.70	4169.20	4171.95
6	70%	4977.60	4968.70	4973.15
7	80%	5772.30	5765.50	5768.90

FINE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	50%	3058.00	3050.00	3054.00
2	51%	3134.00	3125.30	3129.65
3	52%	3208.00	3202.20	3205.10
4	53%	3283.00	3275.40	3279.20
5	54%	3360.00	3352.50	3356.25
6	55%	3435.00	3426.80	3430.90
7	56%	3511.00	3504.60	3507.80
8	57%	3585.00	3578.30	3581.65
9	58%	3661.00	3653.90	3657.45
10	59%	3736.00	3727.90	3731.95

COURSE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	20%	988.30	981.00	984.65
2	30%	1789.80	1782.80	1786.30
3	40%	2569.30	2560.90	2565.10
4	50%	3379.50	3373.10	3376.30
5	60%	4164.70	4159.20	4161.95
6	70%	4967.60	4958.70	4963.15
7	80%	5762.30	5755.50	5758.90

FINE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	50%	3038.00	3030.00	3034.00
2	51%	3114.00	3105.30	3109.65
3	52%	3188.00	3182.20	3185.10
4	53%	3263.00	3255.40	3259.20
5	54%	3340.00	3332.50	3336.25
6	55%	3415.00	3406.80	3410.90
7	56%	3491.00	3484.60	3487.80
8	57%	3565.00	3558.30	3561.65
9	58%	3641.00	3633.90	3637.45
10	59%	3716.00	3707.90	3711.95

COURSE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	80%	5712.30	5705.50	5708.90
2	70%	4922.70	4115.30	4519.00
3	60%	4111.20	4103.10	4107.15
4	50%	3326.40	3321.70	3324.05
5	40%	2523.80	2516.90	2520.35
6	30%	1736.30	1729.90	1733.10
7	20%	942.40	934.00	938.20

FINE TEST:(In Reverse Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	59%	3746.00	3737.90	3741.95
2	58%	3670.00	3661.50	3665.75
3	57%	3596.00	3590.70	3593.35
4	56%	3520.00	3514.50	3517.25
5	55%	3442.00	3436.00	3439.00
6	54%	3372.00	3365.10	3368.55
7	53%	3296.00	3289.60	3292.80
8	52%	3216.00	3211.30	3213.65
9	51%	3141.00	3132.00	3136.50
10	50%	3066.00	3058.80	3062.40

COURSE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	80%	5772.30	5765.50	5768.90
2	70%	4982.70	4175.30	4579.00
3	60%	4171.20	4163.10	4167.15
4	50%	3386.40	3381.70	3384.05
5	40%	2583.80	2576.90	2580.35
6	30%	1796.30	1789.90	1793.10
7	20%	1002.40	994.00	998.20

FINE TEST:(In Reverse Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	59%	3736.00	3727.90	3731.95
2	58%	3660.00	3651.50	3655.75
3	57%	3586.00	3580.70	3583.35
4	56%	3510.00	3504.50	3507.25
5	55%	3432.00	3426.00	3429.00
6	54%	3362.00	3355.10	3358.55
7	53%	3286.00	3279.60	3282.80
8	52%	3206.00	3201.30	3203.65
9	51%	3131.00	3122.00	3126.50
10	50%	3056.00	3048.80	3052.40

COURSE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	80%	5762.30	5755.50	5758.90
2	70%	4972.70	4165.30	4569.00
3	60%	4161.20	4153.10	4157.15
4	50%	3376.40	3371.70	3374.05
5	40%	2573.80	2566.90	2570.35
6	30%	1786.30	1779.90	1783.10
7	20%	992.40	984.00	988.20

FINE TEST:(In Reverse Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	59%	3716.00	3707.90	3711.95
2	58%	3640.00	3631.50	3635.75
3	57%	3566.00	3560.70	3563.35
4	56%	3490.00	3484.50	3487.25
5	55%	3412.00	3406.00	3409.00
6	54%	3342.00	3335.10	3338.55
7	53%	3266.00	3259.60	3262.80
8	52%	3186.00	3181.30	3183.65
9	51%	3111.00	3102.00	3106.50
10	50%	3036.00	3028.80	3032.40

COURSE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	20%	968.30	961.00	964.65
2	30%	1769.80	1762.80	1766.30
3	40%	2549.30	2540.90	2545.10
4	50%	3359.50	3353.10	3356.30
5	60%	4144.70	4139.20	4141.95
6	70%	4947.60	4938.70	4943.15
7	80%	5742.30	5735.50	5738.90

COURSE TEST:(In Forward Direction)

S.No	BW Valve Pos.(forward direction) in%	Stock Flow in LPM		
		Minimum	Maximum	Average
1	80%	5742.30	5735.50	5738.90
2	70%	4952.70	4145.30	4549.00
3	60%	4141.20	4133.10	4137.15
4	50%	3356.40	3351.70	3354.05
5	40%	2553.80	2546.90	2550.35
6	30%	1766.30	1759.90	1763.10
7	20%	972.40	964.00	968.20

Consistency Test Report

Blending Chest (%)	CRC Set Point(%)	Machine Chest (%)
3.32	2.60	2.57
3.60	2.60	2.60
3.20	2.60	2.59
2.60	2.60	2.61
2.80	2.60	2.58
3.20	2.60	2.62
2.87	2.60	2.57
3.74	2.60	2.59
2.84	2.60	2.57
3.60	2.60	2.60
3.70	2.60	2.59
3.62	2.60	2.57
2.92	2.60	2.58
3.10	2.60	2.60
3.30	2.60	2.61
2.85	2.60	2.62
3.05	2.60	2.59
2.80	2.60	2.63
3.40	2.60	2.57
2.70	2.60	2.58

SL.NO	POINTS	GTCL	VALMET/ OTHER FOREIGN COMPANIES
1.	Calibration	Uses potentiometer on the front of the electronics module. The zero and the span do not interact when calibrated.	Use screw drivers and wrench to trun small parts. The zero and the span interact due to which the calibration is slow and time consuming.
2.	Blade Requirement	Uses only one blade for entire range of consistency from 1% to 10% is required.	Valmet requires seven different blades to cover varying consistency.
3	On line service	Electronic module can be serviced and replaced while the mechanical module remains in lines	Electronics is integrated with transmitter and is not designed to be serviced without removing the transmitter from the line .
4	Remote electronic installation	Electronics module can be remotely installed (Upto 100 ft. from the transmitter)	No option for remote electronics.
5.	On site service	Can be serviced on site with spare parts locally available	Normally, required to return to the Company.
6.	Cost	Comparatively cheaper	-----

Uniform basis weight cannot be achieved through manual operation of basis weight valve, a practice which is still being followed in several paper mills**.** It is, therefore, advisable to install at least electronic Consistency Transmission system and Motorized basis weight control valve for consistent supply of the stock to the paper machine in order to get uniform basis weight of paper and trouble free run of the paper machine.