Innovation & Sustainable growth-Paper & Board

Viviana Sayegh

Technical Director- Latino América

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Agenda

- Trends
- Functional materials
- Bio renewable content
- DFC inks & coatings
- Compostable solutions

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DIC Sun Chemical commitment to Circular Economy

Shifting from Linear Economy…

… To Circular Economy*

*Note: Circular Economy Concept introduced via the Ellen MacArthur Foundation

Circular Economy Key Themes

- ✓ **Reducing Packaging**
- ✓ **Reducing Plastic**

} (e.g., reducing thickness/layers)

- ✓ **Recycling** (mono/compatible materials, repulping)
- ✓ **Post Consumer Recycled** & **bio-renewable** materials
- ✓ **Composting/biodegradation**
- ✓ **Reducing packaging printing waste**
- ✓ **Life cycle Analysis, Carbon footprint**
- ✓ **Packaging costs** considerations
- ✓ **No compromise on Food Safety** nor Food Loss

Regulations:
- EU Green Deal, Single Use Plastic Directive
- French Anti-Waste regulation, Italian Plastic Tax

5R's (Reduce, Reuse, Recycle, Renew, Redesign)

Packaging safety and Sustainability

- ✓Sun Chemical has been offering functional coatings to protect packaging & foods for more than 20 years
  - ✓Protective/barrier, UV, O2, vapor, grease, antifog, primers, cold-seal, heat-seal, …
  - ✓Films, paper/board, bags, pouches, boxes, outdoor handling, …
- ✓In parallel, Sun Chemical has been promoting sustainable solutions
  - ✓Bio-sourced ink & varnishes (BRC)
  - ✓Inks & varnishes made of recycled materials (PCR)
  - ✓Solutions to allow composability
  - ✓Solutions to support repulpability
  - ✓Flexo, gravure, offset, screen, digital, water based, solvent based, paste, UV, EB
- ✓Global color management, anti-counterfeiting, tamper resistance

Packaging Sustainability Trends

Trends

New opportunities for board & paper solution to reduce the plastic waste

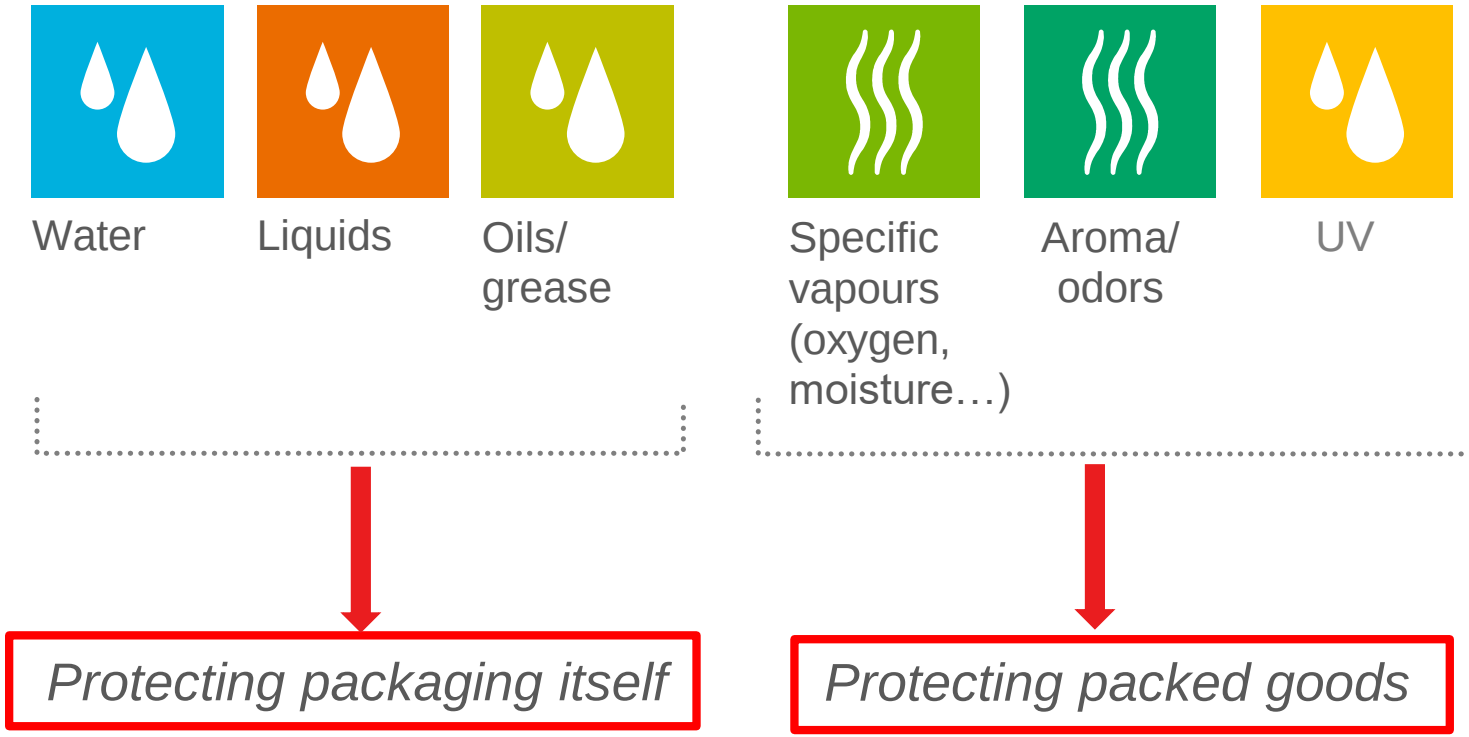
From non-recyclable to recyclable

- Recyclable package
- Goal to reduce plastic waste

Functional Materials

Functional Coatings & Adhesives

Prevent the penetration (or loss) of :



Functional Coatings & Adhesives can Improve Shelf-appeal & Shelf-life while Reducing Film Layers/Weight and Food Waste

Sun Chemical - Functional Coatings & Adhesives Range

Packaging Functional Coatings – Functional Family and Product Ranges

SunSys non – DFC OPV resistance		SunSpec speciality		SunBar barrier		SunFuse adhesion	
Chemical	Vallochem	Grease/Water DFC resistance	SunStar	Oxygen (CO_2, N_2, etc Gas)	Aerobloc	Coldseal	Polarseal
Grease/Oil		Laser	SunLase	UV Light	UVbloc	Heatseal	Thermaseal
Product		Laser	Ablation	Gas Barrier Adhesive	Paslim	Adhesives	SunLam
Friction	Vallolube	Anti-mist	Vistaclear	Moisture	Vaporbloc	Primers	Omniprime
Heat/Cold	Vallotemp					Metallising primers	Metaprime
Water	Vallowet					Extrusion primers	Extruprime
Release	Vallogo						

Protecting inks Protecting Packaging Protecting Packed Goods

Functional Coatings & Adhesives can Improve Shelf-Appeal & Shelf-Life
Reducing Film Layers/Weight & Food Waste
Recycling/Composting features

Paper & Board Packaging

SunStar DFC Water/Grease Barrier Coating

A functional direct food contact water and grease resistant coating to protect paper packaging

- Replacement of plastic coatings/liners which require preliminary separation step for repulping or home composting
  - Coatings made of PE, Waxes, EVA, PLA
  - Laminated Films (eg. PET, PP, PE, PS)
- Replacement of rigid plastic and foamed plastic packaging

- Water-based coating
- Direct food contact (DFC)
- Water, grease & oil resistant
- Ability to heat seal
- Gluable & over printable

Direct Food Contact Barrier Coatings to Water & Grease Retaining Repulpabilty & Composting Properties of Natural Fiber Substrates

Coatings for Recyclable Substrates

Available

Water and Grease Barrier Coatings for Food Carton

- Commercial water-based coatings formulated to provide resistance properties to paper and board substrates, cost-effective, glue-able, heat-sealable and block resistant and repulpable and recyclable, reducing the footprint.
- More sustainable and similar properties option for replacing poly-boards, extruded PE, pre-coated boards, wax and plastic liners.
- Fluorochemical free, do not foam or mist, FDA compliant for direct food contact (21 CFR 176.170 and 176.180)

COBB – Water resistance test
MVTR – Moisture transmission rate
KIT – Grease resistance test
COF – Coefficient of friction

Properties

- Water: COBB, MVRT
- Grease / Oil: KIT Level
- Gloss / Satin / Matte
- Acid / Alkali, Products / Fluids
- Rub / Friction, Abrasion / Scuff
- Release
- Formable
- Freeze-able, ovenable
- Glue-able, Sealable: hot / cold
- Printable, Stamp-able: hot /cold
- High/Low COF, slide angle

Sustainable Paper Packaging Platforms examples

Paper Cup for Drinks, Ice Creams, Foods

Inside printing

- SunStar DFC water/Grease barrier coatings (heat seal version)

Outside printing

- SunStar DFC Water/Grease barrier coatings (heat seal version)
- **Aquagreen** bio-renewable waterbased inks

Micro-Corrugated Boxes

Inside printing

- AquaSafe DFC waterbased inks
- SunStar DFC water/grease barrier coatings
- (or Vaporbloc DFC Moisture barrier coatings)

Outside printing

- AquaGreen bio-renewable waterbased inks
- **OPV or Barrier Coatings**

Carton Board Boxes

Reverse side printing

- SunPak® organic DFC sheetfed inks
- SunSpec SunStar DFC waterbased barrier coatings (heat seal version available)

Front side printing

- SunPak® LMQ Ultra Low Migration SF Inks
- SunPak® FSP Low Migration SF Inks
- SunCoat Waterbased Coatings
- SunInspire Effect Coatings
- SunPak® More than 4 colors / ECG

Paper Bags, Flow-pack, Sticks, Pouches

Outside printing

- **Cold Seal Release Lacquer** or **OPV**
- AquaGreen bio-renewable inks

Options:

- Solimax solvent-based inks
- Aerobloc OTR barrier coatings

Inside printing

- SunStar DFC Water/Grease barrier coatings

or

- **Vaporbloc DFC** Moisture barrier coatings

Options:

- Polarseal coldseals

Direct-Food-Contact inks for Paper and Boards

- SunVisto® AquaSafe – DFC Waterbased inks
- SunPak® Organic – DFC Sheetfed inks

Direct-food-contact technology offers full resistance to specific paper and board requirements

- Enables paper and boards to be printed with DFC inks fully compliant with European regulations
- Suitable for direct food (and skin contact for paper straws)
- Based on a selection of pigments that offers a larger colour gamut than previously available on the market
- Offer high resistance properties

Direct Food Contact inks in combination with DFC barrier coatings
Replacement of plastic laminated films, extrusion and liners

Barrier Coatings & DFC Inks - Paper Platform

Retaining repulpabilty & composting properties of natural fiber substrates

- ✓ **Rigid Packaging (board/carton, corrugated, micro-flutes)**
  - ✓ Frozen, fresh & processed foods boxes
  - ✓ Trays for fruits/vegetables
  - ✓ Dry foods (confectionary, rice, couscous, sugar, etc.)
  - ✓ Take away cold foods (e.g., mix salad ingredients)
  - ✓ Take away hot foods (e.g., burgers, fish & chips, kebabs, …)
- ✓ **Flexible Packaging (paper – flow packs, daypacks, sachets, stick packs)**
  - ✓ Disposable tabletop plates, cups, straws, tablecloths
  - ✓ Dry powder foods (sugar, millers, creamers, tea sachets)
  - ✓ Snacks, chocolate & confectionary (bars, flow packs, pouches)
  - ✓ Frozen foods (bags, sachets)
  - ✓ Dry pet foods (bags, pouches)
  - ✓ Food and flower wrapping

Replacement of Plastic and Paper/Plastic composites Packaging by Paper Solutions for Recycling through Standard Paper Stream

Barrier Coatings & Laminating Adhesives

Film & Paper

SunBar™ Aerobloc Oxygen Barrier Coatings

- ✓ Adds Oxygen Barrier to film, PET, PP, PE, Metalized films, Paper
- ✓ Protects AlOx treated films from stress cracking
- ✓ Allow for mono-material film structures
- ✓ Chlorine free and over-printable with inks

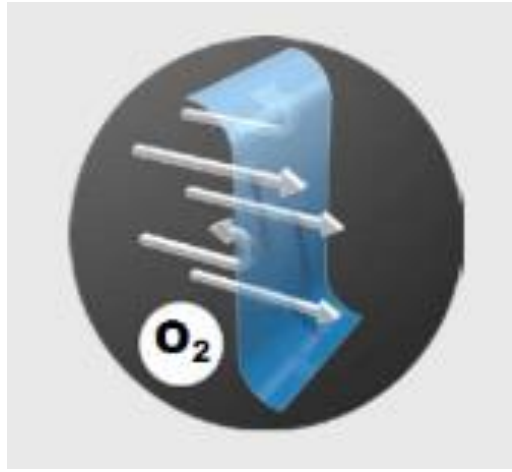
Barrier coatings for enhancing/protecting shelf life
Allowing for reduction of film layers and for mono-material structures

SunBar Aerobloc Oxygen Barrier Coatings - Paper Substrates

OTR Performance in cc/m2-day at 23°C 50%RH

Various Paper quality using Aerobloc barrier coating + Primer + OPV (total coating <3g/m2 dry)

Paper type	Blank	Primer/Aerobloc/OPV
A	140 000	11
B	130 000 - 180 000	1 300
C	65 000 - 160 000	6 500
D	20	2



Oxygen barrier of paper packaging significantly improved
Strongly dependant of substrate quality

Barrier Coatings & Heat Seal Adhesives

Paper

SunSpec™ SunStar Water/Grease Barrier Coatings

- ✓ Water-based coatings barrier to water & grease
- ✓ Suitable for direct food contact (DFC)
- ✓ Heat-sealing version available
- ✓ Retain repulpability and compostability

SunBar™ Vaporbloc Moisture Barrier Coatings

- ✓ Water-based barrier to moisture for paper & boards
- ✓ Suitable for direct food contact (DFC)
- ✓ Heat-sealing version available
- ✓ Retain repulpability and compostability*

**testing WIP but chemistry is compatible*

Replacement of non-repulpable plastic liners/coatings (eg. PE, PET), Waxes and PFAS grease-proofing agents

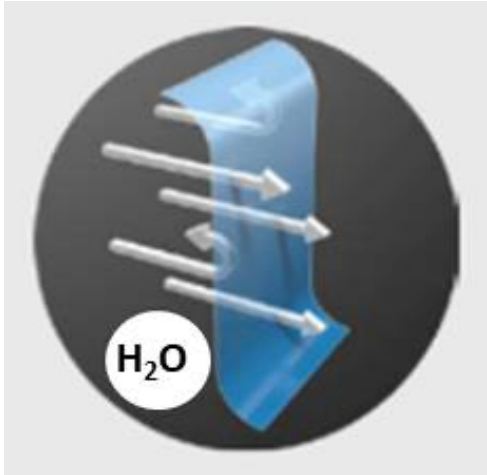
SunBar Vaporbloc Moisture Barrier Coatings - Paper Substrates

MVTR Performance in g/m2/day at 38°C 90%RH

Various Paper quality using Vaporbloc barrier coating (5 to 10 g/m2 dry coating)

Paper type	Blank	Vaporbloc
Kraft A	5 100	90 - 150
Kraft B	5 300	110 - 160
White A		50 - 80
White B		20 - 30*

** (OTR/MVTR dual coating)*



Moisture barrier of paper packaging significantly improved
Strongly dependant of substrate quality, coating process and weight

Bio-sourced content

Bio-derived Content

Sun Chemical uses carbon dating to determine the bio-based content of our products:

- ✓ Increasing **Bio-Renewable Content** (**BRC**) of water-based, solvent-based, or energy curable inks & coatings

BETA
RADIOCARBON DATING
Consistent accuracy
Delivered on time
Beta Analytic

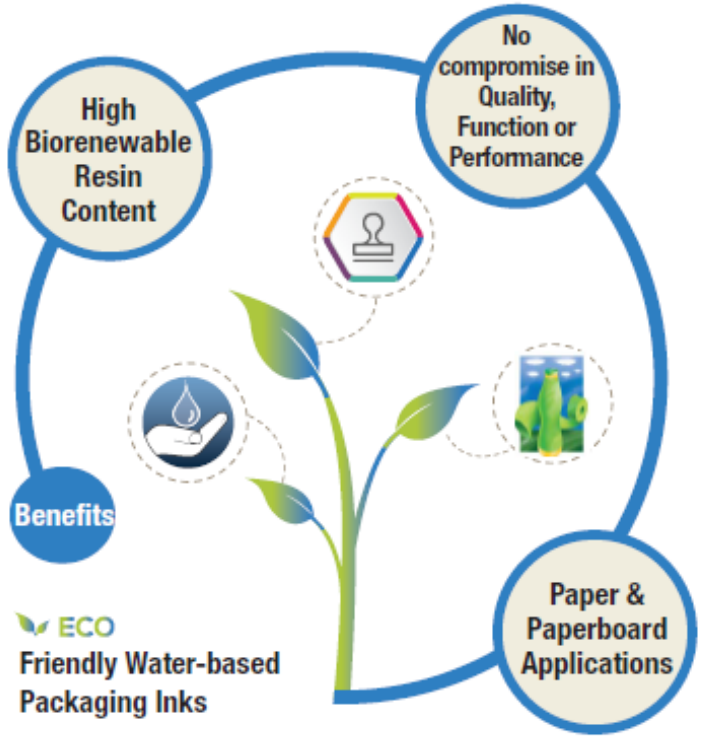
Printed with SunVisto® AquaGreen™ water-based inks

These Initiatives Reduce the Carbon Footprint Associated with Global Warming

Bio-sourced Waterbased inks – SunVisto® AquaGreen™

SunVisto® AquaGreen™ Waterbased liquid ink Technology Varnish

- ✓ Designed for paper, board and PE-coated board applications
- ✓ Leveraging strong and growing patent position
- ✓ Initial introduction in fast food packaging, extended to other segments



Product Features

- ✓ Based on plant-derived resins, starch and other natural RMs
- ✓ 55% BRC in vehicle for paper and board, 56% for film
- ✓ Exceptional resistance properties: rub, abrasion, water, grease…
- ✓ Blendable with standard waterbased pigment dispersions

BETA RADIOCARBON DATING
Consistent accuracy
Delivered on time

OK compost INDUSTRIAL
TÜV AUSTRIA
OK compost INDUSTRIAL
TÜV AUSTRIA

Sun Chemical is Driving the Use of High Bio-Renewable Content Inks and Coatings to Reduce Carbon Footprint

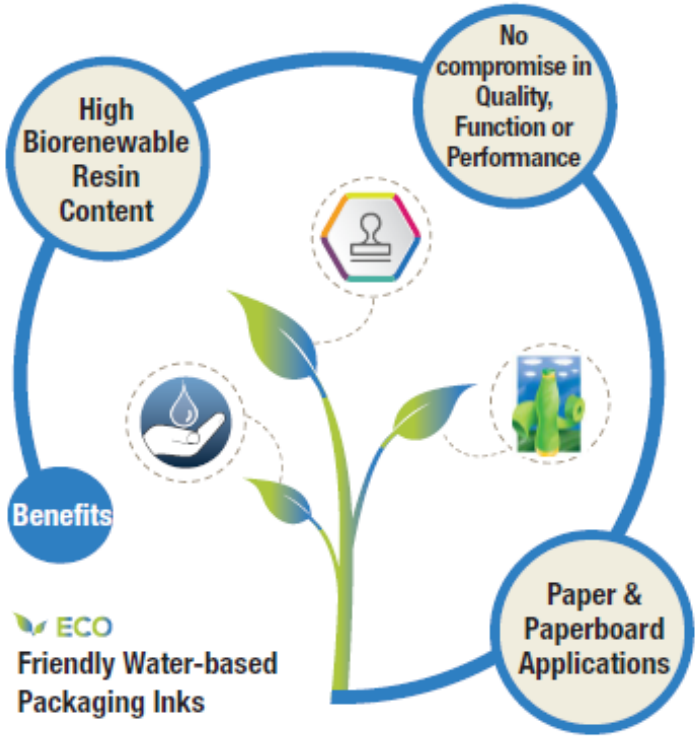
Bio-sourced Waterbased inks – SunVisto® AquaPak™-R

SunVisto® AquaPak™-R Waterbased liquid ink

- ✓ Designed for preprint and postprint corrugated board applications
- ✓ Leveraging strong and growing patent position

Product Features

- ✓ Blendable with standard waterbased pigment dispersions
- ✓ Exceptional printability and ink lay-down
- ✓ Outstanding print fidelity and ink resolubility on press
- ✓ Performance stable and low ink maintenance requirements
- ✓ Quick setting and property development to allow in-line converting



BETA RADIOCARBON DATING
Consistent accuracy Delivered on time
Beta Analytic

AquaPak™-R waterbased inks contain industry-leading levels of bio-sourced raw materials particularly suitable for food packaging. Research on raw materials continues to increase the BRC content

Vegetable-based Offset Inks

SunPak® FSP & SunLit® Diamond – offset inks

- ✓ High performing range of sheetfed offset inks with minimal use of petroleum-based ingredients
- ✓ Excellent lithographic behavior; particularly with inconsistent substrate quality
- ✓ Eco-labeling:
  - ✓ EU Eco-Label based on the EU Commission Decision 2012/481
  - ✓ Converters can acquire "Nordic Swan" bonus when printing mineral-oil free inks
  - ✓ ECMA prescribes the use of mineral oil-free inks to reduce mineral oils in the waste-paper stream
- ✓ **BRC on inks ranging 68-84%** depending on colours

Offset Inks Amongst the highest Amount of Renewable Raw Materials and Provide Excellent Results for Folding Carton Applications

Compostable solutions

Compostability: Why?

- ✓ Established and growing sustainable model: packaging end-of-life integrated into a Circular Model.
- ✓ Simple and practical: easy to manage and implement. Ensures success with limited planning.
- ✓ Alternative to Landfilling (unsustainable) and/or to recycling (not always convenient for the environment & impact-free).

Sustainable attributes of Packaging is now a major focus of brand owners.

O.K. Compost ink lines, adhesives & coatings

SB inks

SOLIMAX
SOLIPROP
SOLVAPLAST
SOLVAPRINT
SOLVAGREEN

Adhesives

SUNLAM SFC-100 + HAC 306
SUNLAM WB Compost A+B

Barrier coatings

SUNSTAR grease barrier
SUNBAR oxygen barrier

WB inks

AQUAPAK OP
AQUAPAK ENV
AQUAPAK GL
AQUAPAK MX
AQUAPAK SP A

AQUAPAK VND
AQUATHENE
AQUATHENE BIO1
AQUAFIBE NK2
AQUAGREEN (renewable)

From a presentation by Franco Maggiori SunChemical UK

A growing portfolio of sustainable options for re-designing packaging

OK Compost Certification – Current Availability by Region

Solvent-based Inks

- ✓ Solimax AP, Solimax P & Soliprop – for film, surface & lamination
- ✓ Solvaplast & Solvaprint – for film & surface
- ✓ North America selection - currently being tested for certification

Water-based Inks

- ✓ AquaPak – for paper & board
- ✓ AquaThene – for polyethylene films
- ✓ AquaThene Bio – for bio-based flms
- ✓ AquaFibe NK2 – for napkins & tissue
- ✓ AquaGreen – for paper, board & PE-coated board
- ✓ North American portfolio being evaluated for certification

Comprehensive Range of Solvent & Water-based inks for Compostable / Biodegradable Packaging

Summary

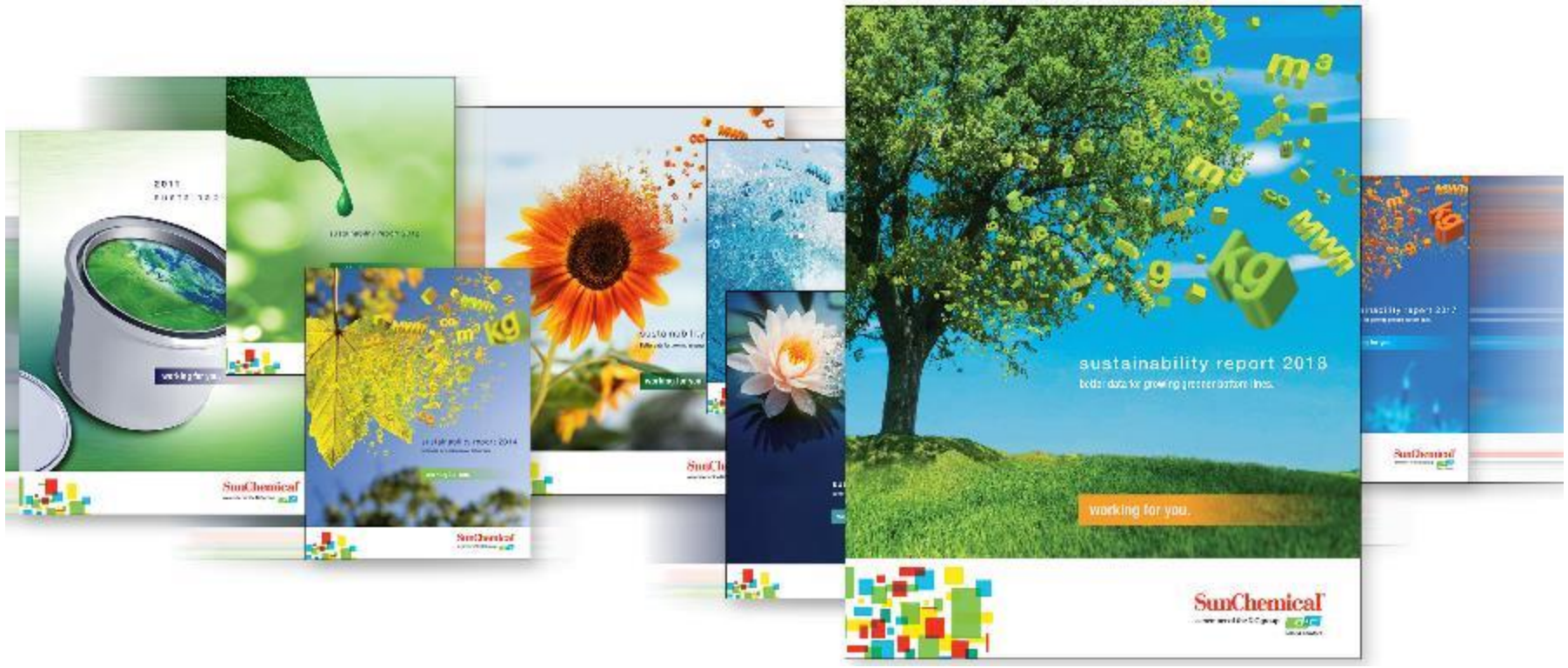
There are many ways to embrace sustainable solutions for the Packaging

As we reviewed here, we can focus them with different perspectives as:

- ✓ Reduce the amount of waste
- ✓ Improve the Packaging bio transformation
- ✓ Improving recyclability
- ✓ Using bio renewable sourced raw materials
- ✓ Redesigned packaging in a more sustainable way

All the options are useful to reduce our impact on the environment

Questions?



Sustainability Efforts

Thank You

Reuse

Reduce

Renew

Recycle

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working for you.

Closing ideas

- ✓ Small changes are better than staying quiet, even is these changes are not perfect but going in the right direction
- ✓ Think cyclically and nor linearly
- ✓ Develop & innovate responsibly
- ✓ Convenience and sustainability are not opposite ideas
- ✓ Observe the challenges from different points of view
- ✓ We do not need one hero doing all the changes, we need everyone of you to do small changes in the right sense
- ✓ Together, we can change the world!

Thanks!