Future food packaging industry with new generation bio-polymer

Ravikumar Machani * Satya Dev Negi * Rita Tandon

For

IPPTA

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Welcome Hotel

Rama International

Aurangabad

Issue…
















Slurpyn

Swiggy

Chai Flasks

EatonGo

DropKaffe

Box8

Spoonjoy

Hungerbox

Cookaroo

EatFresh

Bhukkad

Brekkie

FitGo

Dazo

Faasos

Eatlo

Freshmenu

Paper plates, Food and fruit boxes..

Observations!

- Plastic containers!

  The hot food is packaged and served in plastic containers, hot food reacts with plastic (one of the example if such plastic, Polystyrene foam) and causes 52 different types of cancers as per one of the study in USA.

- Safe and Hygiene?

  High chances of fungus and bacteria from packaging itself and air-borne.

Solution!

- Bio-Plastic!
  - Bio-Polymer property
- Safe and Hygiene!
  - Nontoxic and Anti fungal, anti bacterial
- Education of Biodegradable, Safe and Hygiene to consumers!

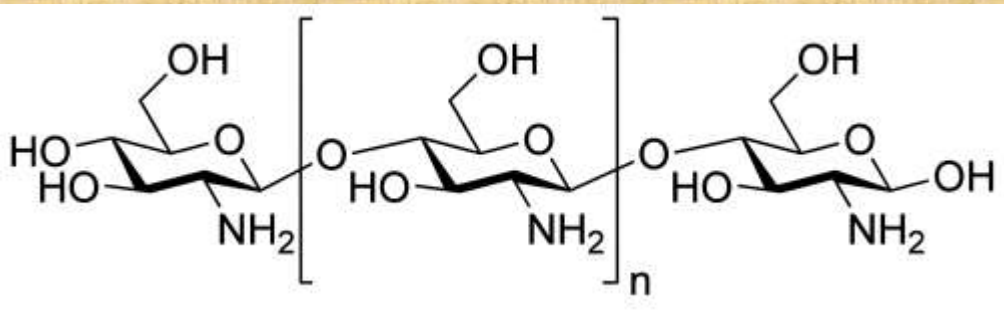
Then arrived at Chitosan

Surprised!

Chitosan already been experimenting in Paper Industry in some studies across the world.

Chitosan!

- Chitosan is a linear polysaccharide. It is made by treating the chitin shells of shrimp and other crustaceans with an alkaline substance, like sodium hydroxide.



- In agriculture as a seed treatment and bio-pesticide
- In winemaking, it can be used as a fining agent
- In industry, it can be used in a self-healing polyurethane paint coating
- In medicine, it may be useful in bandages to reduce bleeding and as an antibacterial agent; it can also be used to help deliver drugs through the skin.

Experiment!

- The studies were conducted on IOCC furnish to assess the efficacy of Chitosan on improving the physical mechanical properties of kraft paper.

i. The 90 gsm, hand sheets were surface sized with 10 gpl chitosan solution in laboratory size press.

ii. Chitosan was added in OCC pulp stock at a dosage level of 8 kg/t and 90 gsm hand sheets were made.

iii. Chitosan at a dose level of 8 kg/t was added at wet end followed by surface sizing with 10 gpl chitosan solution.

iv. Cationic starch, dose of 4 kg/t was added at wet end and hand sheets were surface sized with 70 gpl cationic starch solution.

Kraft paper properties

- Following physical mechanical properties were evaluated on the hand sheets.

Zero Span Tensile Strength (Fiber Strength) - It is a good indicator of the average strength of individual fiber.

Cobb value - Water absorptiveness (cobb value) is resistance of paper towards the penetration of aqueous solution / water.

Bending stiffness- It is a measure of the resistance offered to a bending force by a rectangular sample, expressed in mN (milli Newton).

Tensile strength- Tensile strength is the maximum force per unit width that a paper strip can resist before breaking when applied longitudinally. It depends on fiber strength but primarily on the degree of bonding between areas.

Tearing strength- Tear strength is the mean force required to continue the tearing of paper from an initial cut. Highly dependent on fiber orientation of sheet and affects run ability. Longer and stronger fiber provides high tearing strength.

Bursting strength- It is an important indicator of sheet bonding. Bursting strength is the maximum pressure that paper can resist without breaking when force is applied perpendicular to the plane. Increase fiber length gives higher bursting strength but is more affected by fiber bonding. It is predominantly an internal sheet property.

Anti Microbial test - Gram-negative bacteria Escherichia coli (ATCC 11775).

Characterization of Polysaccharides

Particular	**Chitosan Soln. (10 gpl)**	**Starch Soln. (70 gpl)**
pH	4.4	7.6
Surface Charge, mV	(+) 248	(+) 46
Charge Demand, µeq/g	262	53

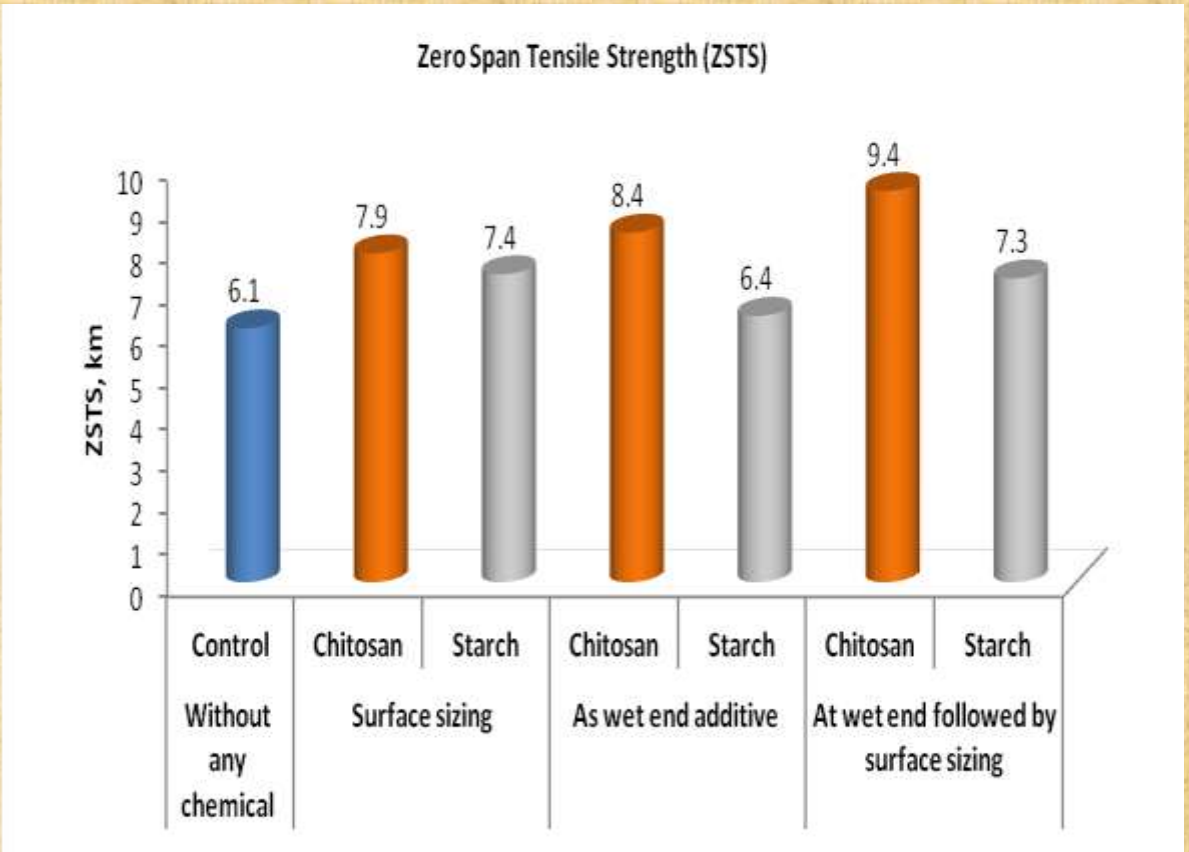
Zero Span Tensile Strength (ZSTS)

Chitosan

- SS – 30%
- WE – 38%
- WESS – 54%

Starch Max

- SS – 21%



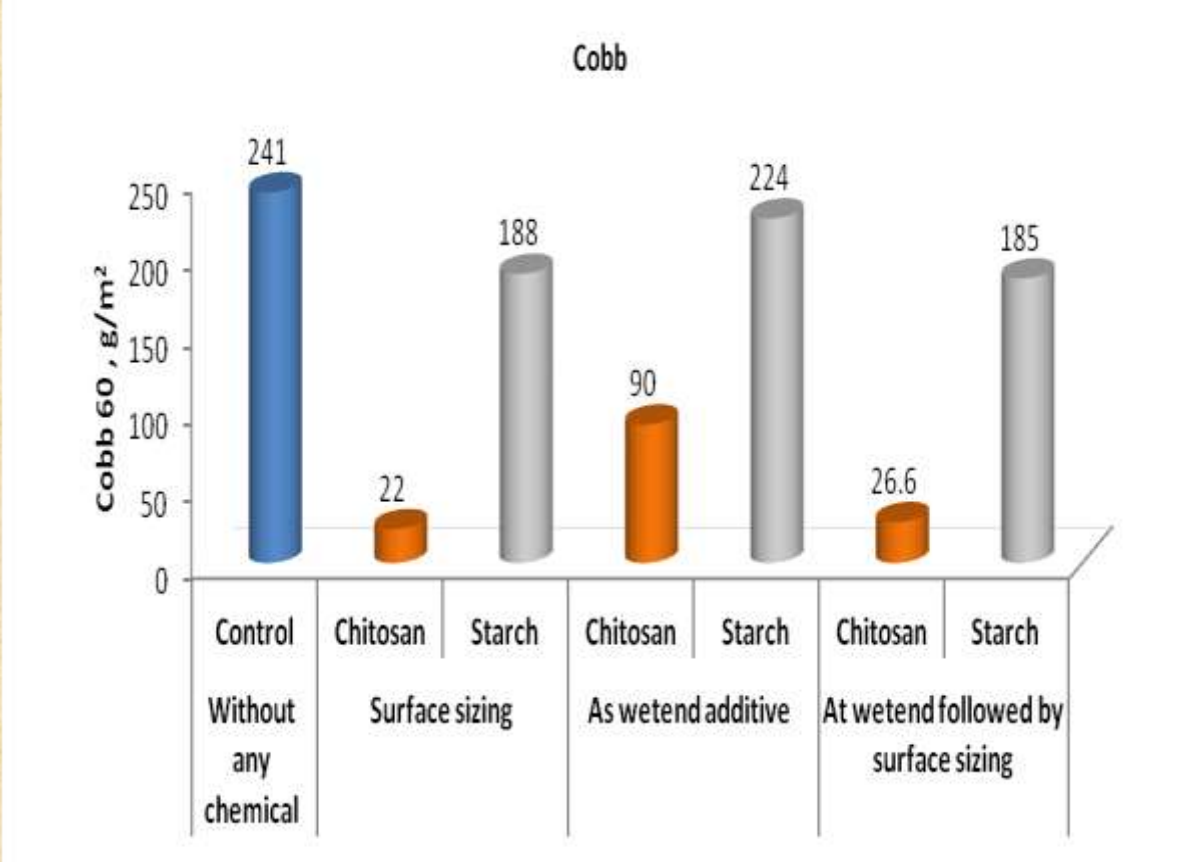
$Cobb_{60}$

Chitosan

- SS – 90%
- WE – 60%
- WESS – 89%

Starch Max

- SS – 23%



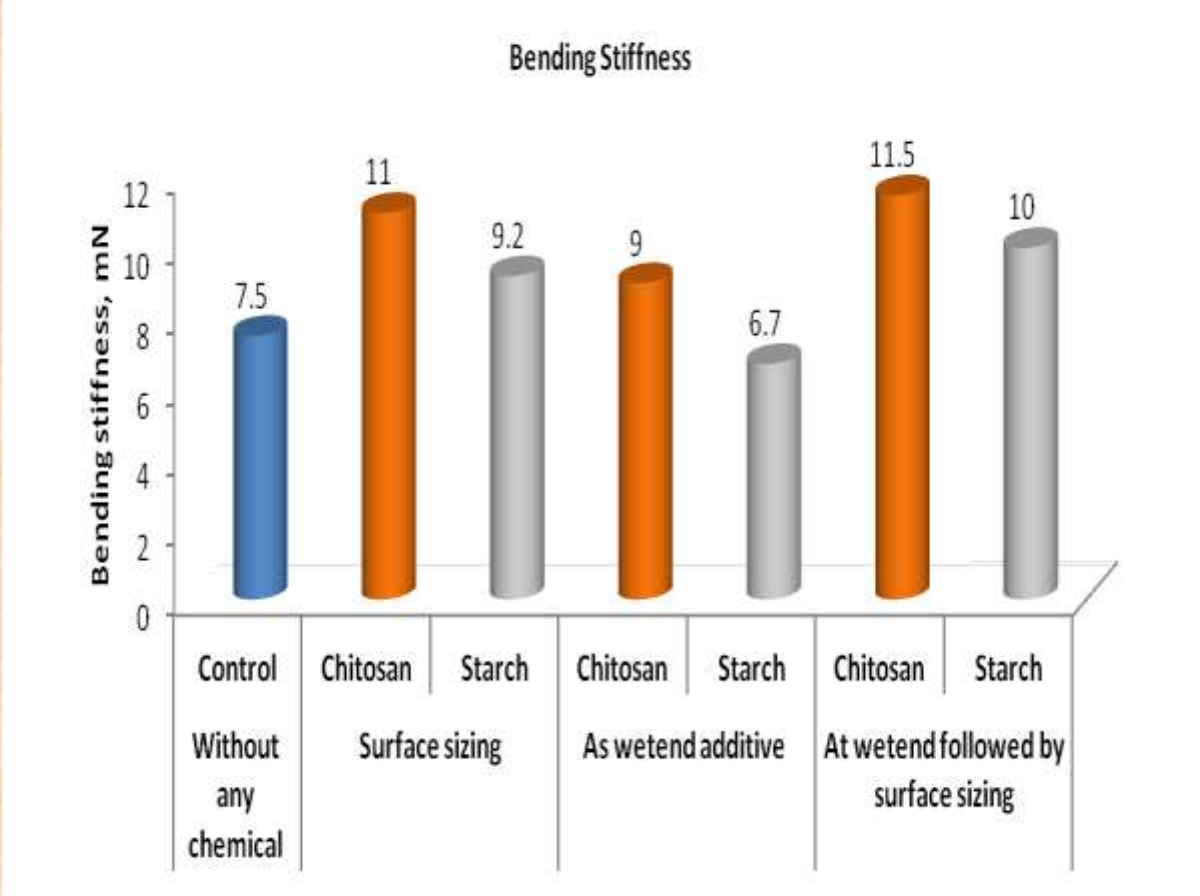
Bending stiffness

Chitosan

- SS – 47%
- WE – 20%
- WESS – 53%

Starch Max

- WESS – 33%



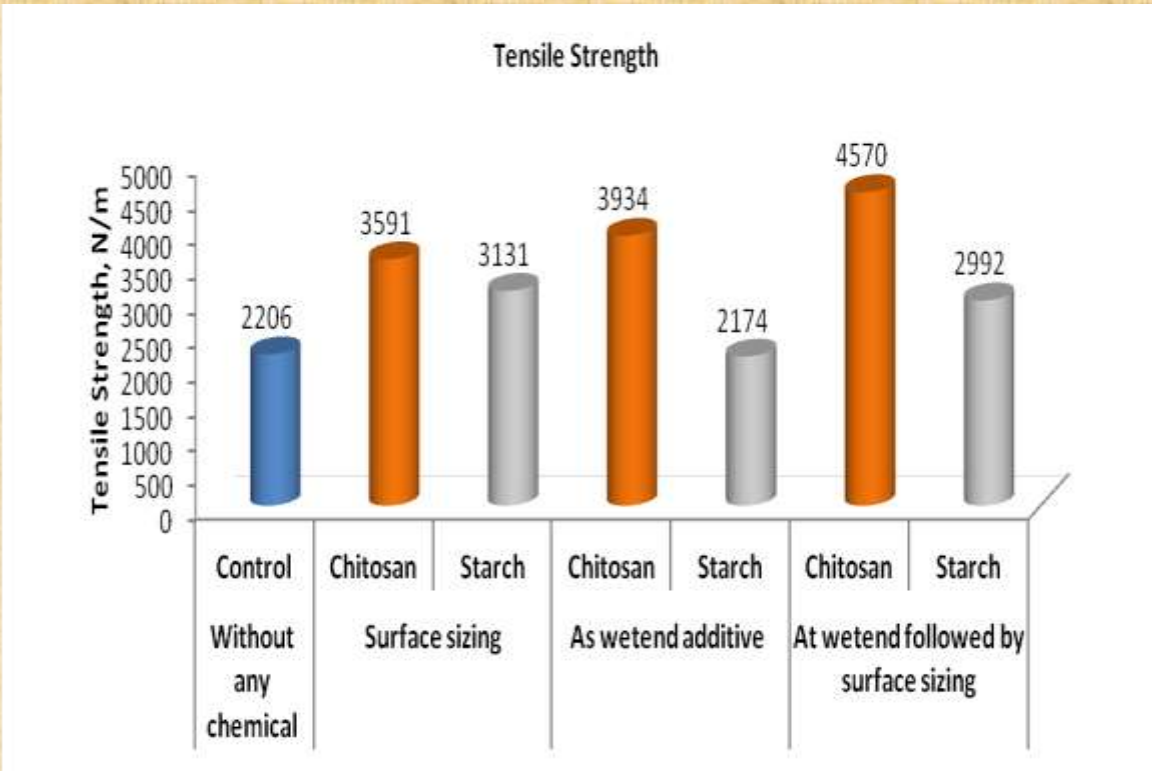
Tensile strength

Chitosan

- SS – 63%
- WE – 78%
- WESS – 107%

Starch Max

- SS – 42%



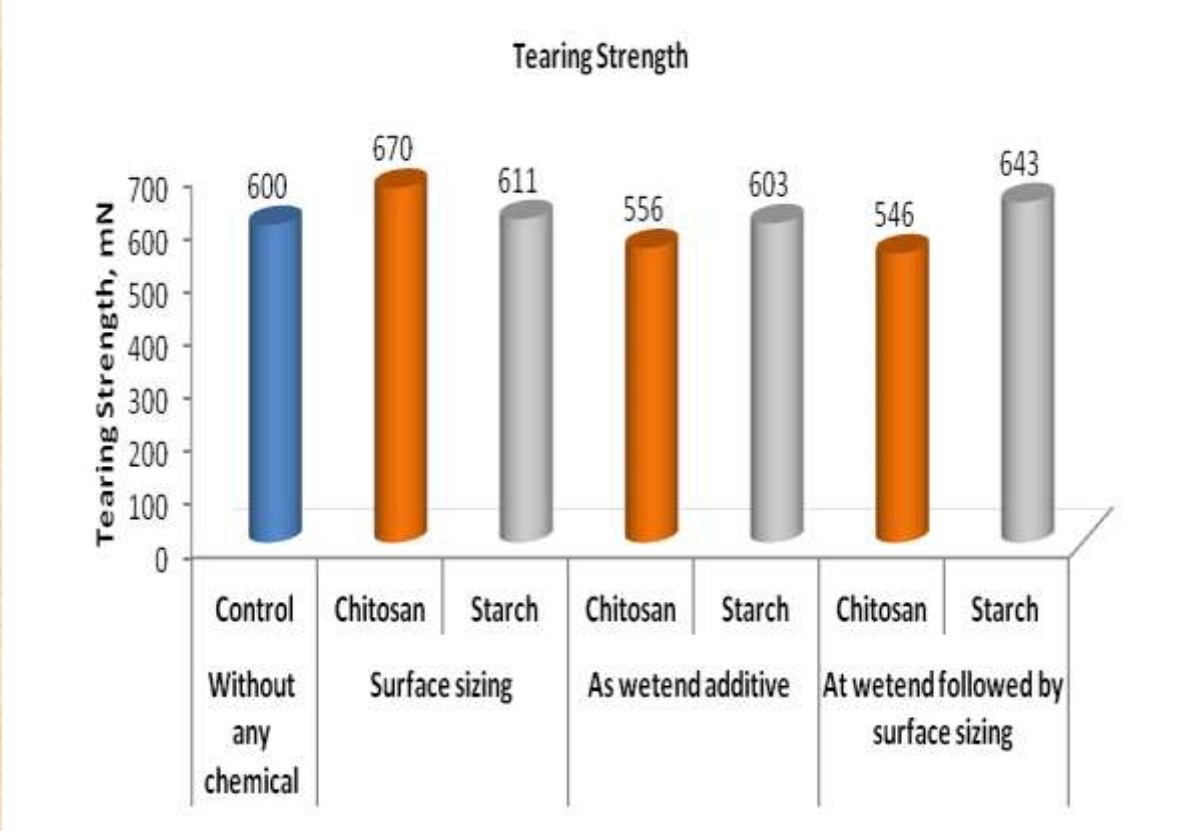
Tearing strength

Chitosan

- SS – 12%

Starch Max

- WESS – 7%



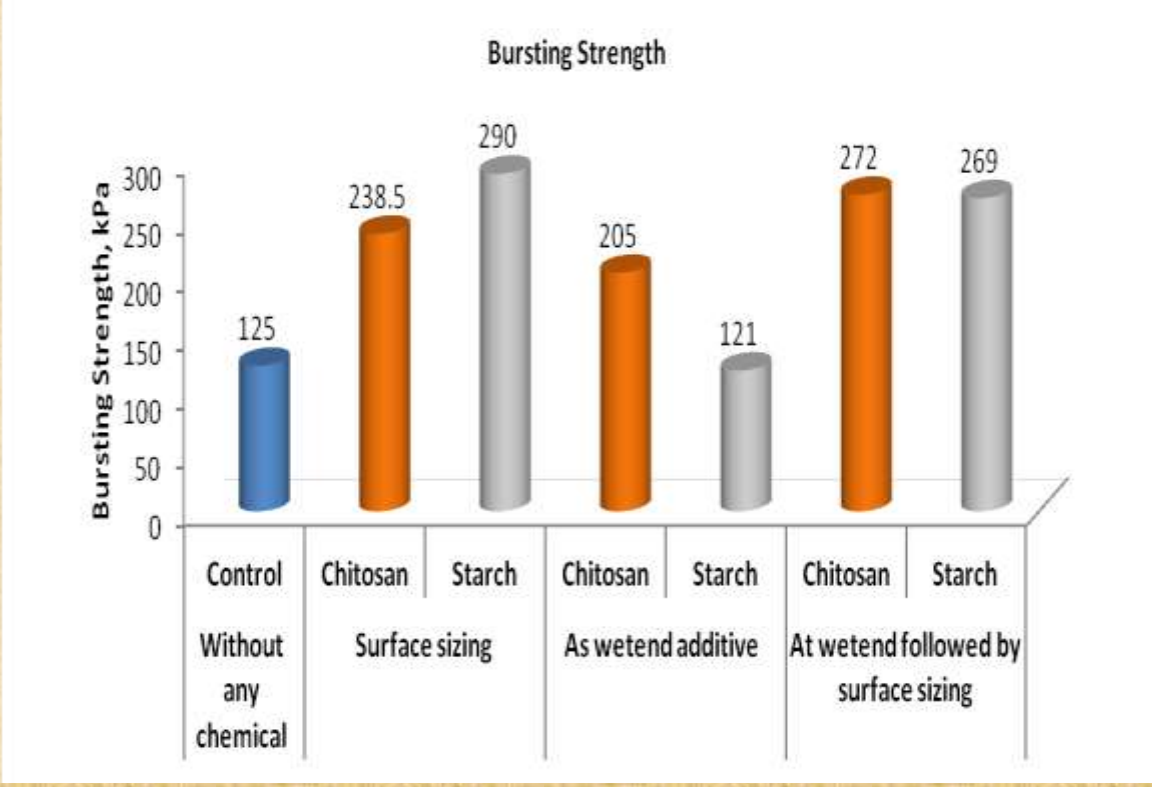
Bursting strength

Chitosan

- SS – 91%
- WE – 64%
- WESS – 118%

Starch Max

- SS – 132%



Anti-microbial test

Chitosan

- BACTASLYDE test kits used, no single colonies developed.

Starch

- NA

Education?

- Establish Business? And Teach?

Conclusion

- Chitosan is best suited as a Surface sizing solution on kraft paper to improve COBB, Strength by 90% and impart antimicrobial property.
- Due to its cationic behavior chitosan is more effective in improving the fines retention as well as helps in reducing the anionic trash in back water.
- Chitosan solution servers the purpose of more than 2-3 chemicals normally used in paper industry and most important is, it’s Biodegradable and nontoxic solution.

Thank you

Questions?

Cost Analysis

Cost analysis process is under negotiations:

- **Consider 70TPD paper mill. They use 280 kg starch per day and other chemicals strength, Cobb improvement chemical etc.!**
- **Assuming! Chitosan can replace above chemical.**

Starch based		**Chitosan based**	
Starch 280kg* 20 INR	5600	Chitosan 40 Kg * 1000 INR	40000
Other 2 chemicals (~)+ Imported OCC	10000	Organic acid 40 Ltrs * 200	8000
Total	15600	Total	48000

If the cost of the Chitosan is 200 INR per Kg, then Total cost = 16000 INR!