

Recycling & Conservation of Water In Recycled Paper Plant: A Case Study at Century Pulp And Paper

Joshi H.C, Thareja L.K, Sharma P.K, Aggarwal S.K, Aggarwal D.C

ABSTRACT

On one hand water catchment areas are shrinking very fast due to rapid urbanization on the other Water sources are depleting very fast due to rising population and Industrialization. Water is life and no wonder if one day there is a war for water in future.

Water is an essential element for very existence of all living beings and also it is key raw material for paper making without which paper making is just impossible. All out efforts are required to conserve the water to sustain the business and also to meet the stringent statutory requirements bound to come in future. Use of modern technology is not the only answer, awareness, motivation and positive attitude is must to meet the challenge.

In this paper the water conservation measures taken in our Recycled fibre based plant are presented.

INTRODUCTION

Apart from the fibrous raw material, water is the most important raw material, without which papermaking is just impossible. Rising population and unscrupulous use of water resulted in depletion of water sources. Paper Industry, one of the potential consumers of water, needs to use this resource very judiciously and frugally. Industry has no other choice except recycle, reuse and conserve water to sustain the productivity. There are many mills, which have to close down for water in summer.

Century Pulp and Paper (CPP) located at foothills of Kumaun, Started in 1984. Century undertook various expansion and modernization programmes. At present CPP is operating four fibre lines with diversified raw materials (viz, Wood, Baggasse & Waste Paper) and three new projects are in pipe line. Right from the inception CPP has been operating in harmony with environment. An elaborate Effluent treatment plant and chemical recovery were installed in the beginning itself.

Source of Fresh Water

CPP is sourcing Fresh water from ground. Properties of fresh water is given in Table No. 1. Underground water is drawn by bore wells and stored in a reservoir. From reservoir the water is pumped to various plants as per their requirement. Various water conservation schemes are implemented in different plants, which resulted in

significant reduction in specific water consumption over last few years. To sustain productivity and accommodate the future expansion utmost priority is given to conservation of water and our target to bring down the specific water consumption less than 40 M³/T of product. Trend of specific water consumption for last few years is given in graph . 1

In this paper we have focused on the water conservation measures practiced

in our 211 TPD Recycled fibre based plant. A modern DIP plant(Double Loop) and a state of the art Paper Machine was commissioned in February,2007 incorporates in built measures for water conservation and recycling like poly disc save alls and DAF units.

Consumption of Fresh Water

Recycled Fiber Paper Plant consumes approx 5550 M³ Fresh water per day. Paper machine & Stock preparation

Table - 1

Fresh Water Properties		
Characteristics	Unit	Value
pH		7.0 - 7.2
TDS		240-250
Conductivity	micro simens	530-550
Total Hardness	ppm	275-290
Ca as CaCO ₃	ppm	180 -200
Mg as CaCO ₃	ppm	90-100
Alkalinity	ppm	270-280
Cl	ppm	12.0-15.0
SO ₄	ppm	25-28
Fe	ppm	0.04-.09
SiO ₂	ppm	26-28

Graph - 1
Specific Water consumption M³/T of Product

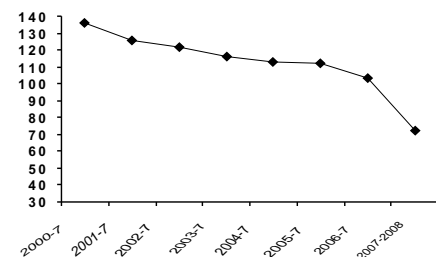
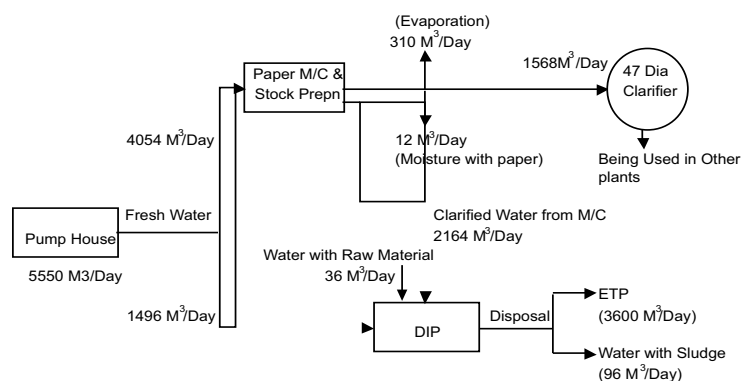


Fig. 1

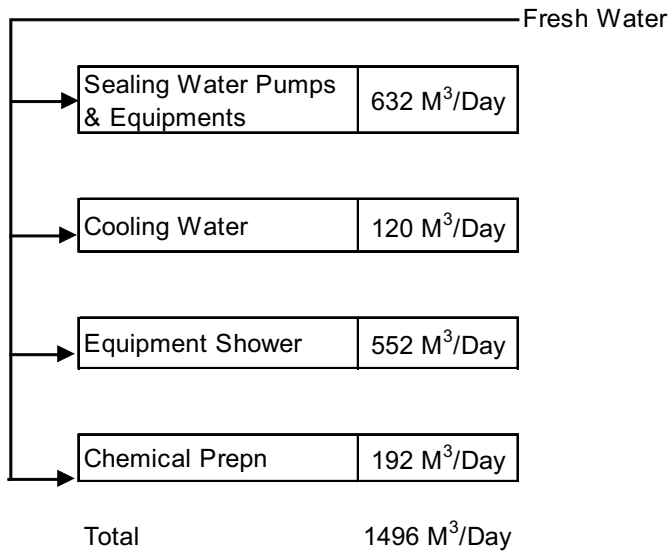


Fresh Water Distribution In Recycled Fiber Plant

Century Pulp And Paper Ghanshyamdharm,
P.O. Lalkua-262 402, Dist. Nanital (Uttarakhand)

Fig. 2

Points of Use for Fresh Water At DIP

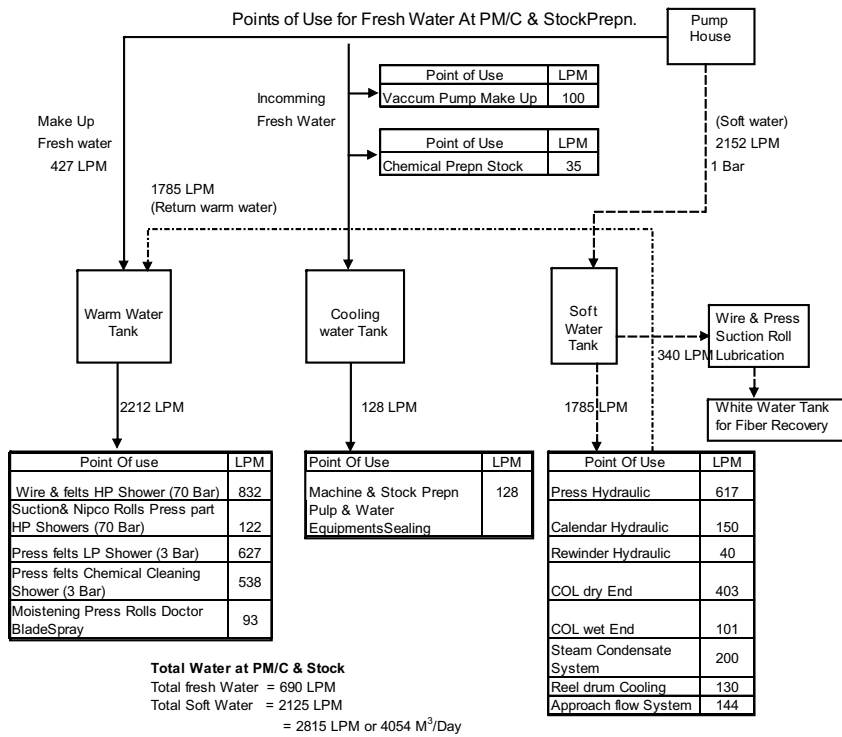


Machine supplier has recommended soft water for Hydraulics of Calendar, Presses & Lubrication of Suction rolls only, but we have faced scaling problems in our existing plant therefore we have taken soft water for COL systems, Steam & condensate systems, Reel drum cooling and approach flow system also. Soft water after feeding to heat exchangers of different hydraulic systems returned as warm water (Temp - 40/42 °C) which is used for L.P showers of felts and H.P showers of wire & Felts. In addition to scale prevention Higher temperature of water facilitated better cleaning of felts. Remaining water (hard) is used as sealing water of equipments, Vacuum pump make up and chemical preparation at stock Preparation. Details of water distribution is depicted in fig. 3

In built Fibre Recovery & Water Recycling Measures At: Paper Machine

Machine is running with alkaline sizing program and first pass retention is maintained 78-80 %. Back water of Paper machine is collected in back water silo. A modern Poly disc save all is installed at stock preparation. All Excess Machine Back water is filtered through poly disc filter, which gives three types of filtrate viz. Cloudy, Clear And Super Clear water. Properties of these filtrate is given in Table No. 2. Cloudy filtrate is re-circulated again to inlet of Poly Disc. Clear Water is stored in a buffer tank, which is used at wet and dry end pulpers, Centricleaners, Consistency dilution, flushing pulp lines & De inking plant by different pumps. An Inclined Screen fitted with 60 mesh is also installed to filter Water from vacuum system. Filtrate is taken in back water tank. Distribution of Clarified water is given in Fig 4

Fig. 3



Kaizen : Stoppage of one 2 bar pump.

Clear water was being used for consistency dilution through a 2 bar pump. This pump was stopped by providing a tapping from cloudy filtrate delivery line to consistency 2 bar pump delivery line header. This resulted in saving of approx 2lacs per annum on account of energy

In built Fibre Recovery & Water Recycling Measures At :DIP

First loop of DIP includes Pulper, Protector System, Screening, pre

consume 4054 M³/Day out of which 2164 M³ water is sent to DIP after clarification and 1568 M³ to 47 dia common clarifier for clarification and use in other plants. DIP consumes 1496 M³/Day Fresh water. Machine is producing 240 TPD Paper on average, which corresponds to approx 23 M³ water per ton of paper. Schematic diagram of fresh water consumption is given in fig. 1

Distribution of Fresh Water at De-inking Plant(DIP) & Paper Machine

At DIP fresh water (1496 M³) is used for sealing water, cooling water, Equipment Showers and chemical Preparation only balance water requirement is met by recycled water. Schematic diagram of fresh water distribution at DIP is given in Fig 2

Table - 2

Clarified Water Properties(Poly Disc Stock Prepn)

Charaterisctcs	Unit	Cloudy	Clear	Super Clear	Super Clear after Filtration
pH		7.8-7.9	7.8-7.9	7.7-7.8	7.7-7.8
TSS	ppm	80-100	20-30	15-20	8.0-12.0
Total Hardness	ppm	270-285	270-280	270-278	270-275
COD	ppm		140-150		

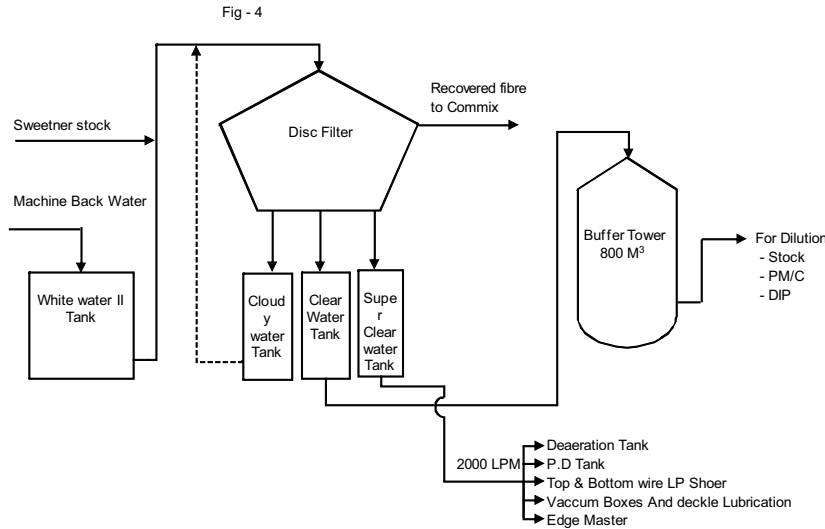


Table - 3
DAF I Water Properties

Charaterisctcs	Unit	Inlet	Outlet
pH		7.1-7.2	7.1-7.2
TSS	ppm	1100-1240	80-110
TDS	ppm	1100 -1181	950-1150
Total Hardness	ppm	390-400	350-376
Turbidity	NTU	1450-1560	200-240
COD	ppm	3000-3500	2500-2700

Table - 4
DAFII Water Properties

Charaterisctcs	Unit	Inlet	Outlet
pH		8.0-8.2	8.0-8.1
TSS	ppm	100-150	50-60
TDS	ppm	720-792	690-740
Total Hardness	ppm	200-240	200
Turbidity	NTU	45-60	35-40
COD	ppm	250-280	230-268

Table - 5
DAF III Water Properties

Charaterisctcs	Unit	Inlet	Outlet
pH		7.3-7.5	7.3-7.5
TSS	ppm	120-140	50-70
TDS	ppm	950-1005	930-1000
Total Hardness	ppm	300-330	270-290
Turbidity	NTU	160-180	70-90
COD	ppm	1800-2034	1600-1850

floatation and washing and dispersing, Second loop consists of Oxidative bleaching, Post floatation and Disc filter & disperger. Back water of loop I & II is clarified and recycled through DAFI and DAF II with help of coagulant and flocculants. There is significant reduction in TSS and Turbidity of water. Properties of DAF I & DAF II Inlet & Outlet Water are tabulated in Table -3 & Table - 4. Scheme of water clarification for DAF I And DAF II is depicted in Fig-5and Fig-6 respectively.

Centricleaner rejects, ink sludge coming out from Pre & Post floatation, Sludge removed in DAF I,II & III is collected in a sludge tank. From sludge tank the sludge is taken to sludge dewatering unit. Dewatered sludge is further squeezed through screw press to reduce the moisture content upto 50-52 % before disposal. Water removed at dewatering unit is clarified further through DAF III before disposal to Effluent treatment plant. Water clarification scheme for DAF III is given in Fig 7 and Properties are given in Table -5.

Effect of Recycling on Quality and Run ability.

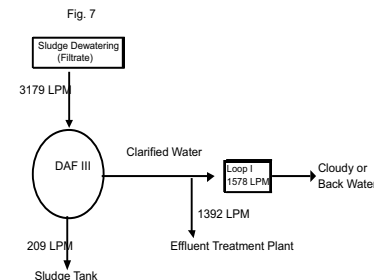
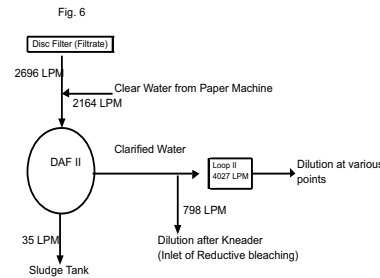
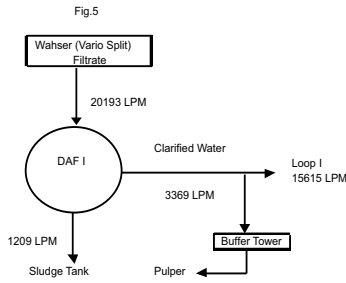
Scaling, Slime, Wire and felt plugging are the common problems associated with recycling. In addition to that stickies & Dirt is a major concern in recycled paper based plant. To over come these problems following precautionary steps are taken.

Sticky Control

Macro stickies are removed by mechanical method (Hole and slot screening) and for micro stickies, antisticky chemicals are used at disperger inlet & HD Tower. In addition to that teflon coating on first dryer and updated cleaning system for screens running efficiently which is removing stickies from screen surface.

Dirt & Specks

De inking is done with enzyme. After thorough screening pulp is taken in floatation cells where major portion of ink is removed. Pulp is further washed through at washer and ink adhered to ash is removed. Dirt count of <50 ppm is achieved in Paper.



Scaling

Major portion of fresh water used is soft water. Even after 18 months of plant running scaling problem was not observed. at Paper Machine equipments. In addition to that it also helped to maintain the hardness of recycled water more or less equal to fresh water.

To control scaling at vacuum pumps scale inhibiting chemical is also being used.

Slime

An effective biocide program is running from day one at DIP, Wet end and fibre recovery equipments. Besides this caustic boil out is taken in every 45

days, without fail and Acid boil out after 4 month . This helps us to maintain bacteria count in the range of 2.5×10^6 and no major down time on account of slime experienced so far.

Wire & Felt Plugging

On line wire and felt cleaning chemicals are being used. Use of warm water at LP shower improves the cleaning efficiency. A high-pressure shower is also installed to clean the Dryer screen continuously.

CONCLUSION

Water is the key raw material for paper making. All out efforts are required to conserve the water to sustain the

business and also to meet the stringent statutory requirements bound to come in future. Use of modern technology is not the only answer, awareness, motivation and positive attitude is must to meet the challenge .We are very sure to achieve our target .At Century are committed to preserve, conserve the resources and grow in harmony.

Acknowledgement

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