Modular Deinking Technology and DIP plants troubleshooting

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Abstract

At the PAPTAC of 2006 we presented a paper called "**Process mapping: Fibre, Energy and Water Management**" where we highlighted the importance of process design when dealing with DIP plants.
At that time we defined 12 sequences called Units Process Blocks (UPB). We determined that the combination of different UPBs allowed us to design a proper DIP line for diverse types of furnishes and grades.

Introduction

Since that time we have put theory into practice. In 2007 we started up the deinking line number 2 (DIP2) at the Saudi Paper Mill.

Saudi Paper Manufacturing Co., (SPMC) is a leading manufacturer of consumer tissue paper in the Kingdom of Saudi Arabia (KSA) with a production capacity in excess of 75,000 MT/yr. SPMC's plant is strategically located in Dammam which allows it to serve the Saudi Arabian market and the entire Gulf region.

In addition to its geographical advantage, SPMC has been progressive in selecting technologies to better serve the markets. Currently the SPMC plant includes three high speed tissue machines (the fourth crescent former machine will be ready for start up in the first quarter of 2009) and two deinking lines. The deinking technology gives SPMC an edge in terms of quality and production flexibility since it can adapt to the changing needs of the local and international market.

SPMC prudently zeroed in on investing in deinking technology to produce high quality DIP pulp products to complement use of wood pulp. The decision enabled the company to provide a wide range of product lines, greater customer value and support to the environment.

	Actual MT/y	2008-2009 MT/y
Tissue Machines Capability	63,000	126,000
Stock preparation (LF&SF)	115,000	126,000
DIP's Lines	66,500	105,000

DIP1 Rebuilding

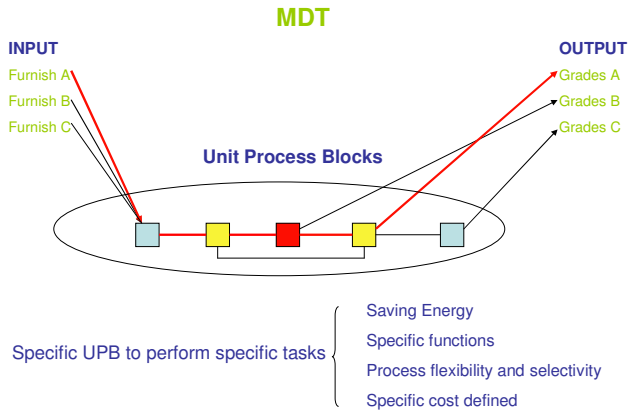
In 2000 a strategic survey of SPMC's DIP1 was conducted and the resulting recommendation was to revamp the whole system. The following results were:

	Before	After
Production MT/y	22,000	35,000
Yield %	<60	>68
Final Brightness ISO°	<75	>82
Macrostickies removal efficiency (Tappi T277)	<70	>93

Subsequent to the successful revamp of DIP1, SPMC decided to implement the new DIP2.

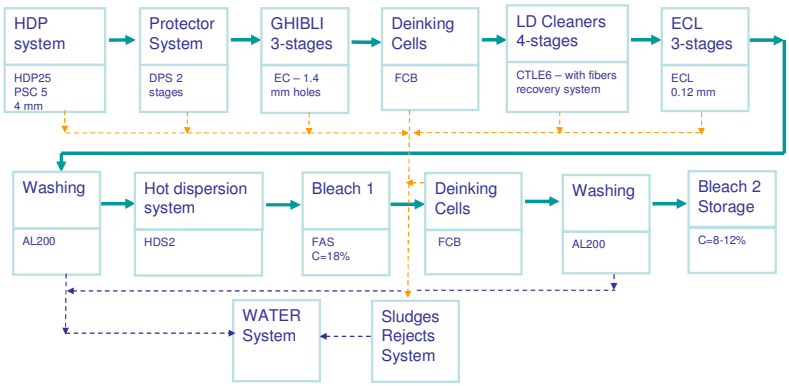
Process Overview

Comer deployed its Modular Deinking Technology (MDT) during the process design phase of this project. The DIP2 was executed through MDT by combining different process stages whilst avoiding duplication of actions which could possibly damage the recycled fibres.



Applying the MDT to the DIP2 system was designed for high flexibility with different process configurations namely as a single loop or as a double loop depending on the inlet furnishes and the outlet final DIP pulp. Additionally a third loop was installed to minimize water and chemical consumption.

DIP2 – process diagram



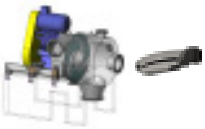
It is of particular interest to note the following:

First at the pulping stage, the application of the Twister technology that allows the furnish to slush up to 22% when the fillers content is higher than 18%. That is indicative of a higher production rate and low specific energy consumption. Also the detrasher, Epurex, will perform with a perforated plate with holes of 4 mm.

Pulping stage

•HD Pulper + Twister rotor

Working consistency up to 22%
Slushing time 16 min

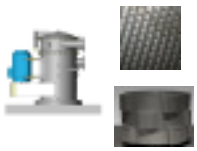


•Epurex PS

Holes 4 mm
Discharging time 6 min.
Working consistency >4.5 %

Second, the combination and integration of the screening phases to obtain macrostickies removal efficiency from 85% up to 98% depends on the furnish and the grades to be produced.

Screening Stage(s)



•GHIBLI

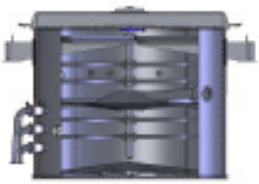
Holes type
Working consistency >3.5 %

•ECL screen

Slots type
Slots size 0.12-0.15 mm
Working consistency 1.2 %

The third and arguably most important part of the process is the ink removal stage that is performed by the Cybercel flotation cell. This stage allows the plant to achieve an increase in brightness on the first loop of up to 12 ISO° and a dirts count removal efficiency of up to 98%.

Flotation Stage(s)



• Cybercel FCB

C=0.9-1.2%

Counter washing concept
No over-mixing actions
High selectivity [inks & macro-stickies]
5 independent levels of air injection
Internal reactor – variable speed control

Vacuum mcw	Bubble size Radius microns	Lpm air for injector at 2 bar	Bubble dynamic upraising speed m/min	Total interface air m2/m injector	Inks/dots Type
-3	430	41	6.93	282	UV-Laser
-4	225	30	1.89	400	Offset-roto
-5	105	21	0.41	600	Roto-News
-6	50	15	0.093	850	Flexo

Details of the equipment in the different process loops are as follows:

Loop 1	
	HD Pulper + Twister rotor
	Epurex PS – Holes 4 mm
	Cybercleaning CPS – 2 stages
	Cyberscreens EC Ghibli +Stralis – Holes 1.4 mm. -3 stages
	Flotation Cell – Cybercel FCB
	LD cleaning – CTL6 – 4 stages
	Cyberscreens ECL – slots 0.15 mm. – 3 stages
	Washers AL – 2 x AL200
	Screw Press PV
	Cyberheater CSH + CDD Disc Disperger
Loop 2	Bleaching Tower
	Flotation cell – Cybercel FCB
	Washers AL – 2 x AL200
	Storage Tower
	DAF1 – water loop 1
	DAF2 – water loop 2
Rejects treatment	Reject Slotted Conveyor
	Rejects Press
	Sand dewatering screw
	Densidisc – LD rejects thickening
	DAF3 – final water treatment

After the installation of the equipment the start-up of the plant was performed in early 2007. Within two months of the start-up, the plant was commissioned with the following results when producing prime grades:

	Contract Design	Actual	Potential with application of MDT process
Production MT/yr	34,400	36,000	52,000
Yield %	>65	>66	>66
Final Brightness ISO°	>80	>82	>82
Macrostickies removal efficiency (Tappi 277)	>95	>97	>97
Final ash content %	<3	<2	<2

The targets achieved reveal that MDT allows a high process and capacity flexibility.

MDT Configuration and application

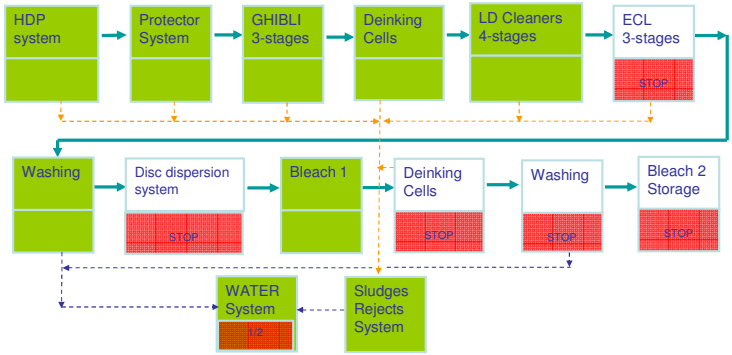
Here are the results and relevant DIP configuration to produce deinked pulp for three different grades: super commercial, commercial and prime.

	INPUT parameters		
Grades	Super C	C	Prime (pulp grade a&b)
Furnish	MOW OMG ONP	MOW OMG	MOW OMG Ledger
Brightness ISO°	57	59	60.5
Fillers content %	16	18-20	20-24

Distinct furnish mixes are used. Depending on the furnish and the final grades to be produced the DIP line runs with select configuration which can be decided by the operator on the DCS system.

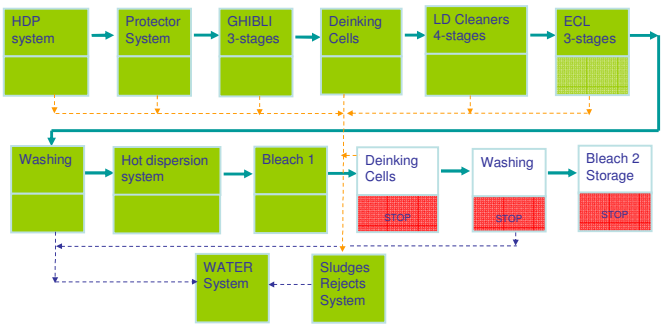
For instance, to produce deinked pulp for the super commercial grade, only the first loop of it is used. You can notice that the fine screening and dispersion systems are not running - as well as the second loop of the process.

Super C - Grade



For the commercial grade that requires improved final pulp qualities, the whole first loop is used.

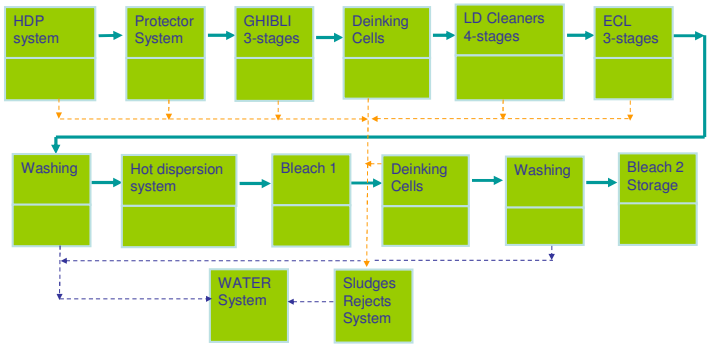
C - Grade



For the prime grades that require pulp qualities comparable to a virgin pulp (grade a and b) the complete line (loop 1and 2) is used.

Prime - Grade

(pulp grade a and b)



For the plant configurations listed above, the following are the quality results:

	OUTPUT results		
Grades	**Super C**	**C**	**Prime** (pulp grade a&b)
Furnish	**MOW OMG ONP**	**MOW OMG**	**MOW OMG Ledger**
Yield %	**>78**	**>72**	**>67**
Brightness ISO°	**70**	**76(78)**	**>82(84)**
Macrostickies removal efficiency (Tappi 277)	**>85**	**>89**	**>97**
Fillers content %	**16**	**18-20**	**<1,5**
Fresh water consumption (m3/t)	**0.45**	**0.6**	**0.5**
Specific energy (kwh/t)	**377**	**432**	**617**

Conclusions

The successful implementation of the MDT technology for the DIP2 project allowed the client to invest in a duplication of DIP2 immediately following the first, thereby saving future development costs. The new project, called "Project 300" is currently in the engineering and building stages and will add 35,000 MT/yr more to the DIP2 line.