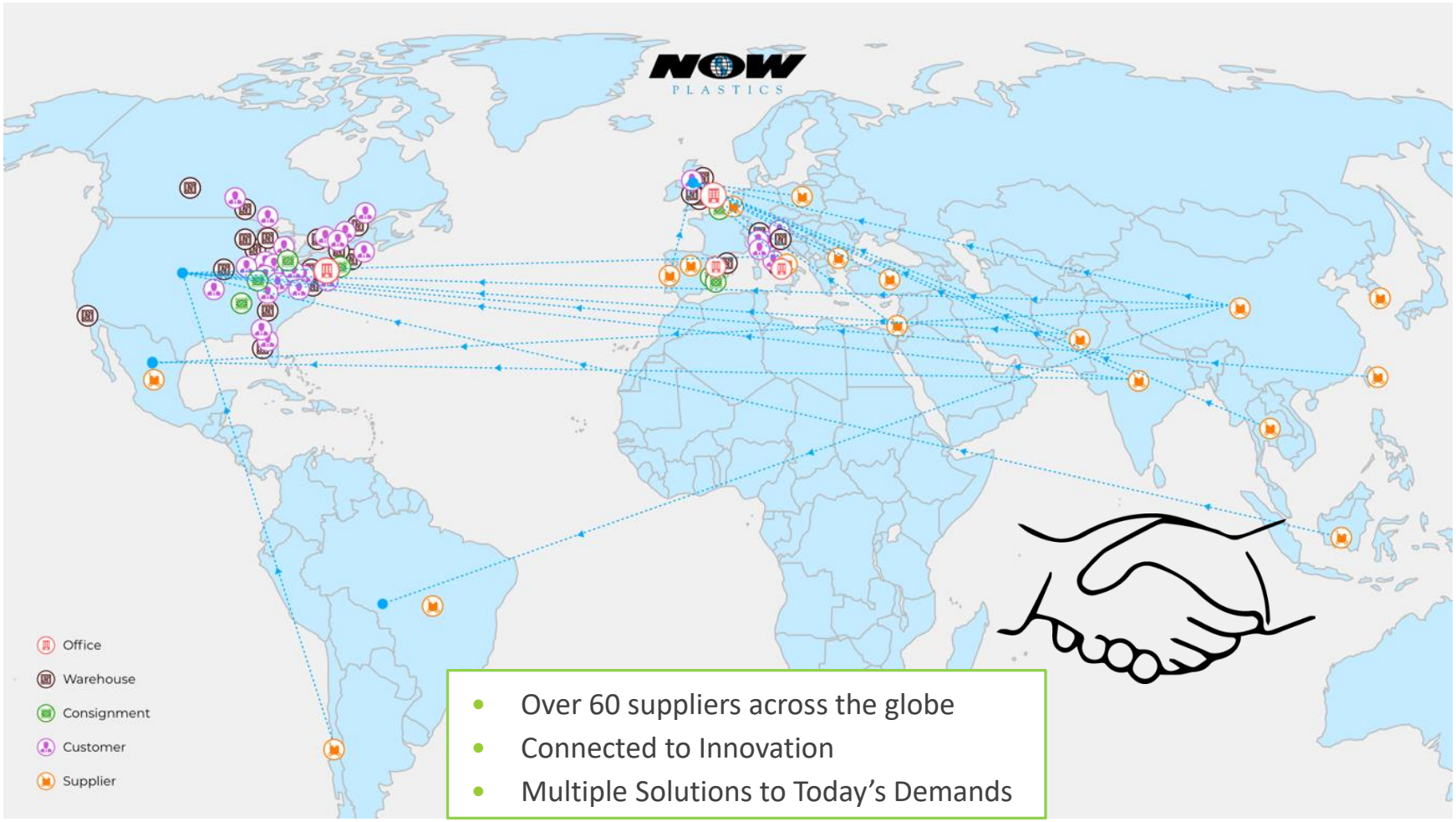
NOW PLASTICS

ECO FRIENDLY FILM ALTERNATIVES

www.nowplastics.com

Table of Contents

Our Global Network
We've Got You Covered



- Over 60 suppliers across the globe
- Connected to Innovation
- Multiple Solutions to Today's Demands

We've Got You Covered

Our Commitment to making the world a better place:

- Continually seeking new product offerings to enhance our ever widening basket of friendlier film products for our environment
- Focused efforts to identify and offer substrates that are produced with a lower carbon footprint and/or a positive impact on the waste stream:
  - Recycled content or recyclable products
  - Films made with resins produced by recycling oils and other byproducts
  - Plant based (sustainable) virgin resins
  - Newer technologies that can achieve biodegradable standards (time based disappearance from land fills)



The World and Now Plastics are reacting to this problem

Practical Analysis

Reality – Plastics cannot be replaced, nor should they be!

- 40 years to build the current infrastructure – hundred of billions of dollars invested
- Too many applications need sophisticated packaging
- Products have been fine-tuned to maximize efficiencies in processing and filling
- Barrier/shelf life requirements cannot be replaced in the near term.
- Costs – nearly all alternatives will be more costly in the short and medium terms – anywhere from 20% to 300%
- Is it a phase or a permanent trend???

Ways to attack the problems in a practical way:

- Use of virgin products will be reduced somewhat and use of PCR type products will increase – where possible
- Adjusted laminated structures to be same polymer family (PE/PE, PP/PP, PET/HSPET, etc)
- Tonnages can be reduced – via downgauging of existing structures or development of alternative structures
- Switch to paper – not necessarily a better carbon footprint; forestry challenges due to higher demands
- Compostable products can be used in some applications; need to work around shelf life and film warranty periods
- Recycling and use of recycled products helps to some degree – but properties will diminish with each recycling period
- Government intervention to motivate creation of recycling systems
- New additives can make products bio-degradable
- Monolayers will improve recyclability of products



Eco Friendly Film Alternatives

Major Categories

- Recycled-content films and recyclable structures
- Films made from bio-based origins
- Bio-degradable plastics
- Compostable “plastics”



Eco Friendly Film Alternatives

Post-consumer recycled (PCR) content films

The next generation of bio-degradable plastics

Films produced from bio-based resins (sustainability)

Compostable Plastics: PLA, Cellophane

Post –Consumer Recycled (PCR) Films:

APET ---- RPET Trays and Thermoforming

PET Films (From mainly bottle reclaim process)

- **Clear PET, MET PET, HS PET, Coated PET**

PE Films

- **PCR for Industrial, Pre-consumer for food packaging**

PP Films

- **PCR option newly emerging; small supply available so initial lead times long. Hopefully will improve over time but supply of recycled PP is smaller than other polymers**

BOPA/Nylon Films

- **PCR made from reclaimed palm oil – food contact certification available.**
- **Can adjust percentage of PCR/virgin resin to control cost upcharge**

Pros

- Existing recycling facilities for PET, PE
- Least economic penalty
- Present the favored option and easiest one to implement
- Specifications mainly unchanged for first recycle
- No need to replace validated packaging
- Potential to downgauge to offset higher cost
- Can mix/customize percentage of PCR content.
- Ability to bury in core layer and have virgin skins

Cons

- Missing recycling for PP
- Somewhat higher cost for thin-gauge films
- Potential for future shortage of recycled goods if demand skyrockets

Recyclable Laminates and Monowebs

- Trend towards developmental work to create laminated structures of similar polymers – 100% recyclable packaging
  - BOPE or MOPE / PE Sealant
    - Multiple sources of each now available
    - Films still considered developmental
  - BOPP / BOPP or BOPP / CPP
  - PET / Heatsealable PET

- Monowebs with surface printing
  - PE
  - PET Heatsealable

Films Produced from Bio-based Resins (sustainable sources)

Typically today sources are plant oils and starches (corn, potatoes, etc)

Blossoming industry so frequent new additions and methodologies

Existing products

- **PE**
- **BOPP**
- **BOPA (recycled)**
- **PLA**

Pros

- Diversification away from oil/gas industry
- Theoretically renewable resource
- Can be both virgin material or recycled material

Cons

- Lack of infrastructure and capacities
- Intermittent shortages
- Consistency of material not proven
- Price typically double
- Least favored option presently

Next Generation of Bio-degradable Plastics:

- Replaces “oxo” degradable which turned film to flakes
- Additives now can allow full disappearance from landfills
- Micro-organisms eat and digest films
- Degradation period can be customized
- Can add to any substrate – PET, PE, PP, BOPA, etc.

Next Generation of Bio-degradable Plastics:

Pros

- Much faster degradation period 1-2 years
- Pricing – modestly higher price
- Customizable percentage
- Requires no change to films currently

Cons

- Not Compostable
- Not cost neutral

Compostable Products

Global trend breathing new life into these products

PE

PLA

Cellophane

Paper

Pros

- Most favorable to environment
- Small group of compost achieving products

Cons

- Shelf life and stability
- High breathability / lack of barrier
- Price – close to triple PET/PP
- New laminate structures require testing
- Hard to convert PLA/Cello
- Shortages of plant inputs

Options by Film Type

Summary of Offerings Presently (December 2019)

PET

- PCR typically 60-90% for all grades of PET (food grade)
- PCR 100% for clear PET
- Biodegradable PET by additive
- Heat-seal PET (142 ga/200 ga)

BOPP

- PCR up to 30%
- Biodegradable BOPP by additive (food grade)
- Bio-based virgin raw materials from plants (renewable)
- Modified standard BOPP to replace PET-higher stiffness and used for PP/PP structure

BOPA

- PCR option via raw materials produced from reclaimed palm oil (food grade)
- PCR can be customized with any combination of recycled/virgin resin

Summary of Offerings Presently (Continued)

PE

- PCR available up to 100% (non food grade)
- Pre-consumer recycled content avail to 50% (food grade)
- BOPE (Biaxially-oriented PE-tentered)
  - Top web versions 100% PE (compared to blend) by our competitors; enhancements also ongoing
  - Bottom web can now allow for reduction of sealant web to 20-25 micron in BOPE/BOPE structure
- MOPE (mono-oriented PE-blown)
  - Top webs showing superior stillness vs. BOPE – medium stiff/medium well stiff/very stiff
  - Can laminate to bottom web from same film producer.
  - Film designs with higher heat resistance (140-150 C) for possible PET and BOPP replacements
- Monoweb structures – PE film thicker and stiffer; can add low sit formula to sealant layer of the film
- Bio based polymers also available

Compostable Options:

- PLA
- Cellophane
- Paper

Thank you!