

Trouble Shooting In High Speed Paper Machine - A Case Study

Radhamohan. K, Murthy R.S.R., Ajit N. Kundap, Rao ARK

ABSTRACT

Laboratory investigation revealed that Calcium, Aluminium, Silica and Iron are the contaminants of the paper machine stock system. These Contaminants together with pulp fines are believed to be responsible for the clogging of wires, felts and suction roll holes etc.,

Attempts to reduce the entry of Calcium into paper machine system by improving the clarity of calcium Hypo-Chlorite Solution and restricting the usage of paper machine back water in pulp mills were found to be of not much of use.

By introducing Hydrogen peroxide bleaching of the cold soda pulp in Cold Soda Pulp Mill, which is the major constituent of newsprint furnish, the entry of major inorganic contaminants i.e., Calcium & Aluminium got reduced to a large extent.

Major advantages were observed after resorting to peroxide bleaching of cold soda pulp i.e. Reduction in machine stoppages and idle time, Improved strength properties with increased percentage of the least cost cold soda pulp in the newsprint furnish and Improvement in the runnability of the paper machine.

NATURE OF THE PROBLEM

Prior to August 93, a peculiar but potential problem was being regularly faced in the newsprint machine. The incidence of machine stoppages were high for cleaning the machine clothing i.e., wires and felts. First the parent roll building used to get deteriorated and subsequently, if not attended to immediately, machine runnability used to get affected necessitating the stoppage of machine for cleaning the clothing. After restart machine runnability as well as roll building used to become normal. A planned stoppage used to consume about 45 minutes time to restart the machine whereas an unplanned one used to consume as much as 1-30 Hrs. The total loss time on this account used to be a staggering 12-15 Hrs. in a month. In this context an investigation was taken up to findout.

- 1) What are the contaminants that are causing this problem ?
- 2) Where from the contaminants are entering the paper machine system ?
- 3) What steps can be taken either to contain the problem or eliminate it altogether ?

INVESTIGATION OF CONTAMINANTS

As a first step the felts wash water, collected at the time of washing the felts with caustic Solution was clarified and filtered, and the sediments were analysed in laboratory.

**The Mysore Paper Mills Ltd.
P.O. PAPER TOWN-577 302
Bhadravati (KARNATAKA)**

As a second step the material collected from the holes of the clogged suction rolls (Suction couch, Suction pickup and Suction press) and the grooves of venta nip Kuster rolls were collected and analysed in laboratory. It was assumed that whatever contaminants were responsible for the clogging of suction rolls must also be clogging the felts as these contaminants have to cross either the wires or felts to reach the suction rolls.

Table - I

Analysis of the Sediments of the press felts wash water collected during cleaning of the felts with caustic soda solution.

1. Loss on Ignition	%	:	92.3
2. Ash	%	:	7.7
a. Acid insolubles (as SiO ₂)	%	:	5.3
b. Others (Ca, Mg, Al, Iron)%		:	2.4

As a third step the thick, hard scales deposited on the clothing of the sectors of the disc save all were collected and were analysed in laboratory. The scaling in the disc save all used to be so acute that the performance of the unit used to drop down drastically and to bring it up to normal, caustic boiling of the unit had to be carried out.

Laboratory analysis of all the above samples indicated that the major inorganic components were Calcium, Aluminium, Iron and Silica. Hence it could be deduced that these inorganic substances in combination with other materials are forming sticky substances which are causing the clogging problem. Hence these can be said to be the root cause of the problem.

WHERE FROM THE CONTAMINANTS ARE ENTERING THE PAPER MACHINE SYSTEM

It could readily be guessed that Calcium must be entering the system through the captive pulps as both the Captive pulps which together constitute more than 80% of the newsprint furnish are bleached with Calcium Hypo Chlorite.

It could also be guessed that Aluminium and Iron must be entering the System through the ferric alum solution which is dosed to the stock in the stock preparation section.

It was suspected that Silica must be entering the system through fresh water as the water quality was not upto the mark.

Table - II A

Analysis of the scales collected from the suction pickup roll and suction press roll holes.

			Collection from Suction pickup	Suction press
1. Loss on Ignition	%	:	65.1	66.5
2. Acid insolubles (as SiO ₂)	%	:	20.3	16.8
3. Calcium (as Cao)	%	:	4.3	5.6
4. Magnesium (as Mgo)	%	:	1.3	1.1
5. Aluminium (as Al ₂ O ₃)	%	:	0.2	0.2
6. Iron (as Fe)	%	:	8.8	8.8

Table - II B

Analysis of scale collected from Kuster roll grooves.

1. Loss on Ignition	%	:	65.6
2. Acid insolubles (as SiO ₂)	%	:	12.9
3. Combined oxides (as R ₂ O ₃)	%	:	5.9
4. Calcium (as Cao)	%	:	9.2
5. Magnesium (as Mgo)	%	:	6.3

It was assumed that the Calcium ions, Al ions and Fe ions under conducive machine operating conditions might be forming substances which are sticky in nature and thus are responsible for the clogging of machine clothings and suction rolls.

Table - III

Analysis of disc save all sector wire cloth deposits.

1. Loss on Ignition	%	:	68.3
2. Silica (as SiO ₂)	%	:	2.7
3. Aluminium (as Al ₂ O ₃)	%	:	14.7
4. Iron (as Fe ₂ O ₃)	%	:	0.9
5. Calcium (as Cao)	%	:	10.4
5. Magnesium (as Mgo)	%	:	1.2

To test whether the above assumption was correct or not a small experiment was conducted. Paper machine back water (clear filtrate from the disc save all) which is used on the final (Hypo - II) bleach washer in the pulp mill was mixed in

varying proportion to a fixed quantity of Hypo-II washer filtrate. It was observed that after mixing both the waters, precipitation was taking place. The more was the addition of back water, the more was the precipitation.

STEPS TAKEN TO CONTAIN/ELIMINATE THE PROBLEM OF CONTAMINANTS

A) Calcium :

The following steps were taken to reduce the entry of Calcium into the paper machine system :

1. Improving the washing of CSRMP as it is the major constituent of newsprint furnish.
2. Improving the clarity of Hypo solution.

Both the above steps did not give a very favourable result. As a next step, usage of machine backwater on the final bleach washer was stopped. This has given some improvement. Since usage of machine backwater in pulp mills cannot be avoided for obvious reasons, it was decided to go in for peroxide bleaching of CSRMP in place of hypo bleaching to eliminate calcium ions totally and thus solve the problem once for all.

B) Aluminium And Iron :

To reduce the entry of Aluminium and Iron into the system, Sulphuric acid dosage to alum solution was resorted to. This step gave a two fold benefit.,

- 1) The clarity of Alum solution had gone up.
- 2) The fall in pH of the Alum solution had helped in reducing the dosage of Alum solution to the stock.

It was envisaged that peroxide bleaching of CSRMP will help in reducing the Alum consumption further as the dosage of the sulphuric acid to the pulp at the end of bleaching in peroxide bleaching system will reduce the pH of finally bleached cold soda pulp.

C) Silica:

To reduce the entry of Silica into the system, the clarity of water was improved in the water works and on line filters were introduced wherever

felt necessary. These steps have given fairly good results.

In July 1993 peroxide bleaching of C.S.R.M.P. was introduced and subsequently the following advantages could be observed in the newsprint machine.

1. The consumption of CSRMP which earlier was averaging around 49% in the furnish rose to 56-60% subsequently.

2) a) Machine runnability improved significantly due to cleanlines of the machine clothing maintained because of reduced contaminants in the system.

b) Improved strength properties of CSRMP with peroxide bleaching as compared to hypo bleaching for the same brightness level maintained also contributed to the higher usage of CSRMP in newsprint furnish.

Due to the above the process downtime has comedown by about 12% with corresponding increase in production.

3) clogging of machine clothing has come down drastically and the cleaning of felts and wires is now limited to just 2 to 3 scheduled machine stoppages per month. In some months the necessity to clean the clothing was not felt at all. The machine downtime has thus come under control leading to higher productivity. The machine idle times for cleaning the machine clothing which was constituting to about 15% in the process downtimes has comedown to about 3%.

4) Reduced clogging of suction rolls like couch, pickup and Suction press rolls. These rolls are now behaving properly till their next scheduled changes which was not the case earlier.

5) Improved and steady performance of the disc save-all due to almost complete elimination of the formation hard scales on the filterclothing. This gets reflected in the ash content of the pulp present in the rich white water which used to be in the range of 7-11% earlier has presently comedown to 3 - 3.5%.

6) Reduced alum consumption from the earlier 2.7% to about 1.5%.

7) Reduced dryer cylinder surface coatings which could be observed physically.

8) The unexpected improvement had been the reduction in the consumption of doctor blades for the granite roll. The life of these doctors improved from the earlier 20 days to about 35 days on an average and the consumption has come down by about 40%.

Presently captive chemical pulp which constitutes about 20-25% of the newsprint furnish is bleached in the conventional CEHH process. If hypo is eliminated in this plant also, it is expected that the contaminants problem comes down further which helps in further improving the performance of newsprint machine.

REFERENCE

Calcium and Aluminium were found to be the major inorganic contaminants responsible for the clogging of felts, suction rolls etc. To reduce the entry of these contaminants peroxide bleaching of cold soda pulp was introduced. Subsequent to the introduction of peroxide bleaching the following advantages are observed :

1. Increase in the consumption of the cheaper cold soda pulp from the earlier 49% to 56-60%
2. Improved machine runnability due to improved strength properties of the pulp and reduced contaminants in the system.
3. Reduction in machine idle time by the elimination of felts cleaning, Wires cleaning etc., to a large extent.
4. Reduced clogging of suction rolls.
5. Improved performance of disc save all due to improved cleanliness of the filter clothing.
6. Reduction in the consumption of alum from 2.7% to about 1.5%.
7. Reduced dryer cylinder surface coatings.
8. Reduction in the consumption of granite roll doctor blades.

ACKNOWLEDGEMENT

The Authors express their gratitude to the management of the Mysore Paper Mills Ltd, for their permission to publish this paper.