Solenis

Solenis On-site GPAM Technology Introduction

Solenis Vietnam Company Limited

Unit 406, Level 4, M-Building,

District 7, Ho Chi Minh City, Vietnam,

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Agenda

1. Solenis’ Business in Brief
2. On-site GPAM and Its Manufacturing
3. Key Application Cases

Serving a Wide Range of Diverse Markets

Consumer

FOOD PACKAGING & PROCESSING

GRAPHIC & SPECIALTY PAPERS

TISSUE & TOWEL

PACKAGING

SPECIALTIES & ENGINEERED WOOD

Institutional

FOOD SERVICES

RETAIL & GROCERY

BUILDING & FLOOR SERVICES

COMMERCIAL

HEALTHCARE

HOSPITALITY

Pool

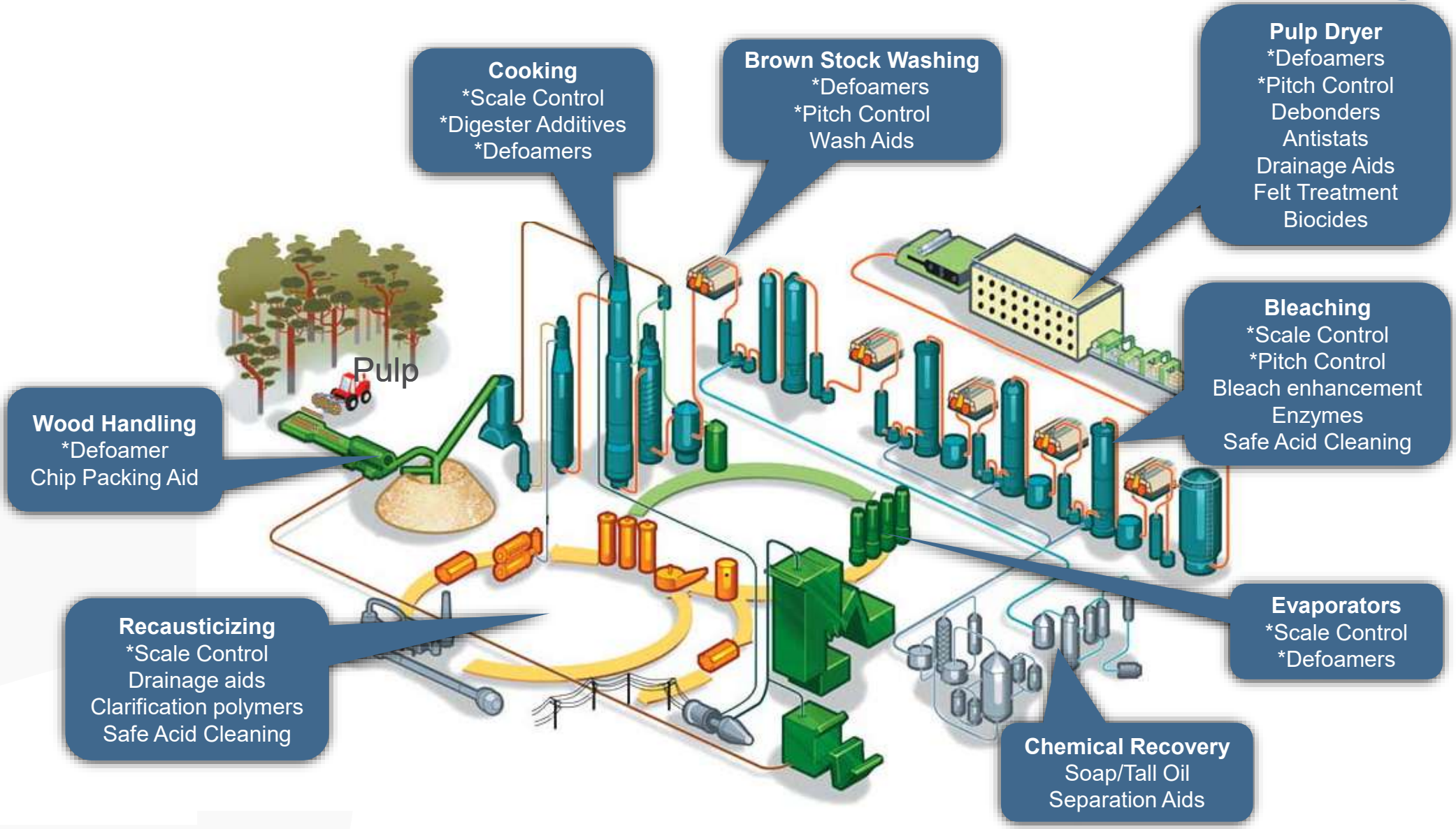
RESIDENTIAL

Serving a Wide Range of Diverse Markets

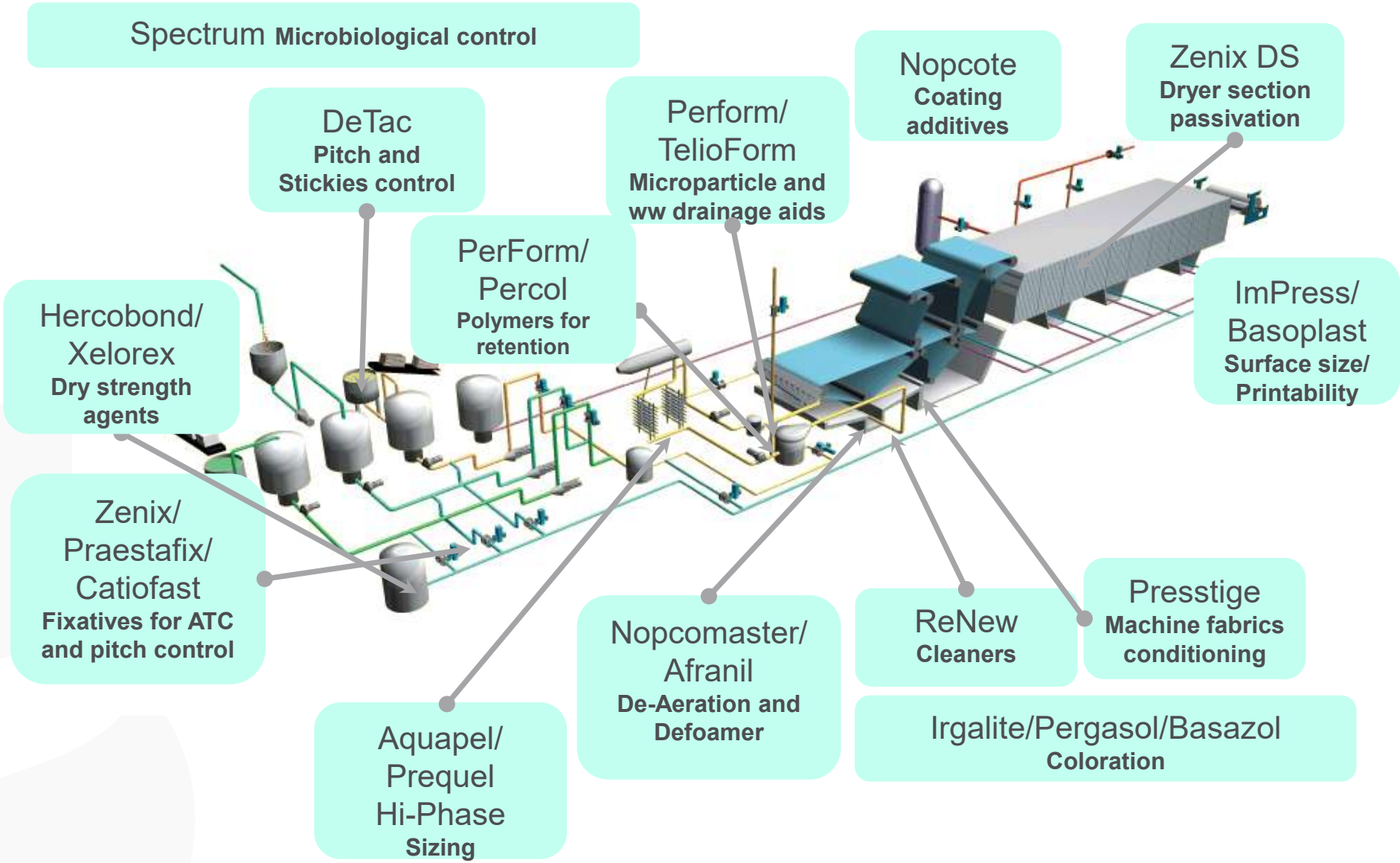
Food & Beverage

Industrial

Solenis Portfolio for Consumer Solutions - Pulping

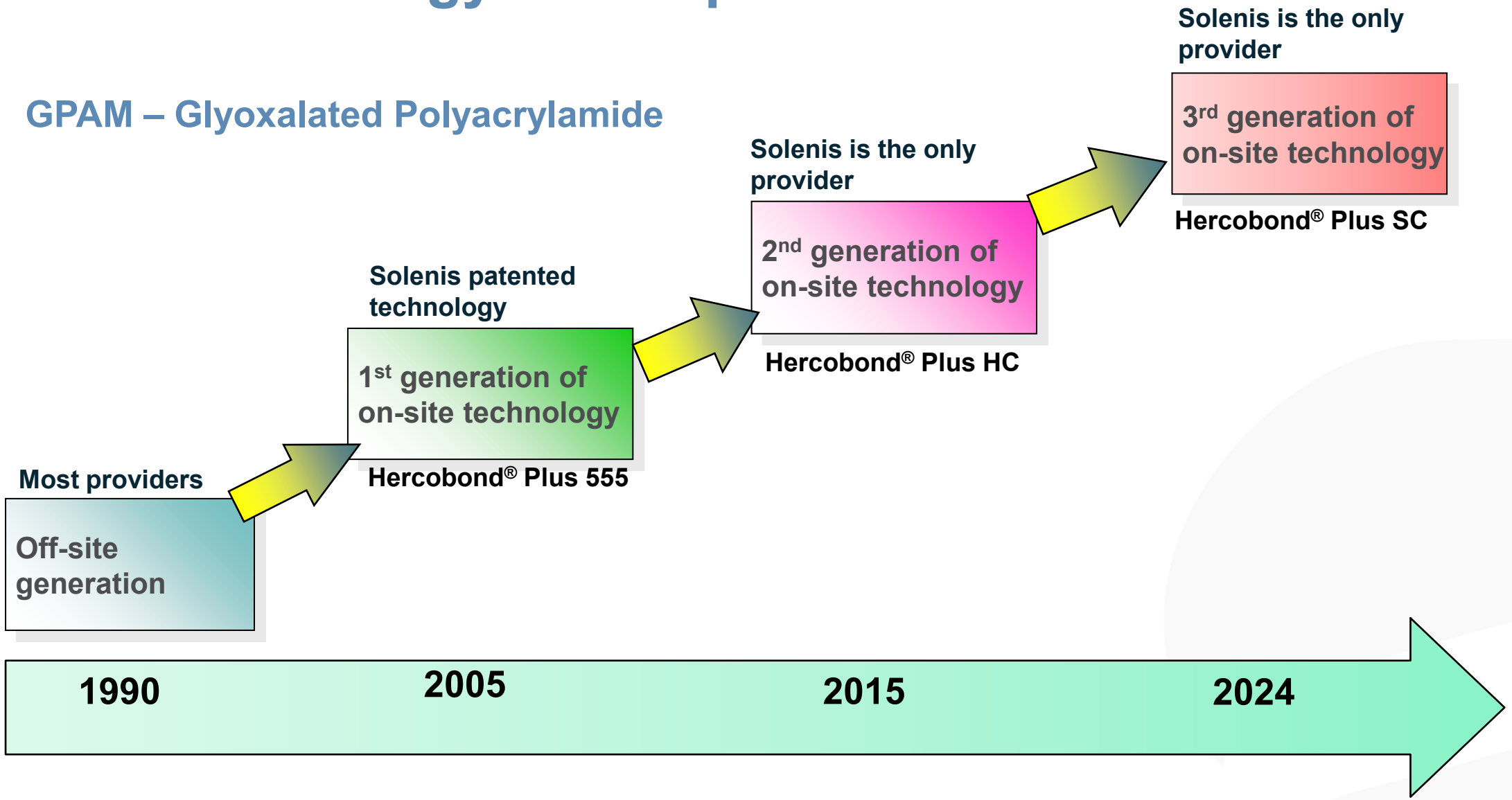


Solenis Portfolio for Consumer Solutions - Paper



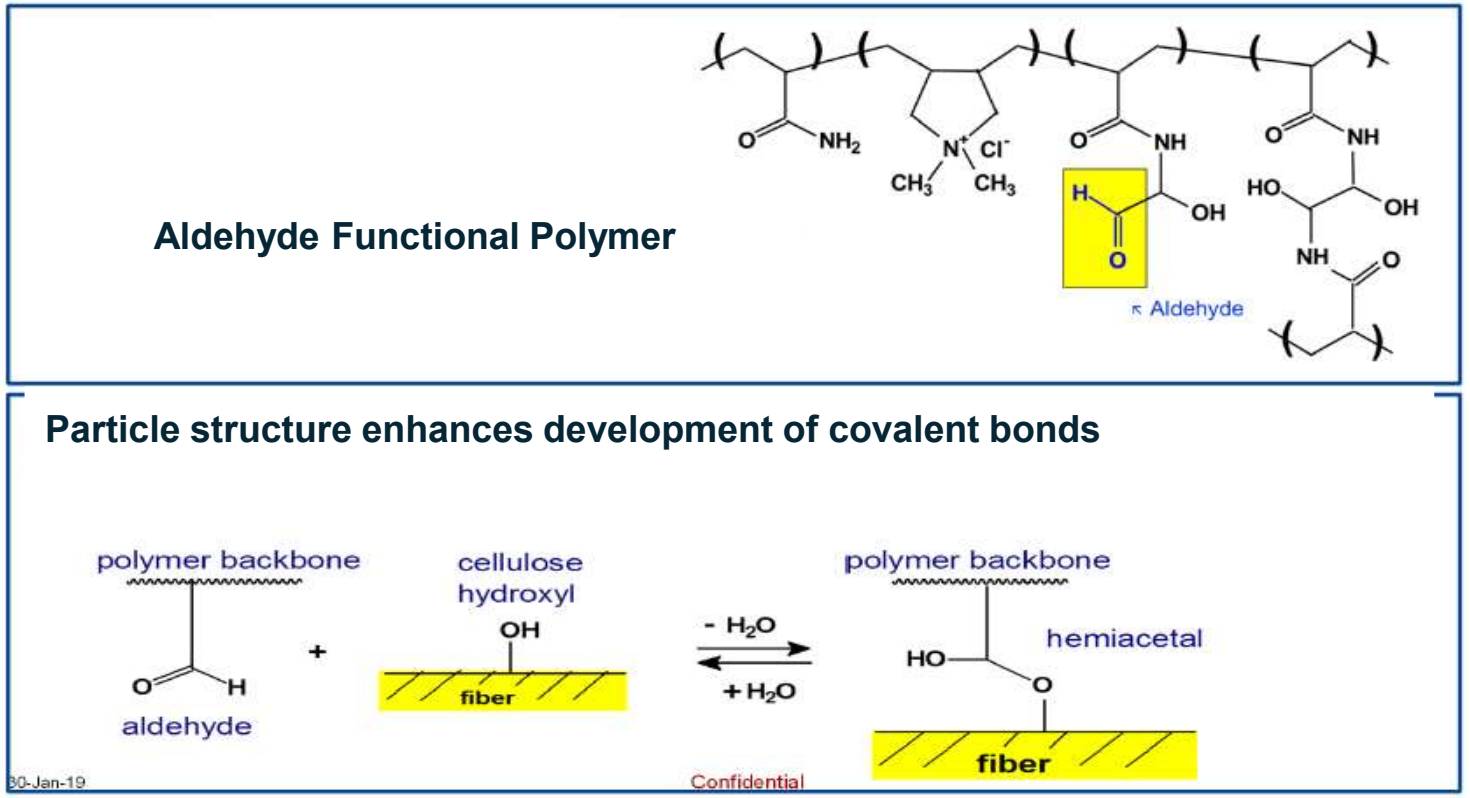
GPAM Technology Development

GPAM – Glyoxalated Polyacrylamide



Unique Chemistry – Onsite Generated Dry Strength

- **Hercobond Plus is …**
  - a structured microparticle generated from a high Mw backbone
  - forms Covalent Bonds with Cellulose
- **Hercobond Plus is not …**
  - a typical “delivered” GPAM
  - as effected by soluble lignin & other anionic trash



Bonding Strength:
Covalent (60-80) > Ionic (10-30) > Hydrogen (4-6 kcal/mole)

Hercobond Plus is the most effective strength additive in the Industry.

Technology Overview

Hercobond Plus products are…

- cellulose reactive cationic dry strength resins
- chemically modified at customer site for optimal performance
- most effective pure strength additives
- an industry proven technology, 18 years commercial experiences

Hercobond Plus does…

- increase SCT, Burst, Concora, Tensile, and Ply Bond of paper and board
- raise productivity via faster wet end water removal and light-weighting
- provide a linear strength response to very high contribution level
- deliver a very high return on investment

Hercobond Plus – Very High Dry Strength Possible

Application Performance

	Typical Containerboard	High Strength Specialty
Physical Test	**1 – 3 kg/T**	**3 – 6 kg/T**
SCT / Ring Crush (%)	+ 5 – 15	+15 – 35
Burst (%)	+ 8 – 15	+ 15 – 40
Tensile (%)	+ 5 – 12	+ 12 – 25
CMT (Concora) (%)	+10 – 25	+ 25 – 40
Productivity Gain (%)	+ 4 – 10	+ 8 to 15
Weight Reduction (%)	- 4 to 8	N/A

This is where the technology is most differentiated vs. competition, and often what is required to make the leap to a new grade.

Case 1: Hercobond Plus HC Application in White Kraft Grades

Overview

- Machine: running speed 1100~1250 m/min
- Grades: White kraft 90~120 g/m^2, 600,000 tons/year
- Furnish: NBKP + LBKP + APMP, ash content：18～22 %

Objectives

- Increase productivity and decrease steam consumption via improving drainage
- Reduce NBKP use.

Solenis Approach

- Adding Hercobond Plus HC in the outlet of machine chest.

Results

- Paper ash increased by 0.5%;
- NBKP reduced by 1%;
- Steam consumption reduced by 50~60 kg/ton;
- Running speed increased by 15~30 m/min;
- Economic benefit: USD 2.0~3.0 million/year;
- CO_2 emission reduction: 7,000~8,000 tons/year.

Case 2: Hercobond Plus HC Application in Testliner/Medium

Overview

- Machine: running speed 1000~1200 m/min
- Grades: Liner and medium, 100~300 g/m^2, 500,000 tons/year

Objectives

- Increase productivity
- Improve strength

Solenis Approach

- Hercobond Plus HC to replace amphoteric PAM, added in machine chest

Results

- Productivity improved by 6-7%;
- New medium grade of lower basis weight developed;
- Overall cost savings: USD 3.0 million/year.

Case 3: Hercobond Plus 555 Application in Tissue/towel

Overview

- Machine: running speed 530 m/min
- Grades: hand towel 36 g/m^2, 30,000 tons/year
- Furnish: 57% NBKP + 43% LBKP, WSR (wet strength resin) 40-50 kg/ton;

Objectives

- Minimize use of NBKP, reduce WSR
- Improve strength

Solenis Approach

- Adding Hercobond Plus 555 at 1.0 ~ 2.5 kg/ton in outlet of machine chest

Results

- NBKP could be reduced by 10~20%;
- Running speed increased by 10~15 m/min;
- WSR reduced by 5~10 kg/ton;
- Creping ratio decreased by 1.0~2.0%;
- Dusting reduced;
- Cost benefit: USD 15~25/ton.

Case 4: Hercobond Plus 555 Application in Tissue/towel

Overview

- Machine: running speed 1600 m/min
- Grades: facial tissue 13.0~15.3 g/m^2, 60,000 tons/year
- Furnish: 20% NBKP + 80% LBKP, WSR (wet strength resin) 20~30 kg/ton;

Objectives

- Minimize use of NBKP, reduce WSR
- Improve strength
- Reduce production cost

Solenis Approach

- Adding Hercobond Plus 555 at ~1.0 kg/ton in outlet of machine chest

Results

- NBKP reduced by 5%;
- WSR reduced by 3 kg/ton;
- Creping ratio decreased by 1.0~2.0%;
- Refining energy reduced from 42 to 25 kWh/t;
- Retention improved from 65% to 78%;
- Cost benefit: USD ~5/ton.

The Possibilities with the Hercobond Plus

1) Furnish substitution – Less softwood kraft and More OCC, BCTMP, or MOW, etc.
2) Basis weight reduction – Save fibers
3) Speed increase – Productivity improvement
4) New grade development – Higher strength and profitability
5) Reduced energy costs – Steam and electrical (refining)
6) Reduced CO_2 emission – Sustainability value
7) ……

GPAM Generators in Operation in APAC

- 60 units running globally;
- 16 units located in APAC:
  - Indonesia – 2;
  - Australia – 1;
  - New Zealand – 1;
  - Korea – 1;
  - Thailand – 1;
  - China – 11.