BARRIER COATING PROJECT- NRS UK

CELLULOSE NANO CRYSTALS

OBJECTIVES

- To replace Plastic packaging with eco-friendly coatings
- Keeping all characteristics of plastics
- Keeping cost at par with current packaging
- 100% renewable
- 100% recyclable
- Cater to all major FMG and food industry
- 100% compostable

NRS INTERNATIONAL ROLE

- NRS Jointly produces innovative products for paints, coatings, barriers and other applications.
- Our products give you tools to improve performance while achieving your sustainability goals.
- We use the only natural and sustainable alternative to oil-based products – the forest, to extract Cellulose Nano Crystals (CNC) and utilize it in our bio-based solutions.
- The world of materials is moving towards bio-based materials. NRS works for you in tackling the world's growing demand for sustainable alternatives to oil-based products.

CNC- CELLULOSE NANO CRYSTALS

- Cellulose is the most abundant bio-polymer on earth.
  It is a primary building block of the cell wall of all living plants.
  CNC provides plants with extraordinary strength, that can be utilized as a building block for the enhancement of existing materials and for the production of novel eco-friendly materials.
- NRS has co-developed a unique technology for the extraction and industrial production of CNC from wood pulp and paper production side streams. We produce CNC and utilize it in our bio-based solutions for various applications.

SOLUTION

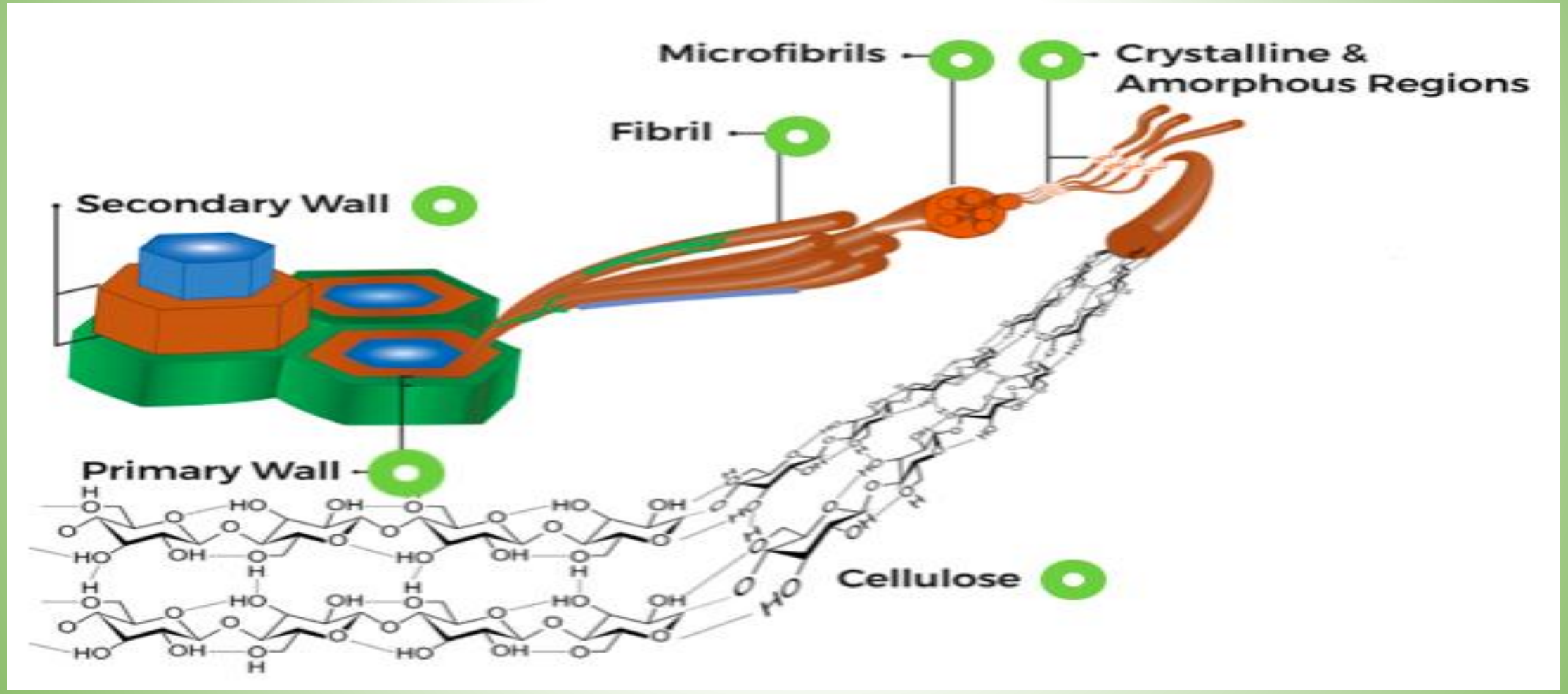
The solution grows on trees - the industrial forest as a source for raw material for the packaging industry

Cellulose Nano Crystals (CNC), Innovative Materials from the forest

CNC is emerging as one the most promising green solutions

- Natural building block of all plants on earth
- Strong, light weight and transparent material
- Safe and Excellent for various bio- based applications

CNC in Nutshell



CORE PROPERTIES OF CNC

- 100% biobased
- Lightweight
- Self-assembly and transparent
- Durable
- Abrasion resistant
- Oxygen barrier
- Rheology modifier
- Recyclable, Compostable and Biodegradable

CORE PROPERTIES

- Highly compatible to water-based systems
- Reinforcement additive for all types of materials
- Enhancement of adhesiveness, scratch resistance, tensile strength, bonding, erosion, anti-counterfeiting, anti-reflection coatings and more
- A carrier platform for introduction and dispersion of other active nano particles for modification of optical properties, gas barrier, active catalysts and more

BUSINESS PLAN

Revenues From

- Selling barrier coatings to packaging and paper
- manufacturers
- Licensing CNC production technology to build plants globally
- to reduce costs and carbon footprint

Partnerships

- Commercial agreements with companies across the packaging industry value chain
- Strategic partnerships for next generation applications (3D printing, printed electronics,
- led lights, textile, composites, etc.)

TARGET MARKET

- Flexible packaging market is over 530 billion USD
- High barrier films for flexible packaging market is over 130 billion USD

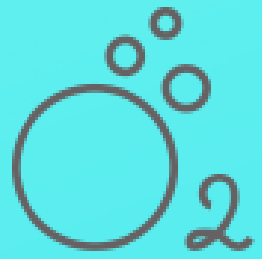
BARRIER SOLUTIONS -OxyLay

- OxyLay oxygen barrier coating allows the paper and packaging industries to replace existing materials that are harmful to the environment with an eco-friendly, recyclable alternative without compromising on performance

- Based on Cellulose Nano Crystals (CNC)- the building block of all living plants, a bio-based strong and lightweight material extracted from cellulose

PERFORMANCE

Performance



Oxygen <1
cc/m²·day @70%

Oil & grease
3M Kit value of 12

Applied as a coating on various substrates including paper, paperboard, plastic and bio-plastic

SUSTANIBILITY

Sustainability

Recyclable. Certified by PTS FIBRE based solutions

Biodegradable and compostable

Made from a renewable resource – the industrial forest

Made using the bio-based material CNC

Silicone and plastic free

INDUSTRY ADVANTAGE

Industrial Advantages

Applied using standard industrial coating machines including slot die, rod coater and gravure

Can be used for various applications including pouches and lids, and serve different industries such as food, consumer products and more

ITS ALL ABOUT VapLay

- VapLay offers environmentally friendly oxygen, oil & grease and water vapor barrier coatings that allow the paper and packaging industries to replace existing materials that are harmful to the environment with an eco-friendly, recyclable alternative without compromising on performance.
- Eco-friendly solution that offers superior resistance to oxygen and oil & grease and allows the paper and packaging industries to replace existing materials that are harmful to the environment with an eco-friendly, recyclable alternative without compromising on performance.

Data Sheet

HydroShield

How to use?

- Ready for use as is.
- It is highly recommended not to dilute or modify it.
- Prior to applying – mix the suspension to assure homogeneity and fluidity.
- If applying on paper – it is recommended to apply two layers of the barrier formula with a total dry coating weight of ~5 g/m^2.
- The most suitable coating technologies are Rod-coater, Gravure and Curtain coating machines.

Storage & shelf Life

- Exhibits good shelf-life stability of at least 6 months.
- Delivered in drums or IBC's.
- Since this is an aqueous dispersion, the product should be stored under cool but frost-free conditions (between 5°C and 25°C) out of direct sunlight.

Properties	Test method	Coated paper*	Units	
Paper grammage (uncoated)	ISO 536	90 ± 6%	g/m²	
Pouch dimensions: Large pouch Length Width Small pouch Length width		 160 ± 2 120 ± 2 95 ± 2 75 ± 2	mm	
Total barrier layers grammage		10 - 15	g/m²	
Oxygen transmission rate	ASTM D3985 and F1927-50	< 0.1	0% RH	cc/m²·day·atm @ 23°C
		< 0.5	50% RH	
		< 3	70% RH	
Water vapor transmission rate	ASTM F1249-13 and F3299-18	< 3	50% RH	g/m²·day·atm @ 23°C
		< 10	90% RH	g/m²·day·atm @ 38°C
Grease barrier	TAPPI T 559 pm-96	12	KIT rating	
Water absorption	ISO 535 Cobb 60	< 1	g/m²	
Sealing strength (140 °C,1 sec)	ASTM F88	> 5	N/in	

CURRENT PAPER MILLS WITH BARRIER PROJECTS

- **EUROPE**

- Michelman, BOBST, & UPM
- Sappi M guard
- Nippon Paper Industries- StarShield
- StoraEnso -Aqua Coating

USA

- OJI
- Pixelle Speciality solutions
- Domtar Inc.

SAMPLES IMAGES

PLAIN

PRINTED

BRIGHT FUTURE OF PAPER PACKAGING

- Amid the COVID-19 crisis, the global market for Paper Packaging Materials estimated at US$230.4 Billion in the year 2020, is projected to reach a revised size of US$323 Billion by 2026, growing at a CAGR of 5.9% over the analysis period. Paper Bags & Sacks, one of the segments analyzed in the report, is projected to grow at a 5.9% CAGR to reach US$109.1 Billion by the end of the analysis period.
- After an early analysis of the business implications of the pandemic and its induced economic crisis, growth in the Corrugated Containers & Packaging segment is readjusted to a revised 5.4% CAGR for the next 7-year period. This segment currently accounts for a 26.3% share of the global Paper Packaging Materials market. Paper bags are generally made using recycled pulp or Kraft paper, or both. Brand owners are using flexible paper bags and sacks as a source of promotion and marketing.

https://www.globenewswire.com/news-release/2022/01/26/2373249/28124/en/Global-Paper-Packaging-Materials-Market-Report-2022-2026-Growing-Environmental-Concerns-Regarding-Use-of-Plastics-in-Packaging-Application-Spurs-Demand-for-Paper.html