Saveall Closing Of Water Loop In Paper Machine.

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ABSTRACT

Performance of the save-all depends on many parameters such as size and dropleg design, operating conditions such as feed properties and shower efficiencies, and maintenance conditions of sector covers and seals which have to be optimized during the start-up of the paper machine. Super clear filtrate which plays a major role in substituting the fresh water used in paper machine one such concept discussed in this paper. Energy efficiency of Save-alls which do not have super clear filtrate, and using back wash filtration system for producing super clear filtrate.

Key words : saveall, super clear filtrate ,energy efficiency, back wash filtration.

Introduction

Saveall play a major role in recycling the back water in paper machine area. Performance of the saveall optimized during the start-up of the saveall. The performance does not change much during the course of operation with any change in the initial change in parameters. Operational problems in save-all arise only during increase in production when running with more than operating capacity. Save-alls are designed for operation based on the back water filler and fines content. Increase in the filler content of the paper (say from 6% to 12%) leaves with more filler content in the back water which drastically decrease the performance of the saveall. For such type of practices saveall has to be to increase with production capacity or chemicals such as filter aids can be used to maintain the same performance.

Saveall technology

Paper machine equipped with saveall consumes less fresh water where the most water recovered from the saveall used in various paper machine operations. mostly two types of save all predominantly used in today's paper machines are i. floatation type (Dissolved Air Floatation-DAF) ii. Disc type saveall filters.

Disc filter type saveall are used in most of the paper machines since the performance of this type is good. The easy and low cost of operation when compared with other type of saveall makes it a good choice. Today's disc filter saveall produces cloudy filtrate, clear filtrate and super clear filtrate. The super clear filtrate from saveall adds an added advantage since this can be used in some of the paper machine showers. (Fig-1)

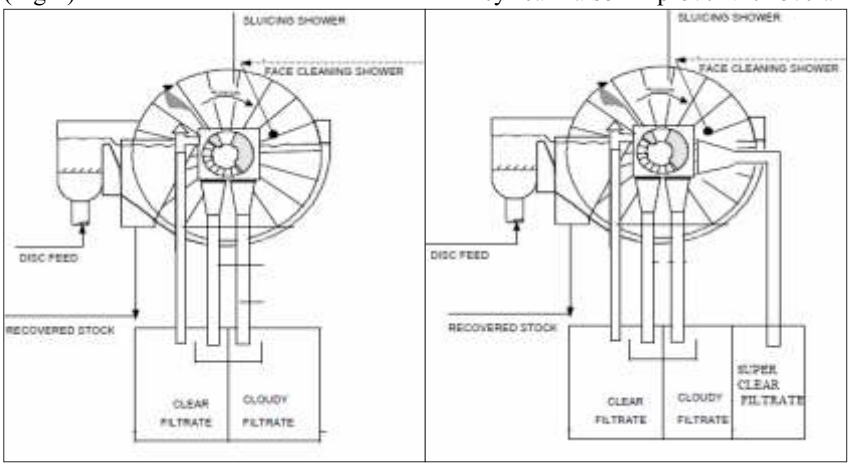

Fig-1 A.Saveall with cloudy and clear filtrate. B.Saveall with cloudy, clear and superclear filtrate.

Other systems and equipment's

There are other equipment's available to improve the efficiency of the saveall without super clear filtrate, such as back wash filter (eg. Algas filters). These type of filters used as polishing filters and reuse the cloudy filtrate to produce clear and super clear filters. They can also improve the overall efficiency of the saveall. The backwash filteration technology operats using thin polymeric disks of a specific micron size. These type of filters are also used for filtration of the excess white water generated during broke thickening and other operations.(Fig-2)

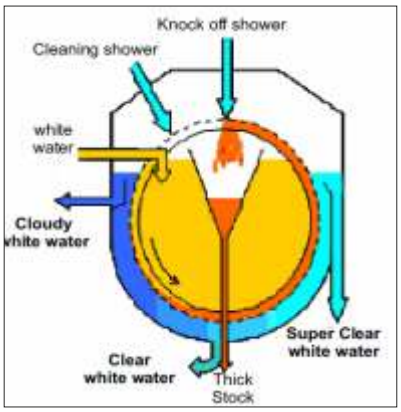

Fig-2.Typical back wash filters

Saveall operation

The required saveall capacity is determined from the water balance around the paper machine and stock preparation area. The excess white water comes from two sources from paper machine wet end and the fresh water addition for the showers. Replacement of the fresh water for the showers with clear filtrate further

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processed with polishing filters is the key source of potential water and energy saving.

The amount of sweetener stock added to the saveall feed is also important to saveall capacity and filtrate capacity. The recommended amount of sweetener is based on sweetener solids to white water solids ratio of 3:1 or to a minimum of 2:1. Adequate ratio is needed to promote drainage rate to handle capacity requirement with efficient capture of fines and filler.

The typical split between cloudy and clear filtrate is 35:65 and for the saveall which operates with super clear filtrate is 30:55:15 for cloudy:clear:super clear. Cloudy filtrate is recycled to the saveall feed mostly. This requires a higher saveall capacity for the increased feed flow rate.

Operating parameters

The operating parameters and the maintained conditions of the saveall have a large impact on both capacity and filtrate quality. Operating parameters include vat level control, disc rpm, vacuum and sweetener amount. The vat level control is done by installing the variable frequency drive for the disc rotation. The optimum speed range for the disc save-alls is 0.4 to 0.8 rpm. As the saveall increases speed towards the upper end of the operation speed range of 1.0 to 1.2 rpm the split between clear and cloudy filtrate is less distinct and clear filtrate quality decreases.

The shower plays an important role in the operation of the saveall. The nozzle of the showers should be cleaned periodically. A plugged nozzle could reduce the efficiency of the saveall. This increase the saveall capacity by increasing the vat consistency and decreases the drainage rate if the saveall.

The selection of the material for the disc cover is an important parameter for saveall performance. There are different types of covers polypropelene ,kynar, stainless steel etc. the typical filtration level for the kynar is tested and the results are shown in Table-1

Parameters affect the saveall operation

Table -1

Filtrate type	Solids level (ppm)	Solids level after filtration with kynar (ppm)
Cloudy filtrate	98	15
Clear filtrate	42	<10
Felt water from uhle box	672	42

1.Table showing performance of kynar filter media

There are many parameters affect the saveall operation. While installing the saveall the proper elevation should be provided for the barometric drop leg. The mesh media of the filter should be chosen wisely since a very fine mesh might help in obtaining a low ppm of filtrate but air cannot flow easily through the mesh. This creates the hindrance for the filtrate to fill inside the disc during the operation.

When the ash of the final paper increased to a double fold the production rate of the saveall should be increased . similarly the final ppm of the filtrates also increase. (Table - 2)

The CSF of the sweetener stock has more influence on the amount of clear and super clear filtrate flow level. A low CSF (300 ml) stock used as a sweetener produces more clear filtrate, and low super clear filtrate. This is due to the drainage resistance of the fiber mat developed on the disc of the saveall during the mat formation. The CSF of the sweetner should be in the range of 400 to 500 ml for the good operation of the saveall.

Sweetener amount and type affect both capacity of saveall and filtrate quality.

Table - 2

Base paper ash	6%	12%
Cloudy filtrate (ppm)	140	250
Clear filtrate(ppm)	20	60
Superclear filtrate(ppm)	10	30

1.Various filterate ppm level for 6% and 12% base paper ash

Table 3

Parameter (range)	Values
Typical flow to the saveall (lpm)	12000 – 17000 lpm
Sweetner flow (lpm)	3000 – 6000
Sweetner consistency (%)	5 - 5.5
Sweetner CSF (ml)	350-500
White water consistency(%)	0.25
Ash content range (%)	40-60
Vat consistency(%)	0.45-0.60
Mat consistency (%)	16-20
Cloudy (ppm)	200-300
Clear filterate (ppm)	20 -60
Super clear filterate (ppm)	10-25

1. **Typical design parameters of a disc filter saveall**

Table 4

Parameter	Value
Base paper ash (%)	6-14%
Throughput(tons/hr)	20 – 30
m/c speed(m/min)	900-1100
FPR (%)	60-80
FPAR(%)	35 – 45
Retention aid used	yes

1. **Paper machine parameters**

The typical ratio of 3:1 for sweetener solids:white water solids. Inadequate sweetener ratio such as 1:1 decreases the saveall efficiency much. The strength property of the fiber filtered from the white water are shown below.

A typical saveall design is shown in the following table and the m/c parameter are also provided. (Table 3 & 4)

Saveall for water saving

Today's machine is designed for very low water consumption where most of the water are recycled. The major water consumption for the paper machine are the wet end showers in which the fresh water is only used for low pressure and high pressure. The other major fresh water consumer in paper machine which the paper maker does not realize is the water used for the dilution of the chemical used for paper machine such as retention aid, filler dilution, etc.

For the dilution of the chemicals the fresh water can be used and for dosing point dilution instead of fresh water the super clear filtrate can be used. Since this does not alter the properties of the chemical. Similarly for the preparation of the filler the clear filtrate and super clear can be used since there is no change in the properties of the filler take place. By choosing these methods of operation the water consumption of the paper machine area can be reduced into half than the previous consumption.

The performance of the saveall can still be increased by dosing retention aid. The optimization of the retention aid is still in trial process. Dosing retention aid with sweetener stock gives maximum effectiveness. This helps in the reduction of ppm of all three filtrate systems. The cost effectiveness has to be worked out. Plant level trials are going on in this perspective. With all the process parameters are optimized and a good dosing rate of 50 grms/ton of sweetener feed into the saveall the cloudy and superclear filtrate ppm reduced to half. This type of retention aid systems are still in operation for floatation type save-alls (e.g DAF-dissolved air floatation).

Table 5

1.Fiber classification of the saveall feed

FRACTION	VALUE
+ 30 fraction%	2.7%
+50 fraction %	8.4%
+100 fraction %	15.3%
+200 fraction %	6.9%
-200 fraction %	66.7%

Table 6

1.Strength and optical properties of the hand sheet made form saveall feed

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Substance	g/m^2	59.9
Caliper	µm	101
Bulk	Cc/g	1.68
Breaking length	m	2890.75
Tear factor	(no Unit)	32.30
Bursting strength	Kpa	110
Burst factor	(no unit)	18.70
Brightness	%	74.88
Opacity	%	95.56
Scatter coeff	m^2/kg	50.28

The fiber classification done for the saveall feed and the results are shown below. This shows the maximum percentage forms the fines fraction. The strength property of the sheets formed from the recovered fibers is shown below. From the following results it is evident that recovering fiber from the white water system has a great effect on the efficiency of the paper machine (Table 5 & 6)

Conclusions

The following conclusions are obtained from the above results.

1. Disc filter type saveall are more efficient than the floatation type saveall in case of performance and cost effectiveness.
2. The disc filters with three filtrate system i.e. cloudy, clear and super clear system can reduce the water consumption of the paper machine.
3. Using super clear filtrate for pm/c wet end showers reduces water consumption.
4. Using super clear filtrate for dilution of the retention aid chemical and for filler dilution reduces the water consumption.
5. Retention aid dosing in a small quantity can improve the performance of the saveall to reduce the ppm of the filtrates. This type of method can be followed if the base paper ash is increased from the present level.

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