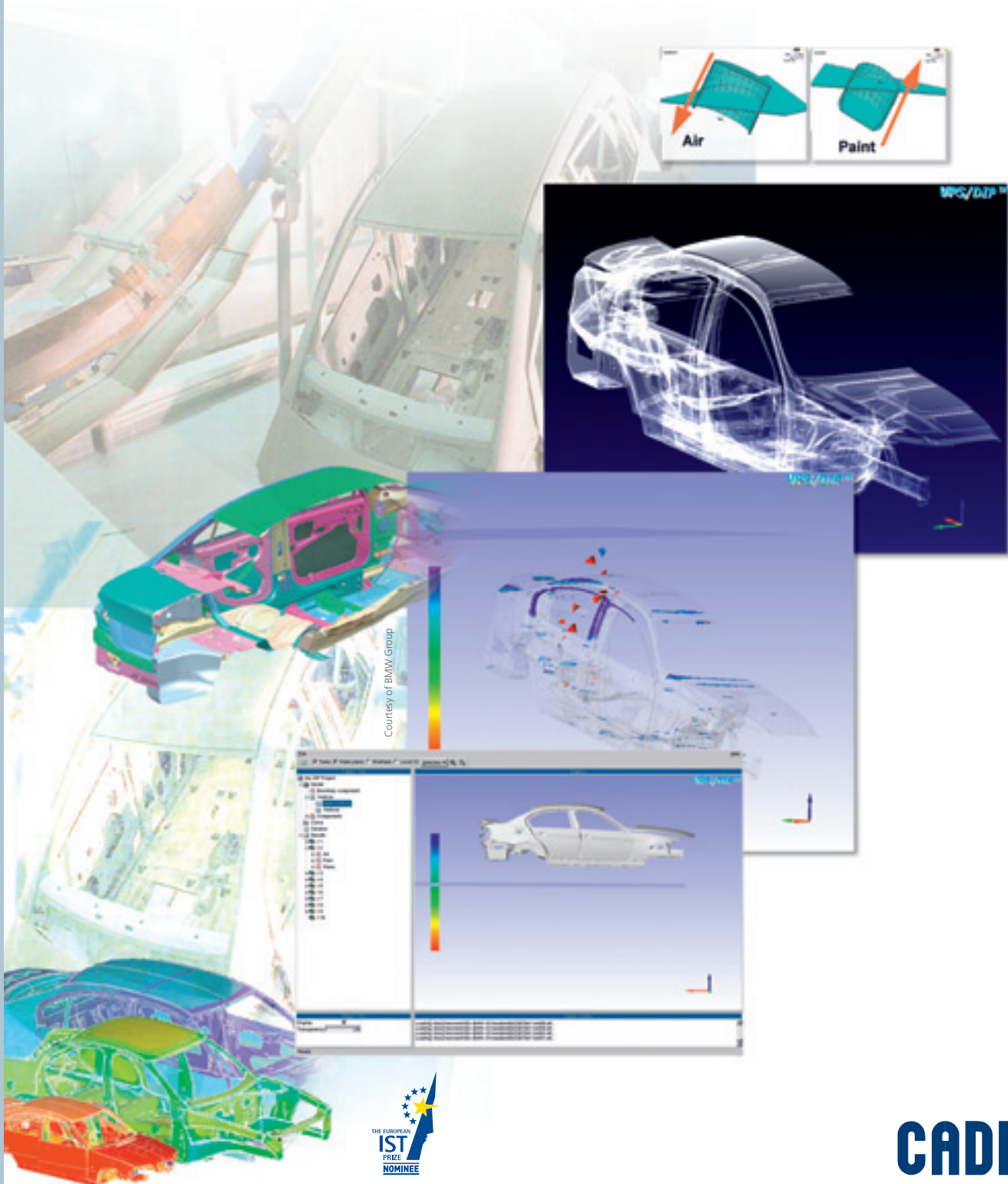


# VirtualPaintShop® VPS/DIP

The Module for the Simulation of transient air inclusions and resulting carry over of fluids due to immersion in basins



## VirtualPaintShop® – VPS/DIP

Computational prediction of anti-corrosive base coat as well as economical production processes has become a key aspect in virtual prototyping of automotive design processes.

VPS/DIP simulates the dipping and emerging of a body-in-white (or any other hollow structure) into and out of a basin filled with liquid (i.e. for electrocoating, pre-treatment or cleaning). VPS/DIP is part of the VirtualPaintShop® (VPS) software suite – a bundle of modules offered by CADFEM GmbH for the simulation of various steps of the complex coating process of automobiles.

VPS/DIP enables the user to improve the quality of the final product as well as the efficiency of the production process. By predicting process results for dipping at any location of the body-in-white without any need for a test using a physical prototype virtual testing using VPS/DIP allows to save valuable resources in terms of time and materials:

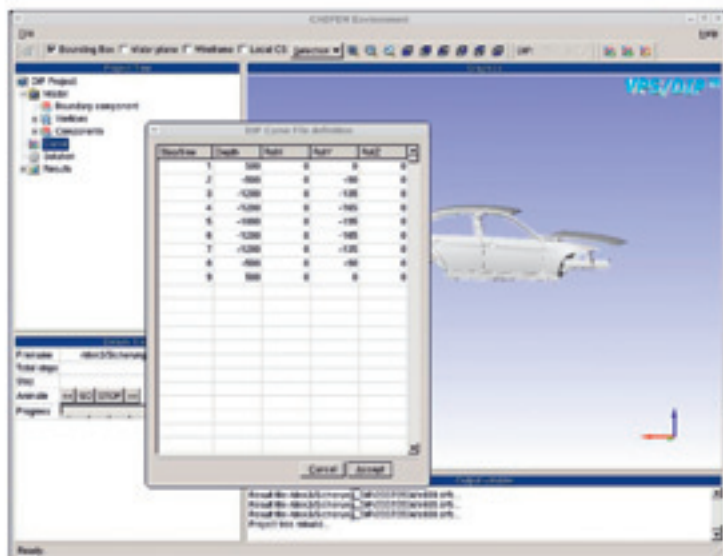
- Find critical locations as air bubbles or carry over of fluid in the structure.
- Revise structures in order to reduce air as well as fluid accumulations.
- Predict carry-over of fluid after dipping out and minimize it to reduce pollution of consecutive basins.
- Optimize your body-in-white for the VPS/EDC simulation.
- Create or optimize your own dipping curve in order to simulate prospective processes.

Finite element models for VPS/DIP are created using the CATIA Toolkit software from the original CAD model.

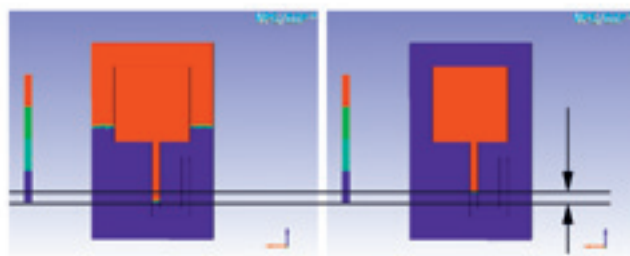
The entire liquid paint volume is meshed with a tetrahedron finite element mesh. VPS/DIP uses this mesh for calculation of the dipping process. Surface elements are implemented. VPS/DIP uses surface elements only for the visualization of results. The resulting mesh might be used for VPS/DIP and VPS/EDC analysis.

The VPS/Environment is the fast and user friendly GUI to define the complete VPS/DIP process.

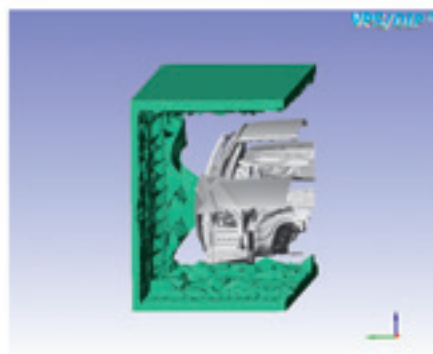
Use the functionality to handle your model, implement your process data and make the post processing.



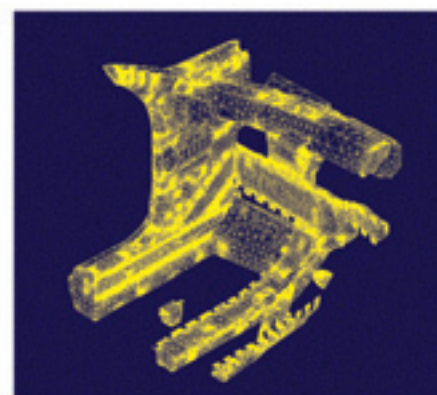
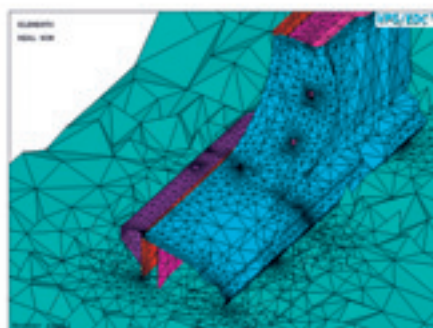
### VPS/DIP calculates the dipping process including the physical effects of compressible air

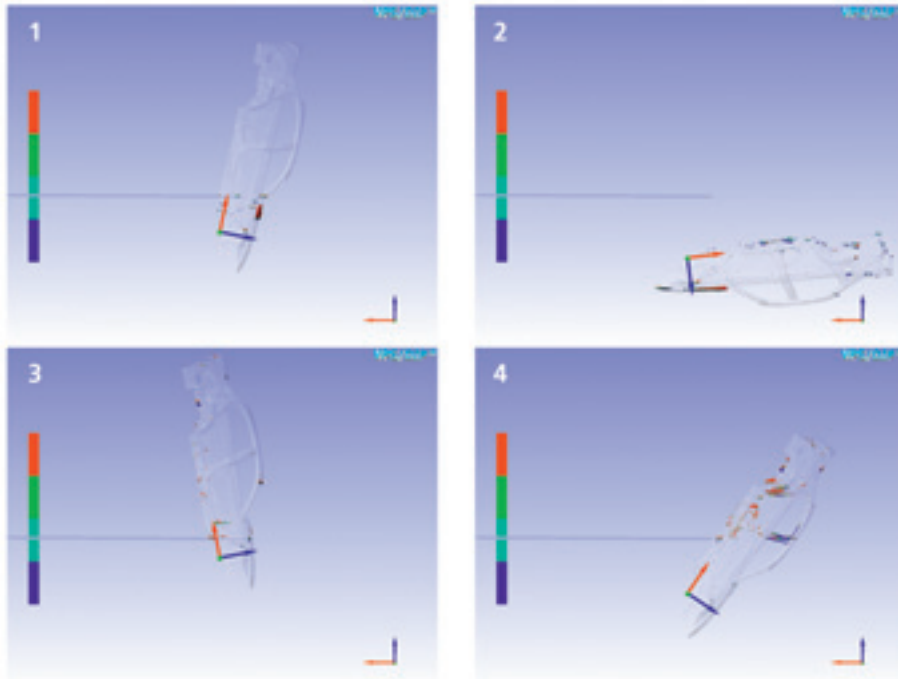


Closed structure: Fluid and Air goes in and out only through the open tube. Pressure and air compression is captured as well.



Boundary conditions: VPS/DIP works with boundary conditions to define where the fluid goes in or out.



**VPS/DIP calculation of a car body model**

Predict problematic structures by dipping your car body into (picture 1 & 2) and emerging it out of the paint basin (picture 3 & 4).

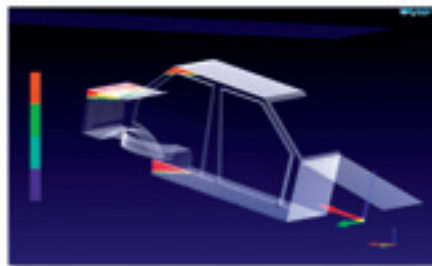
**TECHNICAL OVERVIEW OF VPS/DIP (VALID OCT. 2007)**

- Powerful simulation capability for models of full-scale bodies-in-white
- Import and translation of VPS/DIP-compatible finite element mesh files
- Free definition of model moving and rotation
- Powerful Pre-processing capabilities
- Fast graphics capabilities based on OpenGL
- Powerful Post-processing capabilities for quick assessment
- GUI and solver are time and memory optimized for a maximum performance on big models (> 15 Million vertices)
- Memory consumed data format for model
- Restart capabilities to proceed the process at any time
- Set up of batch jobs for remote compute servers within the graphical user interface

**VPS/DIP and VPS/Environment**

The VPS/Environment is a state-of-the-art visualization tool completely developed by CADFEM GmbH. VPS/DIP uses the VPS/Environment which offers the best available technology with a fast 3D-Graphics-Kernel to define the whole VPS/DIP process.

The Environment is optimized to handle very large models with element counts higher than 15 million volume elements, 4 Million shell elements and a lot of components. This environment will be the future GUI for other VPS-modules as well.

**THE MODULES OF VirtualPaintShop®:**

- VPS/DIP** Simulation of transient air inclusions and resulting carry over of fluids due to immersion in basins
- VPS/EDC** Simulation of electro-deposition coating
- VPS/DRY** Simulation of thermal heat up and cool down of structures; curing of paint layers or adhesives
- VPS/UV** Simulation of ultraviolet curing of coatings
- VPS/ESC** Simulation of electrostatic or pneumatic coat application
- VPS/CP** Simulation of cavity preservation by wax spraying and propagation

**CATIA BASED SOLUTIONS**

(some modules require customization to customer specifics for implementation)

- CATIA Toolkit** Preparation of Simulation Models for VPS/EDC, VPS/DIP, VPS/ESC, CFD or AcousticPathAnalyzer
- AcousticPathAnalyzer** Simulation of acoustic paths within car body cavities

Further information can be found on [www.virtualpaintshop.de](http://www.virtualpaintshop.de)

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## EVALUATE BY PILOT PROJECT

For evaluation of the VPS/DIP capabilities as well as its suitability for your product and process design environment a pilot project conducted in cooperation with CADFEM is recommended. Using your CAD data of the car body or any other structure to be dipped in liquid, process and basin description as well as paint material properties CADFEM will provide the entire modeling and simulation workflow for your current or prospective product line.

## CADFEM SERVICES

- Preparation of the vertex mesh for VPS/DIP using CATIA Toolkit
- VPS/DIP simulation and results evaluation
- VPS/DIP training for your computational or paint technology specialists
- Customization of VPS/DIP to your specific requirements
- VPS/DIP consulting services

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