

**From pellet to final part:**  
The use of masterbatches in your production  
process

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# Agenda

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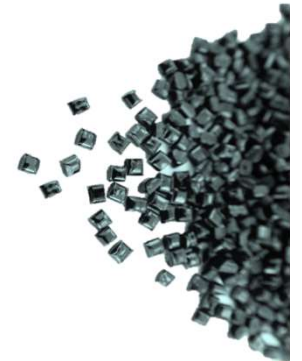
- **Some facts about APS Masterbatch Europe**
- **Markets**
- **Benefits of using masterbatches**
- **Automotive related applications**

## Some facts about APS Masterbatch Europe

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### A. Schulman

- **Custom Concentrates & Services:** Color & additives masterbatches, specialty powders
- **Performance Materials:** Thermoplastic compounds, distribution
- **Engineered Composites:** Highly filled thermoset compounds



### Acquired by LyondellBasell

- Finalized on August 21, 2018

### Integrated in APS, a LyondellBasell segment

- Polypropylene Compounds
- *Catalloy*
- *Polybutene-1*
- A. Schulman assets

## Some facts about APS Masterbatch Europe

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**1200 polymers**  
**1300 pigments**

**1600**  
**ADDITIVES**

**12000**  
**FORMULATIONS**

**in 42000**  
**end-products**

**55%**  
**customer specific**

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# Markets: Packaging

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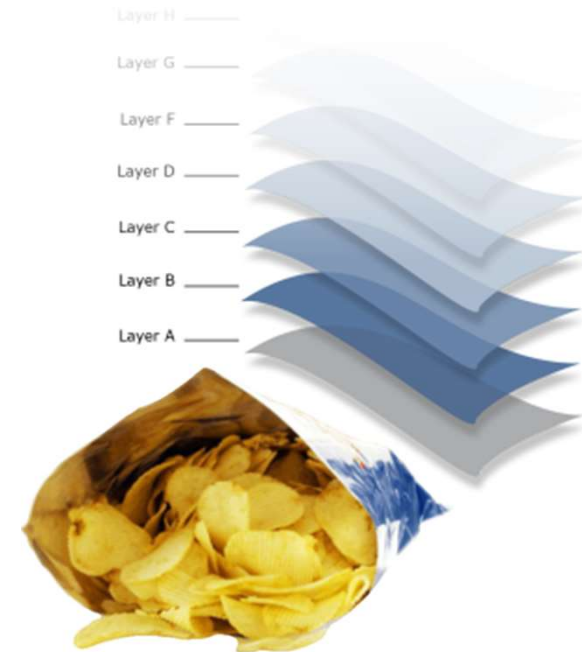
## Additives for functionality and convenience

Slip, anti-block, anti-static, anti-fog, anti-oxidants, UV-block, processing aid, easy peel, soft touch, easy tear, ...

## Pigments and fillers for esthetics and low cost

White, colors, special effects, cost reduction

**End applications** are snack food, frozen food, dairy products, dried condiments, barrier packaging, lidstock, pet food, liquid packaging.



Source: LyondellBasell

## Markets: Agriculture

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**Additives** for specific **functionality in films and textiles**: Anti-fog, anti-block, anti-dust, thermic agents, pigments, light diffusers, ...

**Additives for protection**: UV-stabilization, UV-absorbers, anti-oxidants, ...

... and tailor-made combinations

**End applications** are greenhouses, silage, mulch, ...



Source: LyondellBasell

# Markets: Medical & Hygiene

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**Fillers** in Masterbatches & compounds for breathable films

**End applications** are diaper backsheets, garments, fem-care, ...

**Colors, fillers & functional additives** for cosmetic tubings and blisters



Source: LyondellBasell



## Markets: Industrial applications

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**Additives for various functionalities** in a wide range of industrial applications: slip-agents, anti-blocking, carbon black, conductive black, flame retardants, blowing agents, laser marking, ...

**End applications** are stretch & shrink hoods, tapes & yarns, roofing membranes, foam (PE, PP, XPS, EPS), protective films, ...



Source: LyondellBasell

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- Some facts about APS Masterbatch Europe
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- **Benefits of using masterbatches**
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# Benefits of using masterbatches

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## Compound

**Modified polymer, includes all components, added functionalities that determine the processing and final properties**

- Ready for processing

## Masterbatch

**Product containing high concentration of pigments or additives developed to deliver functionality after dilution**

- Final properties / functionality depend on dosing level
- Form: pellets, powder, microgranules, liquid
- Carrier: standard or functional
- Combi-batches possible



Source: LyondellBasell

## Benefits of using masterbatches

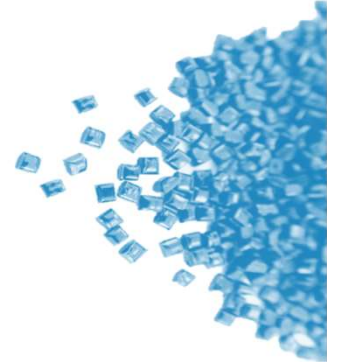
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### Why can a masterbatch be preferential vs. compound:

- More **flexible**: frequent change in formulation, color
- No extra **thermal step**: thermal degradation can influence odor, VOC, ...
- **Fine-tuning** during production:
  - Controlling foam stability
  - FR addition depending on thickness
  - Opacity vs. thickness

### Choice may be determined by:

- **Certification**: pressure pipes (PE 100) – burning norms (UL 94)
- **Mixing capacity** extruder: Extrusion, IM, rotational molding
- **Number of feeders** (masterbatch – combibatch – compound)
- **Costs**: compounding costs / stock control
- **QC** capabilities
- **Industry habits**: mb standard used in packaging, less used in automotive



Source: LyondellBasell

# Agenda

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- Some facts about APS Masterbatch Europe
- Markets
- Benefits of using masterbatches
- Automotive related applications
  - Processing
  - Functionality
  - Esthetics
  - Protective

# Processing

## Polymer Processing Additives:

- **Fluoropolymer-based masterbatches** for film, sheet extrusion, blow molding, Pipe extrusion,...
- **Duraflow** processing improver for injection molding

## Mechanism

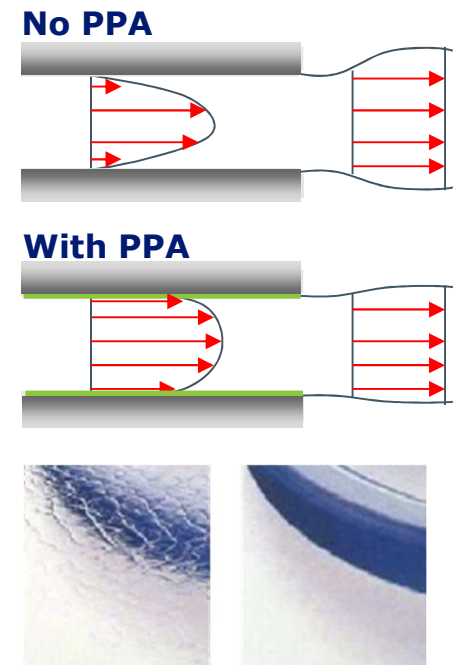
- Formation of a **fluoropolymer coating** on the die-wall
- Reduced friction between molten plastic & metal

⇒ **Pressure reduction**

## Rheology

- Apparent **viscosity reduces**
- **Critical shear stress** ( $\approx$  head pressure) reached at **higher shear rates** ( $\approx$  output)

⇒ **Higher output (improved productivity)**



Source: LyondellBasell

# Processing

## Polymer Processing Additives:

### How can PPA help to save costs?



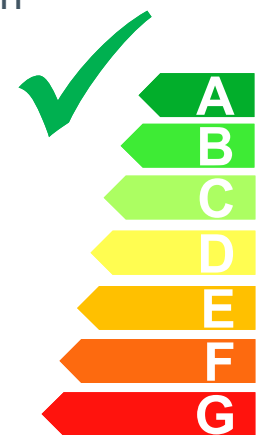
Source: LyondellBasell

- **Enlarge the process window:**  
Pressure reduction – output reduction – temperature reduction
- **Reduction of die build-up:**  
Less down time for die cleaning, less waste
- **Energy consumption:** Energy study: 5 -10% reduction in Energy consumption by motor power measurement

[measured during internal tests on Blown film extrusion, C4-LLDPE - 0.7 mfi [190°C/2.16kg]) and HDE pipe extrusion ]

Temperature reduction of the extrusion process (e.g. LLDPE film, HDPE pipes, ...) would allow a further reduction Energy consumption, estimated to 10%

***Effect strongly depending on mfi & process conditions***



# Functionality

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## Low VOC

- Targets/norms are implemented by automotive producers on maximum values for VOC:
- Choice of carrier resin and additives are important

## UV-protection

- Protection interior / exterior parts against degradation / discoloration
- HALS light stabilizers / Carbon black

## Weight reduction

- Hollow glass spheres
- Blowing agents

## Sound dampening

- Propagation of the sound in the pipe material is depending on its density. Materials with high densities tend to minimize vibration.
- Increasing density of material has a positive effect especially on the low frequencies of the noise

## Examples

- ePP Foam used in dashboards, interior panels
- PE, PP Interior & exterior parts, PP fibers in carpets
- Carpet backings



# Functionality

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## Odor absorption

- Masterbatches with molecular sieves, designed for specific absorption by pore size

## Thermal insulation

- Carbon black added to foam
- Specific grades: graphite, active coal, petcoke,...

## Flame retardants

- Fire test norms in place on burning behavior & smoke formation
- Brominated FR additives very performant
- Trend to halogen-free FR additives

## Thermostability

- Preserving mechanical and optical properties against long term thermal exposure

## Examples

- Foam used in dashboards, interior panels
- Under-the hood
- Foam
- Under-the-hood parts

# Esthetics

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## Indoor panels

- Effects by using Alu-flakes, mica, wood/plastic combinations

## Soft touch

- Multilayer skin on dashboard panels by using combinations of polymers & fillers

## Anti-scratch

- Mineral fillers prevent scratch formation

## Anti-statics

- Avoids dust pick-up
- Migrating additives create a polar surface: AS effect
- Permanent AS: non-migrating polar polymers on the top layer

## Examples

- Indoor panels
- Dashboard skin layers
- Indoor panels, dashboard skin layers
- Interior, instrumental panel, ash-trays

# Esthetics

## Color match requests for automotive:

- **Trends to more colors and smaller volumes** by direct coloration via MB: Personalize interior / exterior
- **Investments in place to serve automotive markets:**
  - Lab in Plock (PI) equipped to produce molded plaques with specified grain & gloss: inserts molds for IM with 2 structures (in cooperation with various automotive producers)
  - Measurement equipment: Spectrophotometer (geometry 45°/0°; geometry d/8°); gloss meter



Source: LyondellBasell

# Protection

## Protection new cars - inside & outside

### Technologies used:

- Two step process:  
cast or blown film, adhesives coating
- Single step process:  
cast film of LDPE + EVA, SEBS, ...



### Requirements films

- Good mechanical properties
- Optical appearance
- High clarity & transparency
- No discoloration of the substrate
- Total absence of gels, agglomerates, die lines
- Easy removal – good adhesion on the edges
- No residues on substrate after removal



Source: LyondellBasell

## Protection: APS Masterbatch Europe offering

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- PPA**
  - Reduces gel formation during extrusion
  - Reduces die-build up : longer run times, no die lines
  - No surface defects
- Anti-block** - Various types anti-block: particle size, shape
- White**
  - High dispersion, low gel
  - High gloss grades available
- Black**
  - High dispersion, low gel
  - Low Sulphur content: no interaction with adhesives, no odor formation
- UV-stabilizer** - Protection film against degradation by UV light
- UV-Barrier** - Protection of the substrate or glue from degrading by UV light
- Colors** - Opaque or transparent, high dispersion grades

## Conclusion

A wide range of functional additives and colors available via masterbatches

With APS Masterbatch Europe, LyondellBasell offers the full range of ingredients next to polymers & compounds

Full range of standard masterbatch products are available

Customized masterbatches & combi-batches possible



Source: LyondellBasell

**BTC: Lab for masterbatch well equipped for customer projects & developments**

**Thank you**