

Insights on SMC / BMC / DMC Start-ups

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SMC, BMC, DMC...

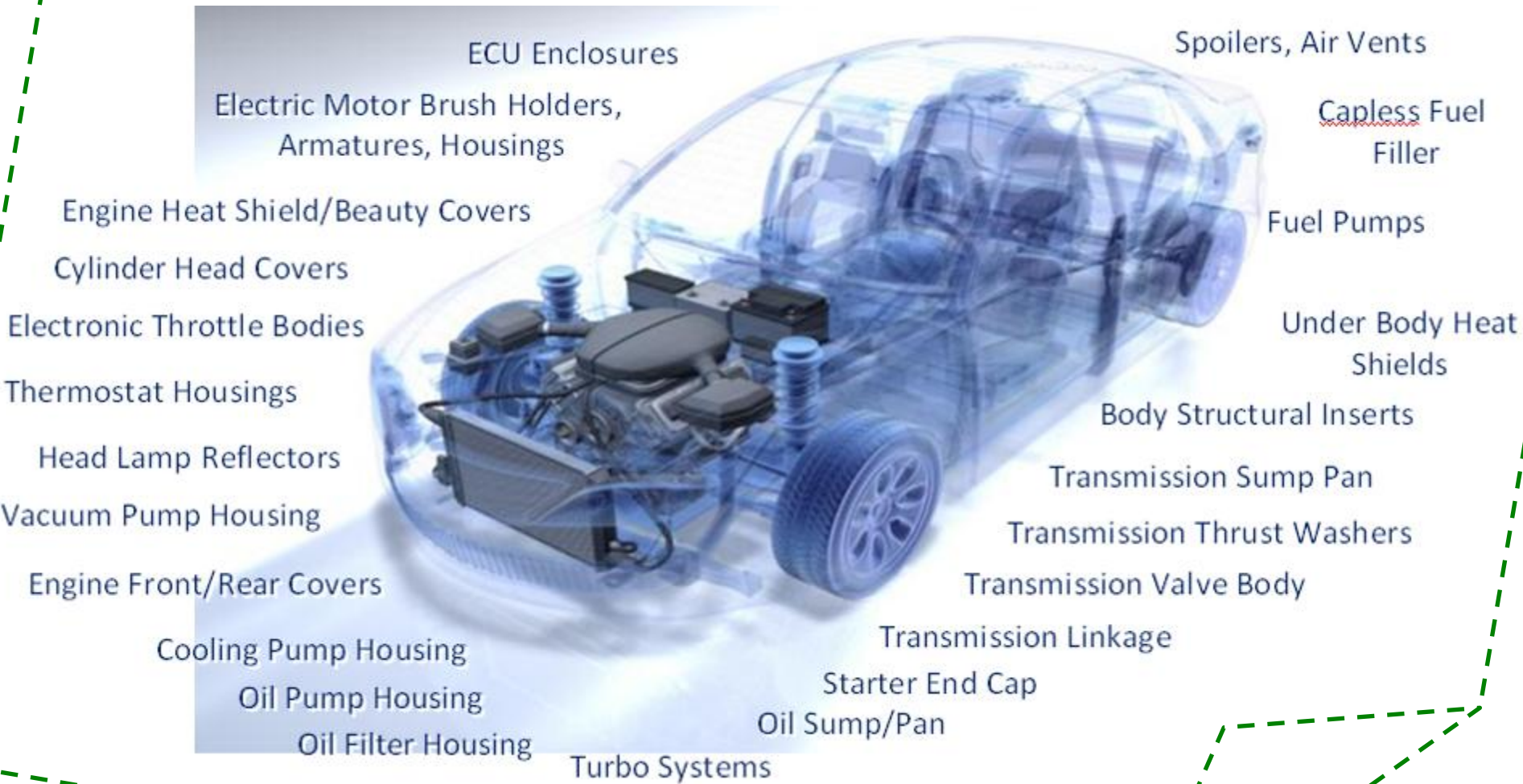


What are the names indicate

- SMC: Sheet moulding compound
- BMC : Bulk moulding compound
- DMC: Dough moulding compound



What can be produced?



For Trucks...Trunk Lid, Hood, Fenders, Noise shield, Technical Frontend, Filter Housing, Oil Sump

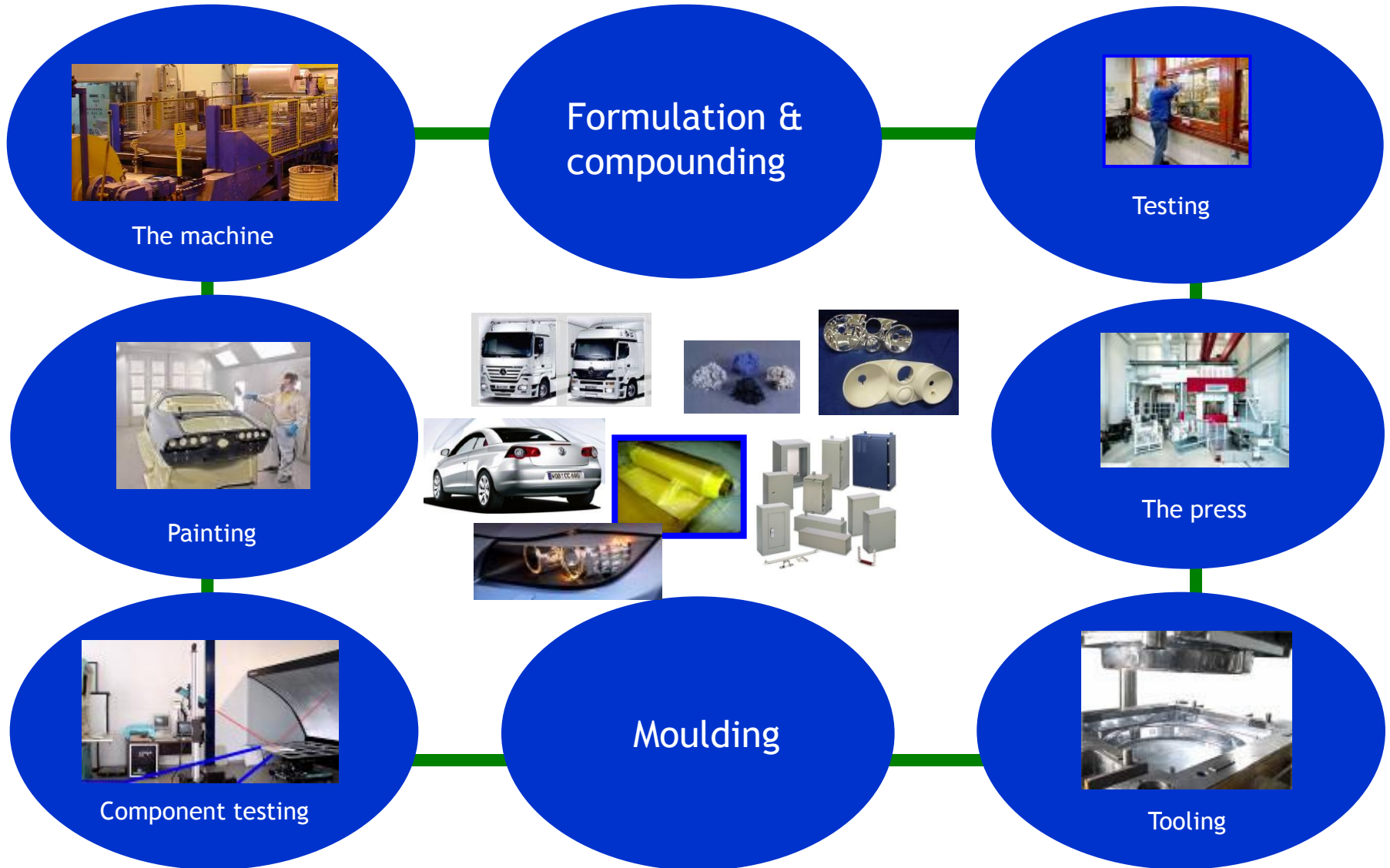
What can be produced?



SMC/ BMC Technology - design for success

- A fiber-reinforced composite material consisting of a **thermosetting resin, glass fibre reinforcement and filler.**
- Additional ingredients such as **low-profile/ low-shrink additives, cure initiators (peroxides), thickening additives, process additions mold release agents** are used.

The complete Value chain



The Machine

- **SMC/ BMC**

(What we need to look....)

- **Primary**

- Glass content %
- Filler loading
- Sheet weight (gsm)
- Production speed
- CTQs of the compound (requirements)
- Industry you like to cater
- Future needs
- Quality control

- **Secondary**

- SMC cutting & slitting system
- Dosage, mixing & pumping units
- Measurements & control system
- Raw material storage

- **Capital Investment**
- **Cost varies with need**
- **Project viability**

Formulation & Compounding

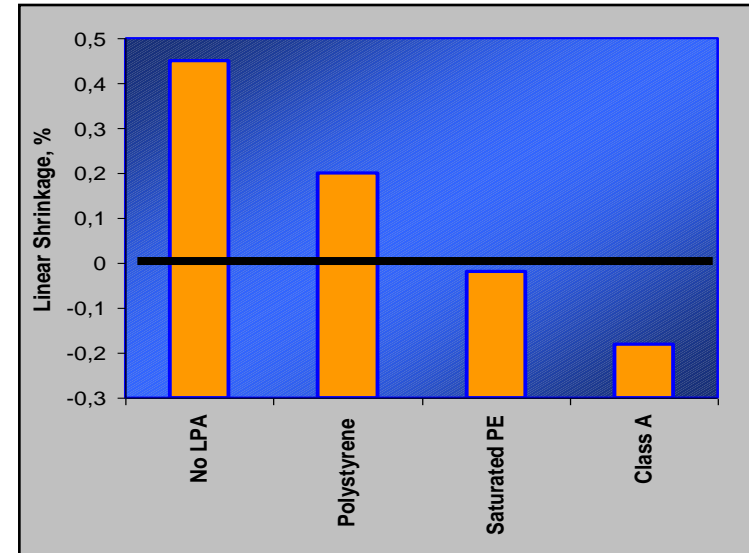
- **The Raw materials**

- Resin
- Low shrink/ low profile additive
- Glass fiber
- Fillers
 - Calcium carbonate, ATH, Talc, Barium Sulfate, Glass Hollow Spheres
- Additives
 - Wetting & dispersing
 - Processing
 - Anti-separation, Anti-settling
 - Air release
 - Release agents

Shrinkage

Shrinkage:

- Polyester Resins have a certain shrinkage during and after the polymerization
 - Influence on linear shrinkage on final molded parts.
- Thermoplastic solutions and Saturated Polyester are added to SMC/BMC formulations to compensate the shrinkage.
- With LS- and LP-Additives it is possible to adjust the desired shrinkage. Expansion is also possible.



Examples for Linear Shrinkage

- Standard SMC ~ 0,5%
- (LS) Low Shrink SMC 0.05 - 0.25%
- (LP) Low Profile SMC 0 or Expansion
- Class-A SMC Expansion ~ 0.1%

Types of LS - and LP - Additive

- Low Profile - Additive
 - Polyvinylacetate (PVAc)
 - Polymethylmetacrylate (PMMA)
 - Saturated Polyester (PEs)

- Low Shrink - Additive
 - Polystyrene

Low profile : Impact on the product

SMC / with out LPA



SMC / with LPA



Types of additives

**Wetting
and
dispersing**

Release agent

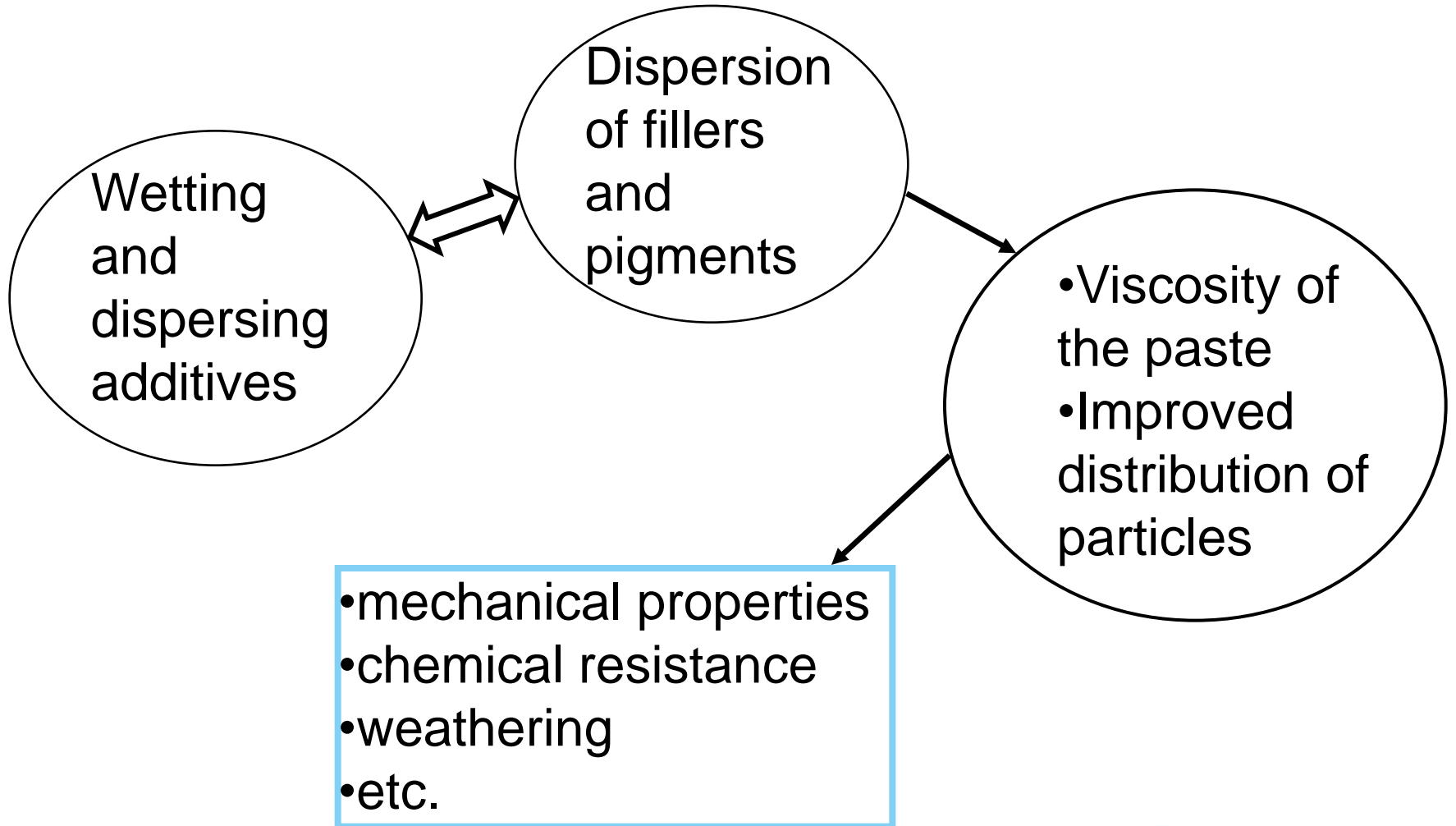
Processing

Anti-separation

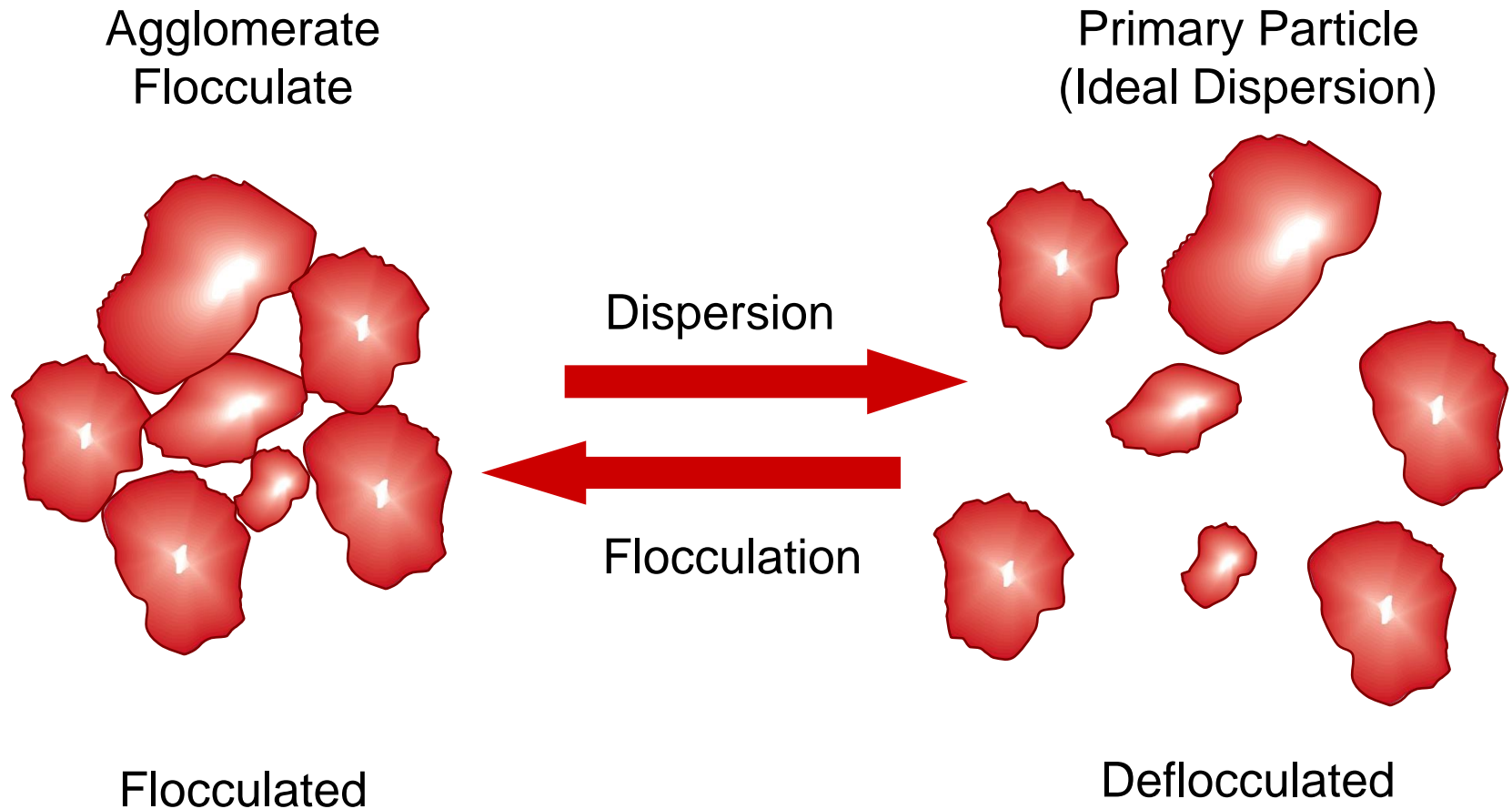
Anti-settling

Air release

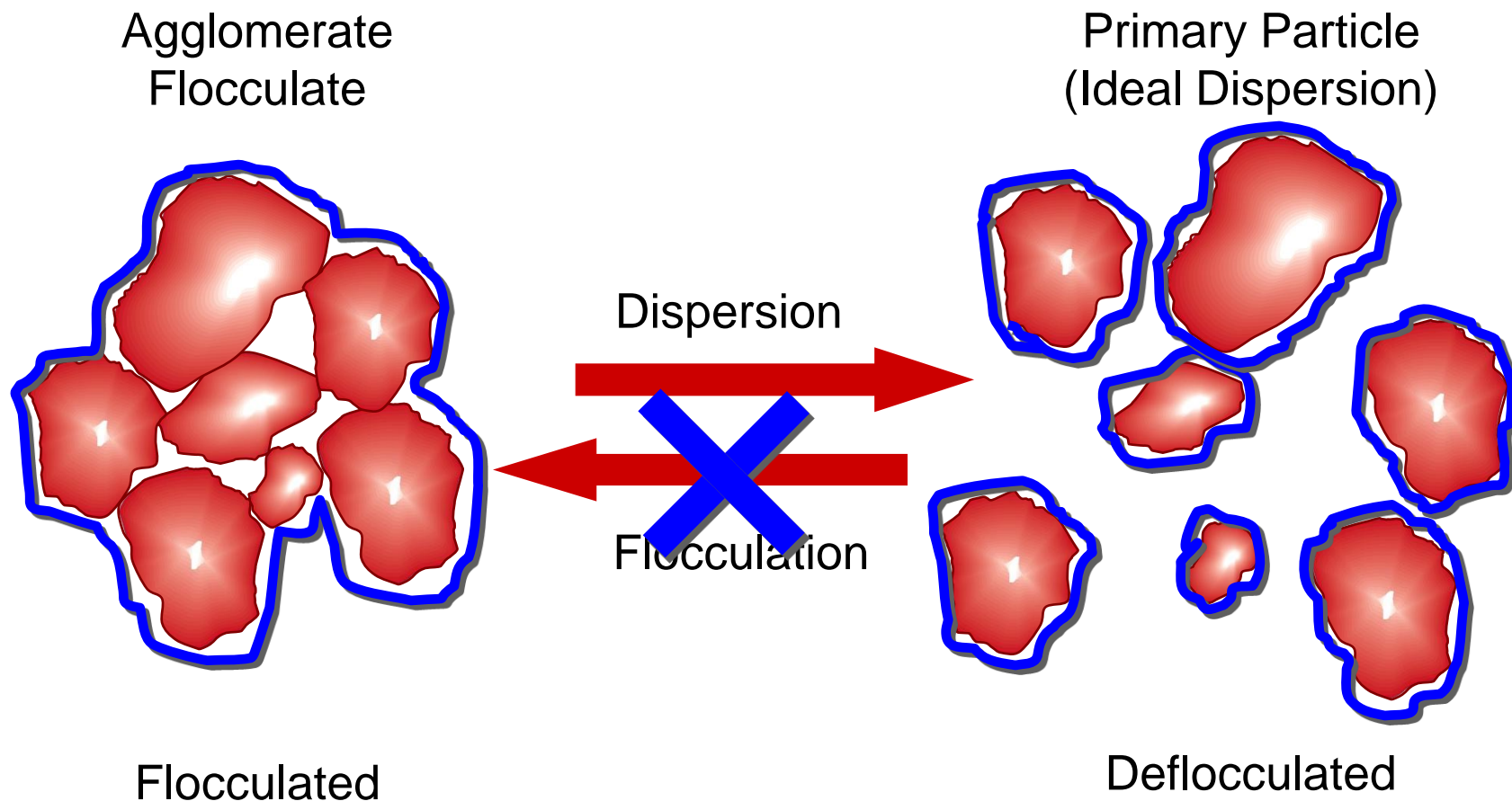
Wetting and dispersing



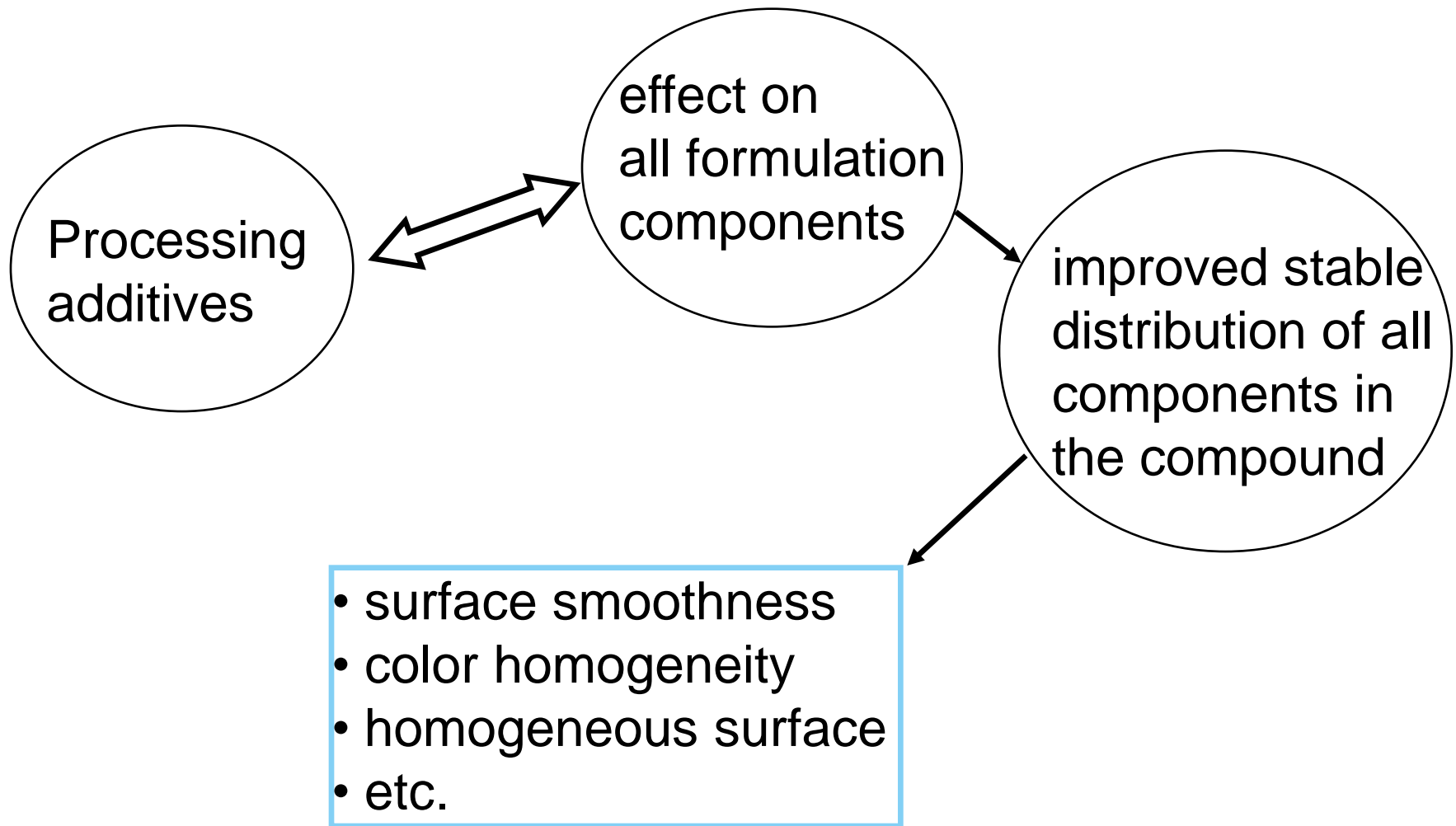
Filler Dispersion - Stabilisation



Filler Dispersion - Stabilisation



Processing additives



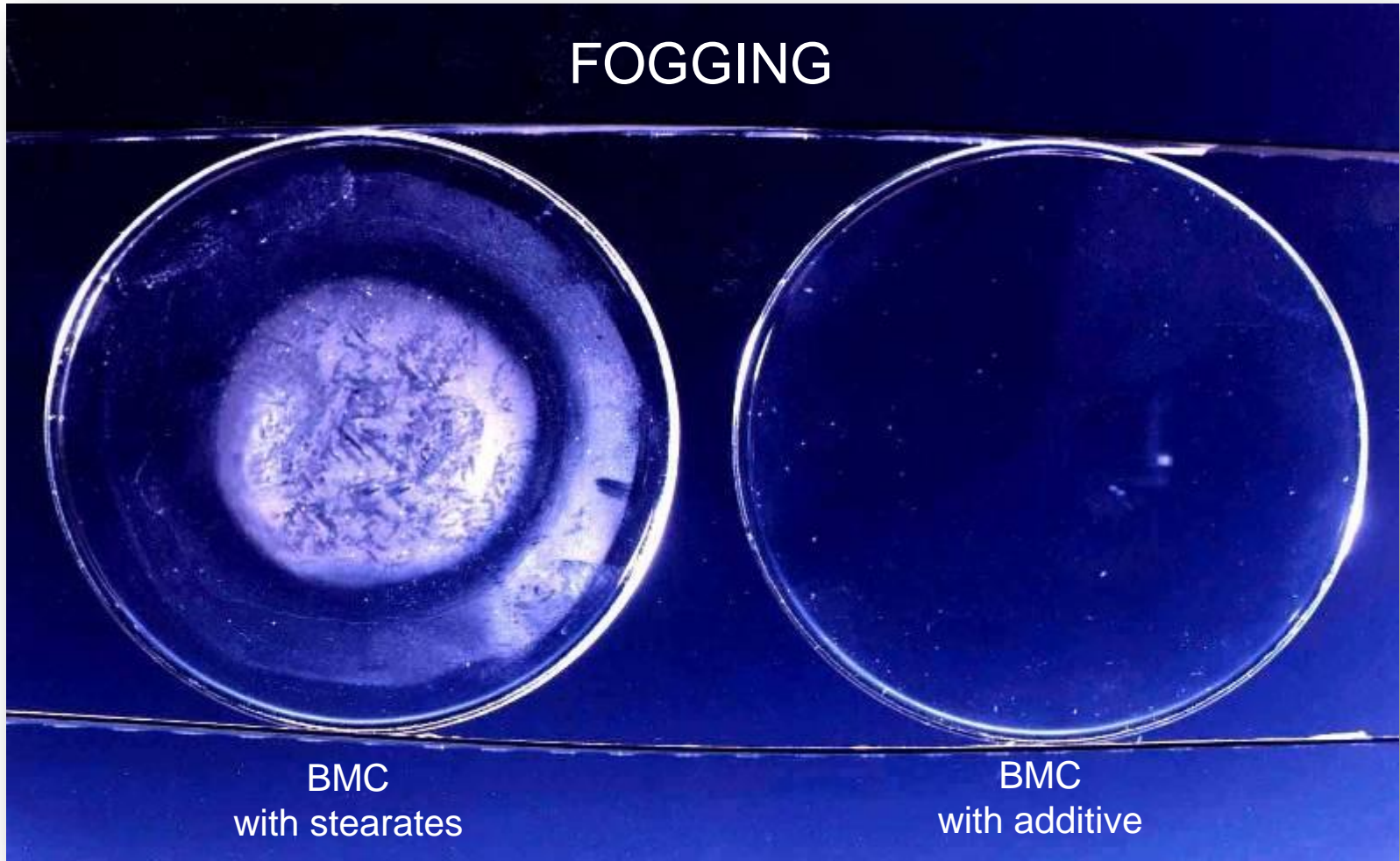
Processing additives for headlamps

The usage of materials at high temperature cause migration of some of the components..... even after metalization and coating.

This becomes visible as a haze on the cold part (polycarbonate pane) inside a headlamp.

Called: F O G G I N G

Processing additives for headlamps



Processing additives

With Additive – anti-separation effect



Control



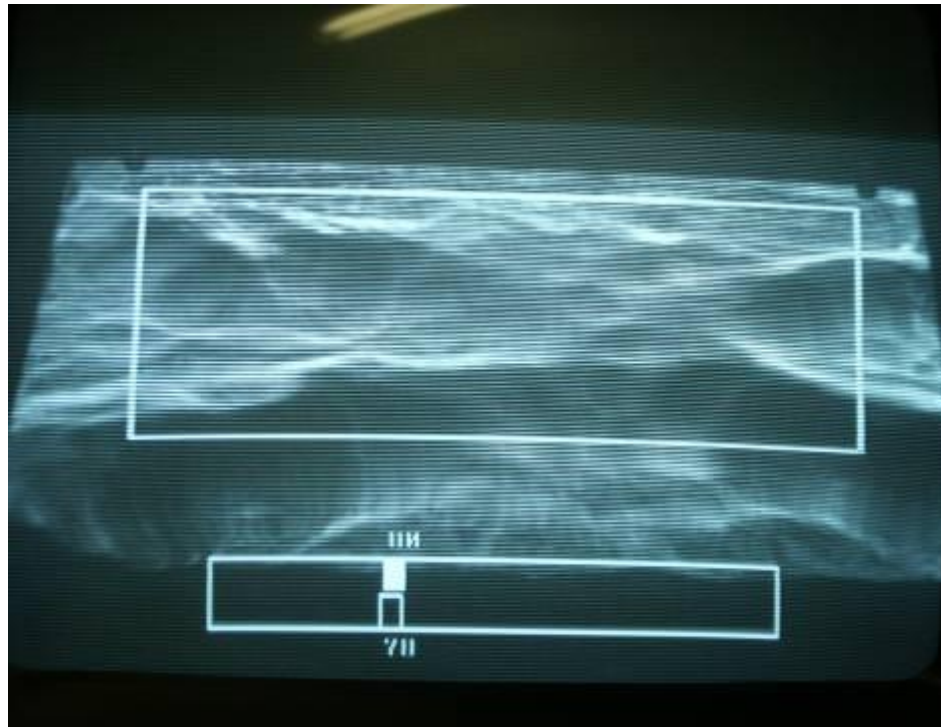
1 phr additive



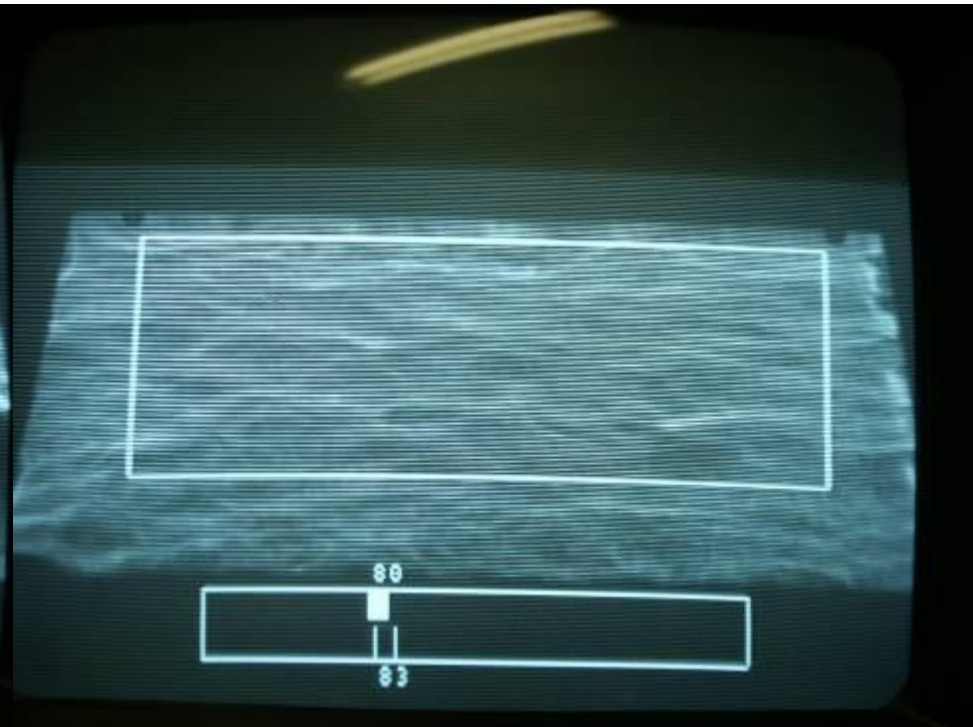
2 phr additive

Processing additives

Impact on surface



Control formulation
40% mold coverage



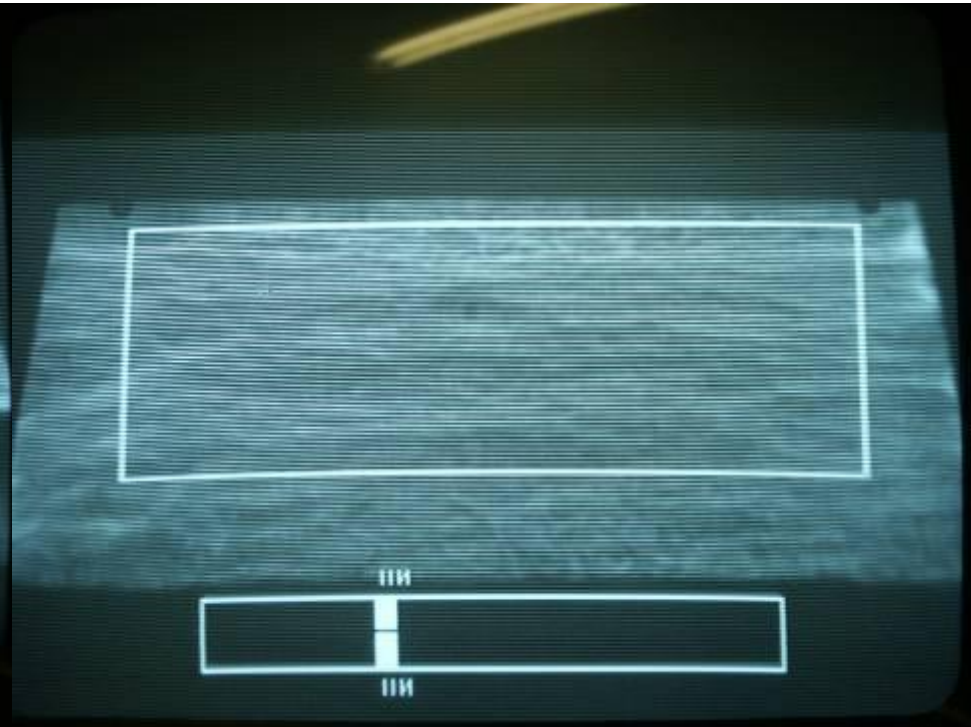
With additive formulation
40% mold coverage

Processing additives

Impact on surface



Control formulation
80% mold coverage



With additive formulation
80% mold coverage

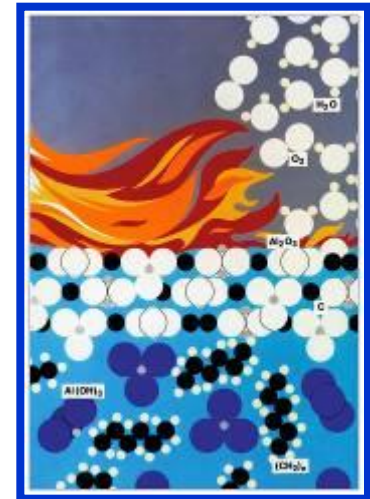
Processing additives

- Many types of processing problems and/or difficulties can be solved through the use of processing additives.
- Changing the processing characteristics can open-up windows of opportunity in many applications.
- Improved processing always leads to cost reduction.

Filler for SMC/BMC

- CaCO_3
 - Mining product
 - Density 2.70 g/cm^3

- ATH
 - The flame retardant effect
 - Density 2.40 g/cm^3



Filler for SMC/BMC

- Barium sulphate BaSO_4
 - Filler for heavy weight applications / noise reduction
 - Density 4.50 g/cm^3
- Glass hollow spheres
 - Filler for light weight applications
 - Density 0.37 g/cm^3



Equipment and Manufacturing

Resin and Color paste



**Resin and Color paste
+ Filler**

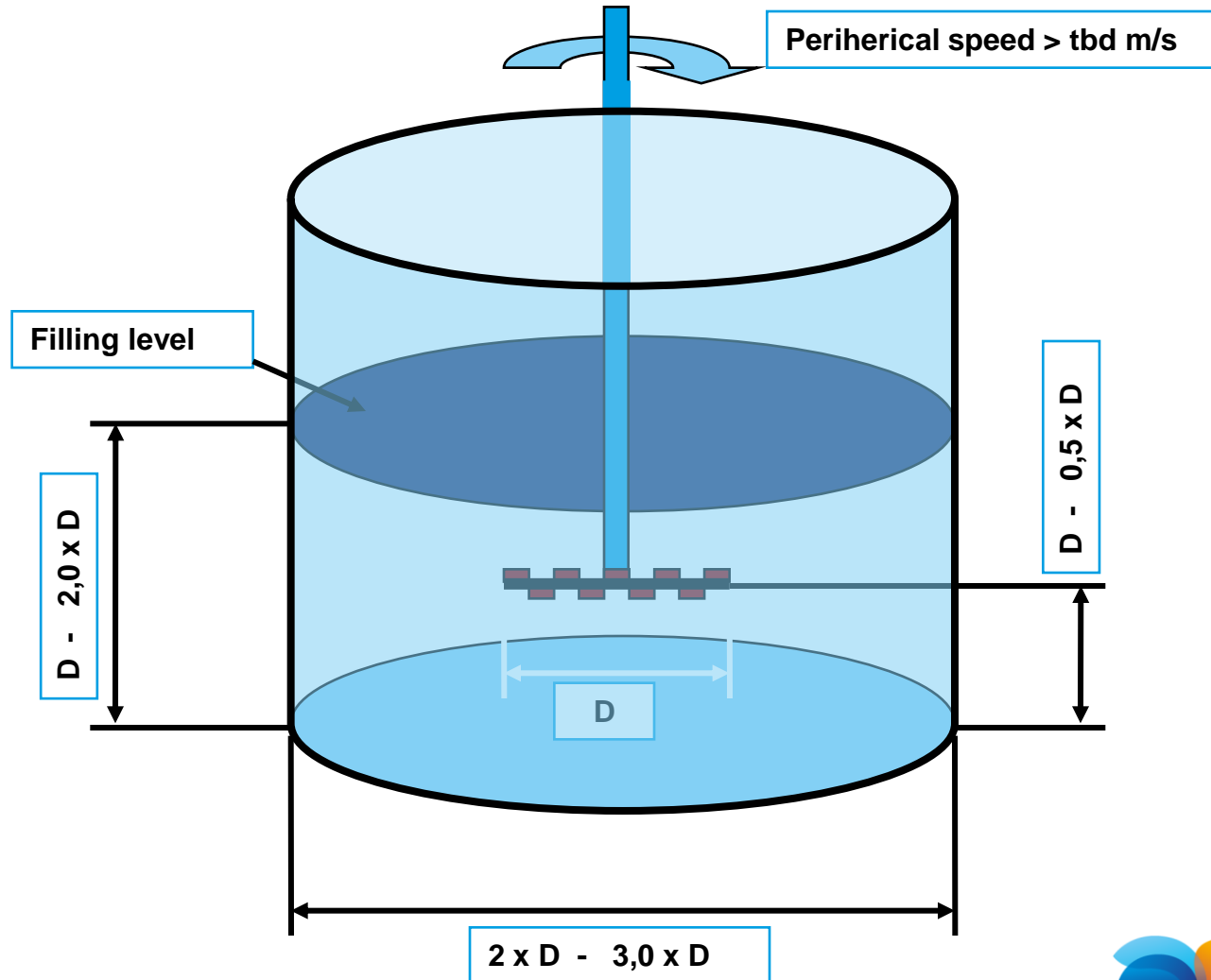


Final Mixture



The mixer....

Dimensions:



Storing, dosing, mixing: attention needed...

Raw materials storage:

- Temperature, moisture, age

Dosing the paste:

- Constant quantity of Filler, MgO, Peroxide, Additives

Mixing the components:

- Constant parameters (Homogeneity, temperature)

Equipment and Manufacturing

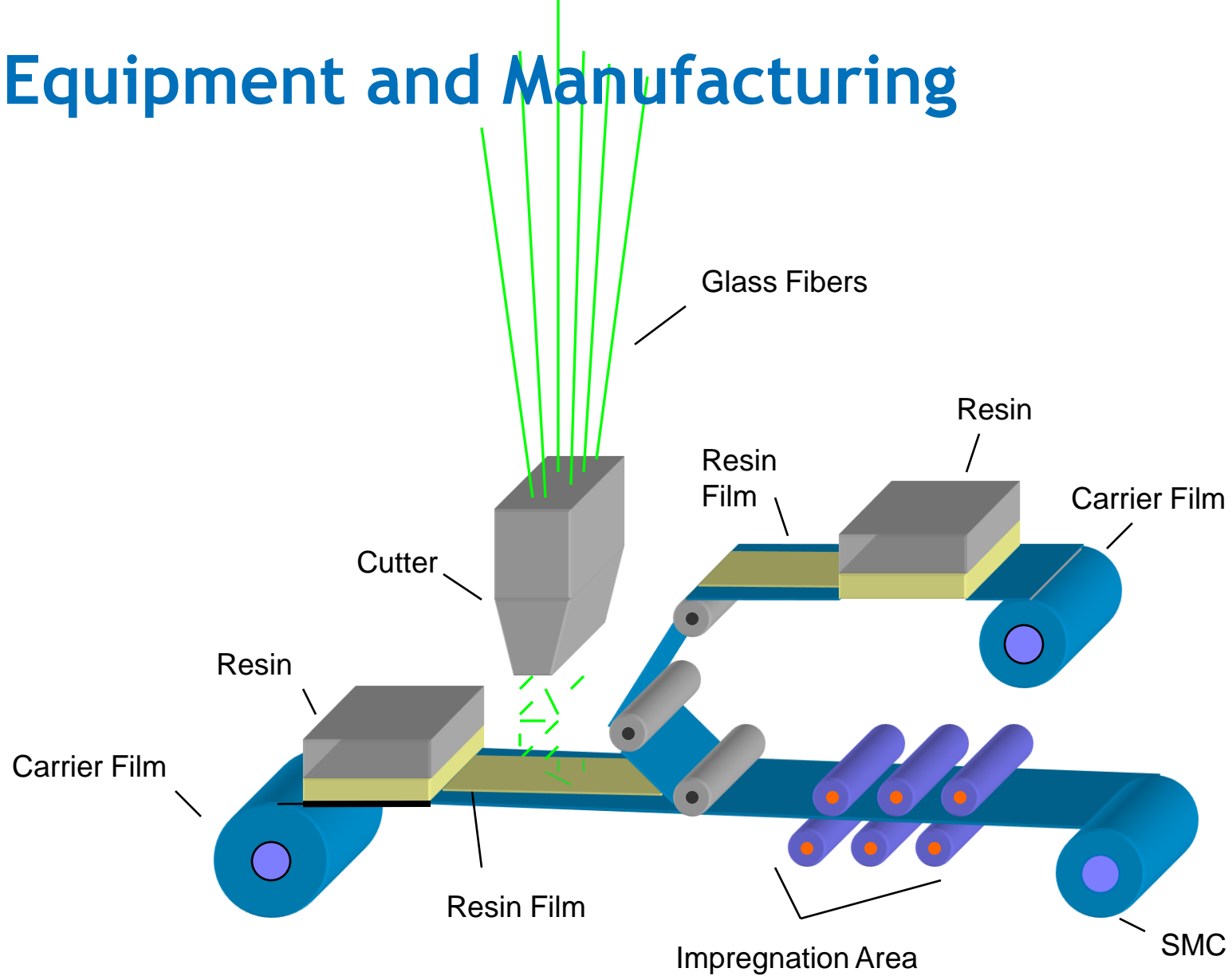
Thickening is essential for entire SMC process !

Thickening can influence:

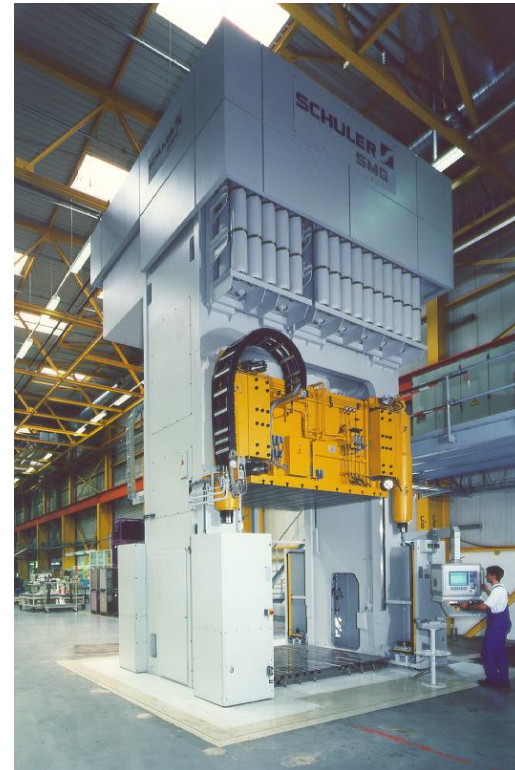
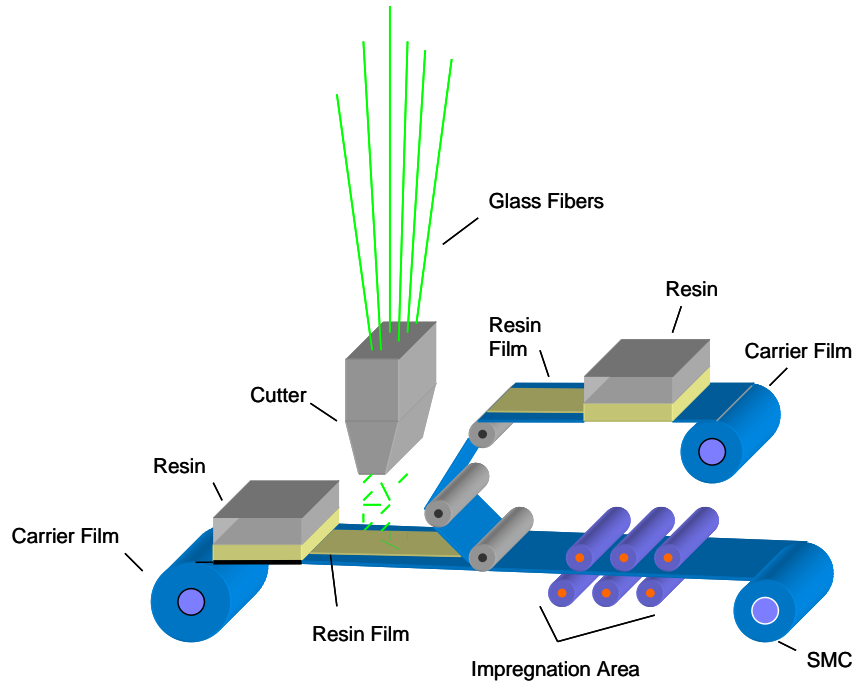
- Impregnation of glass
- Separation of components (e.g. resin / LP-Additive)
- Flow in the mould / transport of fibers
- Handling of SMC (e.g. cutting, sticking)

Thickening of the SMC will be influenced by:
Resin / Additive, Acid number, MgO concentration (type, quantity),
Temperature / storage / time, Moisture content in the paste / filler

Equipment and Manufacturing



Manufacturing and Molding



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Thank you for your attention...