

From Mission Impossible to Commercial Reality

Mono-Material Retort Pouch



May 30, 2024

Chris Cester – Flavour Makers
Chris Ward – InterFlex Group, a Toppan company

Speaker Introduction



Chris Cester

Chris Cester (MAIP) has over 22 years of experience in packaging design and development and is currently the Packaging Manager for leading Australian food manufacturer, Flavour Makers. Chris's recent sustainability initiatives have earned both an Australasian Packaging Innovation Design Award (PIDA) and a WorldStar packaging award.



Chris Ward

Chris Ward, Ph.D., serves as the Vice President of Technology of the InterFlex Group, part of the Global Packaging Division of TOPPAN, Inc. He has over 30 years of experience in Flexible Packaging R&D with a strong track record of collaborative innovation and implementation of sustainable solutions and productivity improvements across a range of converting technologies and packaging applications.



Company Overview





Our Customers

Working with some of the world's biggest brands



Capabilities

Culinary Development Centre



Dry Blending Plant



Liquid (Hot-Fill) Plant



Retort Facility



Case Study



Ready to Eat
Soup

Retort
Sterilized

18 months Shelf
Life



Produced by:
Flavour Makers
&
TOPPAN Inc.

2025 Australian National Packaging Targets (Voluntary)

100%

of packaging to be reusable, recyclable or compostable

70 %

of plastic packaging will be recycled or composted by 2025

50%

average recycled content across all packaging

Phase Out

problematic and unnecessary single-use plastic packaging

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Phase Out

problematic and unnecessary single-use plastic packaging

Flavour Makers Status as of October 2021



2022 Change to CEFLEX standard



| | | Existing thresholds | New thresholds |
|---------------------|-------------------------------------|---------------------|----------------|
| Primary materials | HDPE | Minimum 70% | Minimum 80% |
| | LDPE | Minimum 70% | Minimum 80% |
| | PP | Minimum 70% | Minimum 80% |
| | BOPP | Minimum 70% | Minimum 80% |
| Secondary materials | PET | Maximum 30% | Maximum 0% |
| | PVDC | Maximum 10% | Maximum 0% |
| | Aluminium (<i>not metallised</i>) | Maximum 30% | Maximum 0% |
| | Paper | Maximum 30% | Maximum 0% |
| | Nylon | Maximum 30% | Maximum 10% |
| | EVOH | Maximum 30% | Maximum 10% |
| | PVC | Maximum 0% | Maximum 0% |
| | PS | Maximum 0% | Maximum 0% |
| | Bioplastic | Maximum 0% | Maximum 0% |

Available Solutions

Dry Blending Plant



Liquid (Hot-Fill) Plant



Retort Facility



Flavour Makers Status as of February 2022





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TOPPAN

TOPPAN INC.

Breathing life into culture,
with technology and heart.



1900
Established

USD
11
Billion
Net Sales

54,336
Number of
employees
(Consolidated)

131
Main
manufacturing
bases

236
Number of groups

USD
517
Million
Operating Profit

Global Packaging Network

INTEGRATED PACKAGING SOLUTIONS



GL Barrier Film Solutions

Specialty Films



Transparent base layer
(12µm/48ga PET, 15µm/60ga OPA, etc.)

Inorganic vapor deposition layer
(AlOx, SiOx, etc.)

Patented barrier coating layer

15,000+
Products

45+
Countries and regions

Superior Barrier
Performance
Highly Transparent
Non-AL
Eco-Friendly

35+
Years

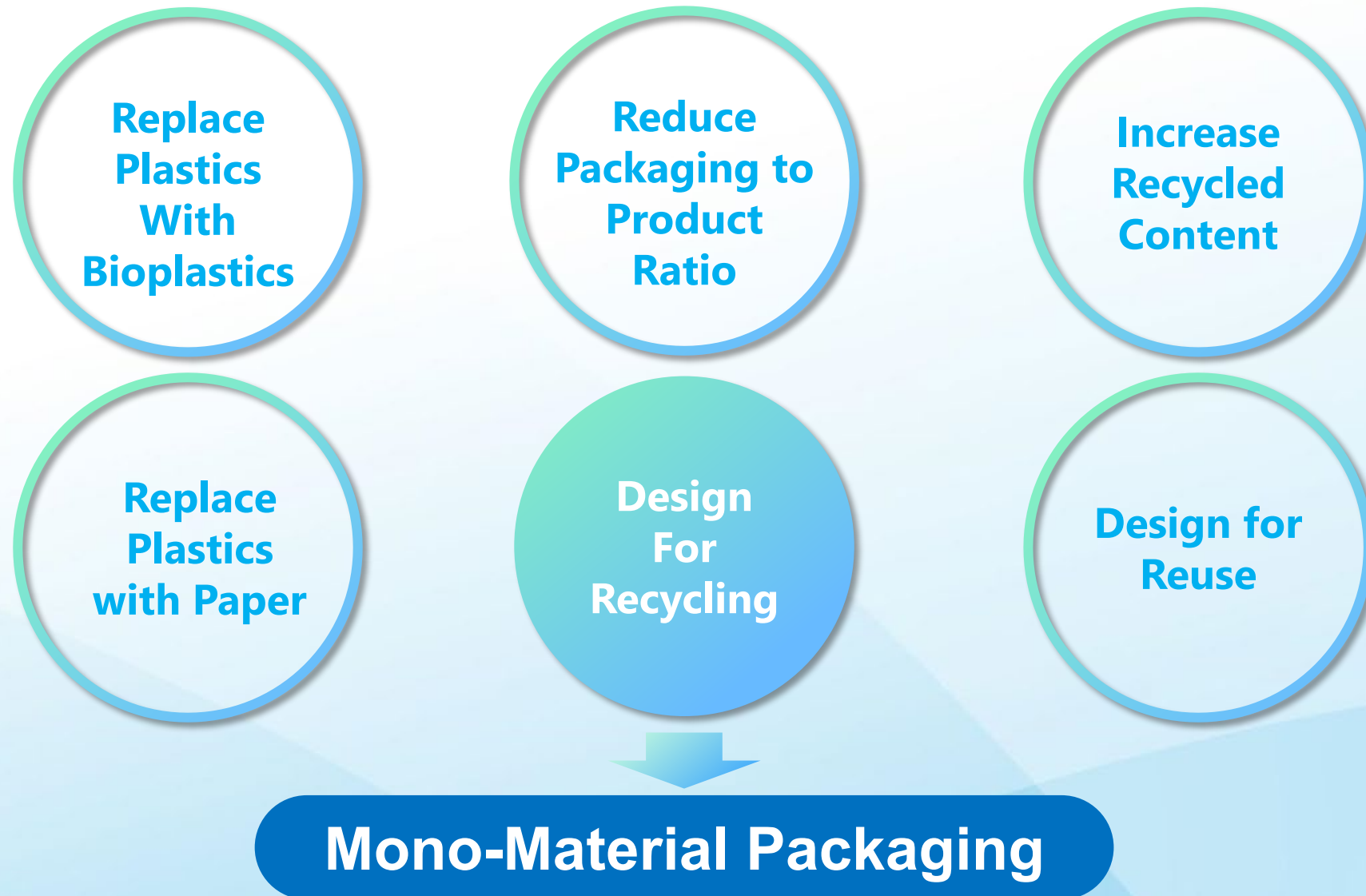


Package Formats



- Flexible Packaging
- Rigid Packaging
- Folding Cartons
- Composite Containers
- Corrugated Fiberboard

Sustainability Strategies

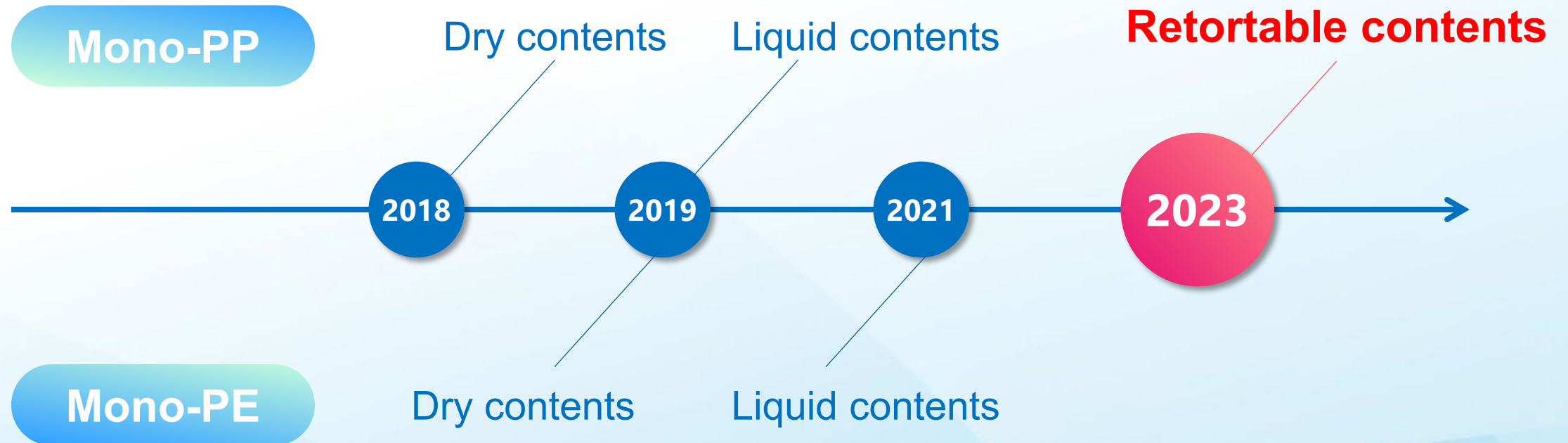


Mono-Material Trends

Mono-material plastic packaging film consumption is expected to outpace that of multi-material packaging over the next five years (2023-2028)

| Mono-material | VS | Multi-material |
|--------------------|---------------------|--------------------|
| 24.0 million tones | Consumption in 2023 | 10.4 million tones |
| 30.0 million tones | Consumption in 2028 | 12.4 million tones |
| 4.50% | CAGR | 3.60% |

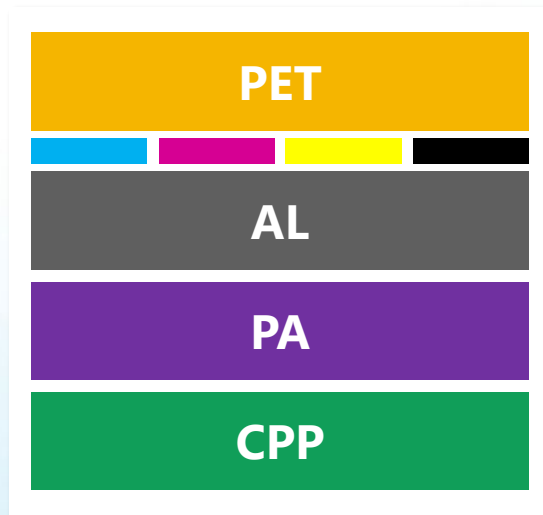
Toppan's Mono-Material Journey



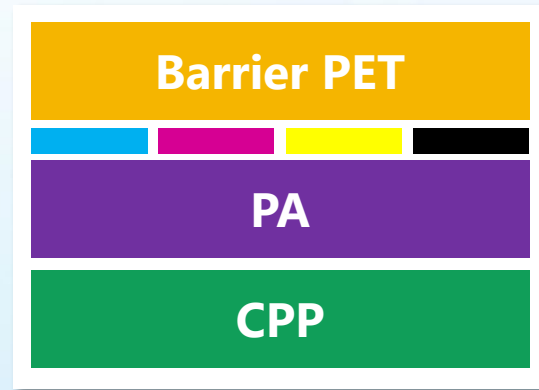
Retort Structures: Traditional vs Mono-Material

Multi-Material

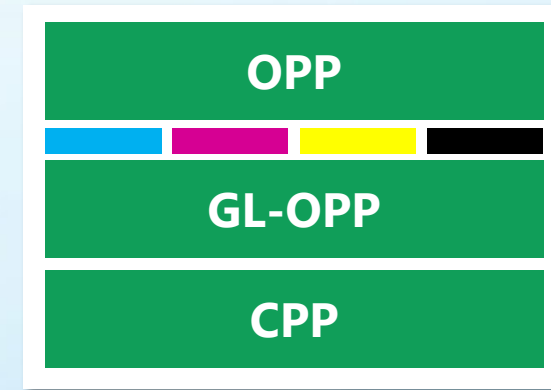
Mono-Material PP



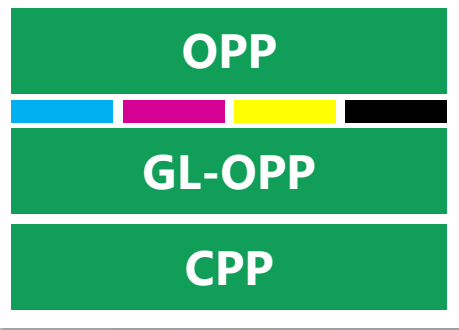
Foil-Based



Transparent



Mono-Material Structure Development Challenges



| Requirement | Traditional Approach | Technical Obstacle |
|---------------------------|---------------------------------------|-------------------------------------|
| High post-retort barrier | Use Alu foil or barrier PET | Less heat resistant substrate (OPP) |
| Pouch sealing performance | Create broad seal window (PET vs CPP) | Narrower seal window (OPP vs CPP) |
| Abuse resistance | Use "tough" material (PA) | Achieving toughness without PA |



Development Challenges

Challenge

01 Develop retortable high-barrier OPP film

Challenge

02 Develop low seal initiation temperature (SIT) sealant

Challenge

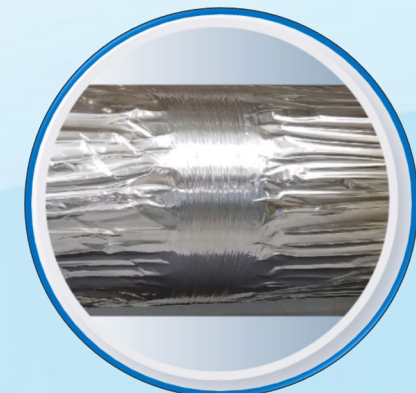
03 Maximize lamination strength

Challenge

01 Develop Retortable High-Barrier OPP Film



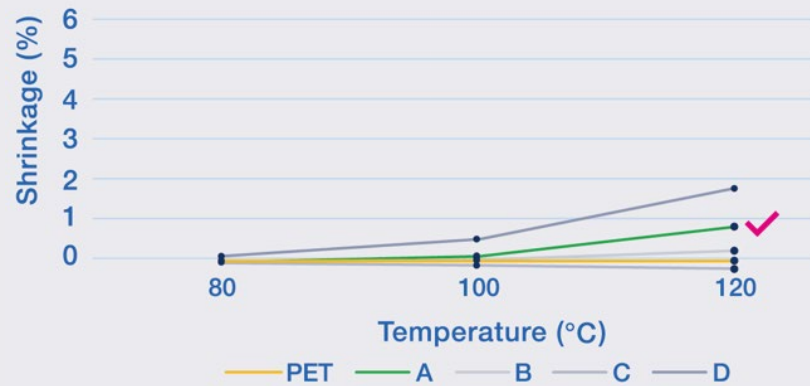
Lower heat resistance of PP film causes **film shrinkage issues** during barrier film production process.



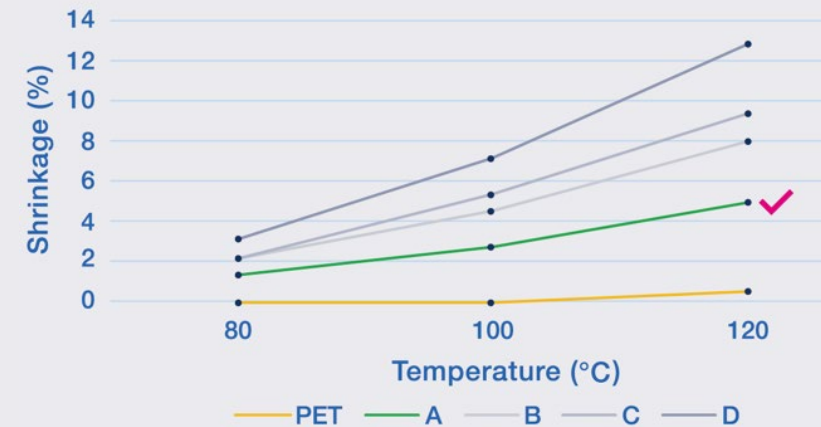
Challenge

01 Develop Retortable High-Barrier OPP Film

TD heat shrinkage



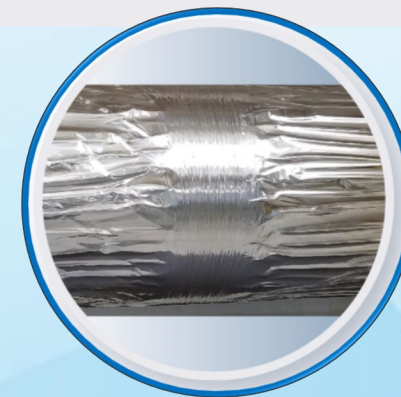
MD heat shrinkage



All numbers are typical values.



Base OPP film A showed no issues with shrinkage after barrier film production process.



Challenge

01 Develop Retortable High-Barrier OPP Film



GL-ARH retortable PET grade



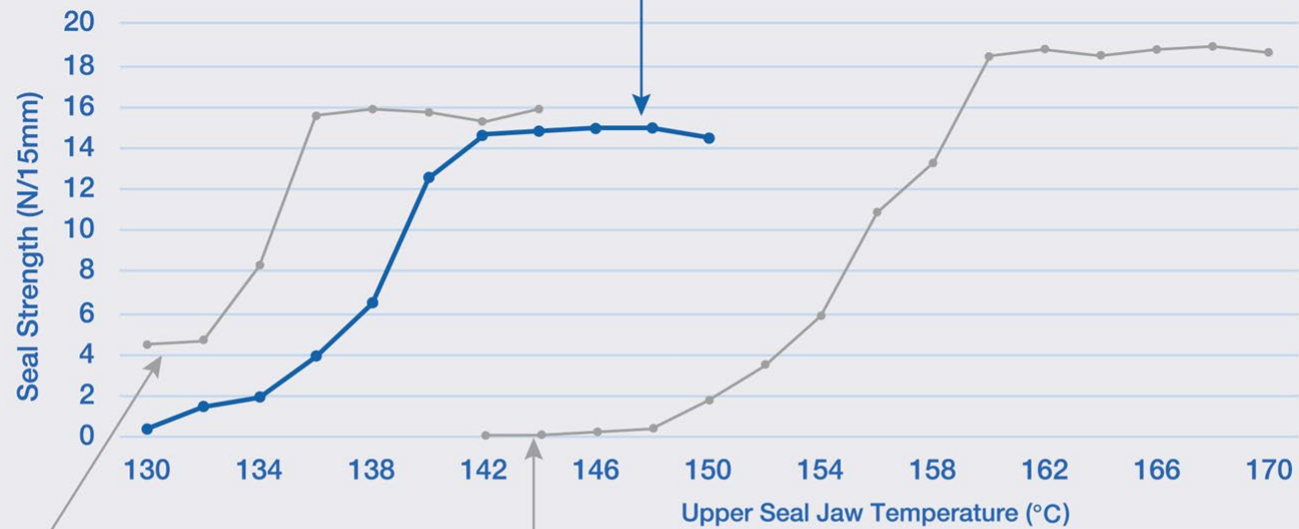
Barrier coating material for retortable OPP

- ✓ **Low temperature curability**
- ✓ Long pot life for production
- ✓ Outstanding oxygen barrier
- ✓ Robust layer for flex-crack resistance

| | OTR (cc / m ² / day) | Original coating material | New coating material |
|---------------|------------------------------------|------------------------------|-------------------------|
| Before retort | | < 1.0 | < 0.5 |
| After retort | | > 4.0 | < 1.0 ✓ |

Challenge

02 Develop Low SIT Sealant



Lowest SIT CPP
Insufficient heat resistance (welded in retort)



Standard Retortable CPP
SIT is too high for pouch making for a mono-material structure



Selected CPP
Suitable for pouch making and heat resistance



Challenge

03 Maximize Lamination Strength



| | Before | After improvement | |
|---|--------|--------------------|---|
| Seal strength | 30N | 60N | ✓ |
| Lamination strength (100mm / min, 90°) | < 1N | 5N | ✓ |
| Drop test | 4 / 10 | 10 / 10 (All Pass) | ✓ |



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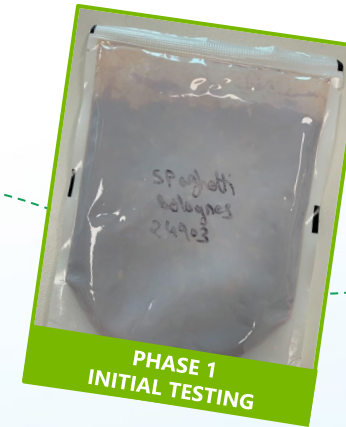
TOPPAN

Development Journey

Flavour Makers
& Toppan First
Meeting



PROJECT KICK OFF (TOKYO)



PHASE 1
INITIAL TESTING



MAJEND MAKCS CO.,LTD
FACTORY TOUR (THAILAND)



SHELF-LIFE TESTING BEGINS



PHASE TWO
LINE TRIALS (MELBOURNE)



PHASE 3
POUCH PRODUCTION



COMMERCIAL PRODUCTION



FINAL QC PASS

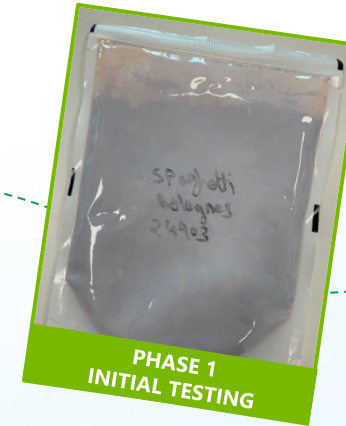
Product
Launch

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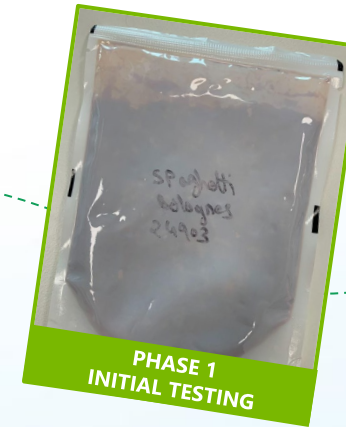
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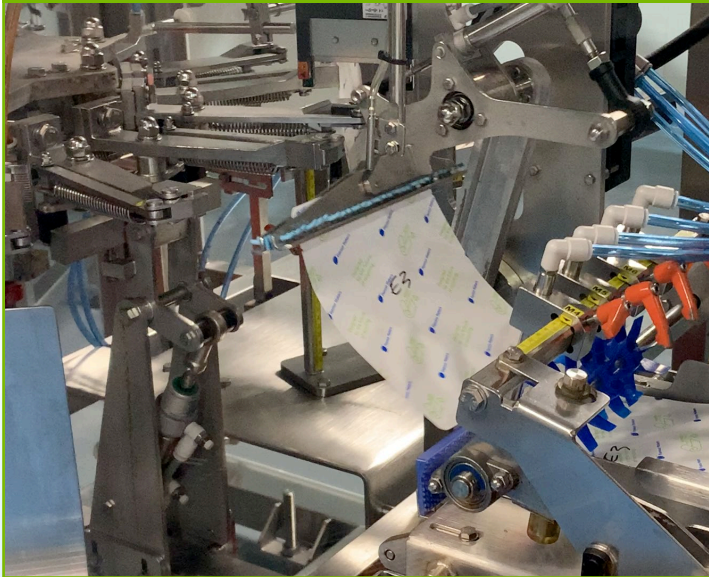


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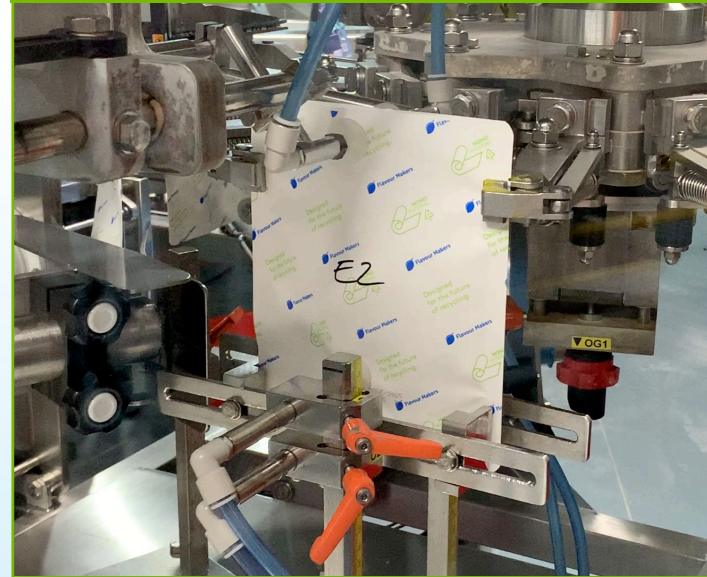
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Development Journey - Line Trials

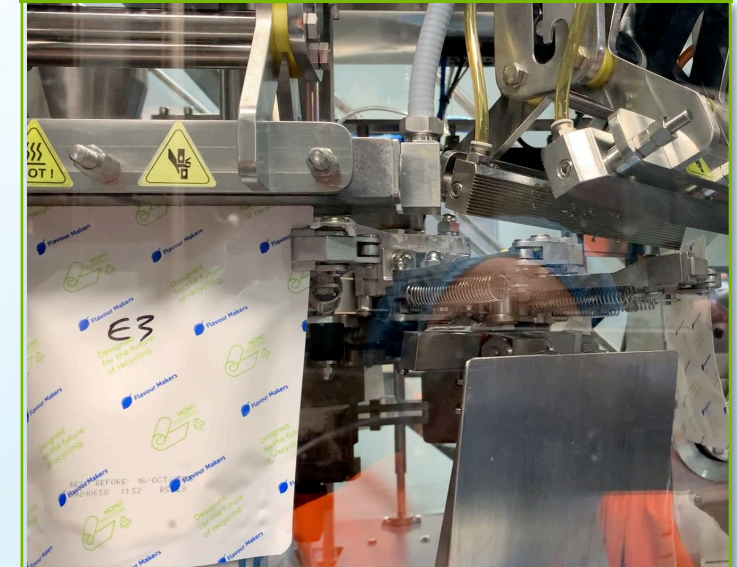
Pouch Pick-Up



Pouch Opening



Pouch Sealing



Development Journey

**Flavour Makers
& Toppan First
Meeting**



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SHELF-LIFE TESTING BEGINS



**PHASE TWO
LINE TRIALS (MELBOURNE)**



**PHASE 3
POUCH PRODUCTION**



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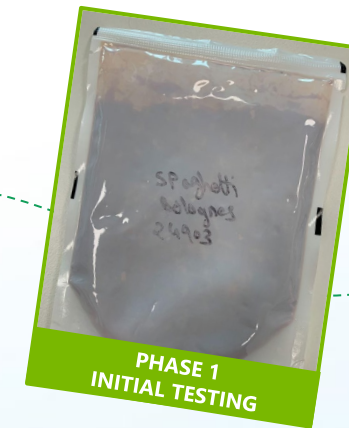
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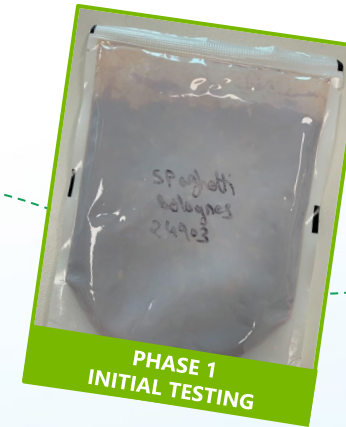
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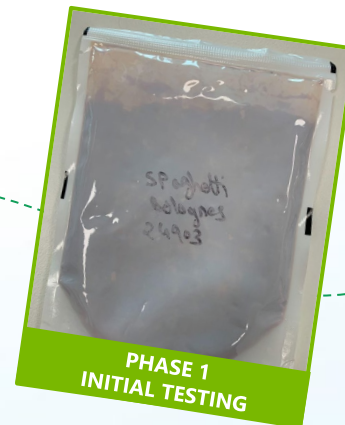
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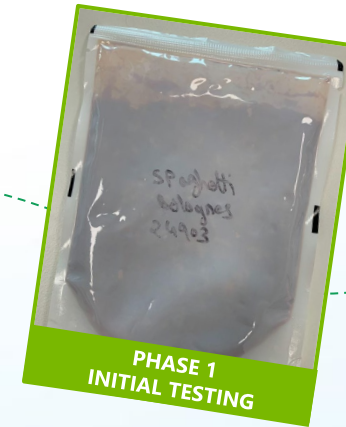
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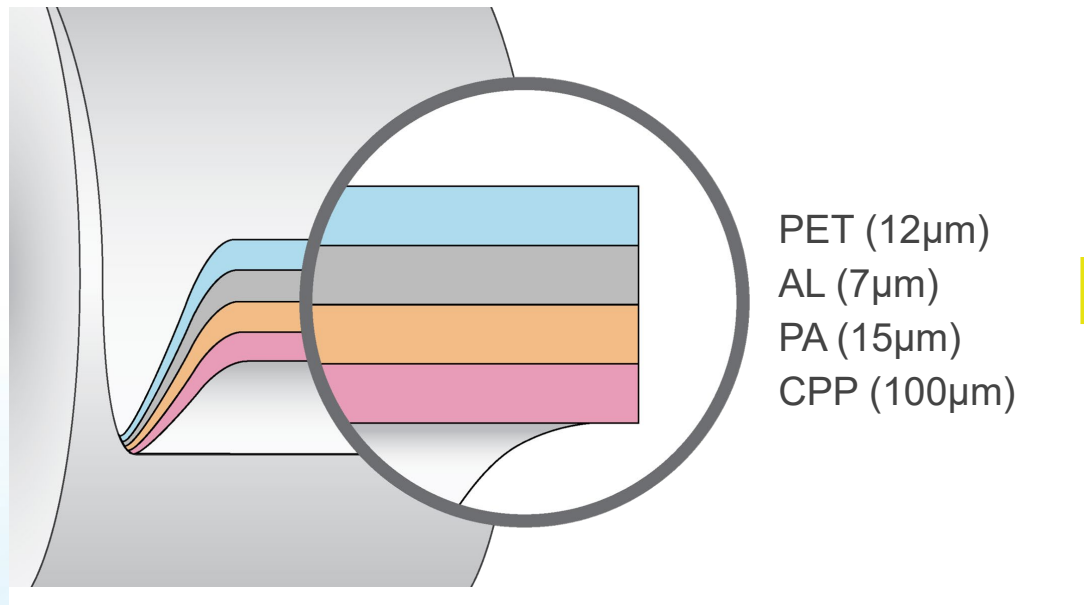


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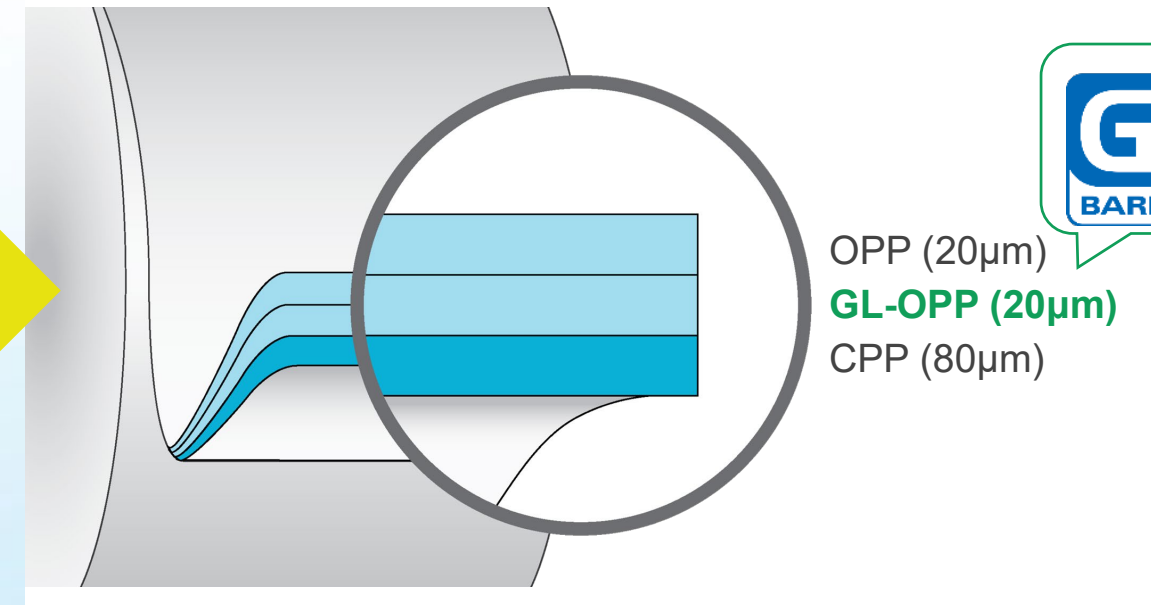
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Structure Comparison

Original (Multi-



New (Mono-Material)

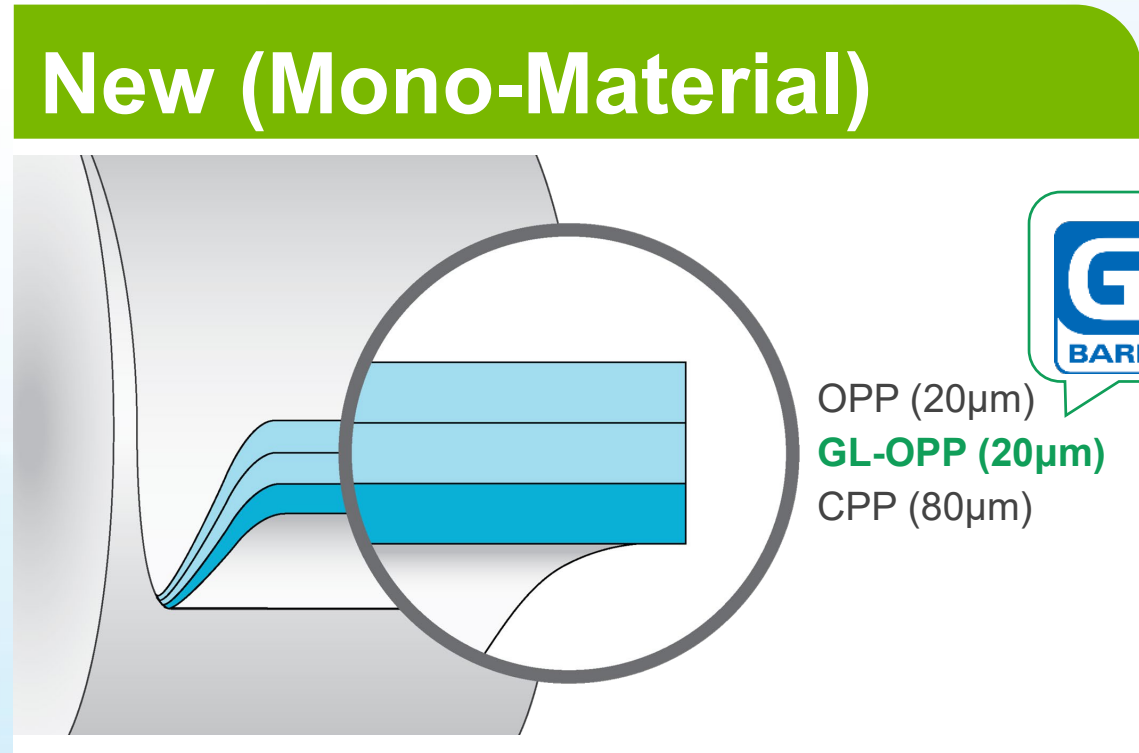


Results

Machine: Toyo Jidoki TT8CR
Sealing Temp: 140°C (284°F)
Line Speed: 22 PPM

Drop Test: 1M / 6 drops / 10 pouches - Pass
Leak Detection: 50kPa/1min + 80kPa/1min - Pass

Retort Parameters: 121°C (250°F) for 45 mins
Pre-Retort OTR: .01 cc/m²/24hr (23°C, 0% RH)
Post-Retort OTR: .17 cc/m²/24hr (23°C, 0% RH)
Shelf Life: 18 Months



Mission Accomplished



✓ CEFLEX compliant

✓ Recycle ready

✓ Excellent seal integrity

✓ No reduction in line speed

✓ No reduction in shelf life

✓ Successfully down-gauged

Mission Accomplished



Australasia's first recyclable mono-material retort pouch



PIDA Gold Winners!

Thank you