

The Electric Power Saving through highly Developed Technology & the successful Case Study at SPP (Stock Preparation Plant)

1. Abstract: Reducing utility cost in the paper industry is one of the big tasks to reduce the total manufacturing cost. Most paper mills that mainly use recycled papers (like OCC, ONP, OMG, SOP, BBC, WBC, MWP, HWS, OB etc.) make use of Coarse Screening System, Fine Screening System & Pulping System in their process. South Korean Machinery Company developed the technology to reduce the power consumption in these systems through the effective optimization between the associated machineries and the associated factors. Most South Korean paper mills remodeled the existing equipment in the Coarse Screening System, Fine Screening System & Pulping System, in consequence, they got the satisfactory power-saving results. This paper is on the basis of the successful Case Study from South Korean paper mills.



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2. INTRODUCTION

2.1 Coarse Screening Process (HDC , Hole Screen, LDC & MDC)

Do you believe that a South Korean engineer had the experience to had entered to stopped Pulpers for the technology development more than 1,000times ? Actually the introduced case study is a product of continuous effort and investment like above Pulper case.

As a result, Pulping time can be reduced at the same slushing quality of output, throughput can be increased at the same power consumption because the inlet consistency of Coarse Screening's equipment & Fine Screening's equipment can be increased or the other way, Power consumption can be reduced at the same throughput because the inlet consistency of Coarse Screening's equipment & Fine Screening's equipment can be increased by our the technology development.

PCT for this technology is under way in the USA, India, China, Indonesia & Thailand. Patent are composed of 15 items.

20~50% Power consumption was reduced against the existing Coarse Screening System & the existing Fine Screening System in the South Korean Paper mills. And about 10% Power consumption was reduced against the existing Pulping System in the South Korean Paper mills.

1) HDC

Increased Throughput Efficiency by Secondary HDC & the output of 1st HDC is sent to next process without passing any Chest.

2) Hole Screen

Developed Rotor Type, Blade type, Blade arrangement, the internal velocity, the internal volume, Cross-sectional area, Flow curve & Piping (Optimal Piping Size) & Pump Engg. (Optimal Pressure & optimal Head)

★ Increased Throughput & reduced the Power consumption by running without nearly ΔP

3) LDC

Increased the consistency & turned LDC into MDC.
 MWP & OCC : 0.8%~1.2% → 1.5~2.0% at the inlet of MDC

ONP & SOP : 0.8%~1.2% → 1.2~1.5% at the inlet of MDC

★ Increased Throughput & reduced the Power consumption by running without nearly ΔP

2.2 Fine Screening Process (Slot Screen)

Developed Rotor Type, Blade Type, Blade Arrangement, the internal Velocity,

the internal Volume, Cross-Sectional Area, Flow Curve, Piping (Optimal Piping Size) & Pump Engg. (Optimal Pressure & optimal Head).

Increased the consistency at the inlet Slot Screen like Coarse Screening System.

★ Increased Throughput & reduced the Power consumption by running without nearly ΔP

2.3 Slushing Process (Pulping System)

Developed Impeller Type, Turbulence Improvement through Various type of Vane, Developed Strainer (Stator) Structure, Increased Rotor rpm & Continuous Pulping by Double Secondary Pulper

★ Comprehensive Design to consider above points according to type of Pulper in remodeling.

2.3.1 Pulper Impeller (Rotor)

1) De-flaking Effect is improved, 2) Fiber Loss is reduced, 3) Specific Energy is increased & 4) Throughput is increased



2.3.2 Pulper Flat Strainer :Same to 5.1.1

Before**After**

2.3.3 Screen Rotor

1) Screening Effect is improved, 2) Fiber Loss is reduced, 3) Specific Energy is increased & 4) Throughput is increased

Before**After**

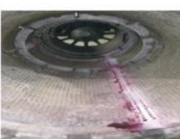
2.3.4 Screw Press

1) Dewater Effect is improved & 2) Through put is increased

Before**After**

2.3.5 Plate & Basket

1) Impurity Removal is improved, 2) Fiber Loss is reduced & 3) Throughput is increased

Before**After**

3. RESULT SUMMARY

3.1. Market Share in the Korean Market within the recent 5 years

3.1.1 Remodeling

- Packing Grade : 80~85 %
- CDB Grade : 85~90 %
- Special Paper Grade & Tissue Paper Grade : 50~60 %

3.1.2 New Project within the recent 5 years : 80~90%

4. EFFECT

4.1. Innovative Power Saving (Basic Power Unit per Production Cost, kW / Paper Ton)

4.1.1 Korean S Paper

360kW/Ton → 320kW/Ton at Liner Board (11% Reduced)

340kW/Ton → 295kW/Ton at CMP (13% Reduced)

4.1.2 Korean K Paper

320kW/Ton → 235kW/Ton at CMP (27% Reduced)

4.1.3 Korean D Paper

275kW/Ton → 250kW/Ton at CMP (9% Reduced)

4.2 Increased Throughput (TPD)

4.2.1 Korean S Paper : 1,250tpd → 1,450tpd (16% Increased)

4.3 Increased Yield (Recovery of long Fiber)

5. CASE STUDY

5.1. OCC Base for Packaging Grade

5.1.1. South Korean "S" Paper / Liner Board & CMP.						
Equipment			Result			
No	Before	After	Unit	Before	After	Variation
1	Slushing Process (Pulper Impeller)	SJ-Super WHL Impeller	kWh	580	580	
			min.	35	28	One Batch time
2	Coarse Screening (Cleaner System) Fine Screening (Screen)	SJ-Super HI Cleaner				
		SJ-Power Screen	mm	0.35	0.30	Slot size
		New SJ-Sand Separator	kWh	1,513	1,044	- 469 kWh (-31%)
		New SJ-Step Screen	ton/day	1,250	1,450	+ 150 tpd (+16%)

5.1.2 South Korean "D" Paper / Liner Board & CMP.						
Equipment			Result			
No	Before	After	Unit	Before	After	Variation
1	Slushing Process (Pulper Impeller)	SJ-Super WHL Impeller (2 sets)	kWh			
			min.	Nil	Nil	Batch time (-20%)
2	Coarse Screening (Cleaner System) Fine Screening (Screen)	SJ-Super HI Cleaner				
		SJ-Power Screen	mm	0.40	0.32	Slot size
		New SJ-Sand Separator	kWh	562	300	- 262 kWh (-47%)
		New SJ-Step Screen	ton/day	1,100	1,250	+ 150 tpd (+14%)

5.1.3 South Korean "K" Paper / Liner Board & CMP.						
Equipment			Result			
No	Before	After	Unit	Before	After	Variation
1	Coarse Screening (Cleaner System) Fine Screening (Screen) Reject Process (Sand Separator)	SJ-Super HI Cleaner	kWh	530	150	- 380 kWh (-72%)
		SJ-Power Screen	ton/day	750	900	+ 150 tpd (+20%)
		SJ-Sand Separator				
		New SJ-Step Screen				

5.1.4 South Korean "J" Paper / CMP.

Equipment			Result			
No	Before	After	Unit	Before	After	Variation
1	Coarse Screening (Cleaner System)	SJ-Super HI Cleaner	mm	Ø 3.0	Ø 2.8	Hole Size
	Fine Screening (Screen)	SJ-Power Screen	mm	0.35	0.32	Slot size
			kWh	774	275	- 499 kWh (-64%)
			ton/day	350	400	+ 50 tpd (+14%)

5.2 OMG, ONP, SOP, OCC & OB Base for CDB Grade

5.2.1 South Korean "H" Paper / Coated Duplex Board

Equipment			Result			
No	Before	After	Unit	Before	After	Variation
1	Slushing Process (Pulper Impeller)	SJ-Super WHL Impeller				6 x Pulper→ - 20% 2 x Pulper→ + 200 t/d
2	Coarse Screening (Cleaner System)	SJ-Super HI Cleaner				
	Fine Screening (Screen)	SJ-Power Screen	kWh	930	595	- 335 kWh (-36%)
		New SJ-Sand Separator	ton/day	610	740	+ 130 tpd (+21%)
		New SJ-Step Screen				

5.2.2 South Korean "S" Paper / Coated Duplex Board

Equipment			Result			
No	Before	After	Unit	Before	After	Variation
1	Slushing Process (Pulper Impeller)	SJ-Super WHL Impeller				- 20%
2	Coarse Screening (Cleaner System)	SJ-Super HI Cleaner				
	Fine Screening (Screen)	SJ-Power Screen	kWh	845	352	- 493 kWh (-58%)
		New SJ-Sand Separator	ton/day	340	375	+ 35 tpd(+ 10%)
		New SJ-Step Screen				

5.3 Virgin Pulp & White Ledger Base

5.3.1 South Korean "M" Paper / Tissue Paper

Equipment			Result			
No	Before	After	Unit	Before	After	Variation
1		Replacement of Pulper Impeller to SJ-Super WHL Impeller (2 sets)	kWh	221	178	-20% Saving
		Replacement of Cleaner System to SJ-Super HI Cleaner	kWh			-150kWh Saving
		Replacement of existing Screen to SJ-Power Screen				
		Remodeling of DIP 1 line in 2016	kWh	305	127	- 178 kWh (-58%)
		Remodeling of DIP 2 line in 2017	kWh	305	127	- 178 kWh (-58%)

6. CONCLUSION

6.1. In Coarse Screening System & Fine Screening System at South Korean Mills

- 1) Our facility is level of 30~40% power consumption compared to other facility in case of Turbo-Separator
- 2) In comparing Screen to Screen, our facility is 30~50% of power compared to other facility by maintaining the constant consistency at top & bottom of the screen through technology development.
- 3) The fiber recovery ratio is better than others

6.2. In Pulping System

- 1) In changing the complete pulping system, 30~40% power was saved against other.

By optimizing type of Impeller & the number of Vane according to the consistency & the furnish, the optimal gap between Screen plate and Impeller knife in designing of equipment, and minimizing to use the secondary pulper.

- 2) In comparing the partial equipment to the partial equipment, 10~12% power was saved against others -The End-