



Latest Innovations Around 'Filler And Pigment Revolution' In India

IPPTA Webinar

June 2020



Introduction

Challenging business environment mainly due to COVID-19 calls for continuous improvement and innovative solutions to sustain profitability

Fillers and Pigments inseparable parts of papermaking system for quality improvements and cost optimization

Webinar Focus: Value Creation from Onsite Satellite PCC* Plants (Filling and Coating), High Filler Technologies and Filler from Lime Mud

Specialty Minerals Inc (SMI) industry leader in providing innovative solutions around filling, coating and high filler technology applications

AGENDA

Who Are We?

- Areas Of PCC Applications
- Onsite Satellite Plant- Concept
- Value Of PCC In W&P Applications
- Value Of PCC In Coating Applications
- High Filler Technologies- Fulfill®
- Filler from Lime Mud-NewYield®
- Overall Summary
- Q&A





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✓ *Technology Oriented*
✓ *Growth Company*
✓ *'We Care'*



Minerals Technologies Inc (MTI) At A Glance



- **\$575 Million 2019 Sales**
- **Paper PCC**
- **Performance Minerals**

- **\$823 Million 2019 Sales**
- Metalcasting
- Household and Personal Care
- Basic Minerals
- Environmental Products
- Building Materials



- **\$298 Million 2019 Sales**
- Refractories
- Metallurgical Wire



- **\$95 Million 2019 Sales**
- Filtration
- Well Testing
- Off-shore Services



Four Business Segments

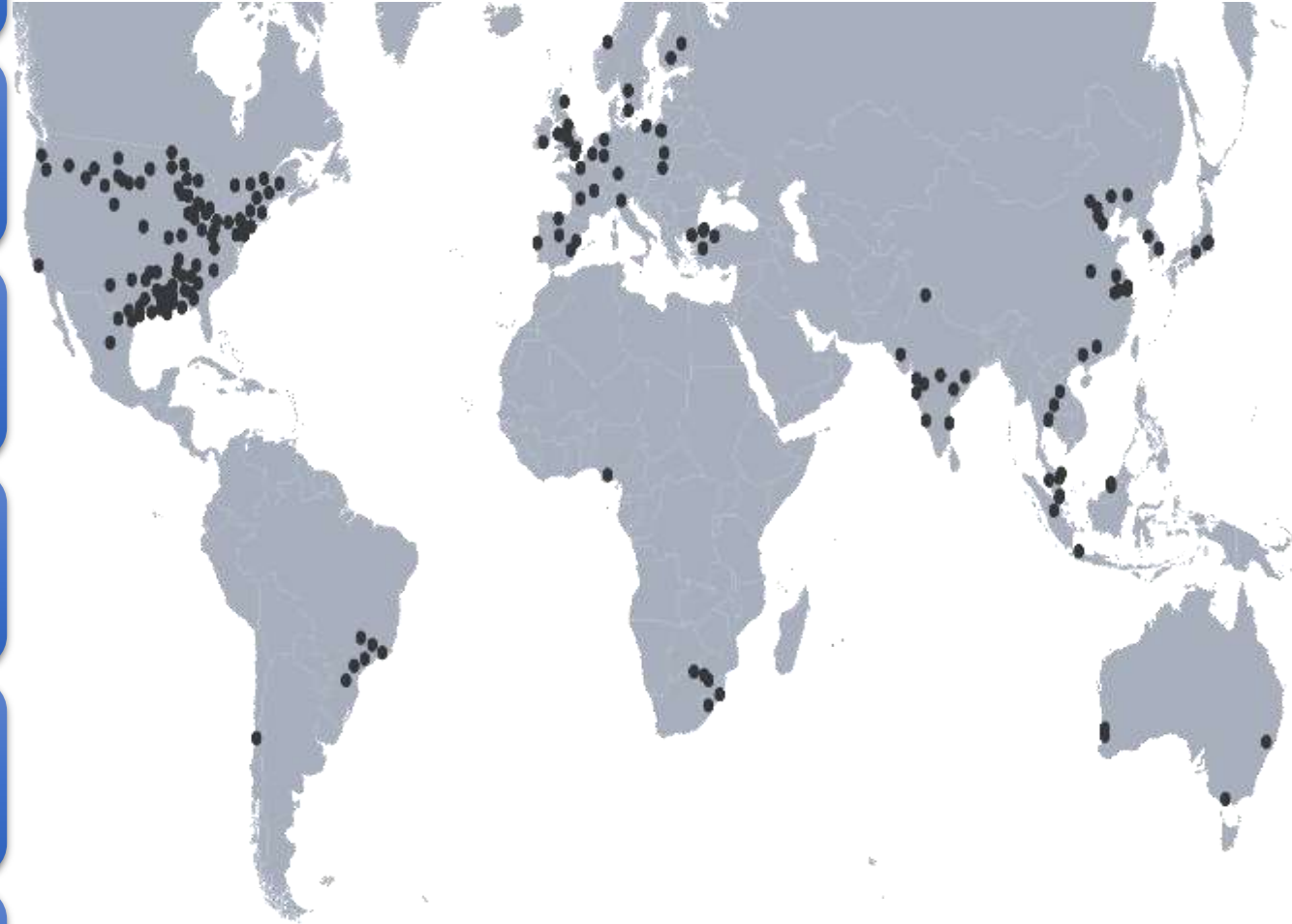
2019 Sales
\$1.8 Billion

Operations in
35 Countries

158
Worldwide
Production
Locations

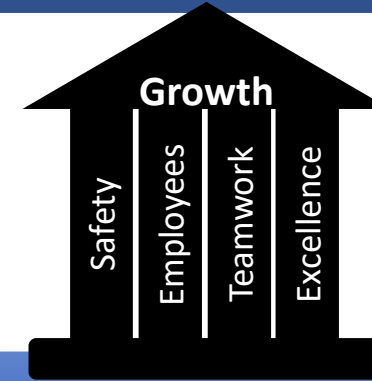
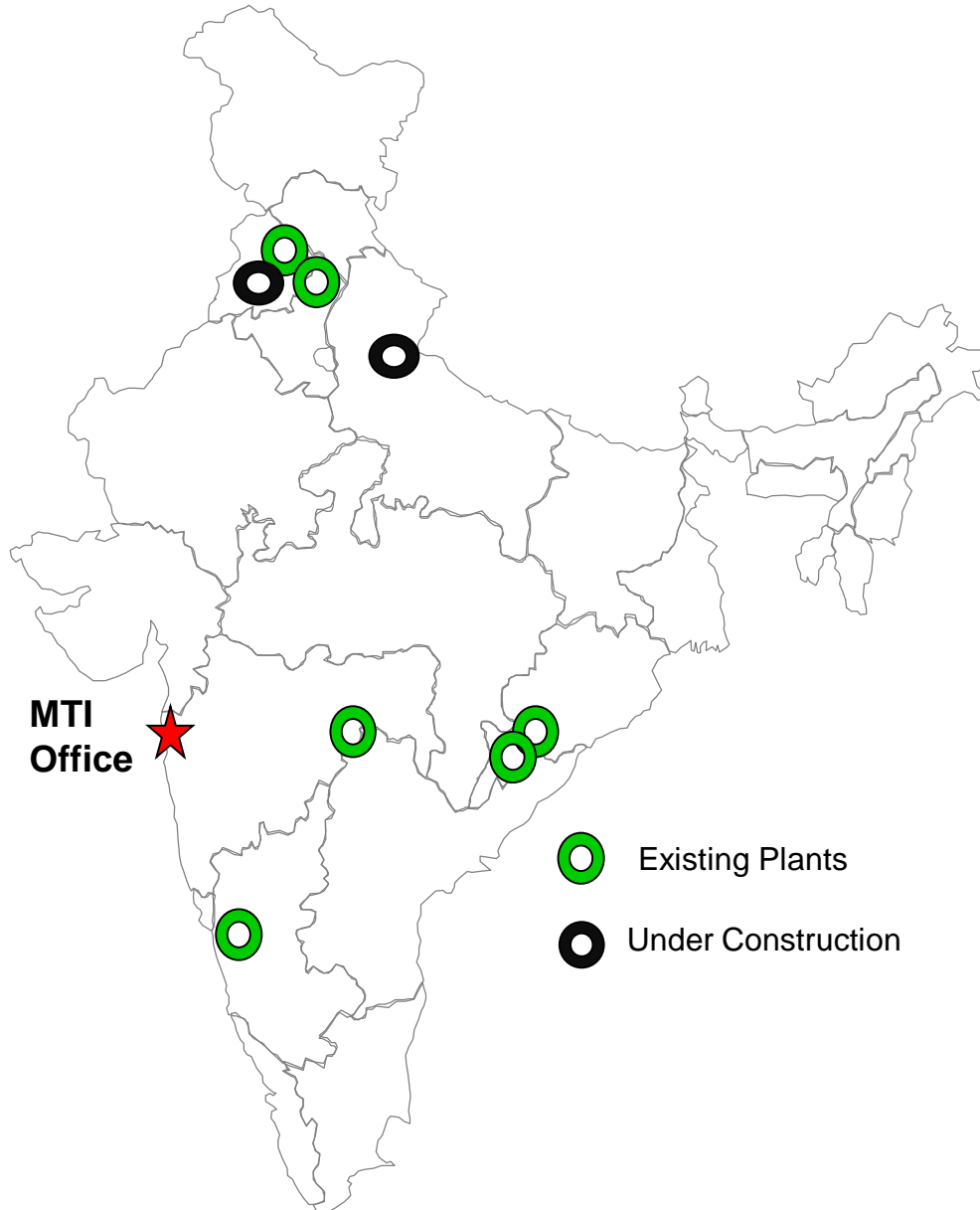
12 R&D
Centers

3628
Employees



MTX
LISTED
NYSE

Since October 23, 1992



6 Operational Plants and 2 Under Construction

Installed capacity approaching 300k MTPA

>15 Lakh MTPA paper produced with SMI PCC

Self Reliance

- >70% market share in Onsite PCC Plants
- Turnover > ₹150 Crore
- Successfully producing PCC with 100% domestic lime
- Dedicated Local Team driving business

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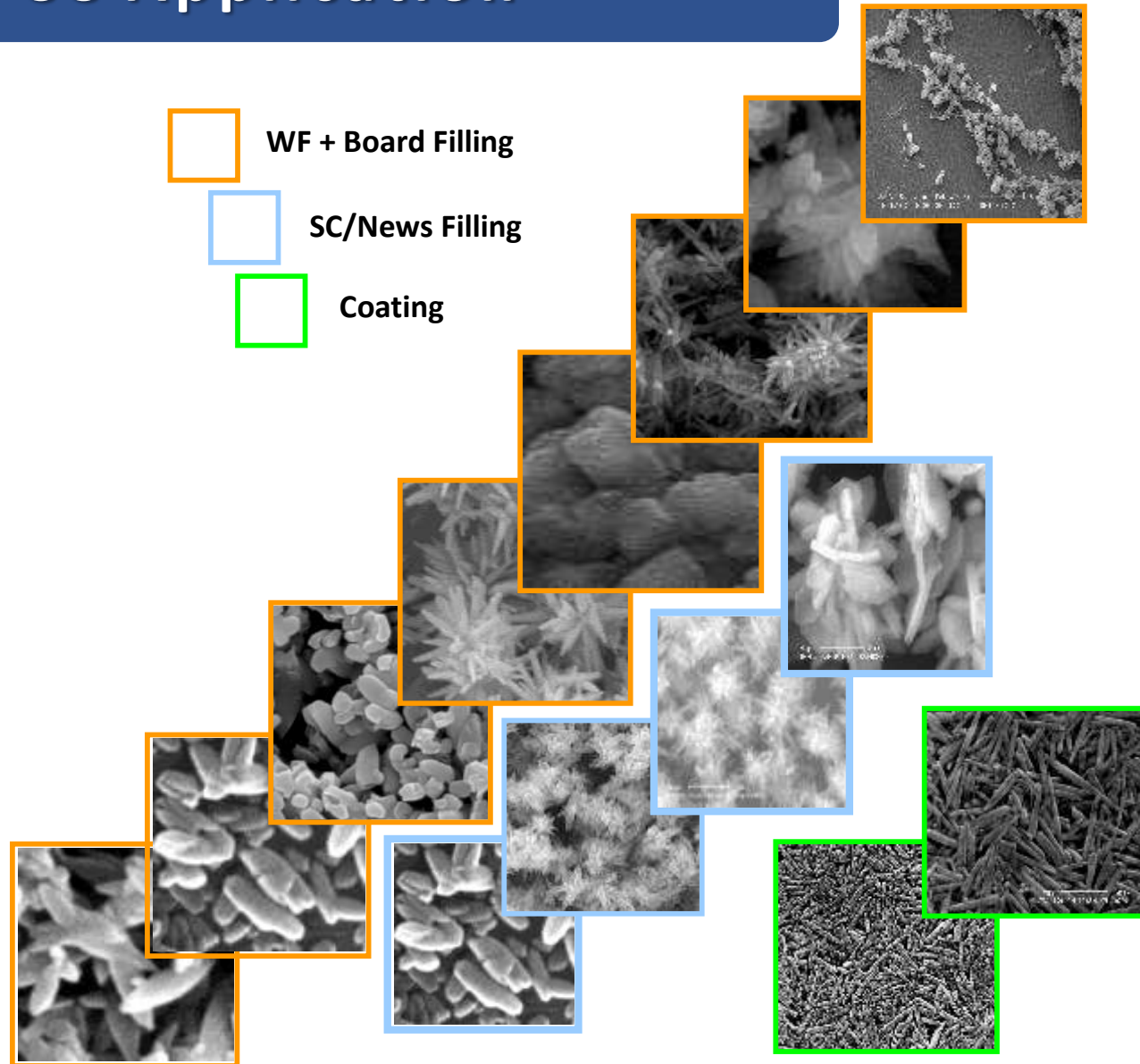


5 Degrees of Freedom

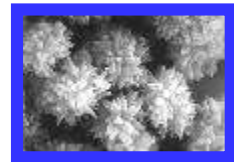
- Particle structure (morphology)
- Particle size (0.3 – 4.0 μm)
- Surface area (2 - 80 m^2/g)
- Distribution
- Surface chemistry

strength, bulk, light scattering, sizing, retention, porosity, gloss, ink absorption, etc. ...

- WF + Board Filling
- SC/News Filling
- Coating



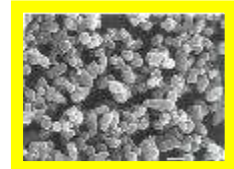
Effect Of PCC Particle Size



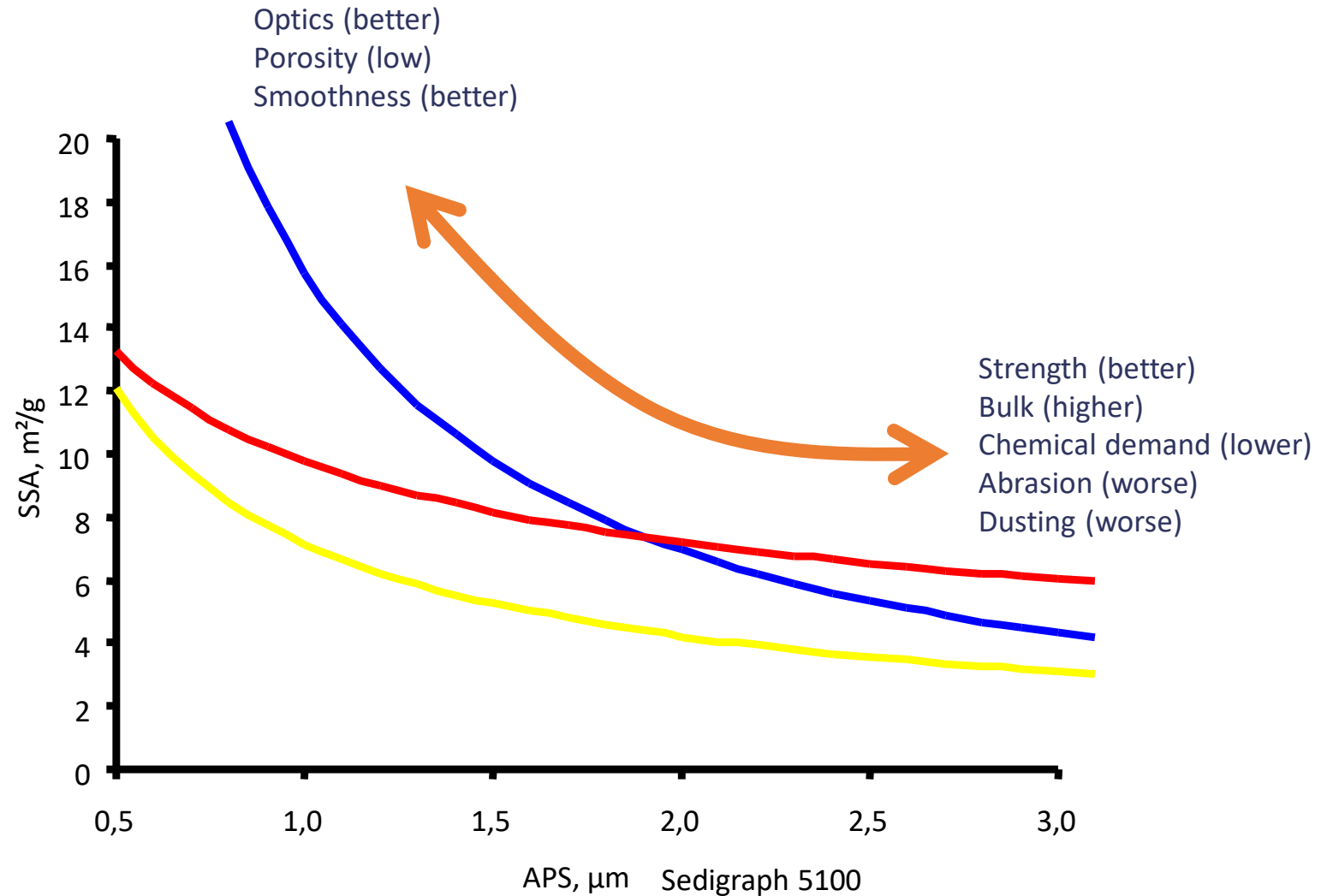
scalenohedral



aragonitic



prismatic



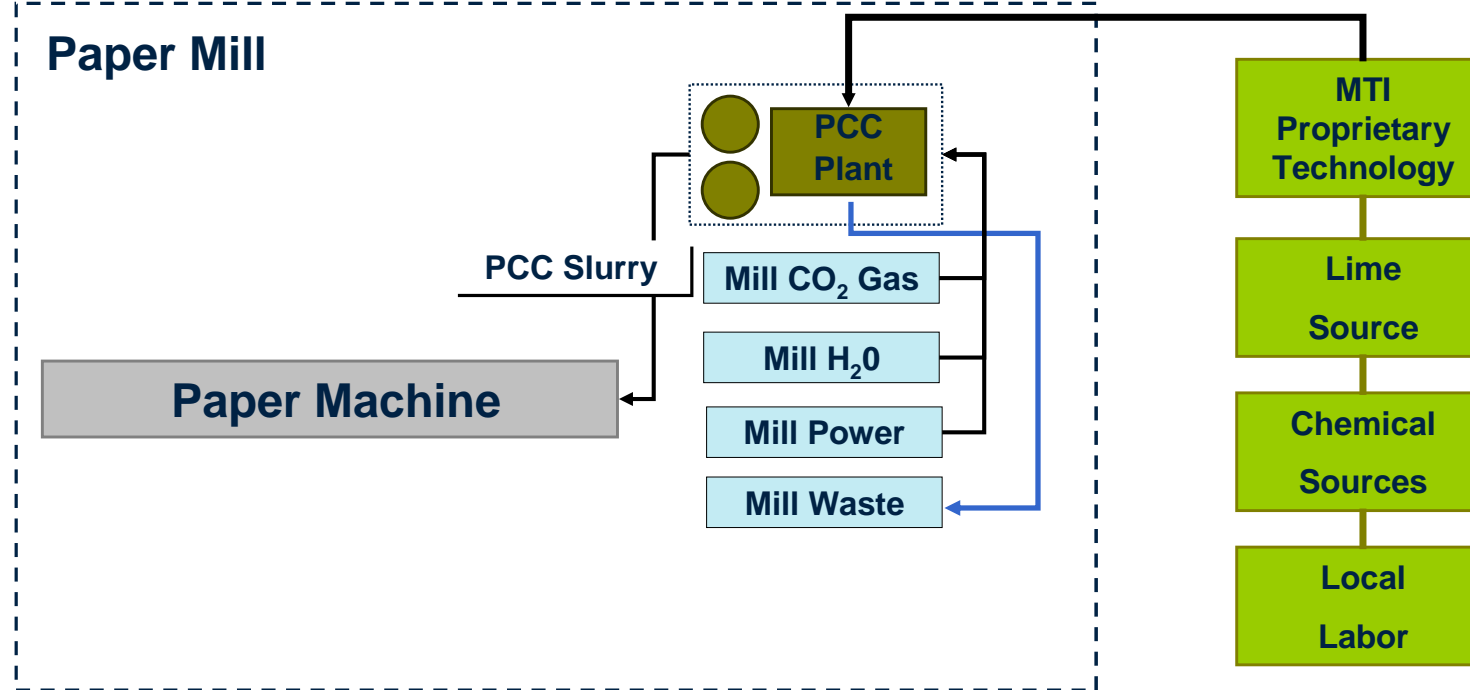
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Onsite PCC Plant Concept



PCC plant utilizes mill infra (electricity, water, wastewater)

Transportation, a major cost component can be eliminated by large extent because only lime is brought to PCC plant.

- CO₂ is captured from mill gas source (ex. power plant, boiler).
- Each 1 ton of PCC adsorbs 440 kg CO₂ and only roughly 600 kg lime is transported.



Environmental Benefits- Onsite PCC Plant



PCC is beneficial to the environment locally

- Reduces mill Particulate Matter (PM), SO₂ and CO₂ from flue gas
- Reduces transport of dry fillers to mill – dry lime for PCC plant is only 60% of current filler
- Allows more filler in paper so may be less pulp production
- Reduces fiber and mineral losses to sewer

Only minimal increase in water use and grit waste – net water use is small increase



Value Of Onsite Satellite PCC Plant



Tailormade product to suit the mill requirements and product mix

Flexible business model; 'Suppliers To Partners' approach

50% cheaper than powder PCC in many cases

Reduction in mill carbon footprint

Solutions for all types of furnish- HW, Agro, Deinked Pulp, etc.

Commercial feasibility even for low capacity plants (E.g. 10k TPA)

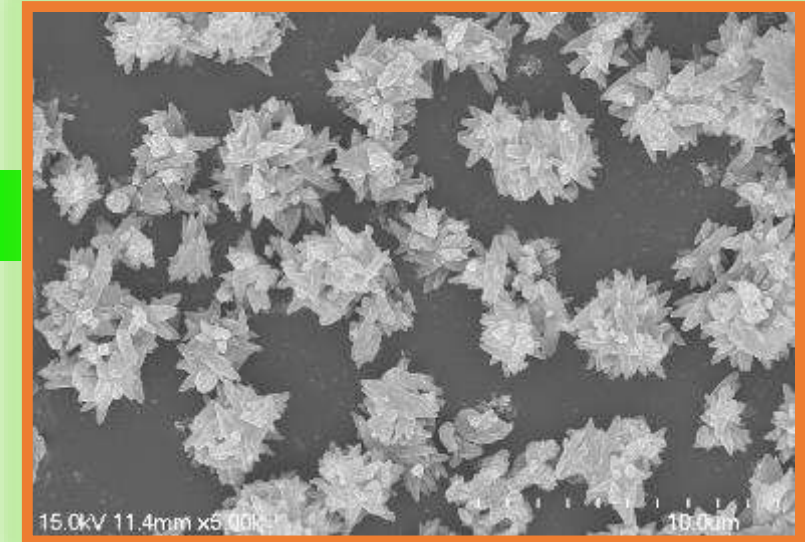
Employment and skill development for locals

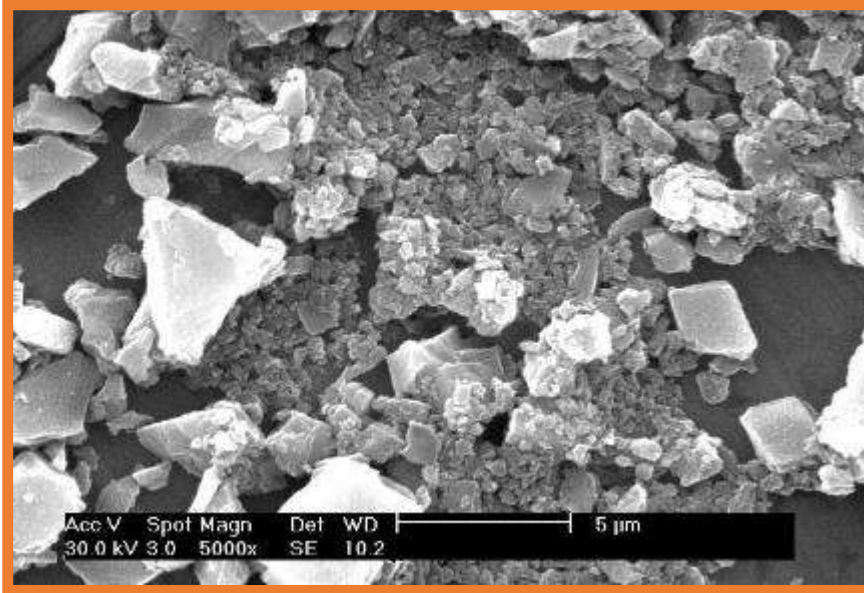


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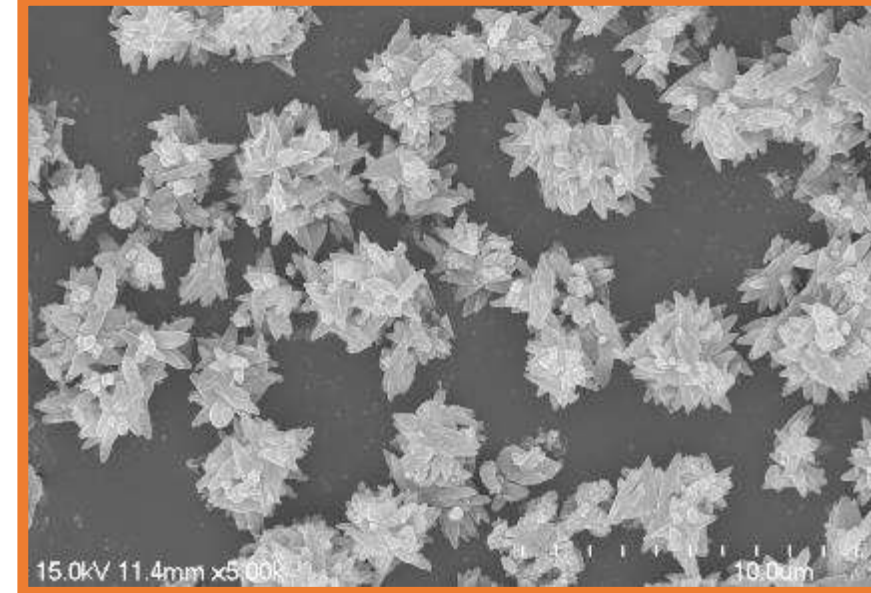


GCC

Solid particle

Low bulk

Limited scattering



PCC

Structured particle

High bulk

High scattering



PCC Value Creation- 18 Indian PM At 100% PCC



Bulk Improved 2.5-7% allowing filler increase

Opacity Increased 2-6% points

Brightness Increased 1-4% points/ up to 50% OBA reduction

Filler levels increased 1-4% points maintaining bulk, runnability

Reduced abrasion on fabrics

Slight drop in Dry Strength at maintained runnability

Sizing chemicals increased 10-20% at same ash

Retention Aid increased 0-20% at same ash

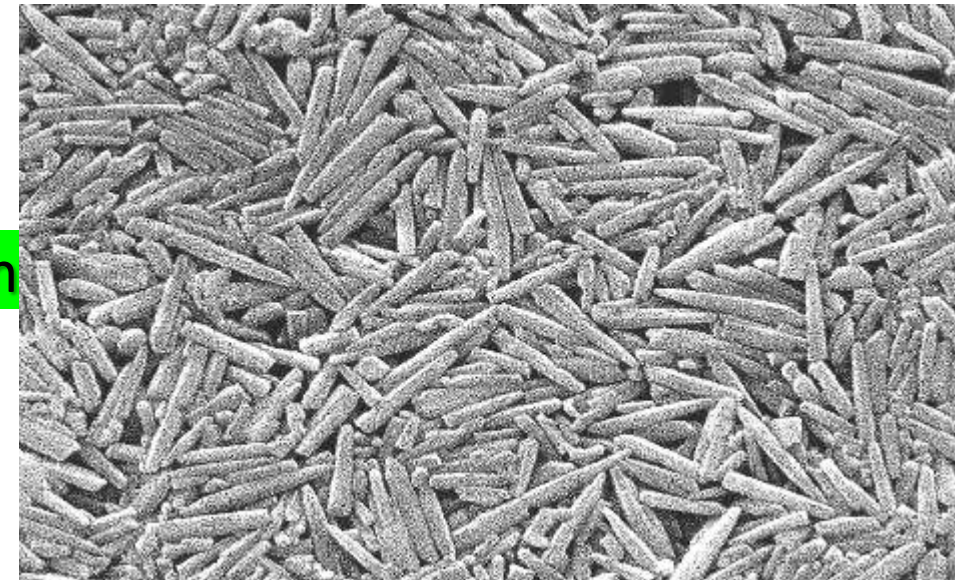


Typical Savings ₹ 500-1500 per MT Paper

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Premium pigment for superior quality coated board applications

New concept to Indian market

Value utilized by global board manufacturers

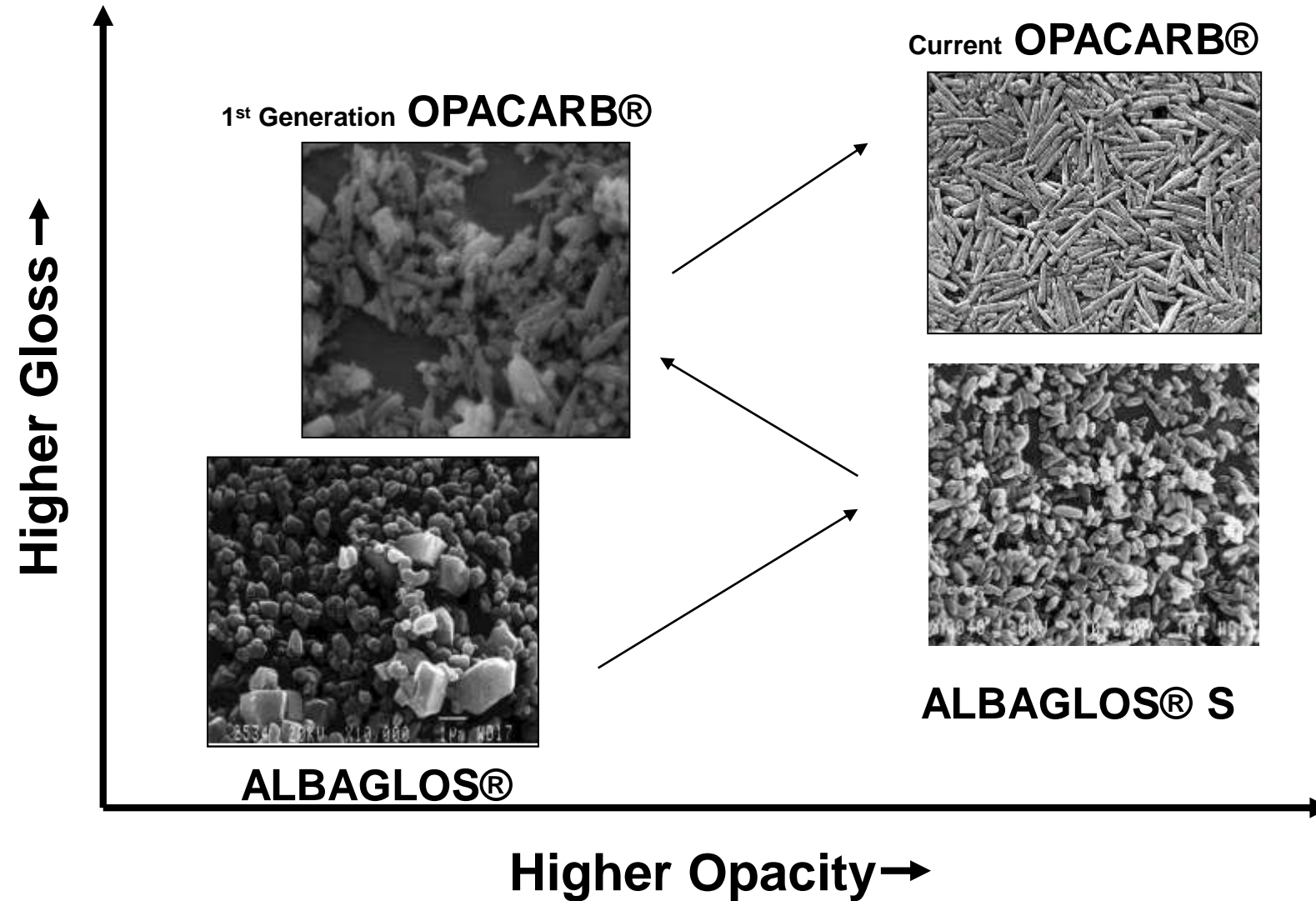
>0.5 million MTPA coating PCC produced and applied globally



Steep PSD products offering unique combination of gloss, brightness, light scattering

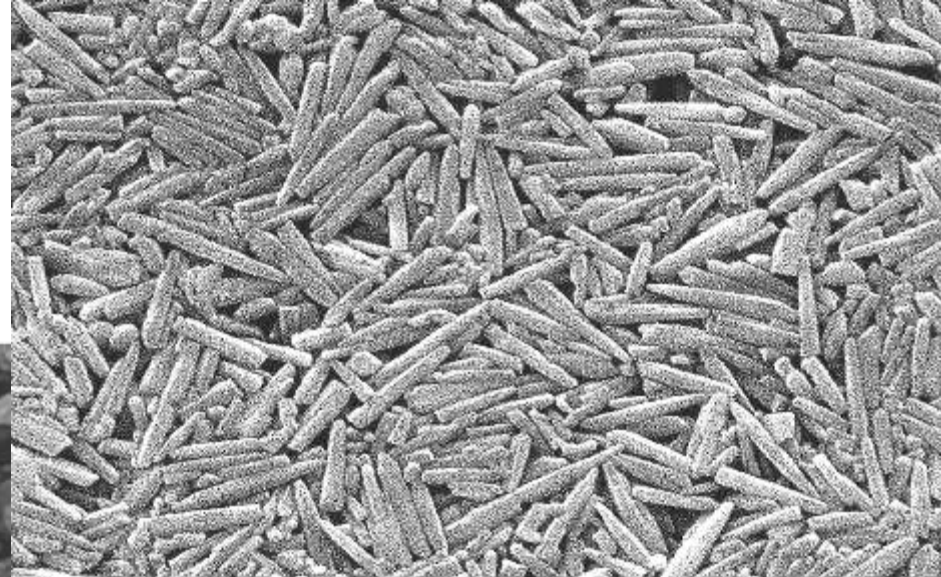
Higher Volumes = Better Value Creation

Evolution Of Coating Grade PCC

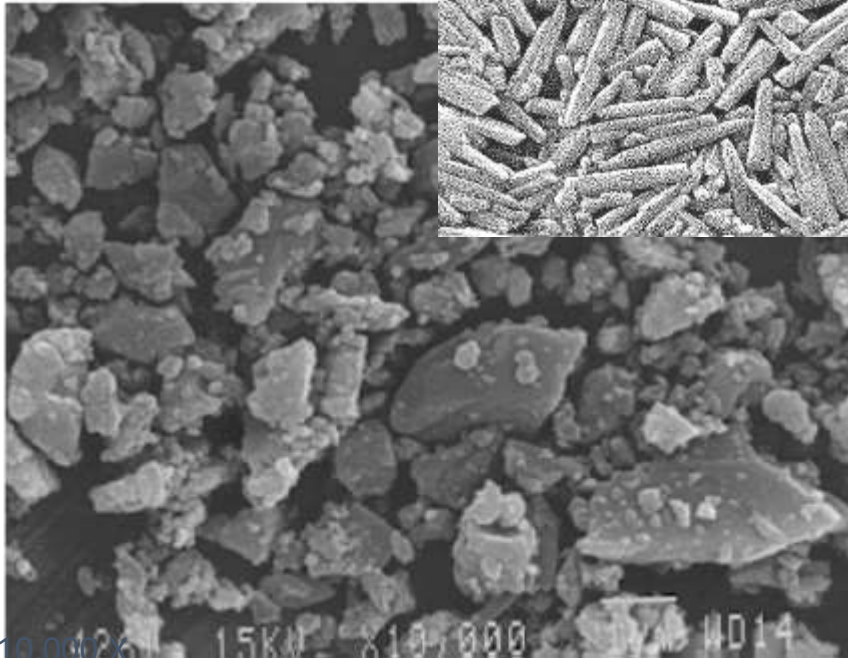


Coating Grade PCC vs GCC

Opacarb® PCC



Coating GCC
Broad PSD



Coating GCC
Narrow PSD





Typical Properties- Coating Grade PCC



Use : Top coating Top and Pre Precoating

Pigment	Opacarb 3000	Opacarb A40	Opacarb A60
Morphology	Aragonite, acicular	Aragonite, acicular	Aragonite, acicular
Domin. Shape factor	4	5	6
PSD 90 , typical	0.8	1.0	1.7
PSD 50	0.35	0.40	0.6
SSA , m ² /g	11 - 15	9 - 13	8 - 12
ISO-Brightness	>94	>94.5	>94.5
Slurry			
Solids content , %	>71	>71	>71
Rheology , Br-100	<500	<500	<500
Rheology , HS	****	***	**
pH	9 - 10.5	9 - 10.5	9 - 10.5

Advantages Of Coating Grade PCC

Improved gloss to allow clay reduction

Improved paperboard brightness and bulk

Increased hiding power or opacity due to excellent scattering coefficient

Binder reduction due to lower surface area of PCC

Blister resistance allows moisture increase due to porous coating structure

Improved Yield due to bulky coating structure and excellent coverage

Reduced drying cost due to porous structure

Improved smoothness and printability





Value Creation- Coating Grade PCC



Concept	Typical Savings
Premium pigment replacement PCC / GCC blends	₹ 0-350 / MT paper
Use of Starch OBA savings Binder reduction	Recipe - Coating Formulation ₹ 150-500 / MT paper
Blister resistance Calendaring efficiency Yield concept Lower brightness base paper Drying energy savings	Papermaking Process ₹ 750-1000 / MT paper
Total Savings	₹ 900-1800/MT paper



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Fulfill[®] Portfolio Of High Filler Technologies

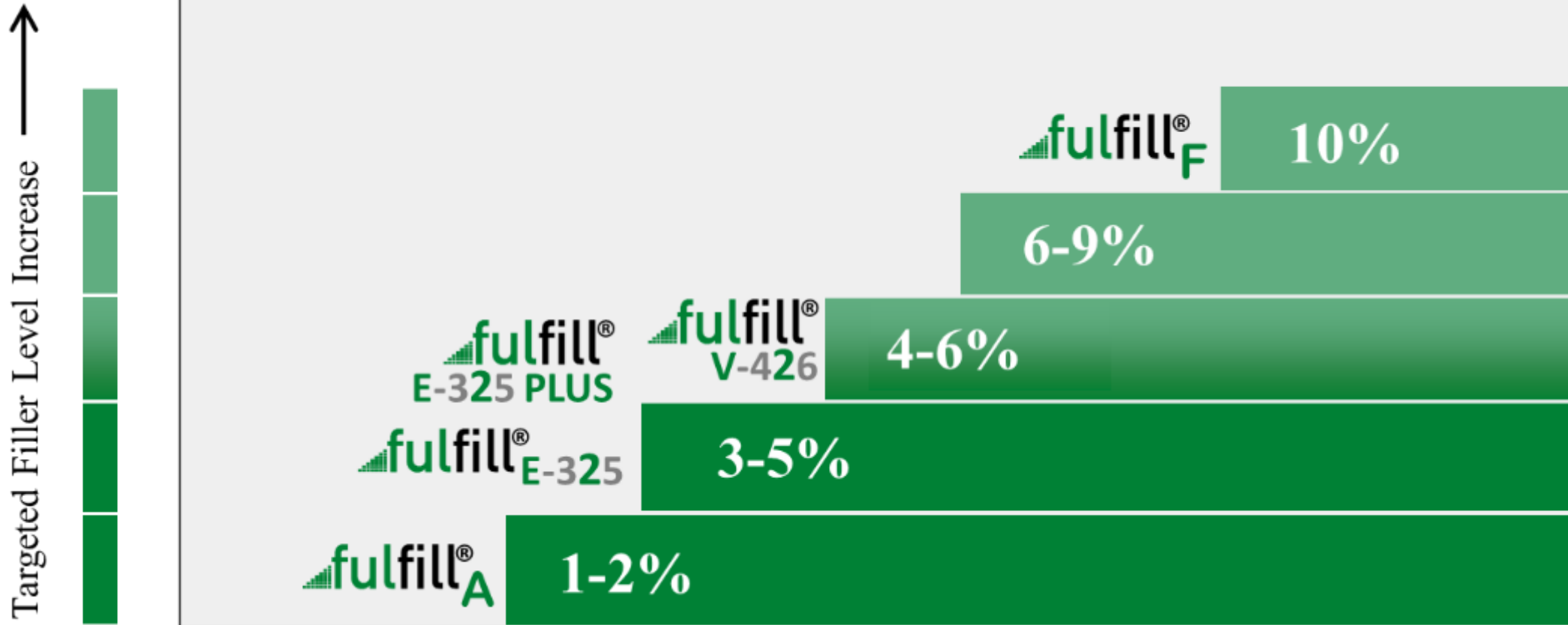


A Series

E Series

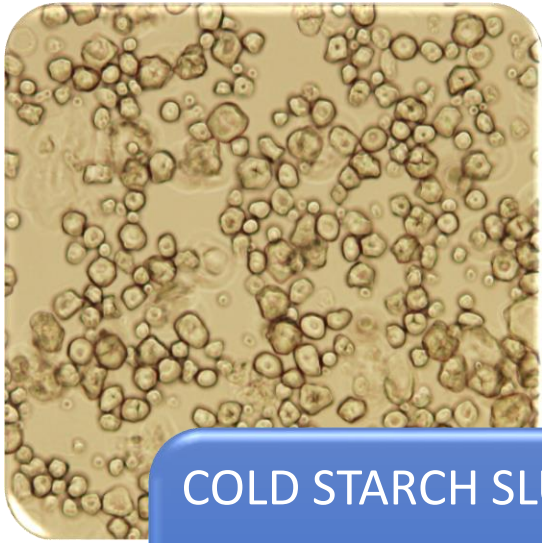
V Series

F Series



Exclusively Available For SMI's PCC Plant Customers

Fulfill[®] E325- Concept



COLD STARCH SLURRY

- Cold starch slurry is taken from the mill make down or storage or prepared for Fulfill[®] E325 skid
- Corn starch in this example



TREATED STARCH

- Each starch will be evaluated for optimum treatment conditions which SMI Fulfill[®] E325 equipment will automatically control to the target



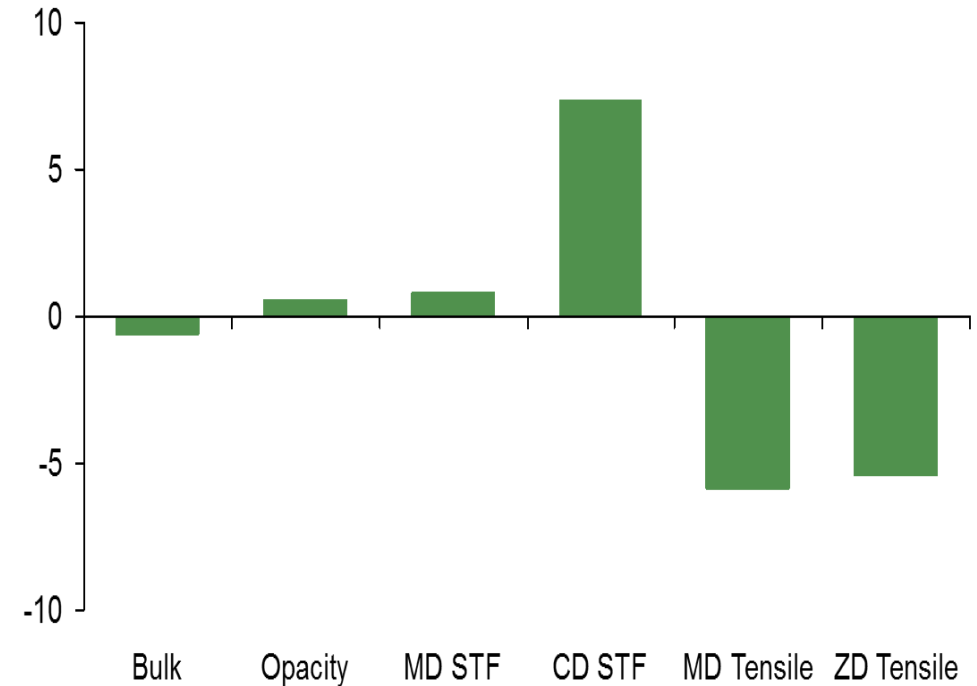
Fulfill[®] E325 COMPOSITE

- The last step is to combine PCC flow with treated starch to form composite filler Fulfill[®] E325

Fulfill® E325- Case Study

Paper Grade	Copy and Offset 80 g/m ²
Furnish	100% HW
Speed	1500 mpm
Deckle	8.6 m
Production	62 TPH
E325 Starch dose when running Fulfill®	3 kg/MT paper
Baseline Ash	23%
Achieved Ash	+3 % units increase Up to 26 %

Change in %



**) Reference filler content at 23% and with E325 at 26%*

Technology running commercially since 6 years!

Fulfill[®] E325 PLUS- Concept

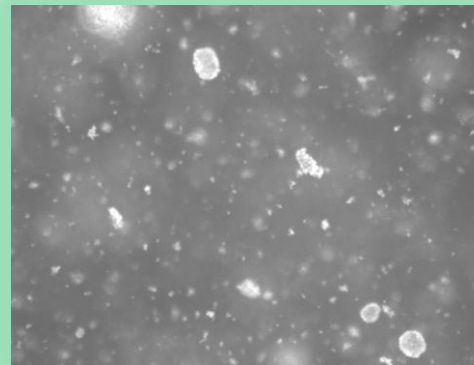
Add-on Technology
on top of std Fulfill[®] E325
utilizing co-additive to

improve interaction
between PCC and
treated starch

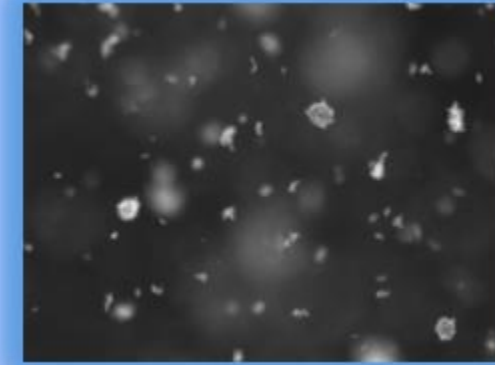
intensify PCC
flocculation in paper to
increase fiber-to-fiber
bonding area for better
strength



Albacar[®] LO PCC



Fulfill[®] E325

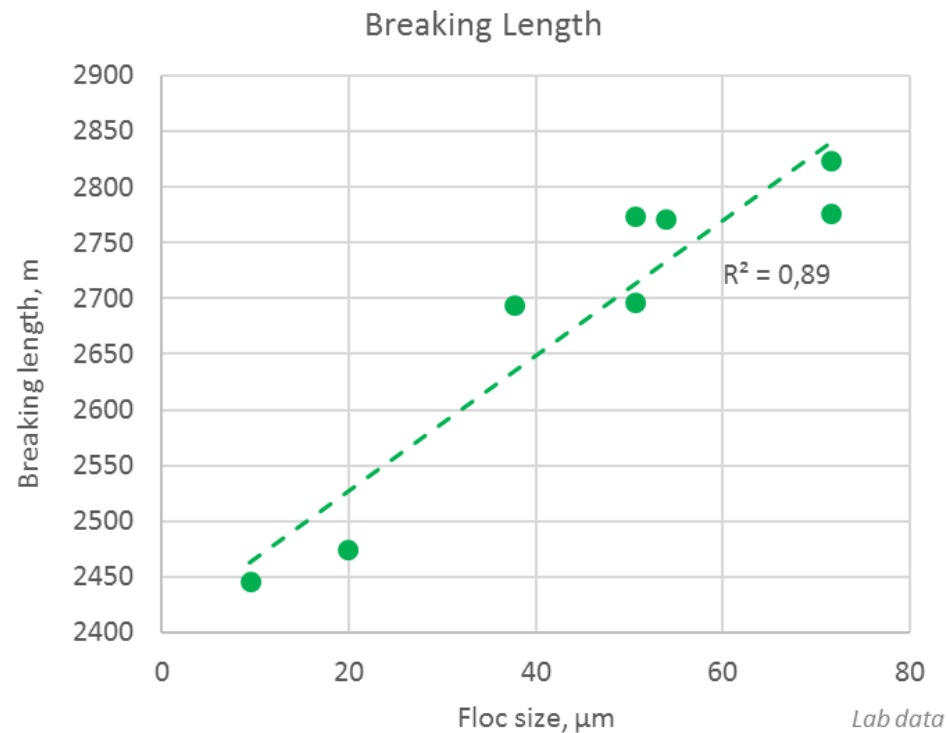


Fulfill[®] E325 PLUS

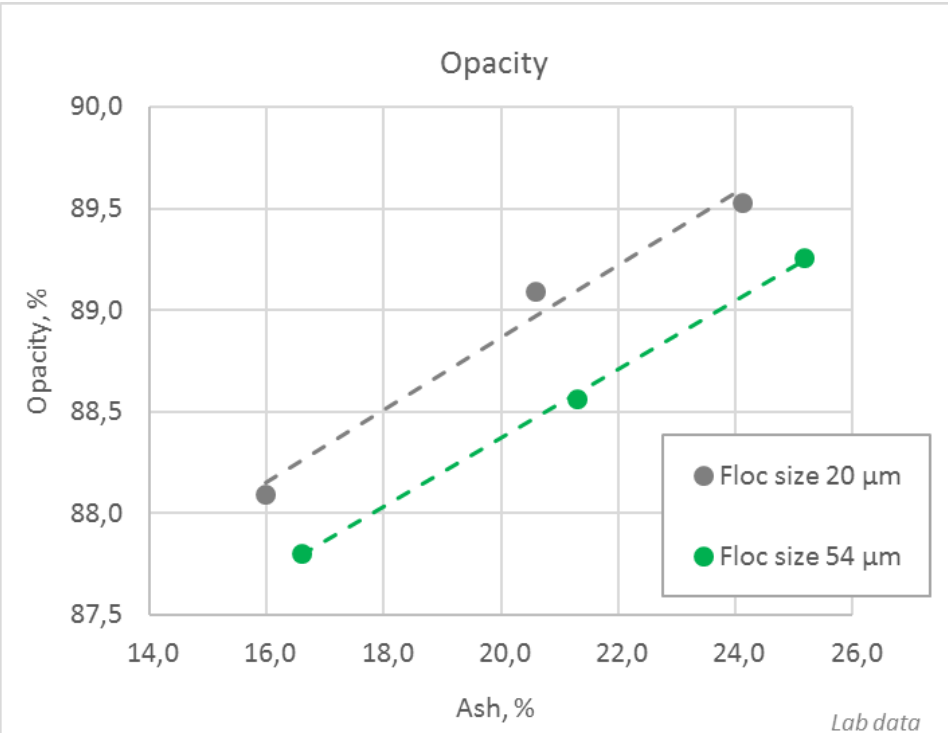
Snap shots with PVM (Particle Vision and Measurement)

Fulfill® E325 PLUS- Impact On Strength & Light Scattering

Improved Dry Strength With Increase In Floc Size



Light Scattering Low at same ash but maintained at increased ash



Lab Scale Evaluation



Fulfill® E325 PLUS- Paper Machine Scale



Technology evaluated on commercial scale with paper machines running up to 1400 mpm speed

Additional 2-3% ash increase on top of base Fulfill® E325 gains- Net gains of 4-5% over baseline

Paper Quality & Machine Runnability maintained

Value creation from fiber replacement, retention aid chemical reduction, steam energy savings

Technology running commercially since >1 year

Paper machine runnability		Paper properties*	
Speed	Maintained	Breaking length	+++
Draws	Reduced / maintained	Bulk	0 / -
Steam consumption	Reduced	Stiffness	+++ / 0
Retention	Improved / maintained	Formation	+ / 0
		Opacity	0 / -

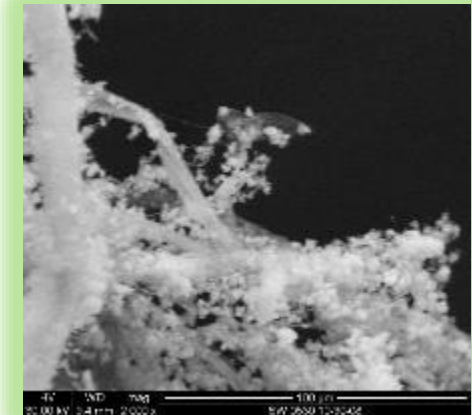
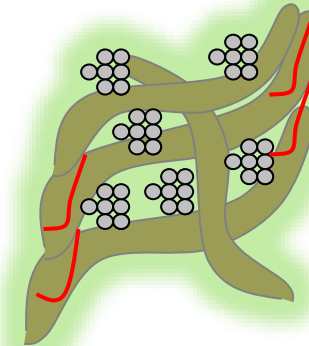
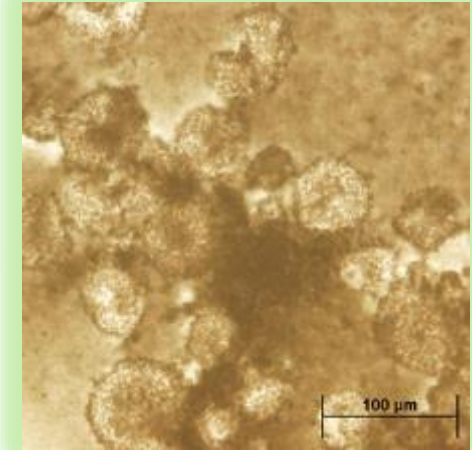
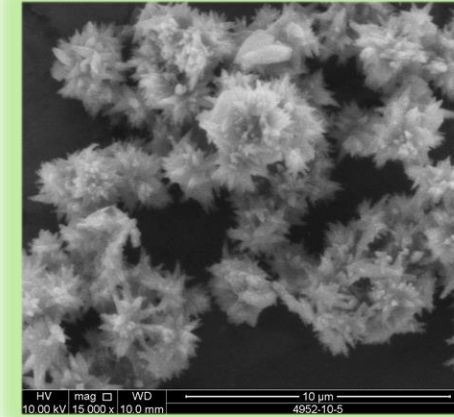
*) Paper properties are compared against base Fulfill® E325 technology at similar ash level.

Fulfill® portfolio of high filler technologies accepting global recognition from papermakers

Fulfill® E325 PLUS recently commercialized with a potential to increase filler levels by 4-6% points

Value creation by fiber substitution, quality improvement, runnability improvement or a combination of all

Typical savings ₹ 250-500 per MT paper



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NewYield®- Introduction



Kraft or soda pulping generates **lime mud** during chemical recovery – usually this calcium carbonate is reconverted to lime in a rotary kiln for white liquor production

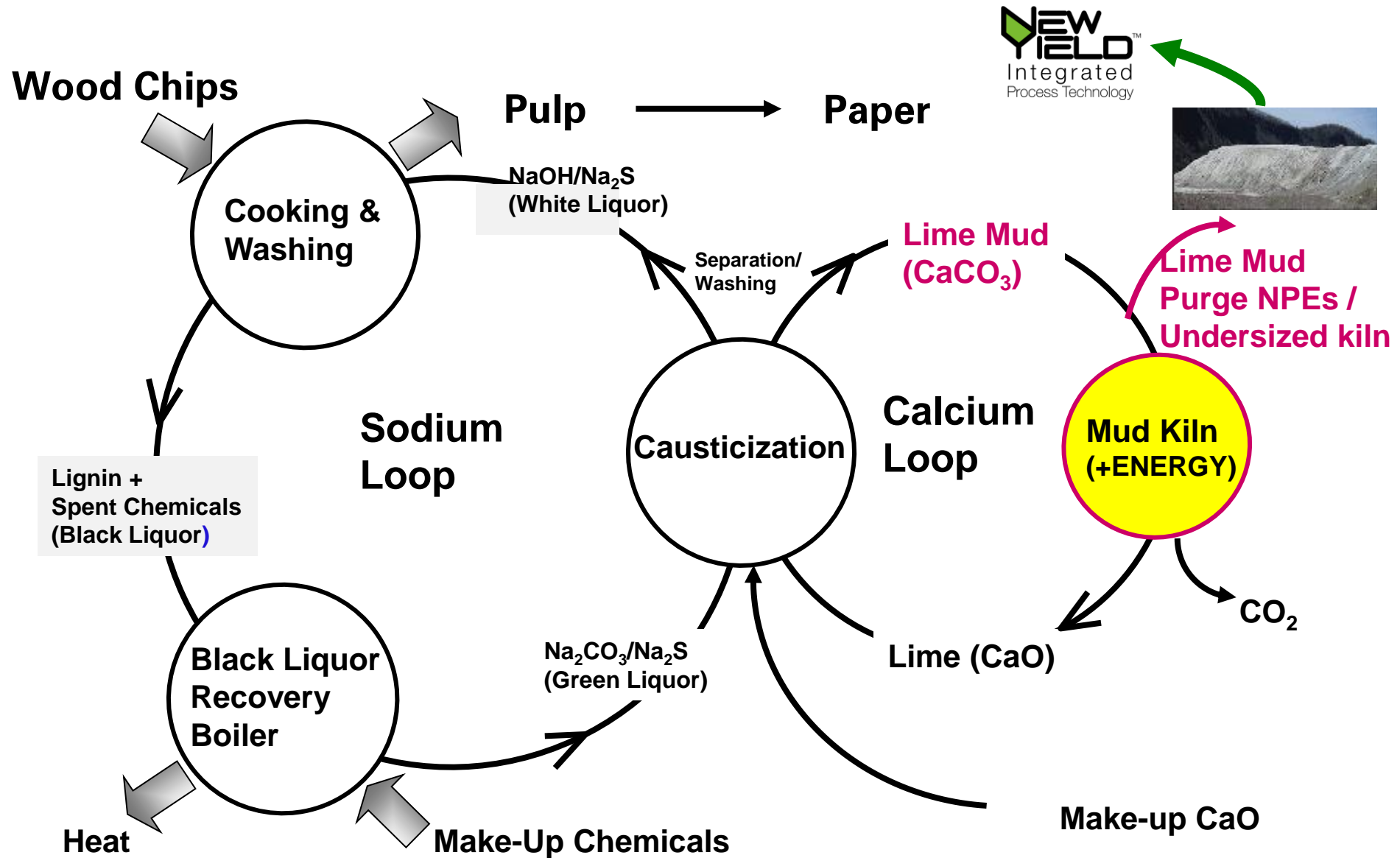
The **lime mud** becomes a solid waste when

- Mill has no lime kiln – open calcium loop
- Impurities such as silica, phosphorus & magnesium must be purged
- Pulp is produced during lime kiln outages

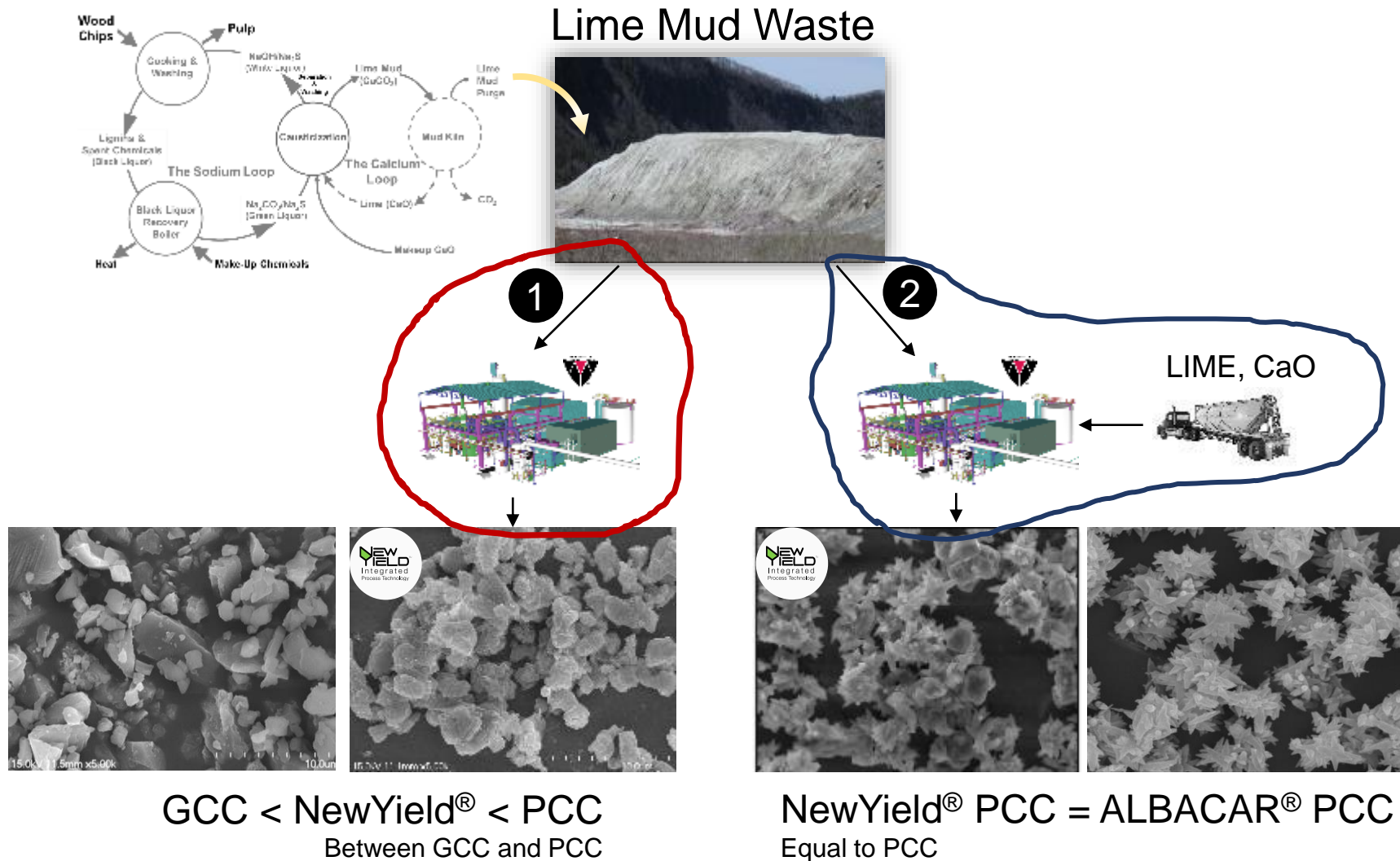
The **lime mud** waste is typically handled by

- Landfilling – which uses valuable space with negative environmental impacts
- Other use – cement kiln, land application, construction, landfill cap

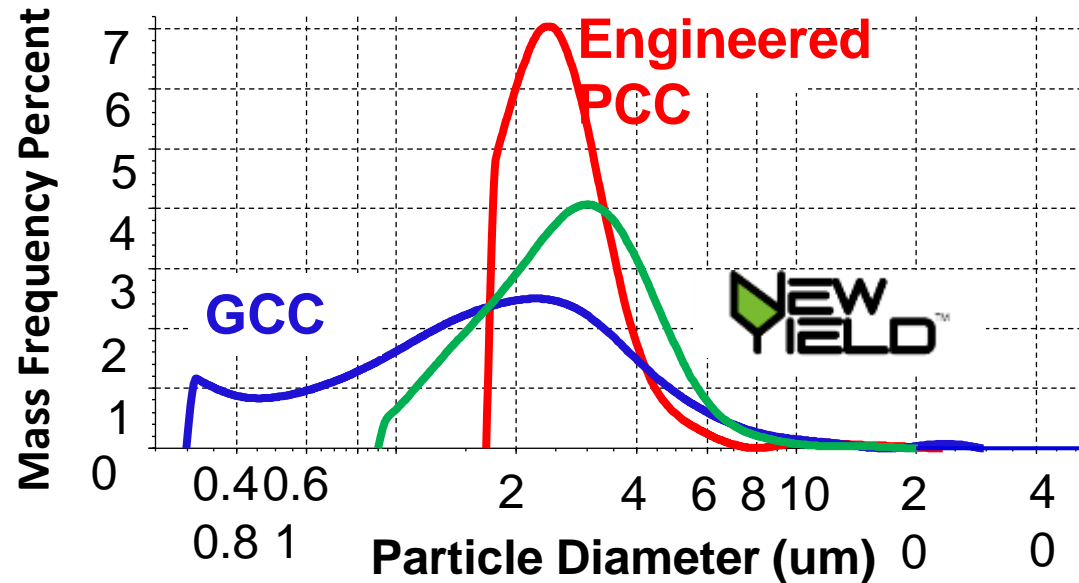
Typical Chemical Recovery Process



NewYield® - Two Scenarios



NewYield[®] Versus Typical Fillers



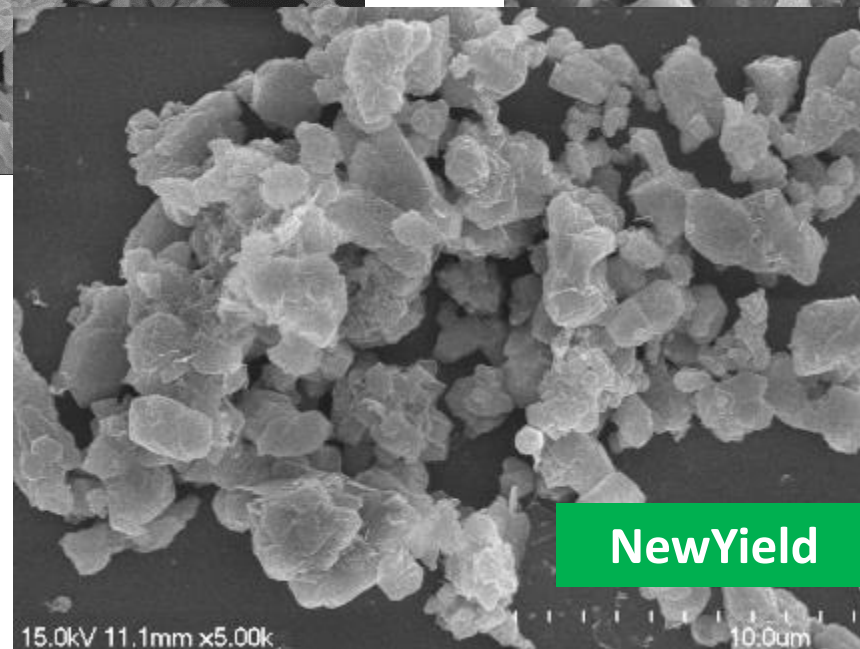
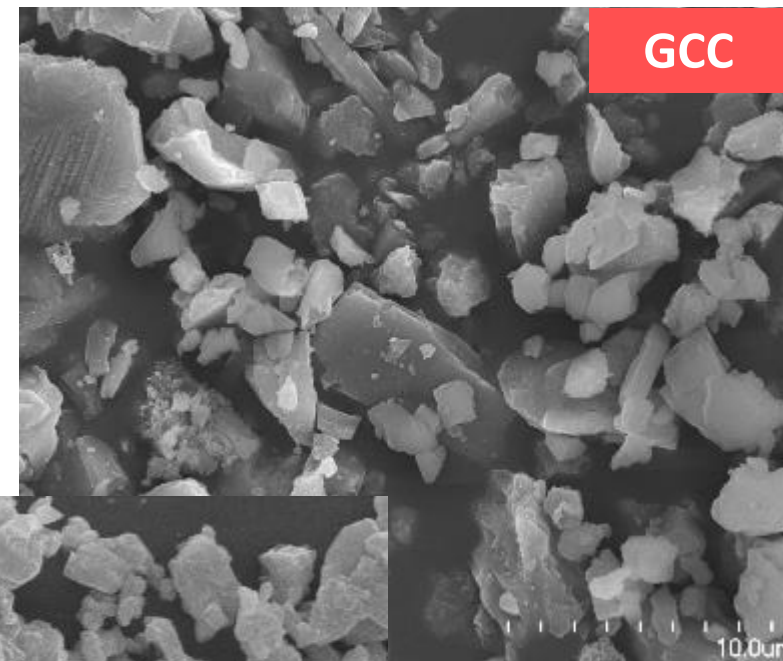
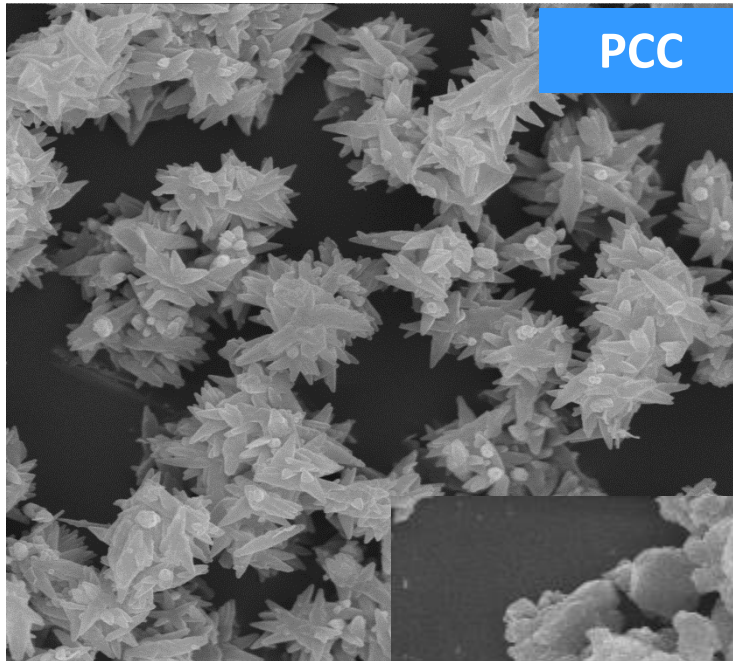
NewYield[®] exhibits more narrow particle size distribution than GCC

NewYield[®] doesn't contain fines portion which is present in GCC

NewYield[®] is more structured (low bulking density) which increases void volume better than GCC

NewYield[®] filler results Improved bulk and opacity versus GCC

Typical NewYield[®] Filler Morphology





NewYield® Filler Application vs GCC



NewYield Filler versus GCC	Δ property
Bulk	+
Opacity	+
Tensile	=
Bending Stiffness	=
Scott Bond	=
Smoothness	=
Porosity	=/-
Tear	=/-
Brightness	=/-

NewYield® Filler is being used to make copy, offset, and coated base paper on modern paper machines with good runnability

Innovative solution to produce usable filler from lime mud- best out of the waste

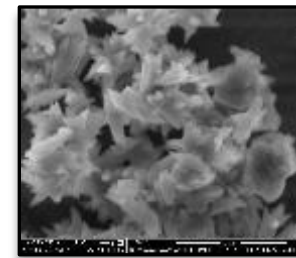
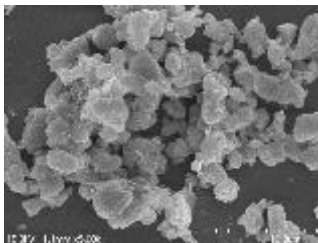
Lime mud characteristics determine the final quality of NewYield filler (E.g. Brightness, Silica, etc.)

Some cases present opportunity to reduce lime usage in PCC manufacture while meeting specifications

Reduces mill environmental footprint

Allows paper to include 'recycled mineral content'

Typical savings ₹ 400-800 per MT Paper



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Onsite PCC Satellite Plants	Leading the ongoing 'Filler Revolution' in India. Coating pigment to follow
	Flexible Business Model; 'Suppliers To Partners' Approach
PCC in W&P Applications	Tailormade Solutions for all Furnish
	Quality Improvement; Typical Savings ₹ 500-1500 per MT
PCC in Coating Applications	New Introduction to Indian Market; Value Globally Recognised
	Quality Improvement; Typical Savings ₹ 900-1800 per MT
Fulfill[®] High Filler Technologies	Fulfill E325 PLUS Latest Offering
	Typical Savings ₹ 250-500 per MT
NewYield[®] (Lime Mud to PCC)	'Best Out Of Waste'; Reduced Environmental Load
	Typical Savings ₹ 400-800 per MT

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For future queries, please contact:
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Let Us
Grow Together And Remain Safe!!

