KraussMaffei

HP-RTM Production Line
Completely automated production line
Challenge: Surface Quality of Composite Material

- Sink marks due to different shrinkage of reinforcement and matrix
- In general direct conventional spray-coating is not possible
- Sink marks and other surface defects can be covered by In-Mold Coating with ColorForm technology
- Post shrinkage must be controlled
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- Surface state of art – SkinForm/ColorForm
- Current technologies for Composite Parts
- New approaches for Composite Parts
A look and feel like leather – with SkinForm®
BMW 5er Gran Turismo = SkinForm aliphatic system
**Reference: Bright Prospects ... with ColorForm®**

**SURFACES**

**Application:**
- 3-Component high value give-away
- Base carrier ABS, soft component TPU + Polyurea lacquer surface
- 60s cycle time (approx. 300,000 parts/year)

**Innovation:**
- ColorForm - high gloss surface out of the mold
- Self releasing polyurea-system and assembly integrated in parts removal

**Benefit:**
- Economical production of high value parts, approx 30% less piece costs
- First class surface appearance
- Complete one-stop shopping
Painting process in one-step injection integrated
ColorForm – Process principle and key benefits

With ColorForm – processing (lacquer injection) a painting or coloring step will be done in a closed mold with 1C or 2C Painting systems ((In Mold Coating).

The part which will be colored can be on:
- thermoplastic or
- thermoset base.

After the curing or reaction time the ready colored part can be demolded out of the tool.

The integration of reaction process know-how into the injection molding process will be developed with KraussMaffei own engineering resources.
Less is more
SkinForm/ColorForm® vs. plastics painting

Plastics painting
IMM - Process
Material \(\rightarrow\) Q-Check \(\rightarrow\) Injection Molding \(\rightarrow\) Q-Check \(\rightarrow\) Transport

Coating - Process
Substrate-cleaning \(\rightarrow\) Primer application \(\rightarrow\) Primer drying \(\rightarrow\) Lacquer application \(\rightarrow\) Lacquer venting \(\rightarrow\) Lacquer drying \(\rightarrow\) Q-Check

Assembly
Transport \(\rightarrow\) Q-Check \(\rightarrow\) Assembly

SkinForm/ColorForm:
Material \(\rightarrow\) SkinForm \(\rightarrow\) Q-Check \(\rightarrow\) Assembly
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External and internal coverings for ambulances –
Customer Ruberti for Aricar
Application example of LFI:
• Front Grill
• PU GF25 frame with plastic film,

Innovation:
• Perfect wetting and distribution of the glass fibres
• Fibre length and volume locally adjusted, no fibre orientation
• Suitable for large body panels

Benefit:
• High dimensional stability structure and accurate fit
• Direct foil lamination in a single working process
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Application:  
- Interior  
- Carbon flooded with CCM

Innovation:  
- KraussMaffei’s CCM Technology  
- Latest mixing head technology  
- Systems Engineering and Mould expertise

Benefits:  
- Short cycle time with CCM technology  
- System is emission-free  
- Less junk parts
Application:
- Roof module
- Epoxy with carbon fiber mat

Innovation:
- Visible carbon fiber matrix
- Mixing head with internal release agent system
- Pressure controlled inject - no fiber disorientation

Value:
- Very high mechanical impact strength
- Low weight
- Production system, many possibilities - development of faster systems
RTM - Wet Molding process
Combination with Polyurethane top coatings

Used for thin components with high fiber volume content and good surface quality
New possibilities
ColorForm covers your surface defects like welding lines/streaks
Surface Quality Improvement Trials – with CCM System
Even self healing surfaces are possible

Image source: Rühl
Technology

Combination of
- Injection Molding
- Thermoforming
- In-mold coating

Excellent surface quality
- Glossy
- Scratch resistant
- Transparent, black, white, each color
The public funded project „InFo“ focuses on the **symbiotic integration of thermoplastic films** in the process chain of fiber reinforced body panels.
In a first step, **hybrid sheets** are made from films and dry fibers. These sheets are then handled with **suction cups, formed and injected**. The remaining **thermoplastic film** on the outer side of the panel **mainly defines the surface** and thereby reduces finishing costs.
automotive body panels for high volume production

characteristics:
no release agent
fully automatable production chain
fiber draping + film forming + resin
injection = single production step
designed for index including:

lightweight potential * parts/day

costs
Our answers to megatrends
We develop solutions for the future

- Energy saving, Isolation
- Lamination, Double-band systems
- White goods, Rigid polyurethane foam
- Excellent surfaces
- ColorForm
- CoverForm
- Lightweight construction
- Long glass fibers/organic sheets
- RTM
- Renewable raw materials
- IMC compounders
- Processing of biopolymers
- Function integration
- C.A.S.E.
- SpinForm (swivel plate)
Our Technology – Your Advantage

Thank you for listening