The Virtual Product Engineering Magazine



issue 42 | fall-winter 2012

### special report Virtual Prototyping for automotive with focus on body in white & chassis manufacturing







Gestamp successfully brings to market a weight-optimized B-pillar stamped from tailored blank Grupo Antolin adopts Virtual Performance Solution for seat design and manufacturing testing

# **Jec**americas

COMPOSITES SHOW & CONFERENCES BOSTON NOVEMBER 07, 08, 09, 2012

Boston Convention & Exhibition Center





### contents

#### 04 special report

- Virtual Prototyping to empower automotive engineering; focus on body in white & chassis manufacturing
- 3 questions for Eric Landel, Lead Expert in Numerical Modeling and Simulation at Renault

#### 08 success stories

- Gestamp successfully brings to market a weight-optimized B-pillar stamped from tailored blank using PAM-STAMP 2G
- Global Seating Systems uses PAM-COMFORT to achieve best in class comfort for military seats
- SIMTech achieves unprecedented Liquid Forging simulation on aluminum heat sinks using ProCAST
- ŠVEC a SPOL swaps trial-and-error for PAM-STAMP 2G to complete a highly complex deep-drawing automotive project
- SAMSUNG Techwin streamlines product management processes with VisualDSS
- Grupo Antolin adopts Virtual Performance Solution for seat design and manufacturing testing
- Efield enables Swedish Defense Research Agency (FOI) to develop invisible Unmanned Aerial Vehicles
- Renault solves communication challenges between CAD and CAE within the scope of its EHPOC project

#### 16 product news

- ESI Release of ESI's pilot version of Adjoint Solver for design optimization, made with Intel's Fortran 90 compiler
- ACE+ Suite Multiphysics and Advanced CFD software improves industrial product development processes from Automotive to Semiconductors industry
- ESI consolidates its composites manufacturing simulation offer with the latest releases of PAM-FORM and PAM-RTM
- New VA One: Latest release of noise and vibration simulation software includes embedded Design Optimization and support for cloud computing

#### 19 corporate

- Efield, European specialist in electromagnetic virtual simulation solutions, joins ESI Group
- OpenCFD Ltd., the leader in open-source software in Computational Fluid Dynamics
- ESI Virtual Reality Solutions demonstrated at Imagina, Monaco
- Local users declare the second ESI India Forum a success
- IC.IDO immersive Virtual Reality solutions at Hannover Messe's "Digital Factory"
- ESI's Composites Solutions benefit from key partnerships and French local state grant
- Save the date!
- Results for the first half of 2012/13

#### Executive Editor: Amy de Rouvray

Editor-in-Chief: Celine Gallerne - celine.gallerne@esi-group.com ESI Group Marketing Parc d'Affaires SILIC 99, rue des Solets - BP 80112 94513 Rungis Cedex - FRANCE Tel: +33 (0) 147 35 80 0 - Fax: +33 (0) 146 87 72 02 www.esi-group.com - Info@esi-group.com Design: Agence TETRAKTYS ISSN 1205-1739 Print: RIVET PRESSE EDITION 24, rue Claude-Henri-Gorceix - 87022 Limoges Dépôt légal: Octobre 2012

All PAM- and SYS- product names as well as other products belonging to ESI's portfolio, including OpenFOAM® are trademarks or trademarks of ESI Group, unless specifically mentioned. All other trademarks are the property of their respective owners.

All text and images included in the articles are the copyright of the companies presenting their applications and simulation tasks.

Photo credits: Fimalac, Fisker Automotive, FOI, Gestamp, Global Seating Systems, LLC, GRUPO ANTOLIN, Imagina 2012, Mazda Motor Corporation, Professor Andrew Long, University of Nottingham, Renault, SAAB Space AB, Sweden, SIMTECH, SVEC, Volkswagen AG, World Auto Steel.

G/RO/11. 146 A

## editorial

Throughout its evolution, the automotive industry has sought to balance cost & performance. Today, weight is a critical concern as the Automotive industry struggles to be more weight efficient and achieve the reduced fuel consumption and lower levels of emissions that are mandated by new and emerging regulations.



Eric Retraint, VP Sales & Marketing Ground Transportation

Vehicle weight reduction is

greatly helped by the introduction of the new materials and assembly techniques that start to replace conventional manufacturing with mild steel and spot welding. Designers are using combinations of metal alloys, such as high strength steel, as well as lighter materials, including aluminum and composites. However, the lack of knowledge and industrial experience associated with the use of these new materials and manufacturing processes can cause delays and trigger costly and late design changes. In order to prevent such incidents ESI has developed a Virtual Manufacturing software suite that provides solutions to simulate complete design and manufacturing processes, from components to sub-assemblies and assemblies and in a common, collaborative environment.

In this issue, you will learn how manufacturers can use ESI's Virtual Performance Solution (VPS) to ensure that weight reduction has no negative impact on performance attributes. VPS - a comprehensive software suite for performance assessment - enables multi-domain performance engineering and optimization. Renault expert, Eric Landel answers our questions on this topic on page 7.

Passive safety systems in cars are already highly developed and we now see the arrival of active safety systems that trigger pre-crash preparation and other advanced driver assistance functions. These require on-board electronic equipment, including sensors and actuators. This is why mastering the complete electromagnetic environment is increasingly important. On page 18, you will learn how ESI is addressing such issues and has strengthened its ability to address large scale electromagnetic problems by acquiring the specialist Swedish company, Efield.

We hope this issue of ESI Talk will provide you with a comprehensive vision of current trends and challenges in the automotive industry and how Virtual Product Engineering can assist in accelerating innovation. We wish you a pleasant journey with us!

## Virtual Prototyping to empower automotive engineering; focus on body in white & chassis manufacturing

Today the ultimate goal of a manufacturer of automotive body assemblies is to develop functional designs, increasingly in a multimaterial mix, that fulfill conflicting product specifications. Meeting increasingly demanding structural and safety requirements, while cutting weight to improve fuel economy and reduce CO2 emissions, requires a more holistic approach to the development process. Consequentially, leaders from major automotive OEMs report that they no longer organize their manufacturing concerns in terms of specific processes – such as casting, welding or sheet metal forming – but instead in terms of:

- · Manufacturing engineering
- · Vehicles structures & safety
- Materials optimization for body engineering & fabrication of components
- · Body engineering digital optimization



In this special report we explore the challenges in more detail and elaborate on the role of Virtual Prototyping as it increasingly replaces physical prototyping and testing.

#### Mastering new materials and processes

Over the years, Virtual Manufacturing has become an indispensable engineering tool to select and validate tool designs and fabrication & assembly processes. Design expectations are leading to an increasing use According to the Industry Research Organization Grant Thornton LLC, the Detroit Three (General Motors, Ford & Chrysler) will shrink their current 40 platforms (2009 number) to 29 by 2014. This trend of fewer core platforms can be observed throughout the entire world.

Getting designs "right first time" at permanently reduced costs is becoming an absolute necessity.



of higher strength or lighter materials. In fact, if we look at the conclusion of the "Future Steel Vehicle" project of the US Steel Market Development Institute we see their expectation that only 2,6% of a next generation vehicle body will be manufactured from mild steel, while 97% will be high-strength steel and other advanced high-strength steels (AHSS).

Increasing use of high-strength steel, advanced high-strength steels (AHSS) and ultra-high-strength steels (UHSS) to assure meeting safety requirements, while reducing weight, has direct implications upon cost. Consequentially new processes need to be evaluated to balance the cost versus benefit equation. These include roll-hemming and hot forming, use of special materials, and initiatives to increase production efficiency; all aimed at decreasing both real production costs and time to market.

To take an example, Arcelor Mittal recently launched a new product range called 'S-in-Motion'. This is the culmination of a 2 year design study to demonstrate what additional weight that can be taken off a 5 door vehicle body-in-white through the innovative application of the full range of Arcelor Mittal's automotive steel grades. That catalogue offers multiple solutions for 43 key vehicle parts and the cost of use can be managed using Virtual Sheet Metal Forming simulation. To support minimizing cost, while meeting functional specifications, each step can be simulated, with automatic virtual multi-operation compensation. Engineers can simulate and control spring-back after forming, hemming or flanging. Quality control can take place after each step of the manufacturing process.



Optimized body structure for different crash scenario with Virtual Performance Solution Courtesy of Volkswagen AG



#### Virtual Prototypes of full body-in-white structures

Virtual Product Engineering helps reduce or, in some cases, replace tests and physical prototypes; saving the cost & time of the physical try-out. With this in mind, industry's current goal is to be able to look at the entire body-in-white as one structure rather than looking at separate parts or features. Virtual Prototyping can then reveal the relationships between isolated components and the consequence of their interactions, and enable the advance of multi-domain Virtual Engineering.

### The ever increasing capabilities of Virtual Manufacturing

In sheet-metal forming, die-face design has moved to precise definition of geometry. Even for complex forming processes, Virtual Prototyping solutions allow for prediction of dimensional accuracy & surface quality; providing parts that are ready for milling, within tolerances, at minimum cost, and in alignment with product specifications. The goal is, of course, to reduce the number of physical try-outs to nil.

In casting, all aspects of the components' fabrication process can now be predicted, including the microstructure, distortion and residual stress. For welding, Virtual Welding solutions cover fast methods to assemble while meeting tolerance requirements, and go far beyond to enable virtual engineering of the most complex physical phenomena that are present in novel, additive manufacturing processes.

#### Virtual Welding of body systems

Welding is an essential part of body manufacturing. By allowing the virtual fabrication of components, engineering, product planning and machine build can be evaluated to determine if a proposed assembly process will deliver with respect to distortion and other criteria for quality results. It is possible to gain a sound understanding of all effects of joining including the clamping and joining processes, the effects of stiffness and material, and the management of tolerances.

#### End-to-end Virtual Prototyping outlook

Virtual body manufacturing is the true starting point for building robust virtual prototypes that can be used in performance evaluations. There are an increasing numbers of examples of linking Virtual Manufacturing and Performance evaluation, including chaining casting to crash performance, and chaining sheet metal forming, welding, heat treatment and crash performance. Today, it is possible to include all sheet metal forming effects such as the heat effects of casting and welding into ESI's Virtual Prototypes. Examples of this are among the case studies included in the magazine.

### From conventional workflows to Concurrent Engineering

70-80% of the ultimate cost of product development and manufacture is determined at the initial design stages. Traditionally, design and manufacturing activities have taken place sequentially rather than concurrently or simultaneously. In theory, the product can flow from conceptual design through to computer-integrated manufacturing (CIM), but in practice, difficulties can encountered when the manufacturing engineer wishes to make a design change to improve manufacturability. Such late-stage changes are likely to be costly; wasting resources and most importantly - time. The Concurrent Engineering Approach provides an advanced product development approach. Iterations are taken into account within the workflow. The main difference from the traditional approach is that all disciplines are now involved in the earliest stages of product design: they progress concurrently, so that iterations converge to a result with less wasted efforts and time.

A key to this approach is clear recognition of the importance of communication among and within disciplines. To this end, computer simulation provides a powerful and effective tool to plan the manufacture of a product and its future performance (read more on improving remote teams' communications on page 15). The next step in the production process is to virtually build the product piece by piece and part by part so it can be tested and viewed just as in the real world.

As amplified throughout this magazine, ESI is enabling the next steps in virtually planning the manufacture of a product by simulating the physics of materials relevant to each manufacturing step and making complex technology accessible for engineers and designers with embedded intelligence and process automation.



Find out more: www.esi-group.com/industries/automotive

## 3 questions for Eric Landel



Eric Landel Lead Expert in Numerical Modeling and Simulation at Renault

#### How does numerical simulation help support Renault in addressing the challenges brought by evolving customer demand and toughening regulations?

"Car manufacturers constantly need to satisfy the fast changing customer taste for new products in an ever faster way! New models turnaround is accelerating, while the number of new models proposed is always increasing. Automotive OEMs therefore need to lower product development costs in order to multiply new projects. They also face the challenge of integrating new technologies that will seduce their customer base, while conciliating with mass reduction and low emission targets. Numerical exploration and optimization are key to implement any upcoming innovations linked to new regulations or new control systems such as active safety, pre-crash braking or driving control systems. Such highly complex systems inducing physics coupling, would simply take years if they had to be investigated using physical prototypes only.

Numerical simulation enables multi-scale investigations, as required to better understand the physical phenomena taking place at local and also global scale when coupling multiple physics or when implementing onboard safety systems. The complexity of local models then needs to be reduced to answer questions using a global approach.

Another challenge that numerical simulation helps to solve is the multiplicity of actors involved in the product design & development of a new vehicle. Numerical simulation needs to overcome and efficiently combine results from different origins and in different formats, to enable multi-domain optimization."

### How does Renault use numerical simulation as a decision making tool?

"Helping to making the right decisions is the single most important role of numerical simulation. Automotive projects need to balance out an incredible number of parameters and constraints from customer satisfaction to quality, performance, cost or time. In this process, simulation needs to provide a basis for answers rather than to complexify an already complex task!

The quality of the decisions made throughout a project is what will help in assessing the return on investment of the simulation activity: if a design problem has been overlooked, the cost incurred can be dramatic. On the other side, simulation results must not alert on a red herring, which would slow down the project unnecessarily. In other words, simulation results must provide an optimum solution to the project team."

### What are the main benefits of Virtual Prototyping in terms of cost?

"Aside from providing a strong base for decision making, numerical simulation helps anticipate the consequences of design changes, therefore reduce the number of physical tests. Ideally, physical tests should only be performed on vehicles exiting the factory equipped with the final tooling, thereby avoiding the cost of developing tooling prototypes. Renault has set itself a goal to significantly reduce the total amount of physical prototypes within the next 3 years. Above cost reduction targets, reducing the number of prototypes needed reduces development lead times; something that is a key to global competitiveness."





## Gestamp successfully brings to market a weight-optimized B-pillar stamped from tailored blank using PAM-STAMP 2G



Virtual modeling helped Gestamp deliver high precision stamping and fullfill customer requirements from the very first formed physcial part

A tailored blank is a sheet of steel that combines several grades, thicknesses or coatings. The different parts are welded together, in order to place the best material at the best place in the right thickness to offer clients a "tailor-made" solution. Tailored blanks offer a possibility to optimize the weight and performance of automotive parts, while simplifying the production process. The following case study demonstrates how complete virtual modeling has enabled the management of a complex manufacturing process.

Gestamp Automoción was entrusted with the design of a stamped automotive B-pillar

"We achieved very good results thanks to the accuracy of the simulation using PAM-STAMP 2G. We were able to use the springback prediction tool to evaluate the die compensation, despite the complexity of such a case with three different thicknesses and two weld lines."

> Eduardo Sulato and Fábio Lichtenthäler, Engenharia da Matriceria Gestamp Automoción S.L.



B-pillar stamped from tailored blank with 3 thicknesses and 2 weld lines (visible)

defined with three different thicknesses, welded together with two weld lines. The stamping tool design needed to take into account the formability of each region of the tailored blank. To add to the complexity of the part geometry, the complexity of the weld lines movement during forming needed to be considered as well.

The Gestamp Paraná business unit was nominated to develop this complex stamping process in Brazil. Due to the complexity of the simulation to be performed in PAM-STAMP 2G, involving multiple thicknesses and weld lines, Gestamp called upon ESI's Brazilian support team to ensure that they would collectively reach the best result in the shortest time. Given the quality of this collaboration between both teams, Gestamp extended the cooperation to perform springback calculations and die compensation using the explicit solver in PAM-STAMP 2G.

To ensure proper die compensation, Gestamp engineers made sure the strain distribution in the part was as smooth as possible. Once the appropriate parameters were set, springback was calculated with the tailored blank properties. The resulting tolerances were far from the required 0.7 mm. The team then used PAM-STAMP 2G to compensate the tools, and only a small region remained out of tolerance, located beyond the trim line. This was acceptable as it would be cut off the final part. The majority of the part was well inside the required tolerance.

After reaching such satisfactory results with the simulation, Gestamp successfully industrialized this particularly challenging B-pillar on the Brazilian market. Results achieved were of exceptional value as proven by the high precision observed in the actual formed part.

#### ABOUT GESTAMP

Gestamp Automoción is an international group dedicated to the design, development and manufacturing of metal components and structural systems for the automotive industry. Today, "Gestamp Automoción" is present in 22 countries and has 95 production, 13 R&D Centers, and over 25.000 people. The turnover in 2010 was 3,040 million Euros.

► for more information:

www.gestamp.com

## Global Seating Systems uses PAM-COMFORT to achieve best in class comfort for military seats



Providing vital comfort to soldiers who need to remain seated for missions often exceeding eight consecutive hours

Global Seating Systems (GSS), a member of USSC Group, is a North-American based company which designs and engineers world-class seating for several types of vehicles. Their goal is to develop the most durable and ergonomically designed seats to reduce day-to-day driver fatigue and stress.

GSS used ESI's seat comfort simulation software PAM-COMFORT to develop a new seat for a military vehicle. Based on customer feedback, GSS defined three main objectives: exceed the previous best-in-class seat in the industry; provide a foam cushion packaged within a minimal space;, and, make the new seat lighter and thinner than any other seat designed before.

First of all, GSS engineers measured the static pressure map of an existing seat and entered it in a PAM-COMFORT model. This model became their benchmark. Then, they designed a new seat, with the objective of improving on the pressure map of the actual production seat. Jeff Krueger, Director of Product Development at Global Seating Systems, stated: "We executed the new design and the pressure mapping using PAM-COMFORT to prove that the pressure map would meet or exceed the best-in-class seats on the market". What's more, GSS engineers actually reached their comfort quality target while preserving the overall unique style and design of their seat.

GSS engineers also evaluated multiple materials before making any physical part samples. They virtually tested three different key variables: different foam types (including foams from different suppliers), different firmness for polyurethane foams (PU), and different foam shapes. The conduct of virtual tests on seat parts "This new military seat design was made 100% with simulation without relying on any physical prototype parts to back up the results. In the end, the physical seat prototype was right the first time and results matched perfectly those of the virtual seat prototype..""

> Jeff Krueger, Director of Product Development Global Seating Systems.

fabricated from different materials allowed GSS to avoid material waste and save cost by only manufacturing the part sample they had selected.

According to Jeff Krueger, without PAM-COMFORT they may have deviated from their original concept style, which could have proven to be more costly and be ill-received by the customer. In short, while achieving their comfort target, GSS kept their brand equity.

In the future, USSC Group expect to continue using simulation with PAM-COMFORT to design upcoming models, not only for military vehicles, but also for heavy duty transit buses, small and medium size buses and other extreme duty transport.



Virtual analysis and pressure mapping of the new seat cushion

#### ABOUT GSS

Global Seating Systems (GSS) is dedicated to protecting US troops through the development and manufacture of high technology, high strength military seating and restraint systems. Their commercial arm, USSC Seating LLC, has been developing and manufacturing seating systems for extreme duty markets since 1987.

► for more information: www.globalseating.com

## SIMTech achieves unprecedented Liquid Forging simulation on aluminum heat sinks using ProCAST

### Mastering this innovative process provides SIMTech with a valuable alternative to traditional casting and forging

SIMTech's patented Liquid Forging (LF) technology is a hybrid process, between casting and forging, that uses an open mold die to produce highintegrity, intricate aluminum structures and components. In a single process, utilizing re-useable dies, a pre-quantified amount of molten metal is poured into a die cavity and pressurized during solidification to form components.

Traditional heat sinks formed by extrusion, die casting and cold forging have design constraints due to process limitations. Manufacturing heat sinks via LF process remove these limitations, while offering many advantages linked to cold



Smaller vent sizes reveal insufficient filling due to back pressure, while 100% filling is observed in dies with well designed vents forged thermal performance, including reduced cost, better thermal conductivity, or reduced necessity for secondary operations. The process is applicable to the manufacturing of cast, wrought and non-standard aluminum alloys used in in the electronics, aerospace and automotive industries.

#### Implementing LF process simulation

To reap the full financial benefits of this new technology, SIMTech used process simulation during the development stages. This allowed them to have a better idea of the problems that could occur in manufacturing. As there was no directly applicable simulation software in the market, SIMtech evaluated several alternatives before selecting ProCAST. ESI then provided support to design the new process.

#### **Optimizing design & process**

Aluminum alloy from series 60xx, not commonly used for casting, was used to produce heat sinks following the Liquid Forging process. After defining the right thermal and fluid properties for this alloy, the process was modeled with ProCAST, using appropriate boundary conditions and process parameters. The main aspects studied were for filling and solidification behaviors.

Theoretically, the filling pressure and speed should counteract the back pressures and prevent any undesirable pre-solidification in the filling phase. The challenge was to determine optimal filling pressures and obtain the right melt filling speeds and assure filling the entire cavity.

Simulation allowed engineers to investigate alternative vent design and evaluate the behavior of molten metal under different back pressures. This guided the selection of vent size and locations. The optimized vents effectively prevented unwanted air or gas entrainment in the fins.

Simulation also provided good insight into the temperature evolution during solidification. This helped engineers to adapt the part and tool design to maintain a progressive solidification towards the pressurized sink bottom, and avoid any formation of shrinkage pores.

#### Results

The process simulation of Liquid Forging inside ProCAST provided an accurate representation of the entire process. Simulation delivered answers to the technical challenges of this new process and thereby created new market opportunities.

#### ABOUT SIMTECH

The Singapore Institute of Manufacturing Technology (SIMTech) is a research institute of the Agency for Science, Technology and Research (A\*STAR), creating intellectual capital through the generation, application and commercialization of advanced manufacturing science and technology, nurturing research scientists and engineers. SIMTech has completed more than 900 projects with more than 500 companies, big and small, in the electronics, semiconductor, precision engineering, medical technology, aerospace, automotive, marine, logistics and other sectors.

► for more information: www.simtech.com

## ŠVEC a SPOL swaps trial-and-error for PAM-STAMP 2G to complete a highly complex deep-drawing automotive project

Reducing manufacturing time and cost by conducting tests on a virtual prototype early in the development process

ŠVEC a SPOL s.r.o. earned an order for the production of tools for a wheelhouse for ŠKODA. The job was highly complex due to the shape and the draw depth required. After several weeks using the traditional trial and error method of testing various drawing operations using prototype tools, ŠVEC a SPOL teams were not able to produce a single part without cracks, unacceptable corrugations or unwanted folds. They therefore decided to integrate simulation into their development process.

ŠVEC a SPOL's first attempts to outsource the simulation work were unsuccessful and added to the pressure on the team responsible for this job. They then turned to ESI's local experts in Czech Republic who introduced ŠVECaSPOL engineers to ESI's Sheet Metal Forming software solution, PAM-STAMP 2G, and began a training program aimed at transferring software tool and process knowledge. Progressively gaining in autonomy, ŠVEC a SPOL teams were soon surprised that the results of simulation were identical to physical pressings. They quickly adopted PAM-STAMP 2G permanently within their production cycle.

The success with this wheelhouse was such that two years later, ŠKODA again selected them for the production of a new generation of the same component. The geometry of the part again involved difficult deep drawing but once verified by simulation the tool geometry could be used directly for production of new serial tools without the need for physical prototypes.

Thanks to the precise results of the simulations, ŠVEC a SPOL s.r.o. was able to complete the second order successfully, in an impressively shorter time period (4 instead of 14 months) with higher quality than the first generation of this part, and without a single physical prototype.

With its decision to implement PAM-STAMP 2G, ŠVEC a SPOL s.r.o. was able to rank among the most successful tool producers. We considerably increased our quality standards and gained new experience that helped us to attract new customers and new orders.<sup>11</sup>

> L'ubomír ŠVEC, Owner and General Manager of ŠVEC a SPOL, s.r.o.



Screenshot of wheelhouse tools as simulated with PAM-STAMP 2G



ŠKODA automotive component wheelhouse

#### ABOUT ŠVEC A SPOL S.R.O.

The company ŠVEC a SPOL. s.r.o. founded in 1993 is based in Vrable, the region of Nitra, Slovakia. The company 's mission is to guarantee professional solutions for customers. It deals with production of special tools, single-piece and small-lot production, production of iron constructions for the building industry and also production of mechanical typewriters for blind and visually impaired people. Today it has 200 employees. In 2008, the company had a turnover of 10 million EUR. The company ŠVEC a SPOL s.r.o. is a certified compliant to Quality Management Systems standard ISO 9001:2008.

► for more information: www.svecaspol.sk

**TECHWIN** 

## SAMSUNG Techwin streamlines product management processes with Visual*DSS*

By enabling two-way communication and data centralization, CAD and CAE engineers can share realistic, structured, and real time information to support component design

SAMSUNG Techwin, a subsidiary of SAMSUNG Group, has been producing surveillance cameras, robots, Surface Mount Technology (SMT) machines, turbine machinery and military-related machines for the past three decades. Their global presence and innovation potential has often been challenged by an insufficient level of coordination and data exchange between their worldwide R&D centers and various departments.

Samsung Techwin turned to ESI's subsidiary in Korea to streamline communication processes essential to production of SMT machines, which are used for assembling electronic circuits with components mounted directly onto the surface of printed circuit boards.

#### Centralization of CAE and CAD Data

VisualDSS, ESI's End-to-End Decision Support System, was installed in the various business divisions involved in design and development of SMT machines. This allowed vital Computer Aided Engineering (CAE) and Computer Aided Design (CAD) information to flow smoothly between various divisions. Aside of this, SAMSUNG used ESI's physics-based module in Virtual Performance Solution for system level dynamic analysis. Overall design data & simulation results could be shared throughout the multiple divisions involved in management process (see Fig 1).

### Feeding back simulation results to design teams

An important task was to enable the transfer to the design engineers of the boundary conditions data needed for the dynamic analysis of each component within the SMT system. Visual*DSS* enabled the set up and fine tuning of the system level dynamic analysis so that SAMSUNG design engineers could access the correct boundary conditions for each component they studied.

#### Enabling Web-Based Project Management

VisualDSS communicates effectively with other databases and Product Lifecycle Management (PLM) software and provides a web client that is highly interactive and easy to use. Engineers, regardless of their location, can make quality decisions, interact simultaneously with several teams and have an easy access to standard and automated workflows.



"With this project, we were able to set-up the whole dynamic analysis process for semi-conductor related machines. This allowed CAE experts to focus strictly on systemlevel analysis while transferring the componentlevel static analysis to the design engineers."

> Seonjae Lee, Senior Research Engineer, SAMSUNG Techwin

#### ABOUT SAMSUNG TECHWIN

SAMSUNG Techwin, a branch of SAMSUNG Group with a global presence, is a total technology security solutions provider. Delivering toplevel technology in precision mechatronics, the company employs 4720 employees and is headquartered in South Korea.

- ► for more information:
- www.samsungtechwin.com
  - -



## Grupo Antolin adopts Virtual Performance Solution for seat design and manufacturing testing



Optimizing the seat in terms of comfort, performance and weight, while meeting safety standards fo car crash and occupant safety

Grupo Antolin is an international Tier One supplier to the automotive industry and its French subsidiary designs and manufactures seats for car manufacturers. Users of ESI's software PAM-CRASH since 1998, Grupo Antolin simulate seat load cases on seats for frontal, rear and luggage impacts. They recently upgraded to Virtual Performance Solution (VPS), so they can run both Explicit and Implicit simulations with a single core model and can use ESI's Visual-Environment to support their need for evaluation in different domains.

"Thanks to the new enhancements for task automations, accurate safety tools corresponding to our needs and easy-to-use data export and automation in the post-treatment, we saved about 50% time for each simulation loop."

> Franck Chantegret, Simulation Manager, Grupo Antolin Seats Business Unit

Grupo Antolin's major objective, which is driven by the requirements of OEMs, is to lower the weight of seats to reduce the global weight of vehicles and consequently CO2 emissions. Decreasing weight requires the use of new materials; perhaps replacing mild steel by aluminum for example. Such changes can have an important impact on safety performance. Thus, it is important to assess whether seats will meet the standards which are part of the OEMs requirements, including the R14 and R17 safety standards.

Recently, Grupo Antolin designed and built for Renault all the seats for the Renault Master, one of Renault's minivan models. The driver seat especially, had specific constraints to be respected during the concept phase. The seat was placed on a metallic podium in which some compartments were to be located as space for accessories. In addition to storage space criteria, weight and passenger safety criteria had to be respected. When the concept phase was approved by Renault, Grupo Antolin started the definition of the final design. A virtual prototype of the seat was built and optimized with the help of simulation to achieve the best compromise for size, weight and performance.

It is of particular interest that the metallic podium was modified to reduce its weight. To achieve the desired result, between 200 and 250 variants and load cases were evaluated. Thanks to simulation, the seat weight could be optimized to meet the requirements. The total weight saving for the driver seat represented 20% of the previous model of the Renault Master driver seat.

Grupo Antolin use the Visual-Environment of VPS to support development and assessment of seat models. With the help of the belt generator, a tool available in Visual-Environment, Grupo Antolin now spends less than 15 minutes instead of half day on adjusting a design.



Sled test with a Hybrid III 50th percentile on a driver seat (AMS 50 km) Courtesy of Grupo Antolin

#### ABOUT GRUPO ANTOLIN

Grupo Antolin, leading global supplier of components for vehicle interiors, offers its clients an Integral Service embracing the conception, design, development, manufacture and distribution of Overhead Systems, Doors and Seats. This Spanish multinational operates in 23 countries with 88 plants and 20 technical-commercial offices.

► for more information: www.grupoantolin.com

### & efleld

## Efield enables Swedish Defense Research Agency (FOI) to develop invisible Unmanned Aerial Vehicles

Electromagnetic simulation helps FOI craft a signature for vehicles that makes them invisible to radar

FOI, Sweden's Defense Research Agency, is one of Europe's leading R&D institute in defense and security. Among other things, their branch in Kista, Sweden, specializes in Unmanned Aerial Vehicles (UAVs). One important task is to make them invisible to Infrared Radar (IR), radar and acoustics.

What is challenging is to design a UAV with good aerodynamic properties, while making it as invisible to electromagnetic waves as possible. The two requirements are not always compatible as they involve diverging physics. To find the right balance, FOI is using ESI's Efield simulation solution.

"We carry out computer calculations, rather than measurements and experiments," says Dr. Adam Zdunek. "With Efield, we simulate real cases and sometimes compare with measurements. We have obtained very good results according to the post-test validations we have made on prototypes. These show that using calculation tools instead of conducting extensive experiments works extremely well in many cases.

We use two types of calculations for invisibility: one on improving existing vehicles and one on new constructions. Efield can take into account the way that radar signals bounce and interact with other parts. The actions taken are aimed at eliminating any reflected signals," Dr. Zdunek continues.

"One of the best benefits with Efield is the ability to split up the simulations. This means that we do not need to recalculate the entire system if we change a part. When a part is recalculated, Efield solutions make use of descriptions completed earlier to recreate the entire model. This is a very useful property that saves much time and effort. Efield's flexible architecture makes it an excellent tool for qualified research. The more multifaceted the problem, the greater use we can make of the software. We are not locked into a specific workflow but can use Efield solutions in a flexible way."

#### Benefits with Efield

- Unified modeling environment for time and frequency domain
- Easy to import and reuse complex Computer Aided Design (CAD) models
- Efficient domain decomposition
- Novel hybrid solution methods
- Parallelized solvers
- Highly qualified support

"We do not need to recalculate the entire system if we change a part."



Simulation of Radar Cross Section of a jet fighter airplane at 3 GHz with Efield® MLFMM with more than 10<sup>6</sup> unknowns "One of the best benefits is the ability to split up the simulations."



Associate professor Dr. Adam Zdunek, Head of the Aeronautic Vehicle Stealth Group (AVS)

#### ABOUT FOI (SWEDISH DEFENCE RESEARCH AGENCY)

FOI is one of Europe's leading research institutes in the defense and security area. The core business is research, method and technology development and studies. The number of employees is around 900, of which 800 are research-workers. FOI is financed on contracts' basis and is responsible to the ministry of defense.

► for more information: www.foi.se

## Renault solves communication challenges between CAD and CAE within the scope of its EHPOC project

Visual*DSS* enabled Renault to easily compare models, select which to reuse, and keep track of changes throughout the design process

Renault recently concluded a project to sustain High Performance Environment for Optimization and Design (EHPOC). The main goal of this 16M€ project funded by the French government and industrial partners, was to deliver multi-scale and multi-physics software dedicated to global design in order to produce best in class numerical design tools. EHPOC aimed to be a cornerstone for industrial innovation and competitiveness, leading to the reduction of design and development cycles and reaching substantial productivity improvement.

The EHPOC challenge was two-fold: firstly, to improve the management of new and existing simulation models and related CAD data changes, and secondly, to produce new models by distributed teams. Both of these aspects characterized an ad-hoc activity: design changes happen for a variety of unplanned reasons that are unpredictable for meshing coordinators. Typical team dynamics mean these changes bring up questions between the local & remote CAD/ CAE teams and the distributed meshing teams...

To deal with the dynamics in a rapid and efficient way, Renault turned to ESI's Simulation Systems Integration modules, VisualDSS and Vdot. A version comparison feature matched the current CAD with readily available simulation models and determined which of those had adequate meshes. Once the list of needed and modified meshes needed was drawn, ESI's software automatically activated sub-processes to supply this list to remote teams and instantaneously request the new or updated meshes needed. The teams could then execute each sub-process following a controlled workflow with great visibility. Aside of this, ESI's software also helped Renault handle questions between customers and suppliers in the design changes process in order to anticipate further requirements.

ESI's Simulation Systems Integration software Visual*DSS* and Vdot helped engineers from distributed teams perform their tasks with the right data, at the right time, following enterprise best practices and with real-time visibility for management and development teams.

Overall, the Renault evaluation team found that this solution gave the meshing coordinator three important benefits:

- 1. Easy comparison of existing simulation models and new CAD geometry
- Support in deciding which models can be reused, and thus minimizing the number of meshes to be rebuilt
- 3. Keeping track of the changes throughout the design process
  - "VisualDSS and Vdot allowed us top promote an easier way to manage modeling projects in Renault. It has provided a tool for seamless updates of a master assembly, driven by an automated process with progress indicators"

Lucas Moulin, Project Leader for numerical Prototypes at Renault.



Dynamically manage issues with remote team



Manage assembly & part changes

#### ABOUT RENAULT

French automotive OEM Renault was founded more than 110 years ago and has since developed internationally. Today it has over 30 production sites and 18,000 business sites (subsidiaries, dealerships and agents) in 118 countries. Renault designs, produces and sells a broad range of vehicles, including since 2011 a range of electric vehicles accessible to all that embodies the company's commitment to the environment.

► for more information: www.renault.com

# ESI Release of ESI's pilot version of Adjoint Solver for design optimization, made with Intel's Fortran 90 compiler

Numerical optimization has proved to be an essential technology to achieve some ever -increasing requirements of the automotive sector. It can be implemented at each and every step of product design to evaluate the aerodynamics, aero-acoustics or even the aerothermal performance levels resulting from a specific product design.

The challenges associated with Optimization in the domain of Computational Fluid Dynamics (CFD) are high at industrial level because of the number and duration of the computations required. Furthermore, the genetic algorithms traditionally used in structural optimization are not suited for CFD optimization. Gradient-based methods, which converge to the optimum in many fewer iterations, require the computation of the cost function's gradient, which is not provided by standard industrial CFD solvers. This preferred method has been recognized as most reliable by major aerospace companies over the past decade and is now being adopted by the automotive sector.

In an effort to make this method accessible to various industries, and to simplify code maintenance, ESI has recently worked towards an independent discrete adjoint solver that takes the form of a dynamic library coded in advanced Fortran 90.

This library aims to abstract all the derivative tools required for assembling and solving the adjoint system, irrespective of any discretization scheme of the application code. It has been fully validated within ACE+ Suite, ESI's multiphysics software. In support of this project, ESI and Intel have engaged in a fruitful collaboration over the last 2 years, and have succeeded in bringing the Intel F90 compiler to a unique level of performance with respect to most advanced F90 features.



Validation example of ESI's adjoint optimization solver. In this example, the solver helped reduce the drag of the vehicle by 13% after a simple optimization cycle

### ACE+ Suite Multiphysics and Advanced CFD software improves industrial product development processes from Automotive to Semiconductors industry

ACE+ Suite is a unique multiphysics modeling and simulation software combining tools in advanced Computational Fluid Dynamics (CFD), Electro-Magnetics (EMAG), Gas Dynamics and Finite Elements Structural Analysis, all working in a seamlessly integrated manner. It helps to take decisions when several physics are involved in product manufacturing or performance, speeding up product development processes and increasing final product quality.

"The latest release of ACE+ Suite includes a unique combination of specialized solvers incorporating highly accurate physics for specific applications spanning automotive, aeronautics and semiconductor industries", affirms Anshul Gupta, Product Manager for CFD/Multiphysics Solutions at ESI.

The new version addresses the increasing need of industries to look beyond one domain of physics to the important interactions underlying the "cause and effect" relationships that drive the performance of products. The software is delivered in separate but connected modules designed for customers working on fast developing applications such as plasma and semiconductor processes, MEMS, biotechnology, microfluidics, fuel cells and batteries as well those of mainstream automotive and aerospace applications.

The latest version of ACE+ Suite comes with an advanced automatic meshing tool, CFD-VisCART that enables parallel processing for Single Domain meshing, drastically reducing calculation times.

Plasma-based processes such as those used in the semiconductor and photovoltaic industries will benefit from improvements related to coupling electromagnetics (EMAG) with plasma models.

Meanwhile, the new ACE+ Suite is designed to reduce computational costs of radiation heat transfer models. The new CAFVM Discrete Ordinate Method for Radiation helps industries such as Semiconductors solve problems related to reactive flow analysis and plasma models. Addressing the specific needs of the aeronautic industry, the CFDFASTRAN density-based solver used to investigate supersonic speed flows in the aerospace and defense industries, has gained in accuracy with improved compressibility corrections for Turbulence models.



► for more information: www.esi-group.com/products/multiphysics/

# ESI consolidates its composites manufacturing simulation offer with the latest releases of PAM-FORM and PAM-RTM

PAM-RTM and PAM-FORM 2012 are two applications dedicated to the manufacture of composite parts. They constitute a unique industrial solution to define and optimize manufacturing processes of dry textiles and pre-impregnated composite fibers (prepregs), with the objective of achieving better part quality and lower production time cycle and cost.

PAM-FORM enables realistic and predictive forming and pre-forming simulation of laminated composites, allowing engineers to select the most appropriate material, the right tooling design, and the best process parameters. PAM-FORM addresses a large range of composites manufacturing processes: stamping, diaphragm forming, hand lay-up and rubber pad forming. The latest enhancements mainly focus on dry textile preforming.

PAM-FORM enables realistic and predictive forming and pre-forming simulation of laminated composites, allowing engineers to select the most appropriate material, the right tooling design, and the best process parameters. PAM-FORM addresses a large range of composites manufacturing processes: stamping, diaphragm forming, hand lay-up and rubber pad forming. The latest enhancements mainly focus on dry textile preforming. PAM-RTM is a simulation software application for resin injection or infusion of composite preforms with or without inserts and core materials. It provides an accurate prediction of the manufacturing process of thick, complex or large composite components commonly encountered in wind energy, aeronautics and automotive industries.

PAM-RTM covers a wide range of Liquid Composites Molding manufacturing processes: Resin Transfer Molding (RTM), Vacuum Assisted RTM (VARTM), Vacuum Assisted Resin Infusion (VARI), Compression-RTM and Articulated-CRTM (CRTM and A-CRTM). Simulating these processes allows engineers to determine the optimal injection strategy, minimize the injection time, control the curing cycle and manage the resulting porosity of the finished part.

Professor Jeferson Avila Souza, from the Federal University of Rio Grande, Brazil, comments, "We have chosen PAM-RTM due to its ability to run 3D models in a realistic way and simulate resin injection in parts such as small boat hulls, propeller blades and automotive parts. [...] The simulation process is steady, leading to quick and reliable results." <sup>44</sup> PAM-FORM helped us achieve our project goals: lower weight and cost of production while preserving the mechanical performance of the part. Additionally, it provided us with more information on optimizing our production process that can be reapplied to similar projects.<sup>9</sup>

> Josef Krena, Development Manager at LETOV LETECKÁ VÝROBA Ltd., part of Latécoère Group.

for more information: www.esi-group.com/products/ composites-plastics/

### New VA One: Latest release of noise and vibration simulation software, that now includes embedded Design Optimization and support for cloud computing

VA One is a complete solution for simulating noise and vibration across the full frequency range and seamlessly combines Finite Elements, Boundary Elements (BEM), and Statistical Energy Analysis (SEA) in a single model. This new release includes an easyto-use Design Optimization module that is fully integrated within the VA One environment, along with significant enhancements to VA One's Boundary Element solvers that deliver faster solution times.

VA One 2012 provides a fully integrated Design Optimization module within the VA One environment. Parameter Variations, Parameter Optimizations and Monte Carlo simulations can all be performed quickly and easily using the VA One Graphical User Interface. VA One's intelligent data caching also ensures fast solve times when using Design Optimization. VA One 2012 includes inbuilt support for solving BEM models in parallel on multi-core desktop machines, remote Linux machines, departmental

<sup>44</sup>Optimizing interior sound package is important in order to meet vehicle cost, noise, weight, and fuel efficiency targets. VA One is a standard tool for MMC and helps us meet our targets.<sup>11</sup>

Fumihiko Kosaka, Noise and Vibration Engineer, Mitsubishi Motors Corporation (MMC). networks, clusters and clouds. VA One automotive and aerospace BEM models, that previously required overnight execution on standard clusters, have been solved in minutes using Cloud computing (using over 800 parallel cores, while incurring negligible hardware

costs). A new flexible 'surge' licensing option is being piloted in VA One 2012 to support this functionality.



Using an inbuilt Genetic Algorithm in VA One 2012 to automatically modify the shape of a muffler in order to maximize low frequency acoustic Transmission Loss

► for more information: www.esi-group.com/products/vibro-acoustics

## Efield, European specialist in electromagnetic virtual simulation solutions, joins ESI Group

#### Strengthening ESI's electromagnetic solutions and adding a Scandinavian presence

In December 2011, ESI Group acquired the Swedish company Efield. Founded in 2006, Efield has developed a set of solutions for virtual simulation of electromagnetic emissions of electric or electronic installations or devices, with the objective of assessing electromagnetic interference or disruption. These solutions, originally aimed at the aeronautical and defense sectors, are quickly becoming essential for the increasing proportion of manufactured products that incorporate mechatronics or electronic components.

Based near Stockholm in Sweden, Efield has been represented by resellers in Europe and Asia (Japan, Korea, India and China). It employed only 5 people but served a prestigious client base, which includes Saab AB, BAE Systems, Ericsson and the China Helicopter Institute.

Efield delivers solutions for the investigation of complex electromagnetic phenomena in a number of important areas including:

- Antenna design with horn, reflector, wire and microstrip antennas as well as broadband antennas and antenna arrays.
- Antenna integration with Radiation pattern of installed antennas on large platforms such as aircraft or ships, and coupling between installed antennas.
- Microwave design with applications including design of filters, connectors and couplers.
- EMI/EMC interaction with analysis of a wide range of EMC/EMI problems including shielding and coupling problems.
- Scattering & radar cross-section (RCS) analysis of structures such as aircrafts, ships, air-intakes, exhausts, and antennas.



Figure 1: A CAD model oft the SWARM satellite Courtesy of SAAB Space AB, Sweden

This acquisition extends ESI Group's existing electromagnetic offering, and addresses a fast growing and increasingly regulated sector; one that is important because of the growing use of electronics in manufactured products. Acquisition of Efield furthers the drive of ESI Group towards diversification; in industry, with presence in aeronautics, electronics and defense, and in international distribution, through direct presence in Scandinavia. The company's annual revenue was approximately 0.4 million euros in 2010, with significant proportion from repeat sales to existing clients.

Alain de Rouvray, ESI Group's Chairman and CEO, comments: "This acquisition strengthens our positioning in virtual simulation of electromagnetic phenomena in areas such as active security in transport, interference in electronics, and stealth in defense. The action is fully in line with ESI Group's strategy, which aims to continually enhance our expertise and our ability to deliver comprehensive End-to-End virtual prototyping solutions that are unique in the market."



Figure 2: Simulation of surface currents on the SWARM satellite Courtesy of SAAB Space AB, Sweden



Figure 3: The Results Manager GUI provides model visualization, results presentation, model and result verification, and data manipulation functions

► for more information: www.efieldsolutions.com

## OpenCFD Ltd., the leader in open-source software in Computational Fluid Dynamics

In September 2012, ESI Group has acquired OpenCFD Ltd., the leader in the Open Source Computational Fluid Dynamics (CFD) software segment, from SGI, the trusted leader in Technical Computing. ESI Group consequently becomes the owner of the **OpenFOAM®** trademark, widely recognized in automotive, energy, aerospace and other industry sectors, and assumes responsibility and initiative for the further development, quality and support of the Open Source software. ESI and SGI will be expanding their partnership and go to market collaboration to improve accessibility of CFD solutions, at affordable cost, reliable quality, and competitive performance.

#### Embracing the opensource business model

- OpenFOAM<sup>®</sup> is a free, open source CFD software family and analysis toolbox. It is developed and packaged by the OpenFOAM<sup>®</sup> team within OpenCFD Ltd., a UK company, and it is distributed by the OpenFOAM Foundation.
- OpenCFD Ltd contributes software, integrates modules and generates documentation to the OpenFOAM® software. It owns the OpenFOAM® trademark and provides services that support the effective deployment of CFD technology.

### Broad user base and a brand with substantial visibility in a fast-growing market

With a continually enforced quality level that benefits from a vast and interactive user base and developer community, OpenFOAM® is highly popular software which has achieved strong penetration into major global industrial companies. One million copies of the software have been downloaded since 2005, providing free access to a powerful analysis tool box that meets the requirements of diverse industry sectors in the field of complex and state of the art fluid dynamics numerical simulations, involving multi-species, chemical reactions, turbulence and heat transfer.

### Strong customer value creation and a unique opportunity for business expansion

ESI Group has already developed substantial OpenFOAM® expertise thanks to its historical knowhow in CFD and reinforced with its recent acquisition of Mindware. This is a natural and welcome complement to the OpenCFD team competencies, and it will further ensure successful downstream integration. ESI proven knowhow and success in industrial software development will further strengthen quality assurance and enable global support of a viable, trusted, and scalable solution for enterprises of all sizes, will be made available via a flexible subscription model.

This acquisition consolidates ESI Group firmly at the leading edge of the evolution of the virtual engineering market and aligned with the increasing interest in Open Source software that may offer better freedom to customize and adapt to the business needs of each customer. This will accelerate the gradual adoption of "End-to-End Virtual Prototyping" by a broader community, through an unparalleled offering of scalable, advanced and integrated solutions, effective web and cloud access, and supporting professional services worldwide. Henry Weller, the creator of OpenFOAM®, co-founder of OpenCFD Ltd and a Director of the OpenFOAM Foundation, comments: "We are delighted to join ESI Group to accelerate OpenFOAM® development and expand support and training services. The advanced capabilities of our Open-Source CFD software OpenFOAM® are widely applicable for automotive, energy, oil & gas, process industries, consumer goods, and heavy industry. This makes our incorporation within the ESI Group well aligned with the Group's broad industrial vision."

Alain de Rouvray, ESI Group's Chairman and CEO, adds: "This acquisition is in line with our selective external growth strategy, and it reaffirms our ability to adapt to, welcome and anticipate changes in the Virtual Engineering market. Indeed we believe that the 'Open source' software model and the associated use of cloud computing will accelerate the low cost and gradual adoption of numerical simulation and, when applicable, will facilitate the further migration to the high value creation of ESI's "Endto-End Virtual Prototyping" solutions.

OpenCFD Ltd. and its team of experts will allow us to reaffirm our leadership in CFD as a means to an end, namely Enabling Virtual Engineering for all. And it will also support the diversification of our business sectors and the adaptation of our business models. Important to our 'go-tomarket' strategy, OpenFOAM®'s broad popularity will provide us with preferred access to its vast and global user base, giving further opportunities for our extended software and services offer, creating substantial value for our clients, staff and shareholders, while opening new, collaborative, innovative and promising perspectives."



OpenFOAM's brand new graphical user interface

## ESI Virtual Reality Solutions demonstrated at Imagina, Monaco

In February ESI participated in Imagina an annual international event, held in Monaco, to showcase the many fields in which 3D visualization and simulation technologies are applied. The objective of this event was to promote these technologies to decision makers and technical experts and to encourage participants to share their experiences.

Imagina brought together professionals from all around the world. Gathering participants from the transport, design and manufacturing, architecture, urbanism, landscaping and even dentistry sectors, the event clearly demonstrated some opportunities for cross-fertilization between diverse industry sectors.

As one of main event sponsors, ESI, offered a live demo of its Virtual Reality Solutions IC.IDO and held a presentation entitled "Immersive Virtual Prototyping" during the parallel conferences.

For more information about ESI events: www.esi-group.com/products/ virtual-reality-solutions



Albert II, Sovereign Prince of Monaco, trying out IC.IDO solutions at Imagina 2012

## Local users declare the second ESI India Forum a success

<sup>4</sup> It was a valuable congregation of various Experts from niche domains. Wonderful atmosphere! How can we virtually get so close to physical reality? It was a wonderful conference.<sup>11</sup>

> Mr.Mahesh Verma, Asst General Manager, Larsen & Toubro Ltd.

The Second ESI India Forum 2012 was organized in Pune on March 28, 2012 and gathered over 110 local users. Customer presentations included: Bosch Chassis Systems India ltd, Maruti Suzuki India Ltd, Ashok Leyland, Tata Motors Ltd, BARC (Bhabha Atomic Research Centre). A Keynote was also addressed by Mr.Prakash Krishnaswamy, Founder of EASi and current CEO of Xitadel.



► for more information about ESI events: www.esi-group.com/corporate/events

## IC.IDO immersive Virtual Reality solutions at Hannover Messe's "Digital Factory"



Following the acquisition of 3D visualization company IC.IDO last summer, ESI participated in Hannover Messe, on 23-27 April, in Hannover, Germany. ESI was part of the fair's 'Digital Factory' one of the world's most important showcases of IT solutions for production and product development. The area represented over 500 square meters dedicated to Virtual Reality and 3D visualization.

Under the brand "IC.IDO", ESI offers immersive 3D visualization, enabling decision-makers to experience their product in real time. Vincent Chaillou, President and COO of ESI Group, affirms: "*This high performance 3D visualization*  technology is key for our customers to bridge the gap between the virtual and physical prototyping worlds. We combine a remarkably intuitive and robust immersive user interface with unique real-time physics for contact detection and flexible connections".

IC.IDO opens new doors for product development. It enables customers to present their virtual product, manipulate it in real time, exchange information across virtual teams, and resolve manufacturing and serviceability issues in an immersive and distributed environment. IC.IDO minimizes risks, reduces failure costs and decreases the use of resources. It also allows for faster and easier global collaboration and communication, ensuring better visibility and visualization of early stage products.

IC.IDO customers include world-renowned companies in the automotive and aerospace sectors as well as in mechanical and system manufacturing industries (OEMs). Representative customers and strategic partners include Audi, Airbus, BMW, Boeing, Bombardier, Caterpillar and John Deere.

## ESI's Composites Solutions benefit from key partnerships and French local state grant

The current success of ESI Composites Solutions is the consequence of ESI's continuous investment in Research & Development and the creation of a portfolio of software and services that successfully address the challenges of the manufacturing industries using composite materials. Ever since the opening of its dedicated R&D center near Bordeaux, France, the company has confirmed its commitment to strengthening its knowledge in composite materials by engaging in key partnerships with universities and industry players. Recently, ESI's partnership with the University of Nottingham, UK, has resulted in the addition of a permeability database to ESI's Composites Simulation Suite, allowing users to benefit from years of research in the field.

"We have worked with ESI on flow simulation, forming simulation and impact modeling for many years, and consider their software to be at the leading edge of composites analysis. During that time we have developed materials characterization techniques to determine necessary input data, in particular reinforcement permeability for resin flow simulation. We are very pleased to be able to provide some of our data for other users – as well as providing useful data for analysis of composites manufacturing. We hope that this will promote further collaboration amongst the composites manufacturing community," declares **Professor Andrew Long**, Dean of the Faculty of Engineering, University of Nottingham.

Other key partnerships include a close collaboration with Universities of Dresden and IFB Stuttgart in Germany, the PPE (Pôle de Plasturgie de l'Est), Dassault Systèmes, and Chinese government's aircraft consortium AVIC. To sustain its leading position in composites, ESI has also engaged in several French, German and European projects including MAAXIMUS, LYCOS, HIVOCOMP, INFUCOMP, LCM-SMART, RAIDOUTIL, MAI-composites or MAPPIC3D. Recently announced funding from the French local government further encourages the company's research activity, including 250 000  $\in$  funding from the Aquitaine region to support ESI's R&D center near Bordeaux.



Nose cone, showing the effect of reinforcement forming on resin flow, using ESI's Composites Simulation Suite Courtesy of Professor Andrew Long, University of Nottingham

for more information: www.esi-group.com/ products/composites-plastics

### Save the date!

Oct 23, 2012	Virtual Performance Solution Webinar Series	PAMCRASH - Performance and New Methods; PAM-IMPL - NVH and Accoustics; Sim Folder, Sim Positioner and FPM; Virtual Seating - Comfort	Webinar starting 3:00 pm
Oct 24, 2012	IABC 2012	International Automotive Body Congress	Troy, MI, USA
Oct 24, 2012	Casting Simulation Seminar	Learn more on our Casting Simulation Suite	Ramat-Gan, Israel
Oct 25, 2012	Acoustics and Aero-Acoustics Modelling	Seminar on Latest developments in Acoustics and Aero- Acoustics Modeling	Eindhoven, The Netherlands
Oct 28, 2012	PACK EXPO International 2012	Worldwide Processing and Packaging event	Chicago, USA
Oct 30, 2012	German Energy Seminar	Using CAE for the development of wind power stations	Hamburg, Germany
Oct 31, 2012	Hotforming Seminar	Meet the world's leading press hardening experts with AP&T.	Belo Horizonte, Brazil
Oct 31, 2012	SAE Brazil 2012	Symposium SAE Brazil about Casting Technology and Sustainability	Joinville, Brazil
Nov 01, 2012	Virtual Performance Solution Webinar Series	PAM-IMPL - NVH and Accoustics; Sim Folder, Sim Positioner and FPM; Virtual Seating - Comfort	Webinar starting 3:00pm
Nov 06, 2012	Airtec	Airtec has established itself as the trade fair for the supplier industry	Frankfurt, Germany
Nov 06, 2012	49th Czech Foundry Days	Czech Casting Conference	Brno, Czech Republic
Nov 06, 2012	Virtual Performance Solution Webinar Series	Sim Folder, Sim Positioner and FPM; Virtual Seating - Comfort	Webinar starting 3:00 pm
Nov 07, 2012	7. Ranshofer Leichtmetalltage	Energy efficiency with basic material and process technology	Gmunden, Austria
Nov 07, 2012	Advanced Engineering UK 2012	Engineering Conference	Birmingham, United Kingdom
Nov 07, 2012	JEC Americas 2012	Composites show and conferences	Boston, USA
Nov 08, 2012	Sprechtag Simulation	CAE methods for developing ships, planes and offshore wind power stations	Hamburg, Germany
Nov 13, 2012	Virtual PLM 2012	Virtual Trade Exchibition on PLM	Reims, France
Nov 14, 2012	Virtual Performance Solution Webinar Series	Virtual Seating - Comfort	Webinar starting 3:00pm
Nov 20, 2012	7. Erlanger Workshop Warmblechumformung	Basics of hot sheet metal forming of extrem solid heat treated steel	Erlangen, Germany
Nov 20, 2012	SimVec 2012	Calculation, simulation and testing in vehicle manufacturing	Baden-Baden, Germany
Nov 21, 2012	PUCA 2012	Japanese User's Conference 2012 on Virtual Product Engineering	Tokyo, Japan
Nov 22, 2012	Expert Conference Carbon Composites	Experts discuss all kinds of challenges with carbon fiber strengthened plastics	Augsburg, Germany
Nov 25, 2012	The SAE BRASIL International Noise and Vibration Colloquium 2012	NVH engineering conference	Florianopolis, Brazil
Nov 27, 2012	FISITA 2012	World Automotive Congress	Bejing, China
Nov 28, 2012	Impact damage, protection, simulation & evaluation exhibition	Simulation Software & Validation Test Exhibition	Bristol, United Kingdom
Nov 29, 2012	CFD Multiphysics Seminar for Microfluidic Devices	Hands-on Workshop for Design & Modeling of Microfluidic Devices	UC Irvine, Irvine, CA, USA
Dec 10, 2012	ESI Germany User Forum	Showcasing ESI's latest advances and a large number of case studies from DACH region	Fulda, Germany
May 27, 2013	Vehicle Safety Conference	23nd International Technical Conference on the Enhanced Safety of Vehicles (ESV)	

## Results for the first half of 2012/13

### Confirming global trends

Alain de Rouvray, ESI Group's Chairman and CEO, comments: "This first half confirms the global trends observed in recent half years, both on a sales level and on an operating level. The dynamic organic growth, combined with the very strong performance of our recurring installed base and the improvement recorded by our high-end services, increases our confidence in the achievement of our development plan for the second half.

Our organic results confirm our effective cost control within a context of strong growth. In the short and medium term, we are seeing a strong desire by our industrial partners to adopt End to End Virtual Prototyping, as well as the need for close collaboration on major innovative projects. This trend is also being confirmed by a substantial improvement in business with certain industrial segments, including the automotive industry, in today's challenging economic climate.

Lastly, our acquisition policy, which is an integral part of our growth strategy, contributed to this first-half growth thanks to the IC.IDO acquisition last year. Furthermore, the recent integration of OpenCFD Ltd. opens the way for rapid sales deployment thanks to the originality and strength of the open-source business model. All of these positive factors give us reason to be confident and determined regarding the second half of our 2012/2013 financial year."

### Unique value creation much appreciated by industrialists

The very high repeat rate reflects our clients desire to continue their transition towards virtual prototyping and the confidence they have in ESI's solutions. Based on a unique approach, our solutions provide a methodological breakthrough in the product manufacturing process.

The improvement in orders taken over the period notably highlights the need for innovation by sectors subject to substantial competitive pressure and strict regulations, and in particular the Automotive (+16%), Heavy Industry (+24%), Aeronautical (+16%) and Energy (+11%) sectors. Note that the ongoing development of partnerships with the automotive industry, despite this sector being hard-hit by the economic turmoil, reflects the need of major businesses for innovation and strong support in their migration to Virtual Prototyping.

Services activity, which recorded substantial growth too, also highlights the anti-crisis nature of ESI Group's solutions with an intensification of high value-added "co-creation" projects.



On September 24th in Paris, Alain de Rouvray represented ESI at the Prix de l'Audace Créatrice (Prize for Creative Audacity) for which ESI was one of the five nominees. French President François Hollande hosted the ceremony Crédit photographique® Fimalac

### Meet ESI at Actionaria, a show dedicated to private investment opportunities on the Paris Stock Market



November 23 & 24, 2012 Palais des Congrès de Paris 1st Floor - Booth A34



#### **ESI HEADQUARTERS**

100-102 Avenue de Suffren 75015 Paris - France Phone: +33 (0)1 53 65 14 14 Fax: +33 (0)1 53 65 14 12

#### ESI WORLDWIDE

ARGENTINA AUSTRALIA BELARUS BELGIUM BRAZIL BULGARIA CANADA CHINA CZECH REPUBLIC EGYPT FINLAND FRANCE GERMANY GREECE INDIA ISRAEL ITALY JAPAN MALAYSIA MEXICO

NETHERLANDS PAKISTAN POLAND PORTUGAL ROMANIA RUSSIA SLOVAK REPUBLIC SLOVENIA SOUTH KOREA SOUTH AFRICA SPAIN SWEDEN SWITZERLAND TAIWAN THAILAND TUNISIA TURKEY UNITED KINGDOM UNITED STATES VENEZUELA VIETNAM



www.esi-group.com