OVERSPRAY-FREE APPLICATION WITH MONOCOAT MATERIAL

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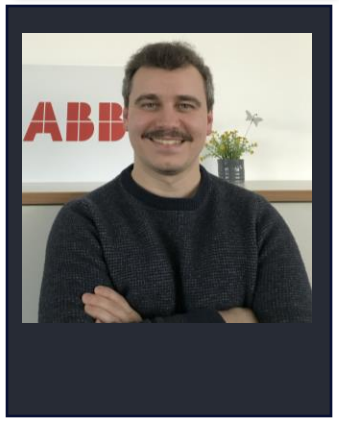
Pierre SARRAZIN — R&D Technical Director

PRESENTERS

Roberta PECORARO

Stellantis Group

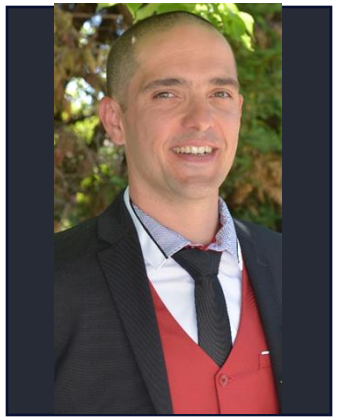
Paint Process Industrialization EE



Viktor RIEDER

ABB

Senior Project Manager PPA



Pierre SARRAZIN

NPAC

R&D Technical Director

AGENDA

1. INTRODUCTION
2. OFA PAINT PROCESS TECHNOLOGY
3. MONOCOAT DEVELOPMENT
4. MELFI LINE PROJECT
5. Q&A

INTRODUCTION

KEY DRIVERS FOR INNOVATION IN THE PAINTING PROCESS

Environmental Sustainability

Cost Reduction & Efficiency

Quality & Customization

Emission Reduction

EVOLUTION OF TWO-TONE PAINT DEMAND IN STELLANTIS BRANDS

Initial Trend

Two-tone used on **PREMIUM** or **SPECIAL** cars.

Trend grows

More customers want two-tone cars for **a stylish and personal look.**

Production becomes harder

Two-tone design are becoming more **complex.**

Our solution

- **Wide portfolio of solutions** to enable effective processes at Stellantis.
- **Overspray-Free Application:** a strategic solution in the innovation roadmap.

WHAT IS OVERSPRAY-FREE APPLICATION

Overspray-Free Application (OFA) is an innovative robotic paint application process in which paint is applied with extreme precision, only where it's needed.

With OFA technology:

- NO overspray, NO material waste, NO emissions
- 100% transfer efficiency
- Application is clean and accurate, adapted for two-tone option and customizations:
  - *No need for masking / demasking*
  - *Process Time and cost reduction*
  - *Two-tone edges are neat*

STELLANTIS

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OFA PAINT PROCESS TECHNOLOGY


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PIXELPAINT

100 % Overspray-free with Drop on Demand (DoD) piezo technology

HD

High picture definition
360 Dpi

x1500

Edge sharp with > 1500 controllable nozzles

Painting velocity
up to 150 - 200 mm/s (depends on paint, object, picture)

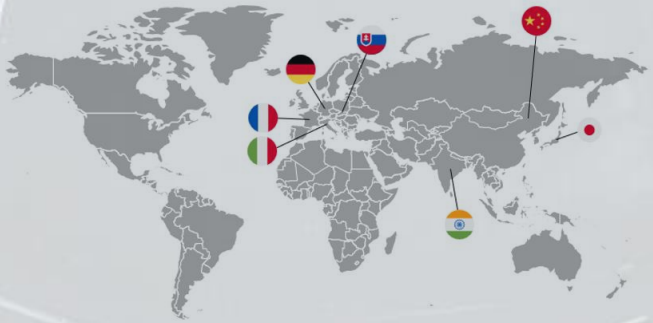
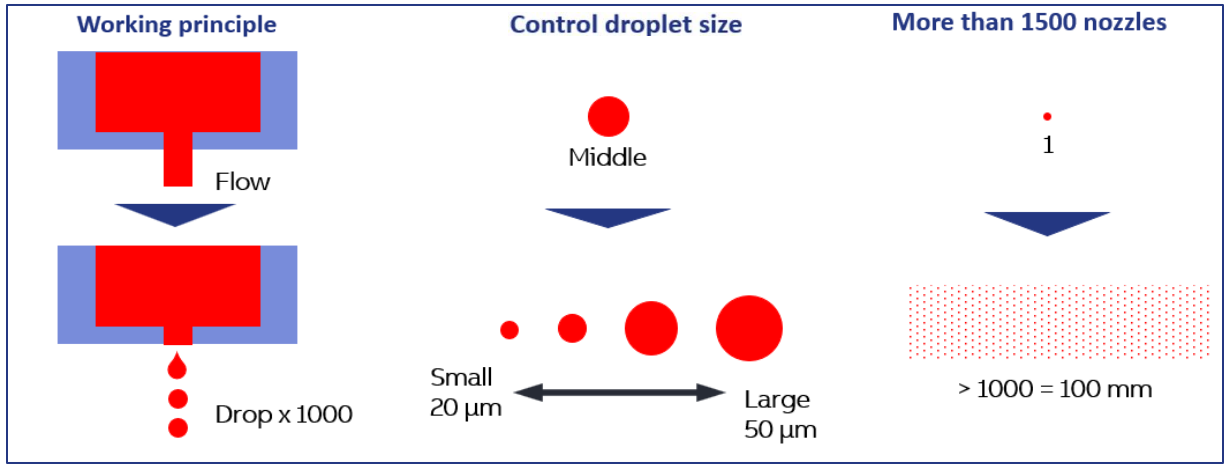


ABB PORTFOLIO

- PixelPaint Application
- Controls system
- Vision
- Modular built
- Process & Paint validation
- Engineering & Commissioning

TECHNICAL BASICS: WORKING PRINCIPAL & OVERLAPPING STRATEGY



Continuous circulation flow of paint material

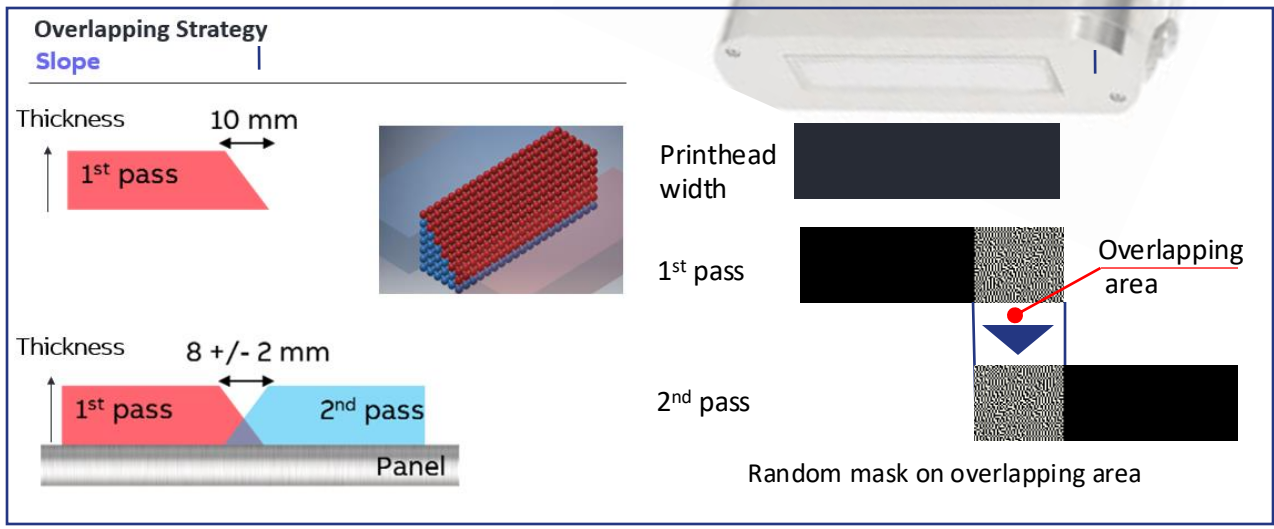
Eject drops on demand controlled by piezo control units and optimized with specific wave form

Possible to parametrize drop size and frequency to control paint layer thickness

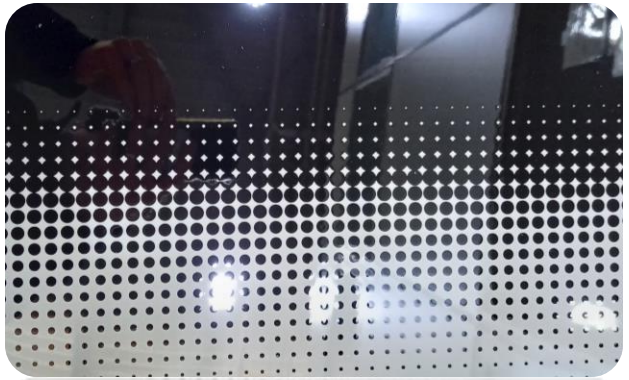
Flexible overlapping strategies relate to paint rheology & surface geometry

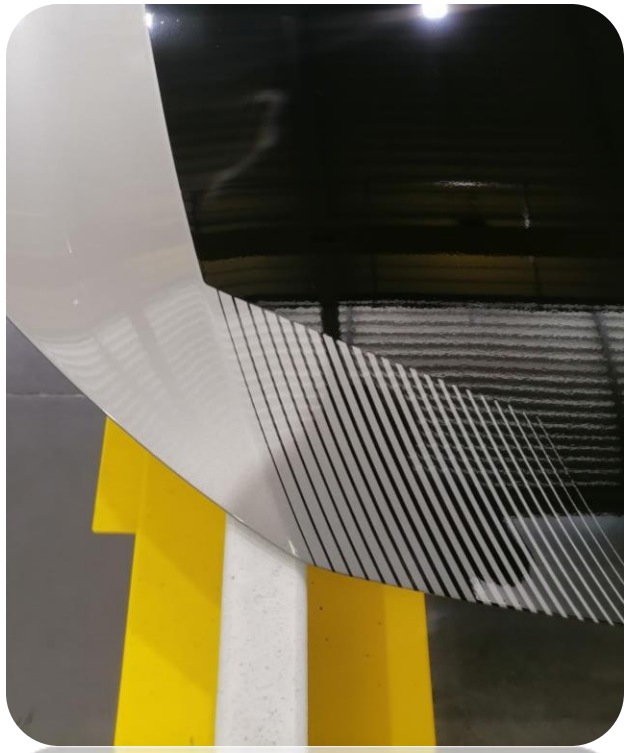
Slope strategies from 0-100 % thickness

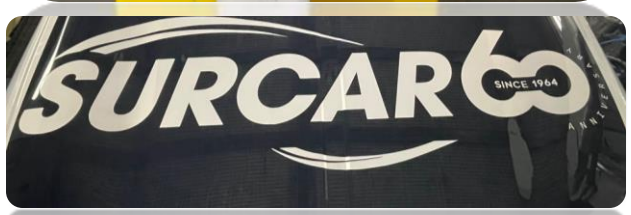
Random mask by gray scale control

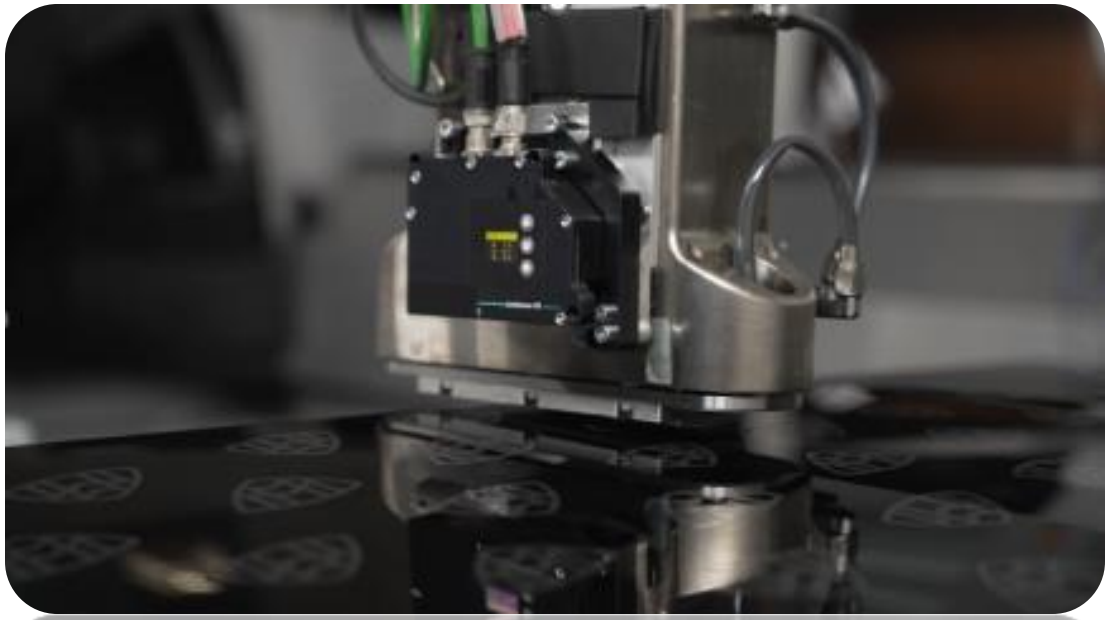


GRAPHICAL PRINTING – SHARP EDGES – HIGH DEFINITION

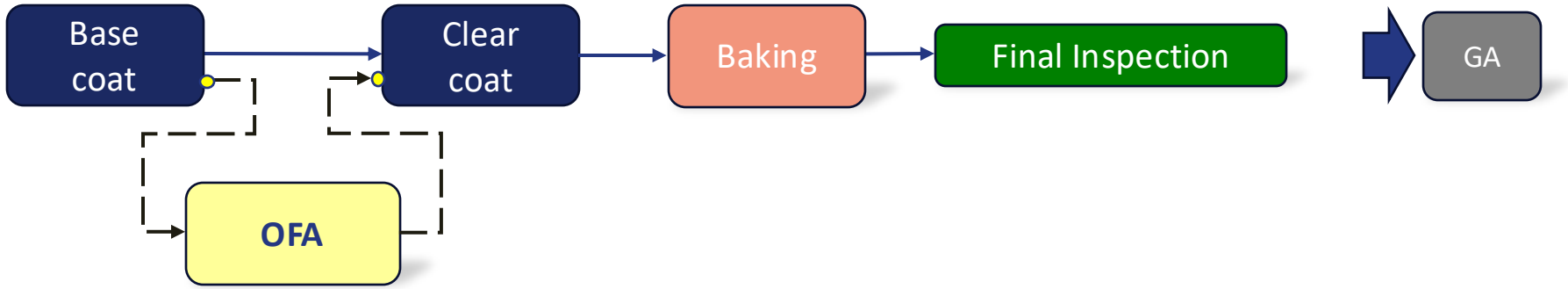




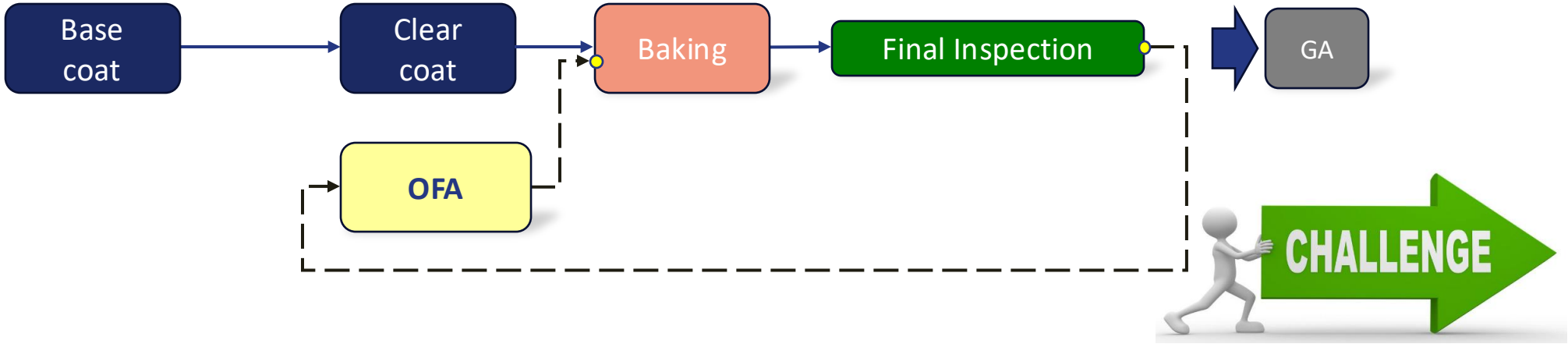




1. GREENFIELD - Fully integrated OFA process with the topcoat booth



2. BROWNFIELD - OFA process integrated into the existing layout and assets



Specific Paint Material

STELLANTIS

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MONOCOAT DEVELOPMENT

Main Properties of Standard Systems

Properties	One product : Monocoat	Two products : Basecoat / Clearcoat
Liquid Media	Solvent Borne	Solvent Borne
Substrate	Baked E-coat or Primer	Baked 1K or 2K CC
Pre-treatment	Light sanding	Light sanding
Application	Roof Atomization	Roof & Hood Atomization
Film build	40 µm	12-15 µm / 40-45 µm
Functional performances	++	+++
Appearance	MAINSTREAM	PREMIUM

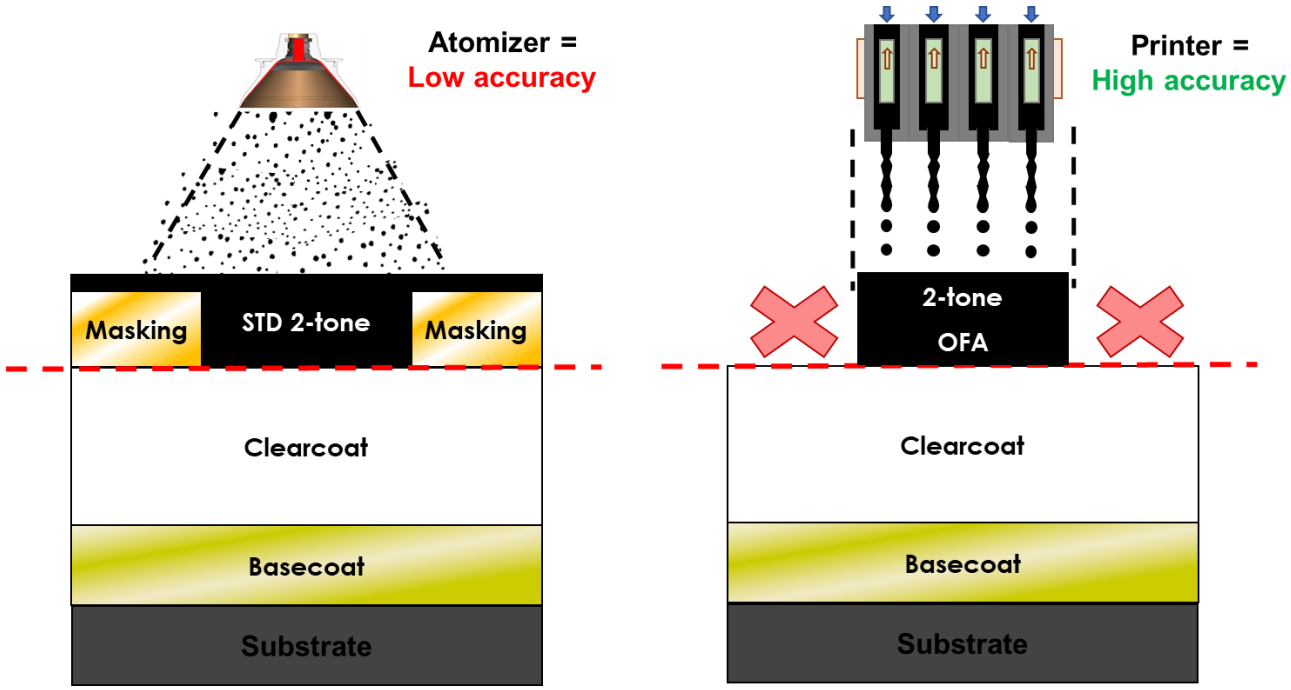
Main Challenges of OFA Water Borne Monocoat in Melfi

- Application over **baked 2KCC** without pretreatment (affect levelling and adhesion ?)
- **Water Borne** liquid media (affect Robustness on vertical parts ?)
- Reduce dry film **thickness to 20µm** (affect optics and mechanical performances ?)

TARGET : PREMIUM QUALITY

New Specifications for OFA

- **Smaller Particle size** : no possibility to use pigments > 10µm.
- **Higher Robustness** on vertical parts because of 100% transfer.
- **Different Paint Liquid properties** to generate a drop instead of droplets.

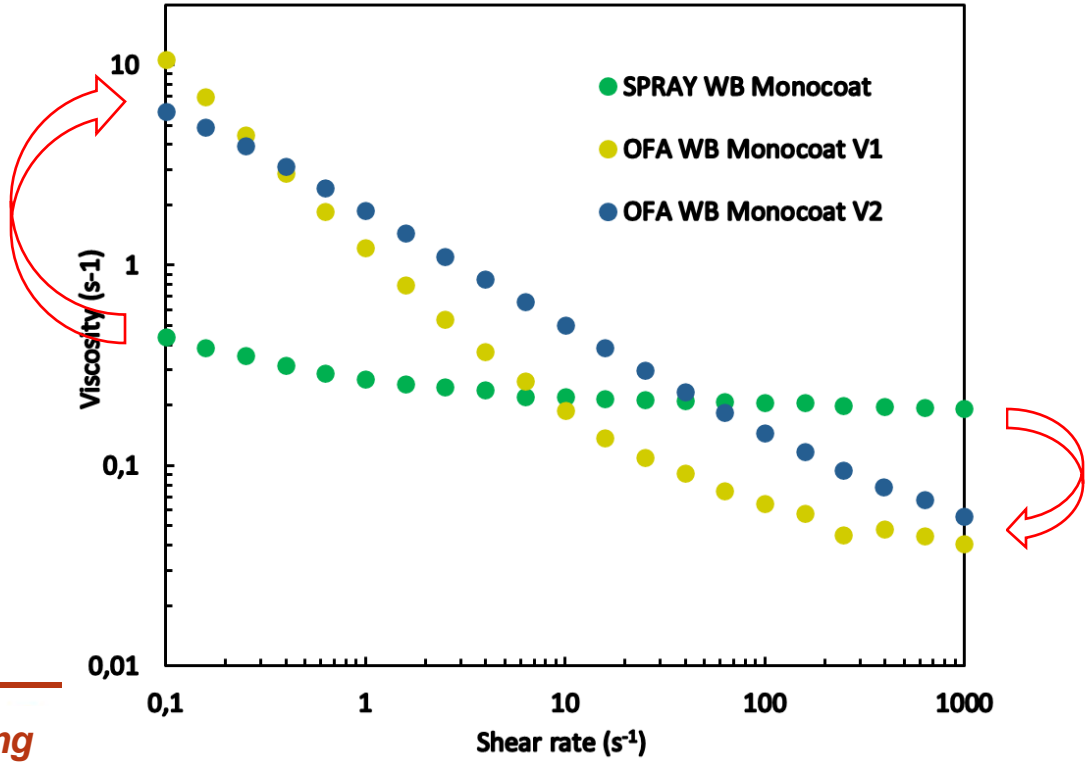


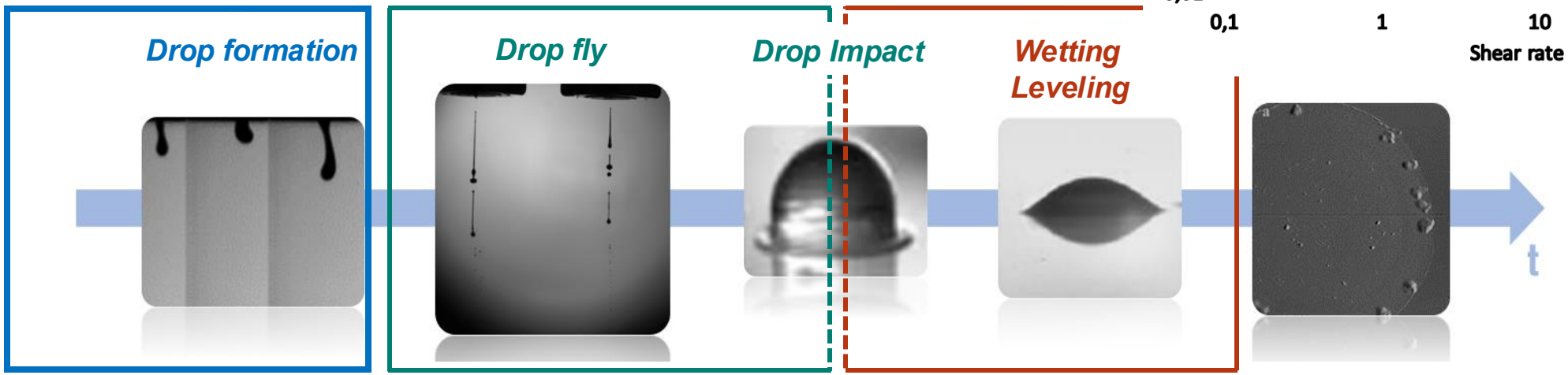
Paint Development Axes for OFA

- New design of **Rheological Profile** to fit with the application
- Define the best **Ratio of Solvant / Additives** to control **Printability**.
- Research of new **Binder Backbone** to get premium film properties at lower film thickness

Rheology Performances depending on OFA Steps

- **Determination of shear stress** nature and rate of each step (drop formation, jetting, drop fly, drop impact, wetting, leveling, drying, sagging)
- **Implementation of lab-tools** to reproduce each step (rheometer cone and plate / capillary, optical contact angle analyser, high speed camera)
- **Modelization** of process / paint behavior to define workability window





- High shear rate (≈ 10^5 s^{-1})
- Capillary rheometry

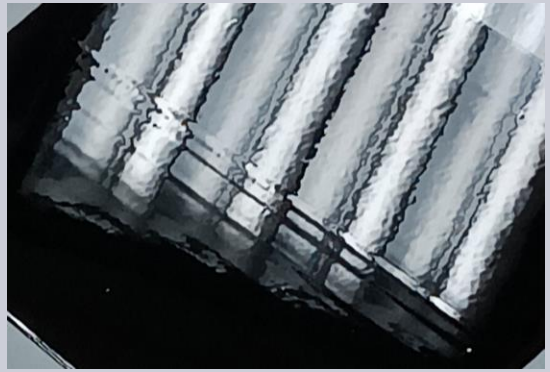
- Medium Shear rate ≈ 10^2 s-1
- High speed camera

- Low shear rate (≈10^{-1} s^{-1})
- Optical contact angle analyser

OFA with 100% Transfer => Balance of Liquid Properties to Control Printability

Paint properties
- Evaporation index of solvant
- Resin type & content

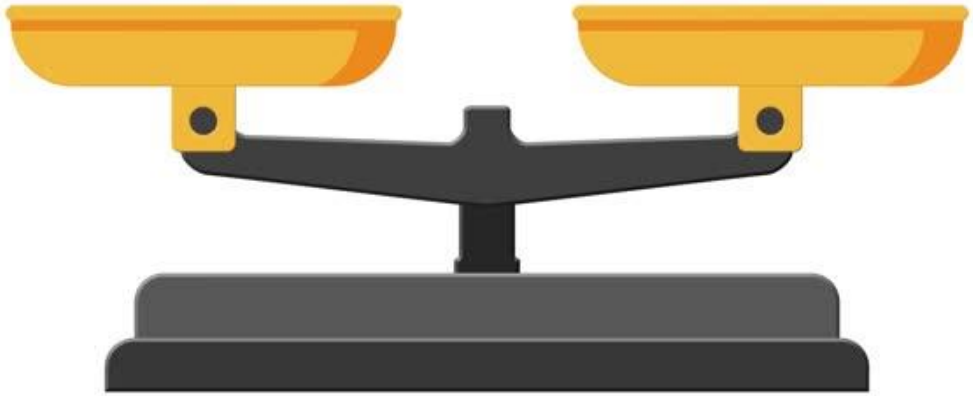
OVERLAPPING / LINAGE



HEAD CONTAMINATION

Solvant Release

Physical Drying

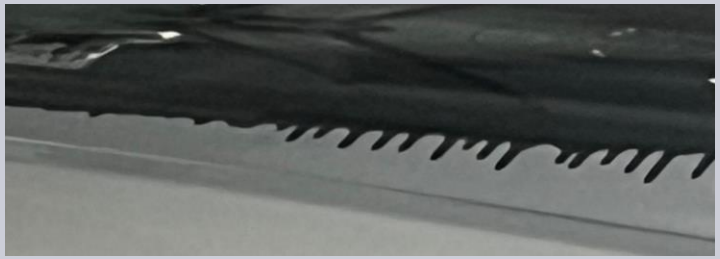


Wet Film Build

Substrate Wetting

Paint properties
- Residual Water content
- Surface Additives type & content

SAGGING



WETTING / LEVELLING

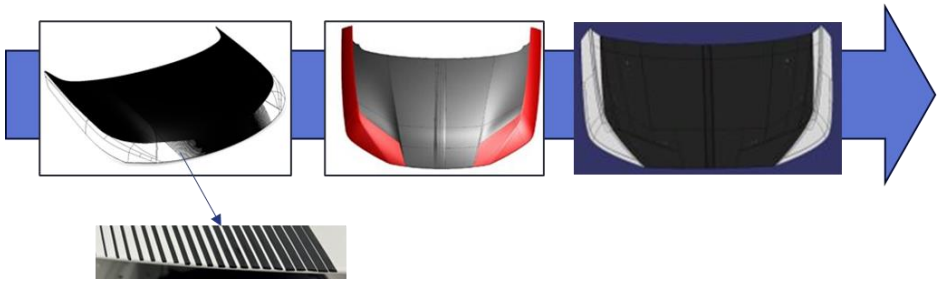
- **Lab-tool** to validate paint design and fit with line equipment
- **Key Process Parameters to set up and calibrate** waveform (piezoelectric monitoring), pressure, frequency, voltage
- **Reproduction of applications and defects** : robot-speed, vertical, bar-coding, lineage, overlapping pattern and area
- Specific programs **to simulate large size application** and to assess nozzle clogging/head contamination

ABB XYZ PixelPaint table
(NPAC Grenoble R&D lab)

MELFI LINE PROJECT

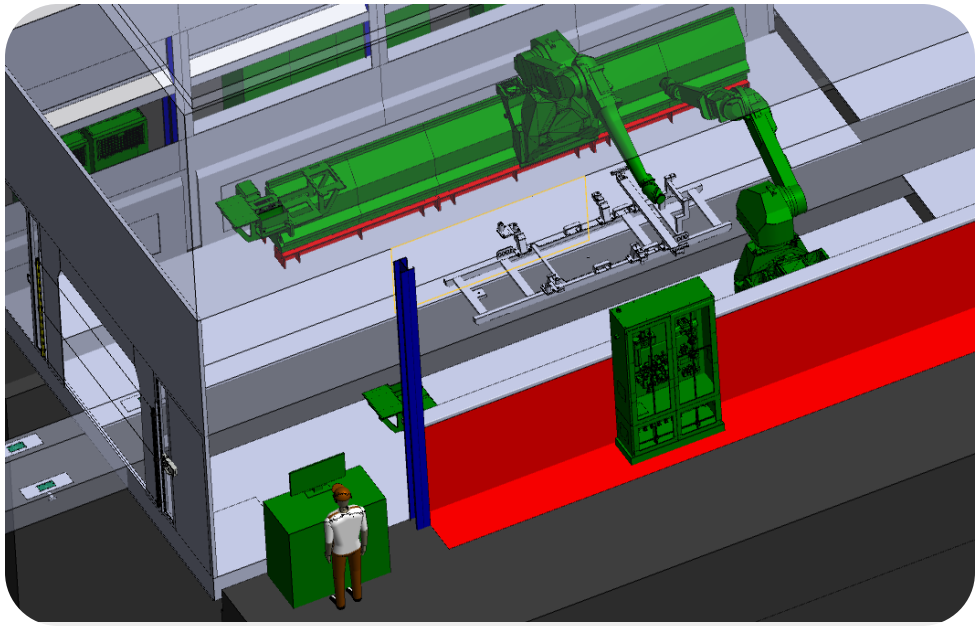
OFA Process:

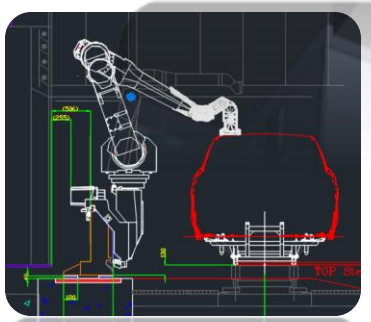
- Implemented at **Melfi Plant** (Italy)
- Applied to the **DS N°8** model for the two-tone hood
- Integrated into the **existing layout and assets**
- Uses a dedicated **WB solid Black Monocoat**

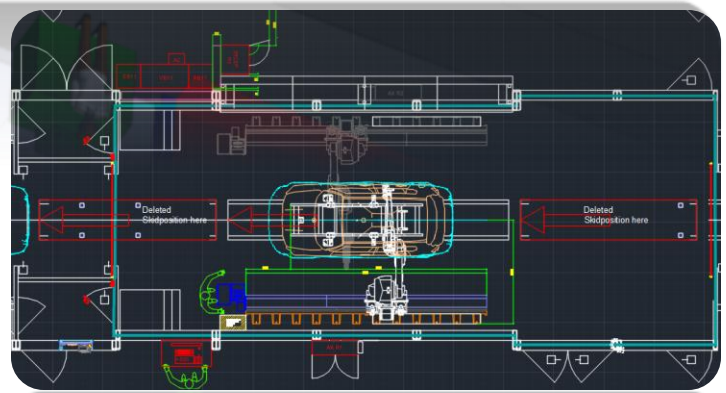


	2024								2025					
	may	jun	jul	ago	sept	oct	nov	dic	feb	mar	apr	may	jun	jun-25
Engineering														
Installation & Commissioning														
Industrialization														
Fine tuning														
Start of production														

PIXEL PAINT: STELLANTIS D85 PROJECT

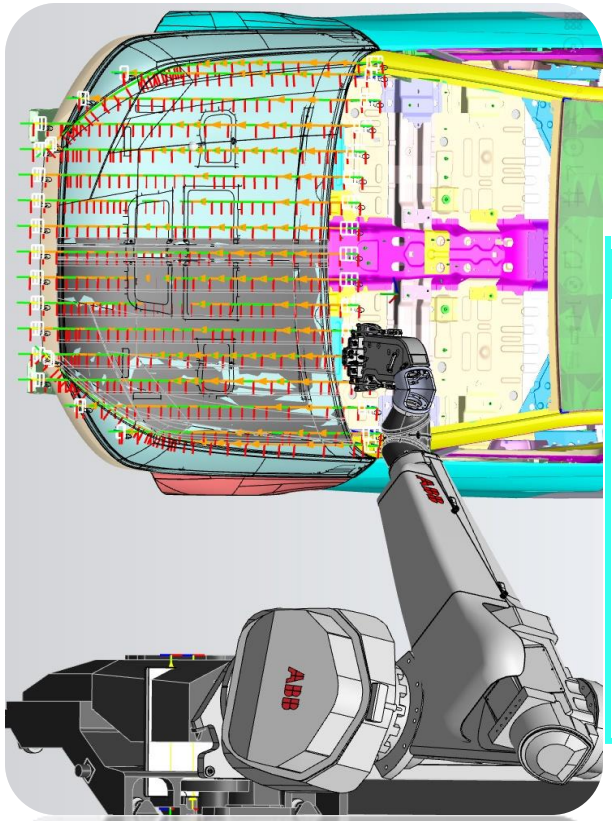


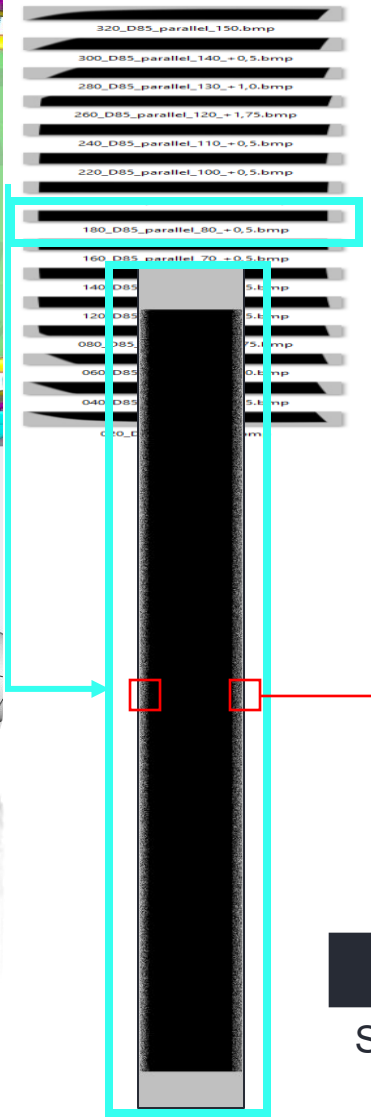


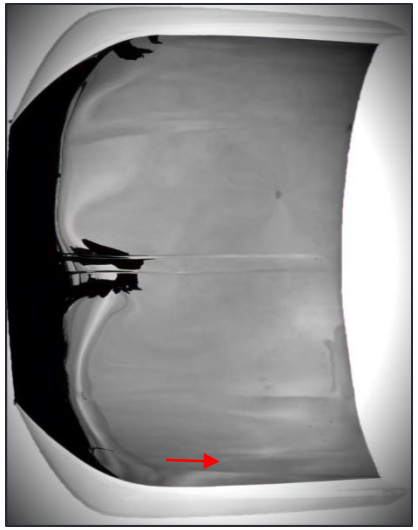


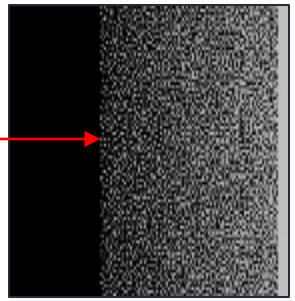
- 1x IRB5500 Robot with PxP Application System
  (prepared for 2nd Robot upgrade)
- ABB Standard Paint Controls Software & VMT
  Vision System (3D + BK)
- 3,5 JPH total
- Commissioning / Process & Paint validation
- Production Support & Quality Fine Tuning

PROGRAMMING STRATEGY

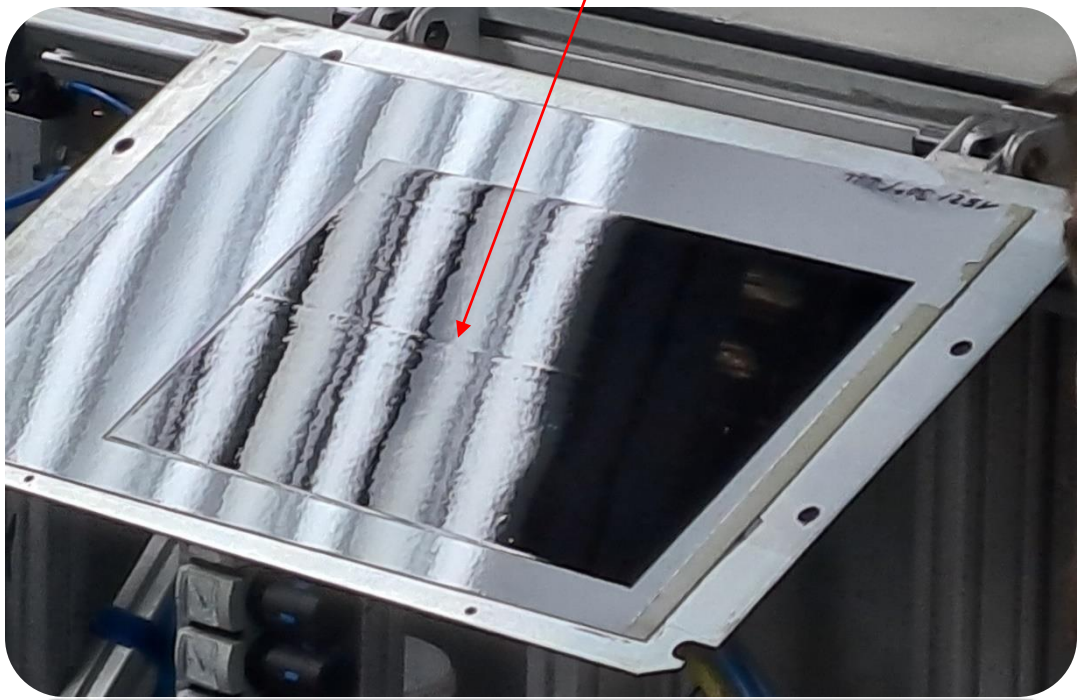








Overlapping of the strokes



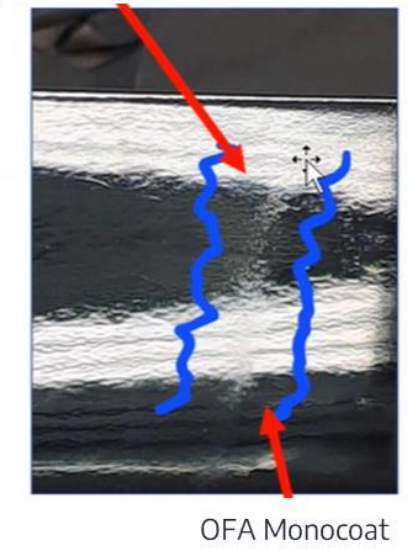
➢ Perfect surface: prevent contamination and ensure activation

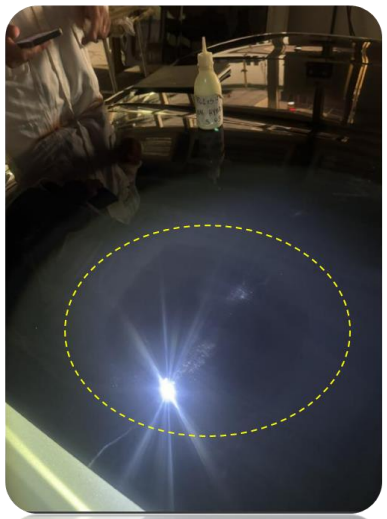
To avoid contamination on the surface after first coat, the hood must be protected

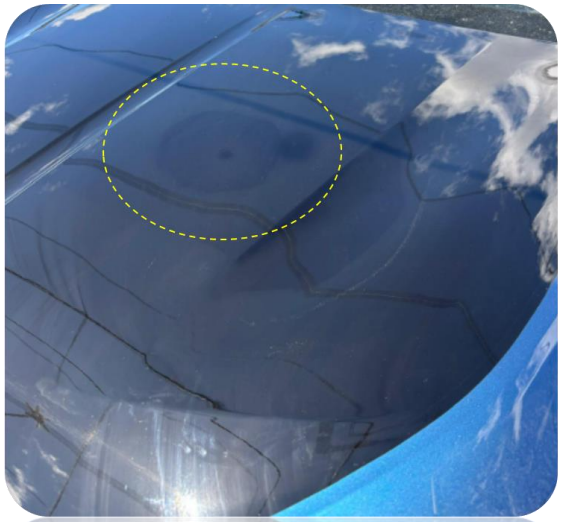
To avoid paint wettability issues the Clearcoat must be activated and cleaned with wipes pre-soaked in 100% pure alcohol

➢ Touch up cycle

The traditional touch-up process is not suitable because the repair edges remain visible. A special Refinish monocoat was developed to ensure high quality.

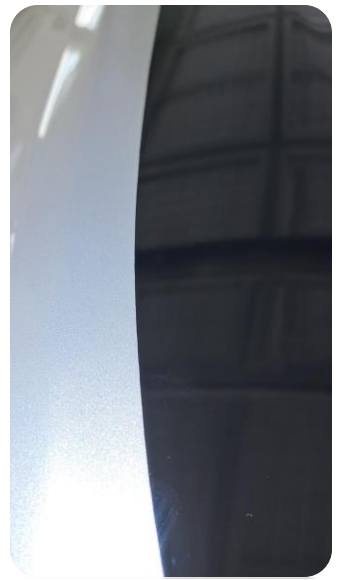






- **Top Quality:**
  - Excellent Gloss
  - Perfect color division lines
- **CO_2 & Energy Reduction**
- **NO Masking / NO Demasking**
- **NO waste of paint and water**

New Standards of **AESTHETIC EXCELLENCE**!



Next steps:

- SOCHAUX Plant, OFA fully integrated in the topcoat booth in the 4wet process.
- Brownfield: roadmap to deploy OFA over the next three years.
- Customization option for luxury models.

Thank you for your attention

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Q&A


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