



# Circular Economy at BASF

March 29<sup>th</sup> 2016

 **BASF**  
We create chemistry

- The concept of Circular Economy
- BASF's understanding of Circular Economy
- Examples of BASF product portfolio contributing to Circular Economy
- Conclusion

# Circular Economy gains in importance

- Since 2010, the Ellen MacArthur Foundation has given greater exposure and momentum to the concept
- European Commission has adopted the new Circular Economy Package on December 2nd 2015, entailing a general action plan as well as a legislative proposal concerning the revision of waste reduction targets

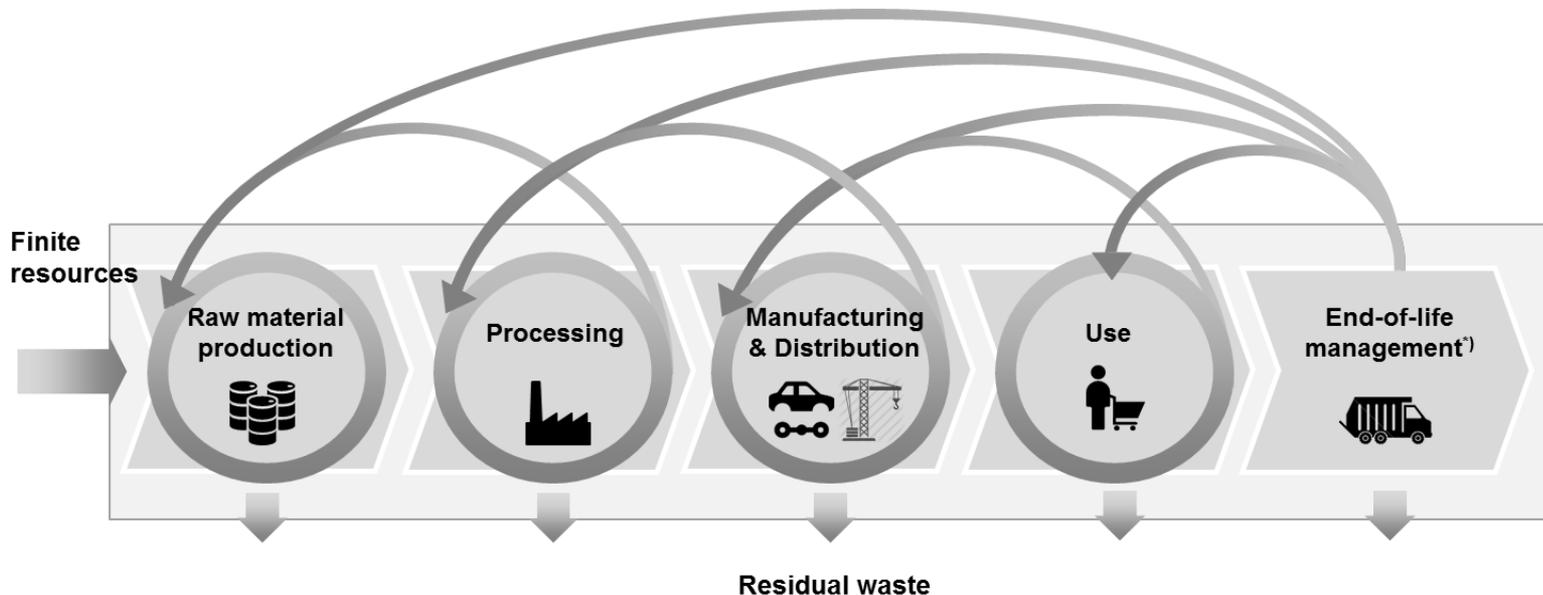
“A circular economy is a global economic model that decouples economic growth and development from the consumption of finite resources.

It is restorative by design, and aims to keep products, components and materials at their highest utility and value, at all times”.



# Elements of the Circular Economy Concept

- Keep resources in use for as long as possible
- Minimize disposed residual waste
- Extract the maximum value from products
- Recover and regenerate products and materials at the end of service life



<sup>1)</sup> including collection

# Circular Economy

## Current trends in key sectors

### Transportation



- Car-sharing
- E-hailing and Mobility Apps
- Autonomous driving

### Agriculture



- Precision farming
- Digital supply chains and solutions for reducing consumer food waste
- Closed loops of nutrients

### Construction



- Shared residential and office space
- Industrial production and 3D printing
- Tracking of materials

# Circular Economy Levers

## REGENERATE

- Renewable energy and materials
- Protect health of ecosystems

## SHARE

- Share and reuse
- Prolong life for multiple use

## OPTIMISE

- Increase performance/ efficiency
- Remove waste in production

## LOOP

- Recycle and remanufacture
- Extract biochemicals from organic waste

## VIRTUALISE

- Virtual meetings
- E-books, music

## EXCHANGE

- Advanced non-renewable materials
- New technologies (e.g. 3D printing)

Circular Economy comprises transformative business model changes beyond waste management.

# Our Contribution to Circular Economy

OPTIMISE



REGENERATE



EXCHANGE



SHARE



VIRTUALISE



LOOP



## KEEP IT SMART



Increase efficiency of processes and enhance effectiveness of products and solutions

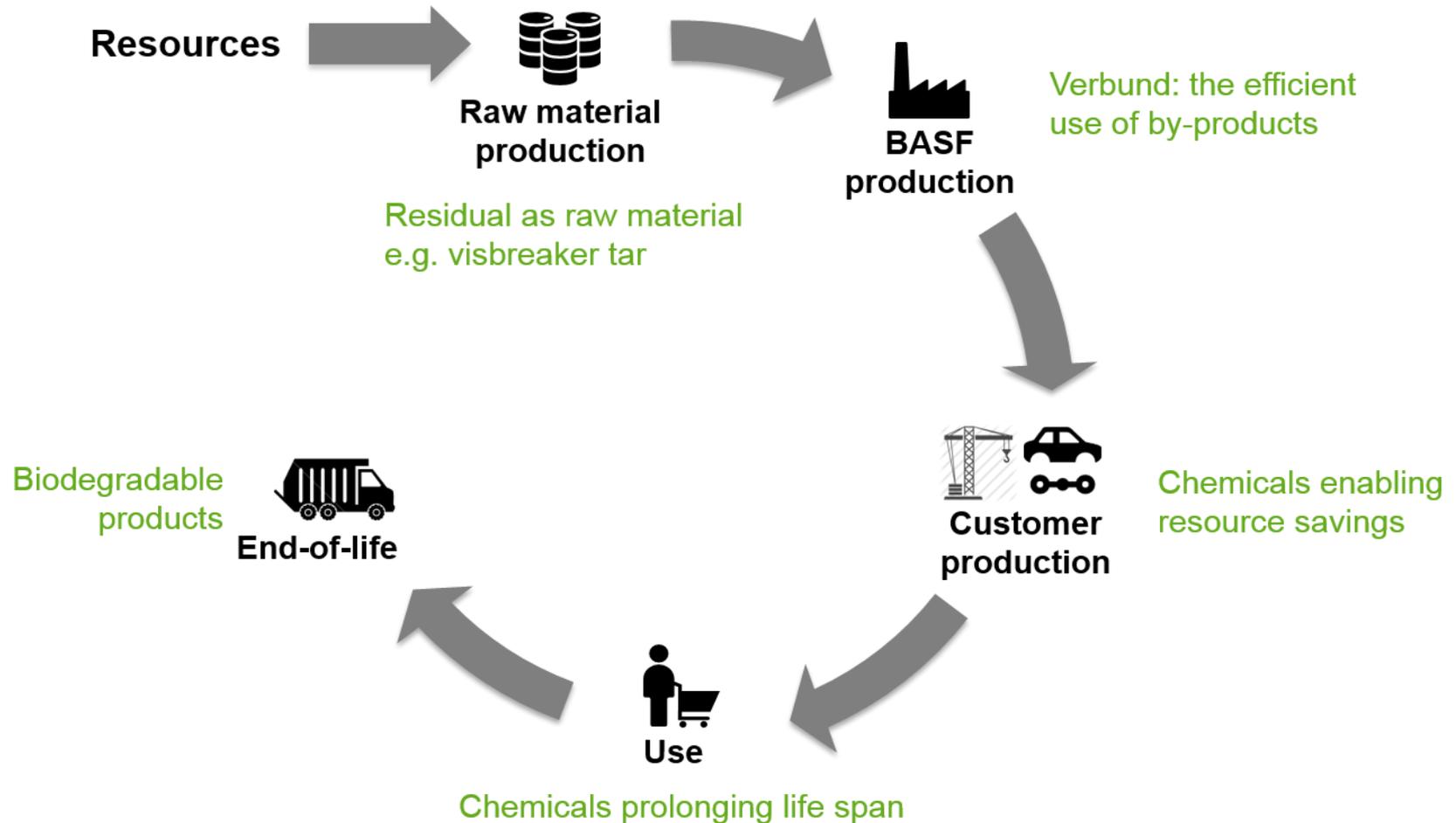
## CLOSE THE LOOPS



Turn waste into resources, use natural loops

Our contribution combines the idea of smart business models with circular resource use.

# KEEP IT SMART



# KEEP IT SMART

## Examples

### Chemical solutions

### BASF examples

#### OPTIMISE

- Products enabling resource efficient production along the value chain

- Verbund concept
- Sokalan<sup>®</sup> RO
- HySorb<sup>®</sup> permeable products
- SAVIVA<sup>™</sup>
- Trilon<sup>®</sup> M types

#### REGENERATE

- Biobased/ recycled products;
- Energy- or GHG-saving products
- Products with less environmental impact

- ecovio<sup>®</sup> M2351 (mulch film)
- Acronal<sup>®</sup> MB 6492

#### EXCHANGE

- Products for health and safety
- Innovation for new technologies (e.g. 3D printing)

- Epotal<sup>®</sup> SP-101D



# CLOSE THE LOOPS

## Examples

### Chemical solutions

### BASF examples

#### SHARE

- Raising the longevity/durability of products

- CathoGuard® 800

#### VIRTUALISE

- Industry 4.0

- The Materials Marketplace project

#### LOOP

- Enabling recycling
- Chemical leasing

- Green Sense® Concrete Technology
- Potassium Methylate
- Lutropur® MSA
- ecovio® FT2341 (fruit & vegetable bags)

# Conclusion

- Circular Economy is much more than waste management
- Several of our implemented solutions already address the Circular Economy model
- Circular Economy brings opportunities for new business models, new solutions and, consequently, new customers
- A pre-condition is a deep understanding of the value chain and customers' needs
- Circular Economy supports value generation of high performance products
- Holistic evaluation of the sustainability of each CE business model is necessary

Combining innovation with our already established business models will generate new values.



We create chemistry

# Sokalan® RO

## Example for Optimise

### Application

Additives for membrane process  
Antiscalant for reverse osmosis membranes

### CE Contribution

- Eco-friendly: no or low eutrophication in water bodies
- Resource efficiency: no usage or decreased usage of cleaning materials
- Reduced cleaning cycles lead to longer operation and increased output

Eco-friendly antiscalant for resource efficient reverse osmosis desalination.

# HySorb® permeable products

## Example for Optimise

### Application

Superabsorbent polymers for baby diapers, incontinence and feminine hygiene products

### CE Contribution

- Highly effective for liquid distribution and absorption
- Replaces bulkier traditional materials such as fluff pulp in diapers
- Thinner diapers save energy and resources, and reduce the volume of waste heading to landfills or incinerators

High performance superabsorbent which replaces fluff pulp in diapers.

# SAVIVA™

## Example for Optimise

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### Application

A new generation superabsorbent based on a breakthrough droplet polymerization technology with unique properties for absorbing hygiene products

### CE Contribution

- Thinner diapers and improved haptic with increased comfort for end user
- Significant raw material savings (SAP and Fluff reduction) through high capacity and efficiency
- Increased dosing accuracy for waste reduction

New generation of high efficient superabsorbent polymers.

# Trilon® M types

## Example for Optimise

### Application

Home Care and I&I, Focus Dishwashing

### CE Contribution

- High performance as strong chelating agent
- Readily biodegradable
- Meets eco-label requirements
- Good eco-tox profile compared to other strong chelating agents
- Phosphate alternative in automatic dish wash (ADW)

The strong alternative to phosphates in modern dish wash formulations.

# ecovio<sup>®</sup> M2351 (mulch film)

## Example for Regenerate



### Application

Mulch film, certified biodegradable in soil

### CE Contribution

- Waste avoidance
- Avoiding white pollution
- Avoiding soil displacement
- Resource efficiency and water savings over time

Over time, ecovio<sup>®</sup> helps to avoid adverse consequences of the white pollution in agriculture.

# Acronal® MB 6492

## Example for Regenerate

### Application

First BASF binder for interior paints based on the biomass balance approach

### CE Contribution

- Replacing fossil raw materials with renewable feedstock at the beginning of production process
- Less greenhouse gas emissions
- Enabling interior paints that combine environmental responsibility with uncompromising premium quality

# Epotal® SP-101D

## Example for Exchange

### Application

Dispersion coating and printing on recycled fibers

### CE Contribution

- Ensures food safe packaging
- Excellent migration barrier
- Alternative to the use of fluoro organic chemicals, PE extrusion coating and wax impregnation for oil and grease resistance
- Easily recycled

# CathoGuard® 800

## Example for Share

### Application

Cathodic electrocoats for corrosion protection

### CE Contribution

- New CathoGuard® e-coats are optimally suited for integrated coating processes that dispense with application of the primer coat
- They contribute to the durability of millions of cars, while offering an alternative to tin-containing formulations

An innovative solution for the highest eco-efficiency.

# Materials Marketplace project

## Example for Virtualise

### Application

Cross-industry collaboration's platform for efficient use of resources

### CE Contribution

- Reduction of energy consumption and GHG emissions
- Reduction of the necessity for raw materials
- Create new jobs and business opportunities

The Material Marketplace allows to transform waste in by-product.

# Green Sense® Concrete Technology

## Example for Loop



### Application

Performance package for more economical and environmental friendly concrete

### CE Contribution

- Formulations of concrete mixtures that contain a high proportion of recycled materials
- Extended lifecycles of buildings

Unique performance package that optimizes concrete mixtures.

# Potassium Methylate

## Example for Loop

Application

Biodiesel

CE Contribution

- K-Methylate enables the production of biodiesel from waste materials such as used cooking oil or animal fat
- Biodiesel of such origins substitutes and saves up to 85% of GHG emissions compared to conventional Diesel

Potassium Methylate enables Biodiesel from waste materials.

# Lutropur<sup>®</sup> MSA

## Example for Loop



### Application

Various, e.g. Metal Surface Treatment, Cleaning, Chemical Processing, Biofuels, Mining, Drilling

### CE Contribution

- Strong and odorless organic acid with superior efficiency
- Part of the natural sulfur cycle, readily biodegradable
- Highly efficient catalyst with low side product formation
- Enabler for second generation biofuel technologies (biofuel from waste streams)

Strong organic acid with high efficiency and low environmental impact.

# ecovio® FT2341 (fruit & vegetable bags)

## Example for Loop

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### Application

Certified homecompostable fruit & vegetable bags

### CE Contribution

- Dual use: fruit & vegetable bag and organic waste bag
- Higher organic waste diversion from landfill
- More biogas potential for biogas plants
- More compost

ecovio® fruit & vegetable bags help close the loop of the food value chain.

# German Sustainability Award for Resource Efficiency

- BASF was presented with the Special Award “Resource Efficiency” at the ceremony for the German Sustainability Award 2015
- The jury recognized BASF’s
  - Verbund concept that has set the benchmark in the chemical industry for resource and energy efficiency for decades
  - Innovative business models for sustainability, for example, the “mass balance” method

