
Welcome

Dr. Bala Panchapakesan

Introduction

- Started Carrier with SPB – Erode in 1978
- Passed BSc Diploma – 1984 and left for USA
- Pursued MSc/ PhD and MBA
- Leadership role in consumer product/ container board in Cellulose div.
- Over 30 papers written by him have been published.
- Holds one patent in his name
- President BPK Consulting Services, LLC

Improving Productivity and Performance of Recycling Plant Operations

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USA

To discuss

- Key Elements Raw Material Procurement and Balancing
- Discuss Critical Assets in Processing of Recycled Fiber
- Help With How to Strategically Think About the Recycling Plant
- Capacity, Upgrades and Operation
- Discuss How Do We Balance Cash Costs, Throughput and Quality

Agenda

Introduction = Recycling Plant

Waste Paper Recovery = USA and India

Design and Operating Conditions

Opportunities For Improvements – Example Technical Evaluation

- Design Capacity vs Operating Capacity
- Quality of Pulp
- Waste Minimization

Capital Investments – in Steps

Summary

U S A OCC Usage

- **Paper and paperboard were recovered for domestic and export use at a record rate of 70 % in 2020.**
- **For OCC, the rate is a much more impressive 90.0 % - 92.0%, according to the Corrugated Packaging Alliance.**
- **On average, a corrugated box contains roughly 50% recycled fiber. Around 51% of OCC is used to make new corrugated board, with 11.5% used for boxboard materials, such as cereal boxes.**
- **Around 32% of recycled OCC is exported.**
- **Supply/Demand dynamics are going to change with new US Policies (Gov't)**
- **Effects of Pandemic and Amazon and other shipping companies growth**

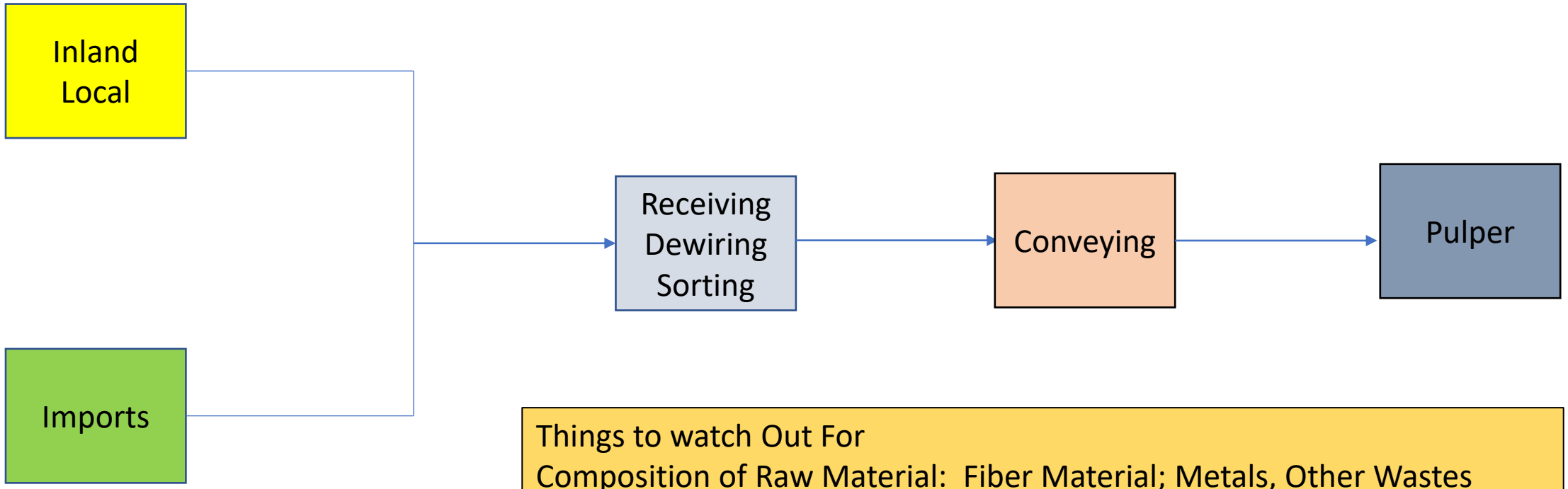
INDIA OCC Usage

- **India received more recovered fiber imports since China placed restrictions on imports of OCC/Mixed Office Waste Material in 2018.**
- **India is the biggest consumer of recovered fiber imports on this list of nations, other than China. China is so big that it has consumed over the past 30 years about one-third of the world's recovered paper. India can come close to China on usage of recycled fiber over the next 15 to 20 years.**
- **India produced about 17.5 million metric tons of paper and board in 2018 and increasing since then.**
- **It used recovered fiber to produce 65 percent of that volume. Of the 13.5 million metric tons of scrap paper consumed by India's mills in 2018, 7.5 million metric tons (about 55.6 percent) were imported.**
- **The volumes of [exported] recovered paper to India will gradually keep going up as the optimal use of installed capacities and the restart of unused capacities.**
- **Plant managers may like to focus on optimum mix of recycled fiber/virgin fiber on cost and quality**

INDIA OCC Usage

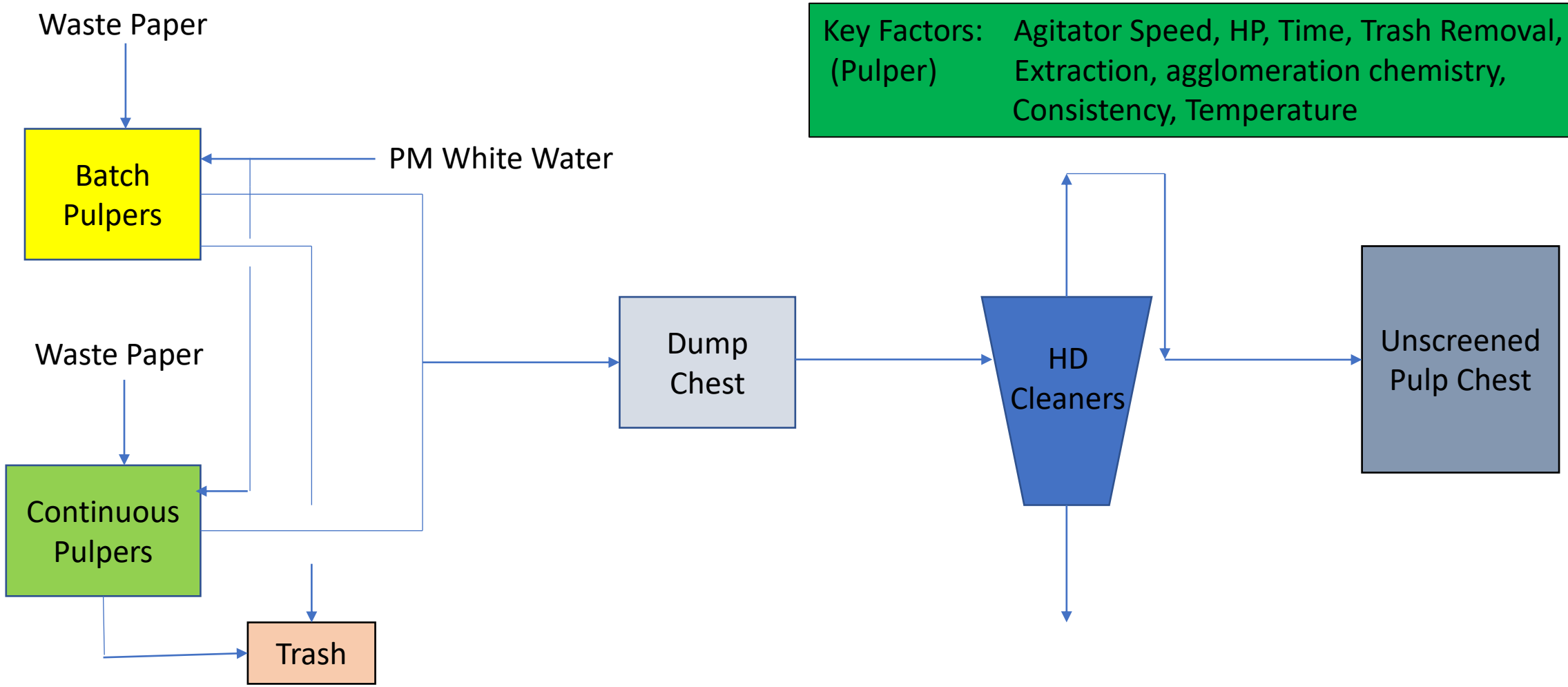
- **India achieved about a 35 % – 40 % percent recycling rate in recent years.**
- **Several policies, acts and rules have been framed by the central government and its departments, an overarching National Material Recycling Policy that would holistically address material recycling has not yet been framed," (MRAI secretary general).**
- **India is implementing best practices used in various segments of the global recycling industry**
- **CPPRI is conducting trials on collection of waste and recycling with support from Government. More to come on this.**

Waste Paper Procurement and Processing



Things to watch Out For
Composition of Raw Material: Fiber Material; Metals, Other Wastes
Proportion of Coated Paper, Mixed Office Waste, Box Plant Waste, Boxes
Glues, Other Sticky Materials

Hydrapulpers and HD Cleaners



Batch and Continuous Drum Pulper

Courtesy: Helico Batch Pulper

Courtesy – Andritz

Key Factors: Consistency; Horsepower; Raw Material Quality; Rejects rate

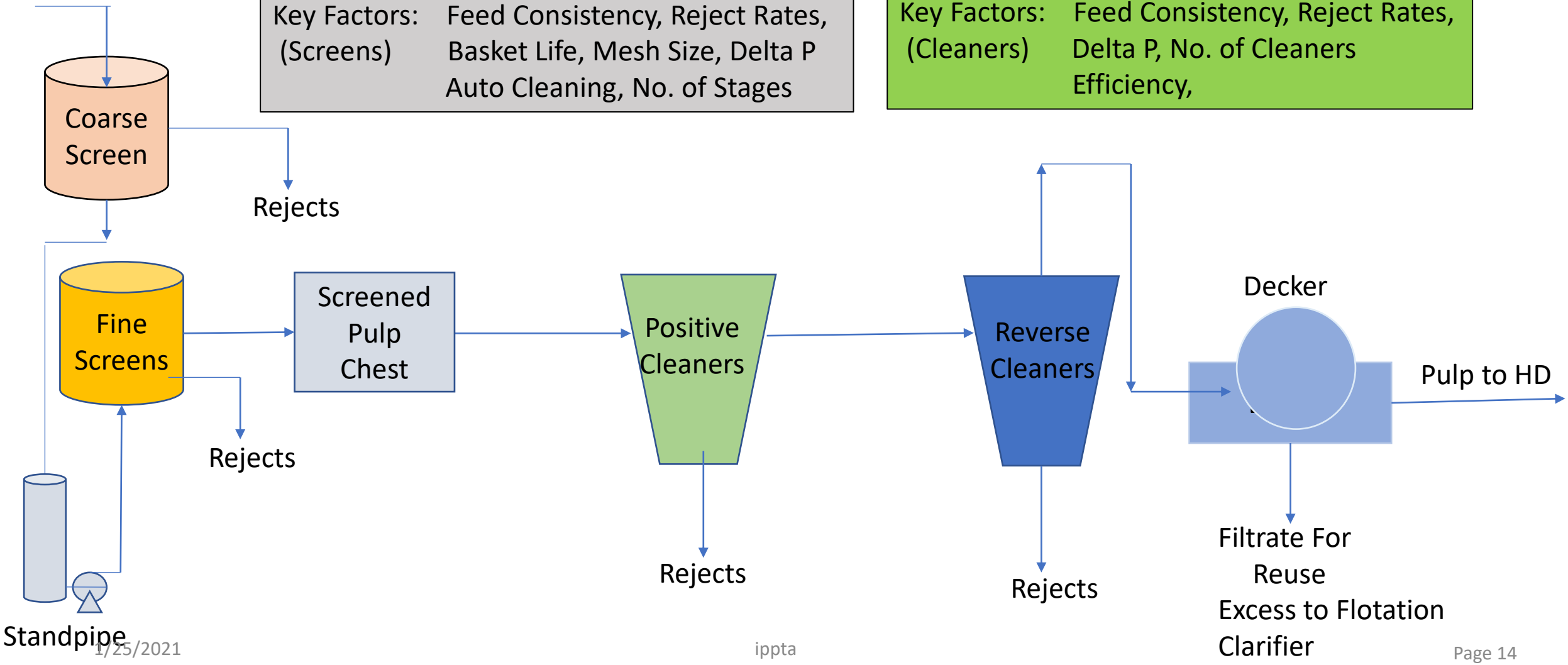
HD Cleaners

Courtesy: Andritz: DuoClean system with AhlCleaner RB

Screens and Cleaners

Key Factors: (Screens) Feed Consistency, Reject Rates, Basket Life, Mesh Size, Delta P Auto Cleaning, No. of Stages

Key Factors: (Cleaners) Feed Consistency, Reject Rates, Delta P, No. of Cleaners Efficiency,



Screens and Cleaners

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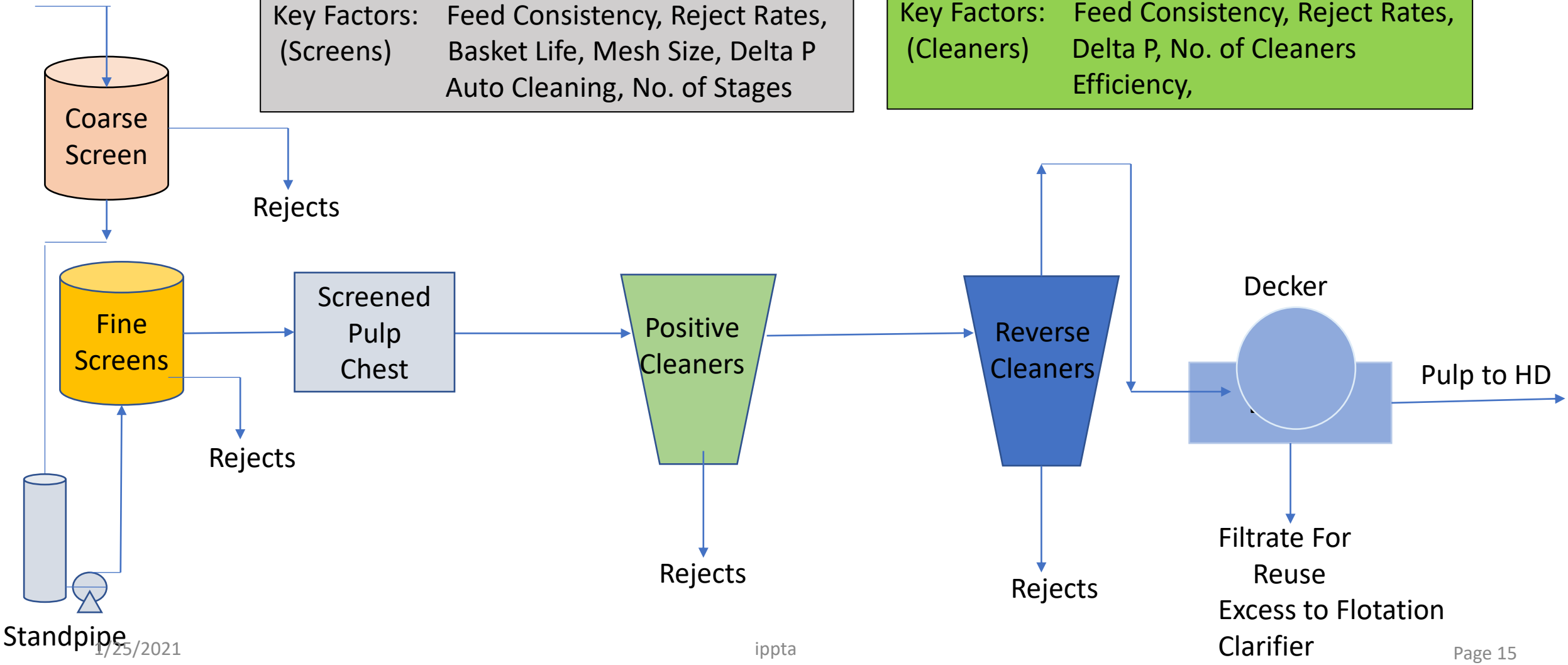


Factors to be Considered For Improving Efficiency

Majority waste paper users 80 % in kraft paper; 20 % Board

Waste Paper Parameters Expected Norms:

- **Mixed Office Waste and Magazine Paper Should be Less Than 10%**
- **Plastics and Non-Fibrous materials to be less than 2 %**

Batch/Continuous Pulper: Operate at Design Consistencies

HD Cleaners: Optimize the Feed Flow, Discharge Flow, Delta P and Purge Rates

Screens: **Operate at Design Feed Consistency, Reject Rates, Maintain Basket Life, Mesh Size, Delta P, Auto Cleaning, No. of Stages**

Cleaners: **Feed Consistency, Reject Rates, Delta P, No. of Cleaners, Efficiency**

Design of Recycle Plants – Case Study

Design Capacity: 240 TPD

RECYCLING PLANT MATERIAL BALANCE

DESIGN BASIS: 240 ODTPD

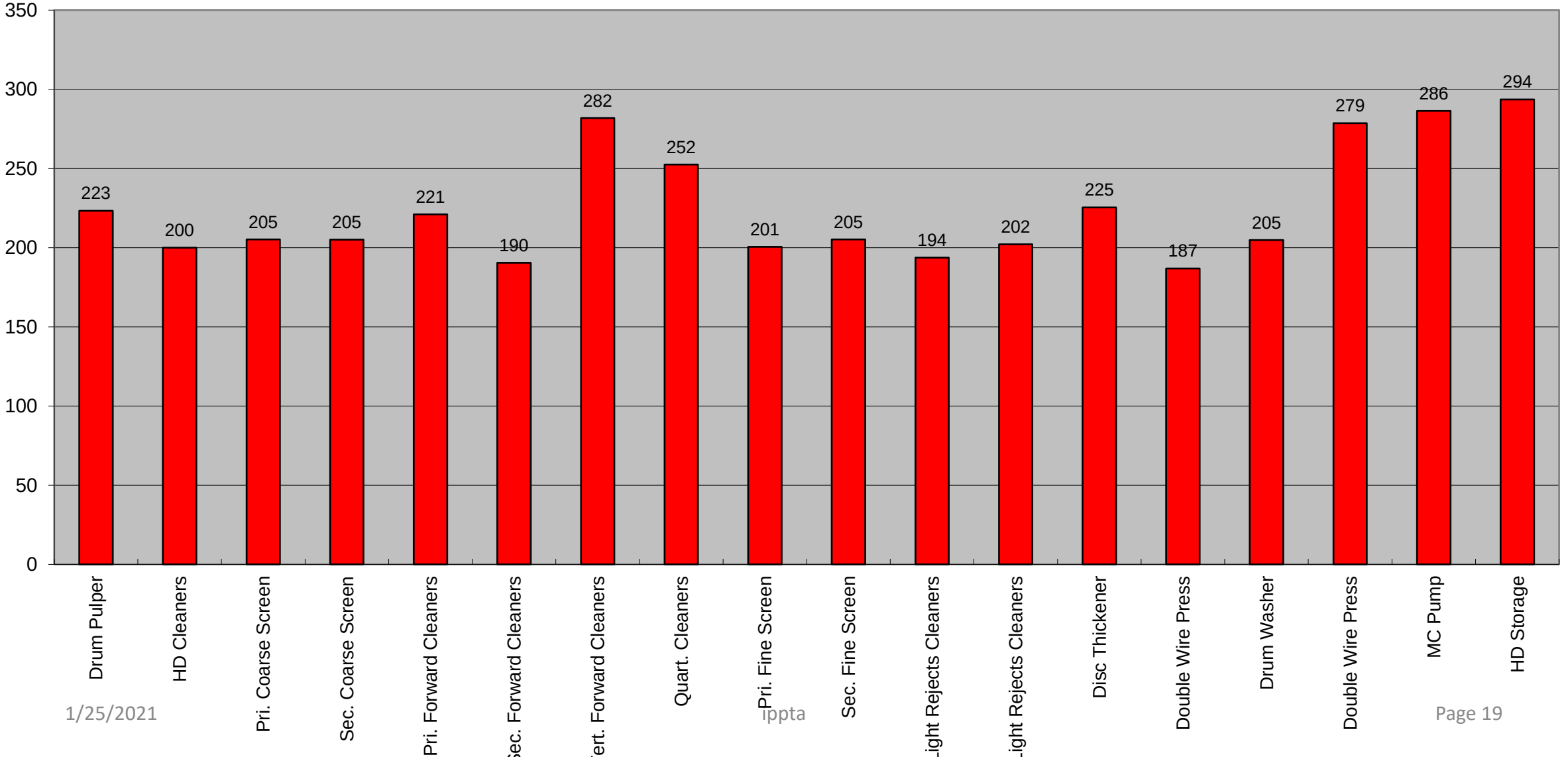
Waste Paper Requirement 300 ADT/d

15	4. Pulping Drum:	TPD	Cons, %	GPM
16	Waste Paper Feed, ODT/d	270.0	90.00	50
17	Caustic from Storage,	0.0	0.00	0.3
18	Peroxide from Storage, 0.75 %	0.0	0.00	3
19	Sodium Silicate from Storage			
20	DTPA from Storage, 0.155 %	0.0	0.00	1
21	Dispersant from Storage, 0.26 %	0.0	0.00	0
22	Cloudy WW from Cloudy Filt. Tank to Pulper	0.4	0.03	300
23	Stock from Pulper	270.4	16.50	273
24	5. Screening Drum			
25	Feed from the Pulping Drum	270.4	16.5	273
26	Dilution from the Cloudy Filt. Storage Tank	1.9	0.03	928
27	Feed to the Screening Drum	272.3	3.80	1201
28	Screening Drum Perforations Size = 3/8"			
29	Screening Drum Accepts, (W/V = 99.5/ 99.8)	271.5	3.80	1199
30	Screening Drum Rejects	0.8	5.70	2
31	Rejects to Rejects Conveyor	0.8	5.70	2

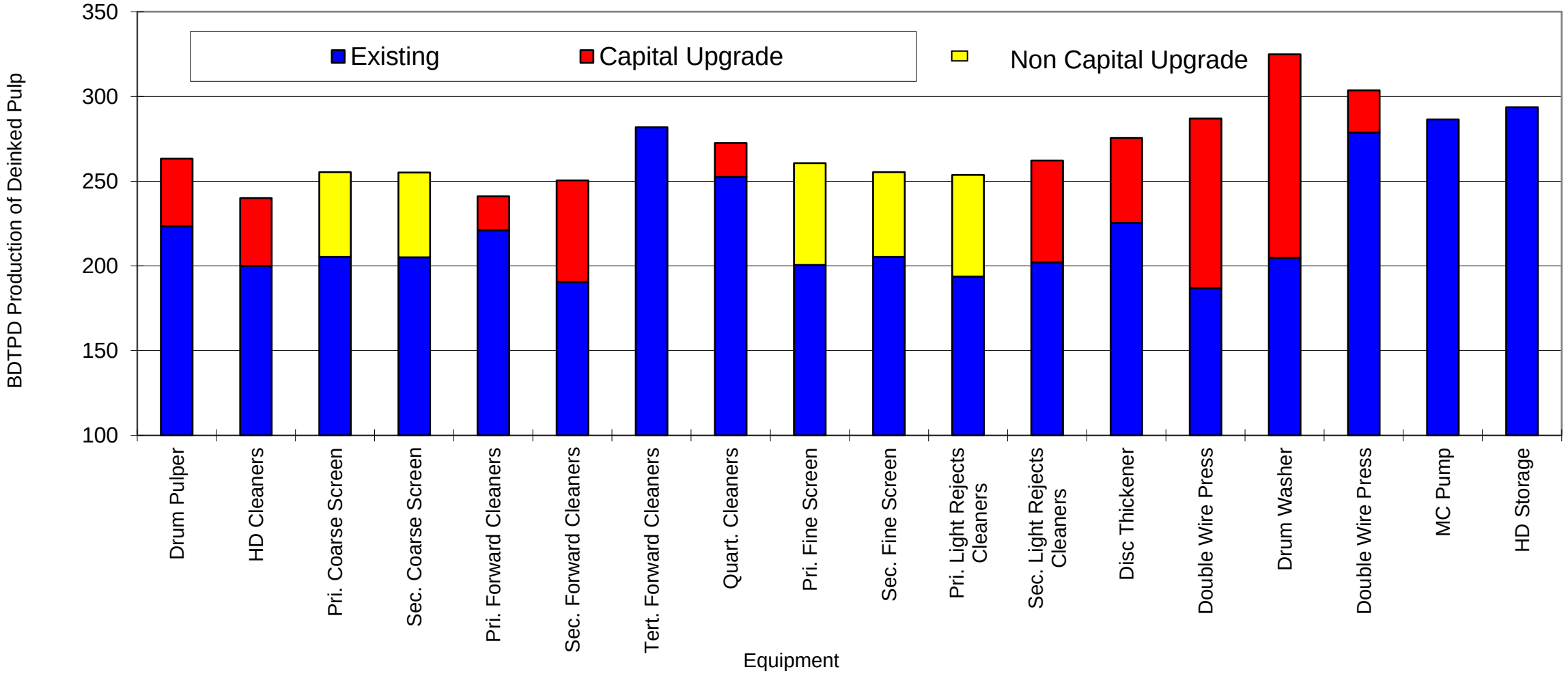
Material Balance For Recycle Plants Equipment Limitations

Design					Production =		209TPD		
Pump			Motor		Pump		Motor		
Flow gpm	Impeller Size, In	TDH Ft	HP	RPM	Flow gpm	TDH Ft	Estim. HP Req.	RPM	Comments
1600	18 3/4	140	100	1200	0				OK
500		65	30	1800	0				OK
500		65	30	1800	0				OK
1250	11.5	50	25	1200	1466				Coarse Screen Feed Tank Pump Limited
1400	12 3/4	65	40	1200	1466				Coarse Screen Feed Pump Limited
400	12 1/4	65	15	1200	356				OK
2800	16.125	48	40	1200	2647				OK
2650	16 x 15	51	50	900	2647				OK
2650	16.5 x 14.5	51	50	900	2647				OK
5900	425 mm	110	250	1200	5619				OK
1500	15 3/4	100	60	1200	1469				OK
450	14.375	100	25	1200	439				OK
130	9.625	100	?	?	106				OK
410	14 7/8	110	25	1200	409				OK
500	15 1/8	110	30	1200	591				Sec. Light Cleaner Feed Pump Limited
6000	18 1/4	120	250	1200	6309				Pri. Fine Screen Feed Pump Limited
800	12"	60	20	1200	1025				Sec. Fine Screen Feed Pump Limited
110	11 5/8	60	7.5	1200	238				Tert. Fine Screen Feed Pump Limited

Material Balance For Recycle Plants Bottlenecks



Material Balance For Recycle Plants Capital and Non-Capital Upgrades



Economics of Plant Upgrades

Base Capacity: 240 TPD; Upgraded Capacity: 300 TPD

Option	Investments	Upgrade Existing Plant	INR, Crores	Return on Investment, Year
1	Plant Upgrades	3.0 Million U S Dollars	Rs. 22	
	Increased Production	60 TPD		
	Pulp Value	$5.9 Million Dollars	Rs. 43	< 1 Year
2	New Plant 100 TPD	$10.0 Million - 15.0 Million	Rs. 110	
	Pulp Value	5.9 Million Dollars	Rs. 43	2.6
3	Pulper, Screens, Refiners, 100 TPD (Lower Pulp Quality)	6.0 - 8.0 Million Dollars	Rs. 58	
	Pulp Value	$4.2 Million Dollars	Rs. 31	1.9

Cost will be different if you have existing building and Electrical Infrastructure to accommodate upgrades
Used equipment can give better economics, but higher maintenance and lower life cycle.

Waste Reduction – Recycling/Deinking Plant

OCC Yield	Good Performance	=	88% - 92%
Deink Pulp Yield	Good Performance Yield	=	78% - 80%

Key Focus Areas:

Raw Material Quality

Minimize Pulper Rejects (Extraction Plates)

Minimize Screen Rejects

Minimize Cleaner Rejects

Avoid Fiber Losses from Stock Chests

How do you decide to make investments

- How is the plant operating capacity versus what it is designed for ?
- Are the individual equipment operating reliably?
- Are we getting the yield on pulp close to what the target is ?
- Does it make sense to invest incrementally or we need to look at major capital ?
- What are the short term and long term strategies on Facility Growth ? Does the proposed direction fit that strategy ?

Summary

In this session we discussed

- Wastepaper Recovery and Markets in USA and India
- Process Equipment in the recycling plant operations
- What are the specific issues in operation
- What factors are to be considered for improving efficiency and throughput
- What you can do to improve performance of existing plant.
- Economics of Rebuild vs New Plants

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