

SPB'S Approach On Water Conservation In Paper Machine A Case Study

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ABSTRACT

Though the total amount of water on this planet has never changed, the nature of that water is changing. Immigration, population growth and climate change are affecting the way we all think about our relationship with the world's water supply. And by 2050, when the world's population is expected to peak at about 9.4 billion people, it is conceivable that water could become one of the world's scarcest and most valuable commodities. Water isn't just a societal issue it also affects businesses around the world.

There is an ever increasing awareness that water resources, which are mobile, renewable natural resources, exist in limited quantities. The continuous and indefinite expansion of water uses is not possible. A situation of stability in the use of the water that is currently available must be sought. This should be one of the main strategic goals of a long-term water management policy. There is an urgent need to find ways of saving, reusing and recycling water, and to develop methodologies to improve water resource management.

This paper describes SPB's approach on Water Conservations and its benefits in Paper Machine.

Introduction

The United Nations has recognized access to water as a basic human right, stating that water is a social and cultural good, not merely an economic commodity. Since ancient times, water has been recognized universally as an invaluable resource. Water has been harvested in India since the dawn of civilization. The Ramayana, Mahabharata and various other Vedic, Buddhist and Jain texts contain several references to water harvesting structures in existence and water being revered as a life giving and sustaining force. The bible quotes, 'I am the Alpha and the Omega, the beginning and the end. To the thirsty I will give water without price' - Revelation 21:6. In

Islam, the *Sharia* law in Koran literally translates to laws of sharing water.

Water consumption in Indian Paper Industry:

Industrial consumption is lower compared to agricultural consumption. In India, Total water consumption by paper industry in a year is around 905.8 million m³ and the effluent discharge is around 695.7 million m³.

Global standard of Specific Average Water consumption is 28.66 m³/t in Large Scale Wood Based Pulp & Paper Mills. But in India is around 100 m³/t of paper. This higher consumption is due to

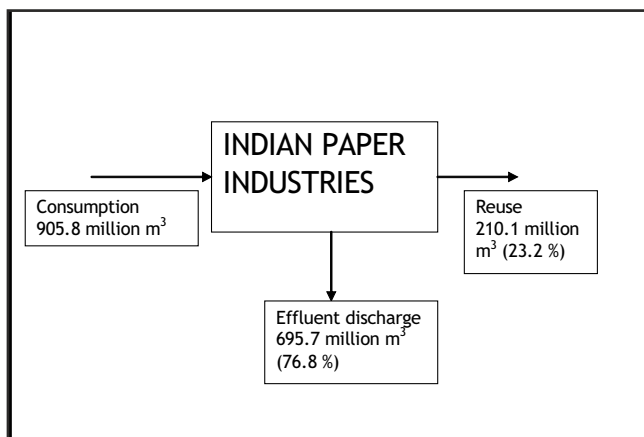
- Lack of Technology adaptation
- Poor Equipment efficiency

TABLE 1
GLOBAL BENCHMARK
FOR SPECIFIC WATER
CONSUMPTION

COUNTRY	SPECIFIC WATER CONSUMPTION m ³ /Ton of Paper
United States	64
Australia	28.66
Europe	40
Canada	67
Finland	40
Spain	30
INDIA	???

Cultural Paper mills producing Cream wove, Map-litho and Chromo papers. Industrial paper mills produce Kraft, Paper Boards. Specialty Paper mills produce Security papers, Electrical grade papers and Tissue papers etc.

FIG. 1 - INDIAN PAPER INDUSTRIES WATER USAGE

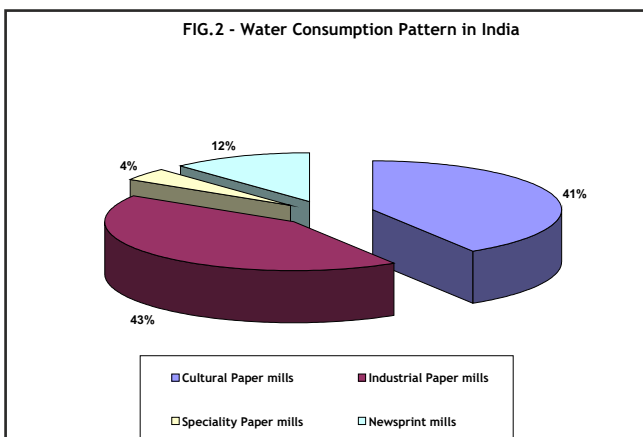


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➤ Poor water management practices
In India, the consumption pattern of Water is as given below:

Is there Standard Benchmark for Paper Industries?

The Global Benchmark for Specific



water consumption is given in Table-1. But in India, is there standard Bench mark?

Water Conservation Measures:

The conservations measures are

- Equipment modification
- Behavioural modification
- Process Modification

Equipment Modifications:

- Recycling – Used water in the same process
- Reusing – Used water in some other process
- Reclamation – Collecting the waste water and use for some process

Behavioural Modification:

- By stopping misuse of water for cleaning, etc
- Turn off water when not using it like

in hose, tap, etc.

The water conservations through

- House keeping measures (Low cost Measures) like Leak identifications and arresting,
- Production scheduling (to avoid unwanted draining the system),
- Automation like Level controller, pressure controller.
- Better Raw material utilization to avoid excess water usage in bleaching operation.

WATER BALANCE IN PAPER MACHINE # 5:

FIG.3 - PULP BALANCE

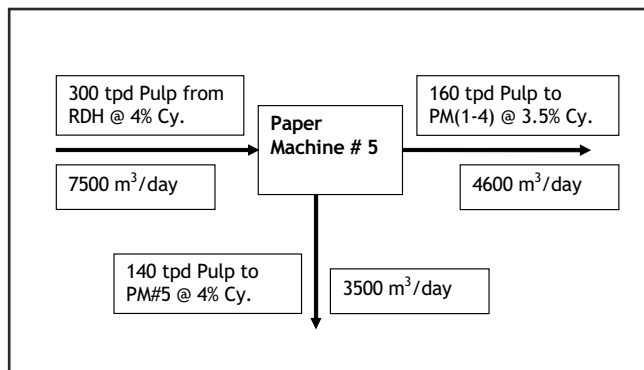


FIG.4 - WATER BALANCE

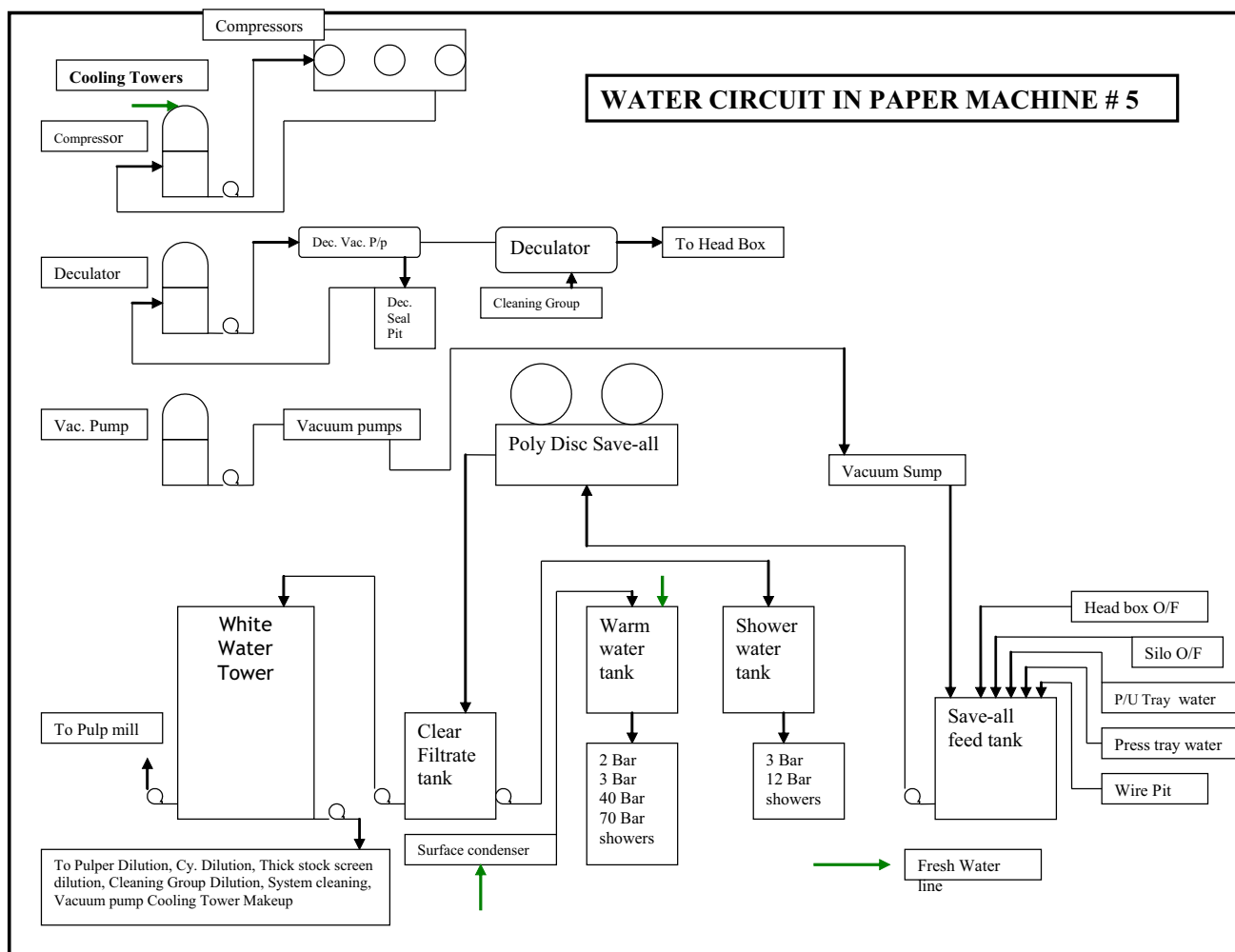
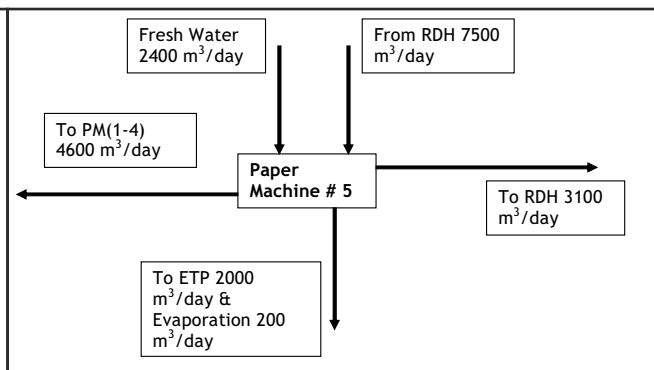


TABLE 2
FRESH WATER DISTRIBUTION BEFORE &
AFTER IMPLEMENTATION OF WATER
CONSERVATION MEASURES

BACK WATER	FRESH WATER	BEFORE (m ³ /day)	AFTER (m ³ /day)
All Pulper Dilution	Compressor Makeup	200 m ³ /day	200 m ³ /day
Consistency Dilution	Warm Water tank makeup	60 m ³ /day	60 m ³ /day
Shower Water Tank	Surface Condenser	1580 m ³ /day	1580 m ³ /day
Thick Stock Screen system dilution	Deculator seal pit makeup	100 m ³ /day	NIL
Cleaner group tank makeup	Vacuum pump sealing water tank makeup	300 m ³ /day	NIL
	Pump Sealing water	250 m ³ /day	250 m ³ /day
	Chemicals Preparation	200 m ³ /day	200 m ³ /day
	Others	50 m ³ /day	50 m ³ /day
	Total Consumption	2790 m³/day	2390 m³/day

TABLE 3
PAPER MACHINE SHOWERS

	WARM WATER TANK	SHOWER WATER TANK
ppm	10 – 20	60 – 70
Filter	--	Barrel Filter (Duplex)
Usage Points	2 Bar Lubrication shower for Forming roll, Suction Couch roll, Suction Pick up roll, Suction Press roll	12 Bar for Sheet Knock Off shower and Edge Knock Off showers with ON/OFF valves
	3 Bar for Wire showers	3 Bar for Felt roll showers
	40 Bar for High Pressure showers in clothing	
	70 Bar for High Pressure showers in roll cleaning	

FIG.5 VACUUM COOLING TOWER
SYSTEM BEFORE IMPLEMENTATION

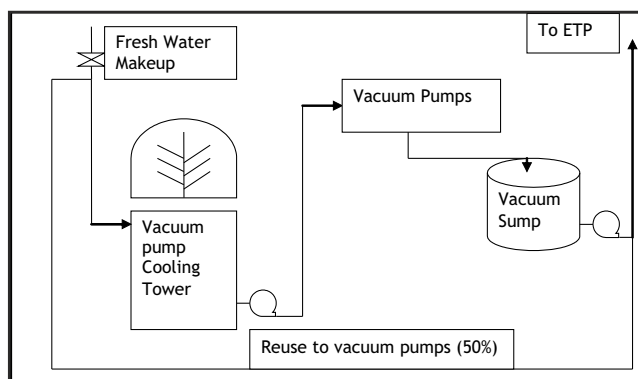


FIG.6 VACUUM COOLING TOWER
SYSTEM AFTER IMPLEMENTATION

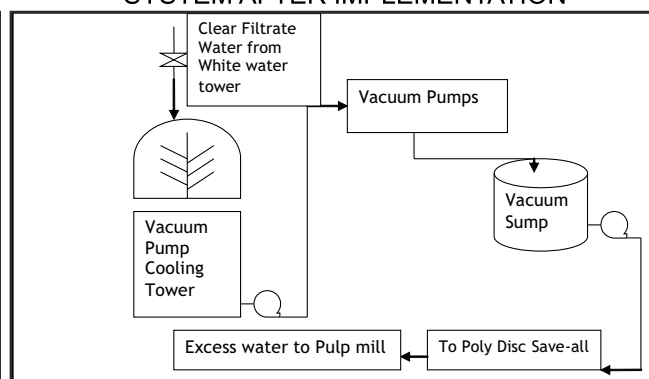


FIG.8 DECULATOR COOLING TOWER
SYSTEM AFTER IMPLEMENTATION

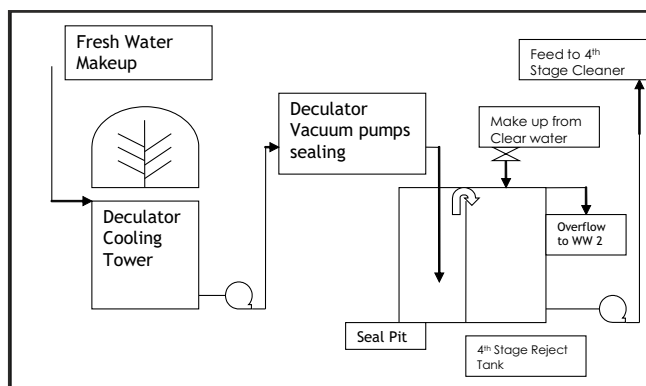
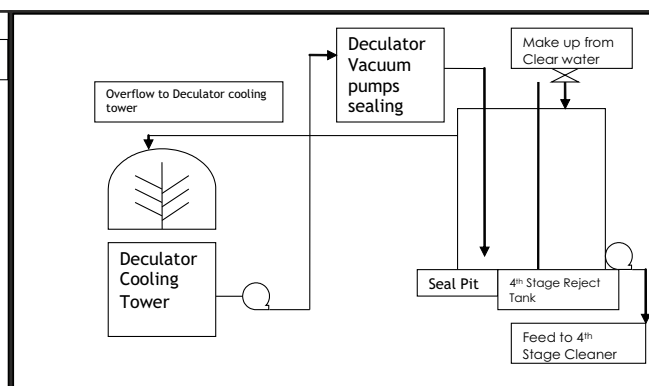


FIG.7 DECULATOR COOLING TOWER
SYSTEM BEFORE IMPLEMENTATION



Process Modification:

- Optimal usage of Cooling water collecting and reuse
- Collection and recycling of clean water from vacuum pumps
- Use of Seal-less pumps. This is used in most of the chemical industry. It can be adopted in our industries also.
- Monitoring of Showers in Paper machines and increase the usage of back water.

SPB' Approach On Water Conservation Measures:

SPB's water source is River Cauvery. In PM#5, we have more closed loop system for water.

Briefly, PM#5 Paper machine comprises of

Make : VOITH
Head Box : Hydraulic W type with top lip Anti-deflection control
Wire Part : Duoformer F
Press Part : Duo-centri II with Suction Pick up,

Dryer Part

Speed Sizer
Calendar

Pope reel

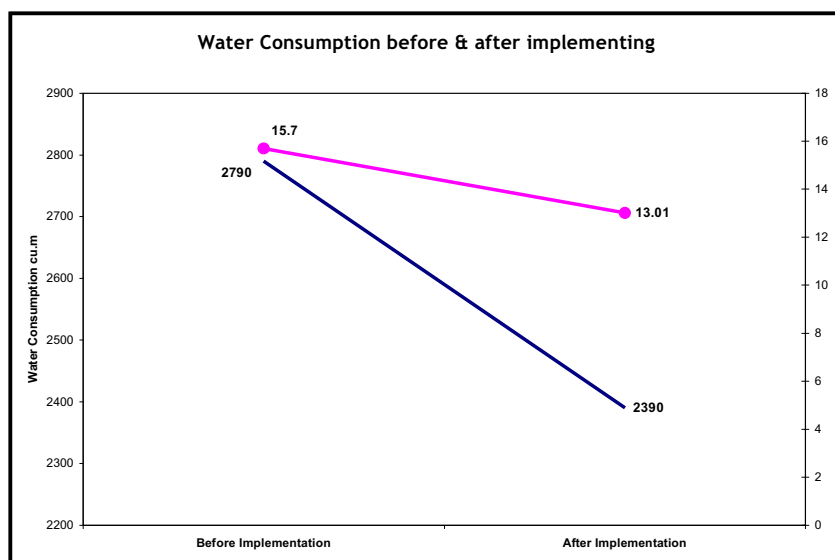
Suction Press, PU covered CC rolls in I and III nip position.

: I & II groups are Unirun and III, IV, V and VI groups are conventional Top & Bottom cylinders.

: Voith Film Press
: Single stack with singly nip CI rolls

: Grooved drum with Primary & Secondary arm.

FIG.9 WATER CONSUMPTION BEFORE & AFTER IMPLEMENTATION



Automation : ABB DCS - Advant station 500 series
QCS Accuray 1190 version.
GSM Range : 45 to 140 GSM
Machine Speed : 400 to 950 mpm
Products : Wood free Printing & Writing Paper Surface sized Map litho paper Pigment Coated Paper
Copier Grades
Coating Base Paper
Average Production: 180 tpd
Furnish : 70 % - 80 % - Captive Bleached Hardwood Pulp (ECF Bleached)
20 % - 30 % - Captive Chemical Bagasse Pulp (ECF Bleached)

CASE 1:

In Vacuum pump cooling tower, fresh water was added and return water sent to Effluent due to the following reasons:

- Fines content is more in return water
- Temperature is more i.e. around 50 deg. C
- Cooling tower fins are getting choked with fines settlement.

Action Taken:

- ✓ Vacuum Pump cooling tower makeup water was replaced with Clear Filtrate Water (60 ppm) from Poly disc save-all to replace Fresh water Make up.
- ✓ Vacuum sump water was diverted to Poly Disc Save-all and the excess clear water of 60 ppm from White water tower is supplied to Pulp mill for Bleached Tower Pump Consistency control.

Benefits Achieved:

1. ETP load reduced
2. Fresh water replaced with Clear filtrate from Save-all
3. Back water used in Pulp mill helps to maintain final pulp Brightness (Since Back water contains OBA)
4. Fines recovered in Poly Disc Save-all.

CASE 2:

Fresh water was added in Deculator cooling tower for make up as the Sealing water was going to Deculator Seal Pit and to White water Tank because

- High Temperature i.e. 40 deg. C
- To maintain vacuum barometric leg.
- Contamination of Deculator Vacuum pump sealing water with 4th stage Reject tank water.

Action Taken:

- Deculator vacuum pump sealing water was diverted to Deculator Cooling tower for Reuse through Overflow line without disturbing Vacuum Barometric Leg.
- Deculator Vacuum pump Sealing Water (40 deg. C) is recycled through Cooling tower.
- Increased the Height of the wall between Deculator Seal pit & 4th Stage Reject Tank thus segregated Vacuum pump sealing water from 4th Stage Reject tank water.

Benefits Achieved:

1. Deculator Cooling Tower makeup with Fresh water eliminated.
2. Deculator Vacuum pump Sealing

water temperature (30 deg. C) achieved by passing through cooling tower.

Future Plans:

- From all pumps sealing water will be collected in a sump and will be re-used. Thus 250 m³/day can be saved.
- By using efficient filters, we proposed to substitute fresh water with backwater, wherever possible. Thus, we are targeting for water consumption - **10 m³/ton** of Machine Production.

Conclusion:

By Process modifications and using the available automation

- Water consumption reduced by around 400 m³ per day in Paper Machine #5
- Clear water sent to Pulp mill thus saving the costly chemicals like OBA.
- Recovered costly fibers and fillers from Vacuum pump sealing water, thus disturbance in wet end chemistry like Charge Demand, etc avoided.
- By closing the water loop in the Paper Machine complex, wet end chemical consumption is optimized.
- ETP load reduced by close water loop.

LET'S NOT STOP; WE NEED TO GO FURTHER.

Acknowledement:

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