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Ansys LST

Issue 4, April 2020

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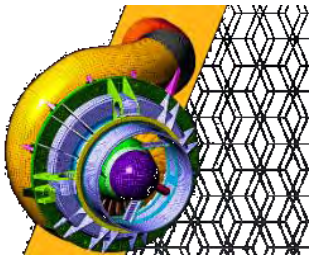

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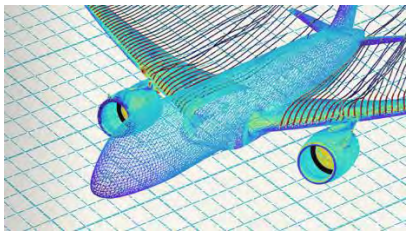

16th International LS-DYNA@ Conference Virtual Event

June 10-11, 2020 | Free Online Live Event

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The focus is engineering technical solutions/information.

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The focus is engineering technical solutions/information.

Livermore Software Technology, an ANSYS company

Development of LS-DYNA, LS-PrePost, LS-OPT,
LS-TaSC (Topology), Dummy & Barrier models and
Tire models for use in various industries.

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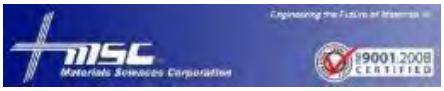

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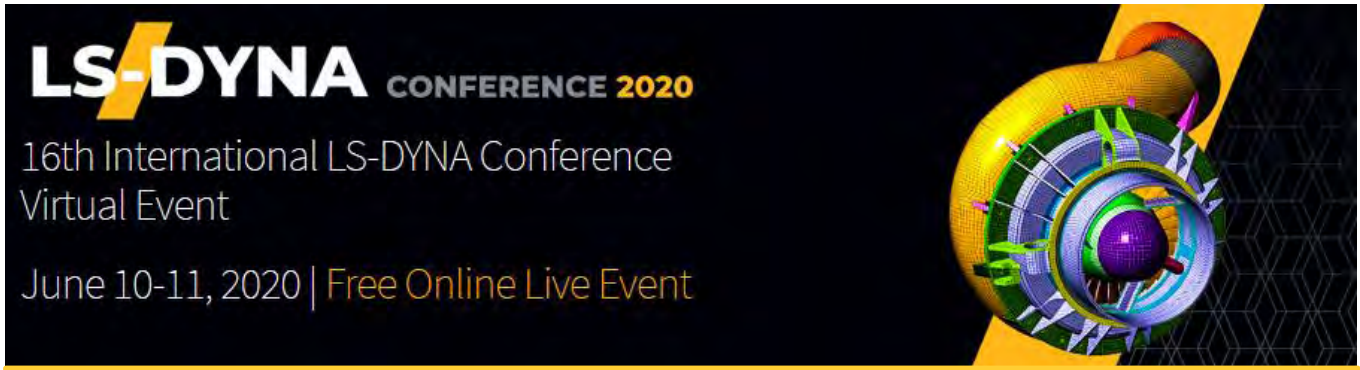


About The Conference

Two days.

Countless opportunities to learn. Zero barriers to entry.

June 10-11, 2020

For the first time ever, the annual LS-DYNA User Conference will be a free to attend, virtual event — coming to you live from your computer.

Today, business environments are changing more rapidly than ever, and technologists must innovate quickly to incorporate new features while reducing development costs and delivering new products to market before the competition. We look forward to bringing key industry & academic stakeholders together to discuss the newest technological advancements in finite element analysis (FEA). We will address issues related to complex, real-world problems, look at ways to increase efficiency, reduce cost and understand how LS-DYNA plays a key role in achieving these goals.

With over 1,000 attendees, exhibits and hundreds of technical presentations, this conference is an excellent opportunity for networking with LS-DYNA developers, product engineers, industry leaders, researchers & academia; across all industries from aerospace to automotive and beyond.

Save Your Virtual Spot

About ANSYS, Inc.

If you've ever seen a rocket launch, flown on an airplane, driven a car, used a computer, touched a mobile device, crossed a bridge or put on wearable technology, chances are you've used a product where ANSYS software played a critical role in its creation. ANSYS is the global leader in engineering simulation. Through our strategy of Pervasive Engineering Simulation, we help the world's most innovative companies deliver radically better products to their customers. By offering the best and broadest portfolio of engineering simulation software, we help them solve the most complex design challenges and create products limited only by imagination. Founded in 1970, ANSYS is headquartered south of Pittsburgh, Pennsylvania, U.S.A., Visit www.ansys.com for more information.

Published on April 1, 2020
by Jeff Tharp
Electronics, Multiphysics, Optical, Tips and Tricks
Ansys, Ansys SPEOS, Electronics, Integrated Photonics, Optics

Integrated Photonics Technology: Model Communications & Sensors

Combined integrated photonics technology and electrical systems are an important part of 5G, autonomous vehicles and the internet of things (IoT). Photonic sensors and transceivers are a key component of data security, data communication and environmental detection because of cost, scalability, performance and energy efficiency.

An everyday example is a fiber optical connector used in small form-factor pluggable (SFP) transceivers for datacenter and fronthaul 5G applications. This communication device uses light to transfer data over optical fibers between electronic systems. Engineers need simulation tools to model this and other integrated photonic systems, to ensure that:

A simulation of a fiber optical connector interacting with electronic systems

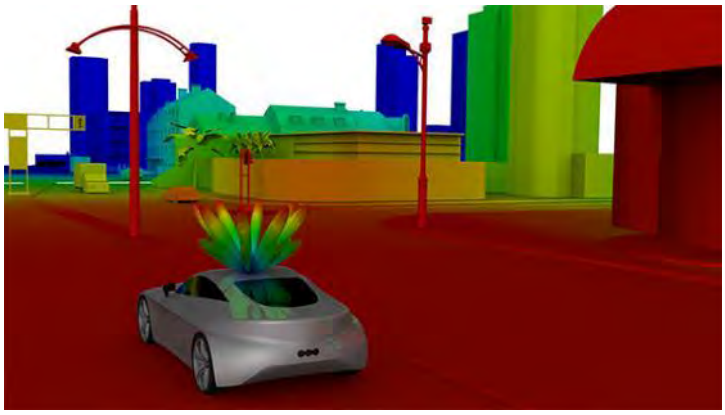
- Photonic emitters/detectors are compatible
- Data transmission is optimized for speed, accuracy and energy efficiency
- Operation is robust over a range of environmental conditions
- Fabrication and packaging costs are minimized
- Data contents are secure

Engineers can then integrate these models to validate, optimize and design the complete system.

That is why Ansys is excited to announce the acquisition of Lumerical. They offer a photonic multiphysics solution with the capability to solve electro-optical systems, including thermal, charge-carrier and light emission effects.

A Theoretical Integrated Photonics Workflow to Design Lidar Systems

Lumerical's user interface (UI) offers an integrated design environment (IDE) that can intuitively couple models that include optical, emissive, electrical, thermal and electromagnetic simulations. This multiphysics mindset fits the needs of those working on integrated photonics for 5G, autonomous vehicles and IoT applications.



Simulation of an autonomous vehicle's lidar systems shows how accurately (red) or inaccurately (blue) certain objects are detected.

For instance, autonomous vehicles require low-cost lidar system sensors within their environmental detection systems. Using integrated photonic simulations, engineers will be able to assess the performance of the emitting laser, as well as the nanoscale integrated phased array (or liquid crystal) used to form and steer the beam. The propagation of the laser beam and its interaction with the environment is then modeled using macroscopic optical simulation technology — such as Ansys SPEOS. Then, engineers can use Lumerical technology to model how the integrated sensor receives the laser signal calculated from the macroscopic optical simulation.

Currently, when simulating lidar systems, Ansys users need to acquire integrated photonic information from measurements or vendors. By integrating these simulation technologies, engineers will be able create high-fidelity simulations that can help them optimize source and detector designs.

To help engineers simulate electronic systems and their interaction with photonic circuits, Lumerical has partnerships with various foundries to provide customers with high quality photonic process design kits (PDKs). As a result, by integrating their portfolio with the Ansys platform, engineers can simulate and characterize a full electro-optical communication or sensing system.

To learn more about integrated photonics, visit the Lumerical website.

Developing CAE software systems for all simulation disciplines. Products: ANSA pre-processor/ EPILYSIS solver and META post-processor suite, and SPDRM, the simulation-process-data-and-resources manager, for a range of industries, incl. the automotive, railway vehicles, aerospace, motorsports, chemical processes engineering, energy, electronics…

The advanced CAE pre-processing software for complete model build up

ANSA is an advanced multidisciplinary CAE pre-processing tool that provides all the necessary functionality for full-model build up, from CAD data to ready-to-run solver input file, in a single integrated environment.

ANSA is the users' preference due to its wide range of features and tools that meet their needs. The list of productive and versatile features is long and the alternative tasks and processes to be completed using them are countless.

Environment

All software features are accommodated in an integrated environment, with highly customisable GUI. The software is available for all contemporary popular operating systems in 32bit and 64bit architecture with multi-core CPU usage. The accelerated graphics, the rapid confirmations and function access, the GUI customisation options, the model browser and lists handling, the filtering and modification operations, and the integrated search engine comprise a user friendly environment that ensures outstanding performance and productivity.

CAD data input & clean up

CAD definitions and model structure data in CATIA V4, CATIA V5, NX, Pro/ENGINEER and JT formats can be converted into ANSA files using the available translators. Moreover, custom interfaces to PDM or SDM systems, powered by scripting, bring product and model structure data into the heart of the software.

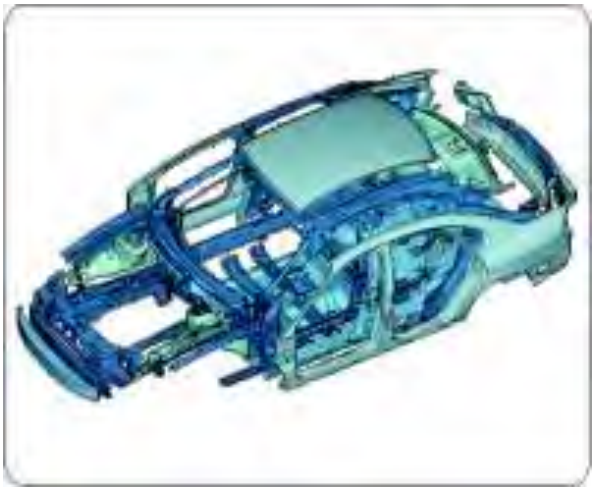
CAD geometry can be also read in from neutral file formats (iges, step, vda-fs), manipulated and healed by the proprietary powerful built-in geometry engine. A wide range of geometry healing functions, including those for the generation of neutral fibers, deliver geometry descriptions ready to be meshed

ANSA data management

ANSA Data Management (ANSA DM) is a centralized data management system, used to collect and store in a structured and hierarchical form all engineering data that are used during the development process of a vehicle simulation model. It assures the effective and efficient data handling throughout projects, by streamlining updated model data to engineering teams, allowing the easy sharing of common data and offering access to library items for the analysis dependent solution settings. The DM Browser, moreover, allows the browsing of the DM Root to identify the available CAD versions, study versions and representations for comparison and model update.

Model Comparison and update

An integrated tool that compares two models in order to identify differences in geometry, attributes, solver-specific definitions, as well as connections. User friendly navigation and identification features are provided while a complete or partial replacement can be performed, updating the model according to user directions.



Process Automation

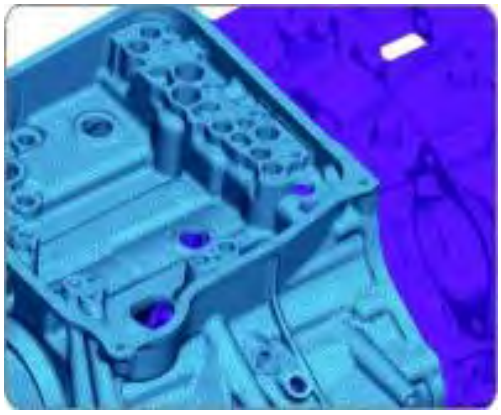
Task Manager and scripting language provide a unique modeling solution for automated and effective applications.

Task Manager is an integrated workflow manager that includes all individual tasks of a simulation model development. The process template is built up by the CAE expert who sets the boundaries between distinct modeling actions and predetermines all modeling parameters that must be respected, leaving to the inexperienced user a minimum degree of interference and limited decision making.

The scripting language is an enhanced programming tool that boosts productivity providing the power to access data and perform custom operations in an automated way.

Meshing

The integrated Batch Meshing tool leads to controllable and effortless optimal results, for both shell and volume meshing. Following the versatile mesh area idealization, geometry can be meshed according to modeling requirements by cutting edge surface and volume meshing and wrapping algorithms.



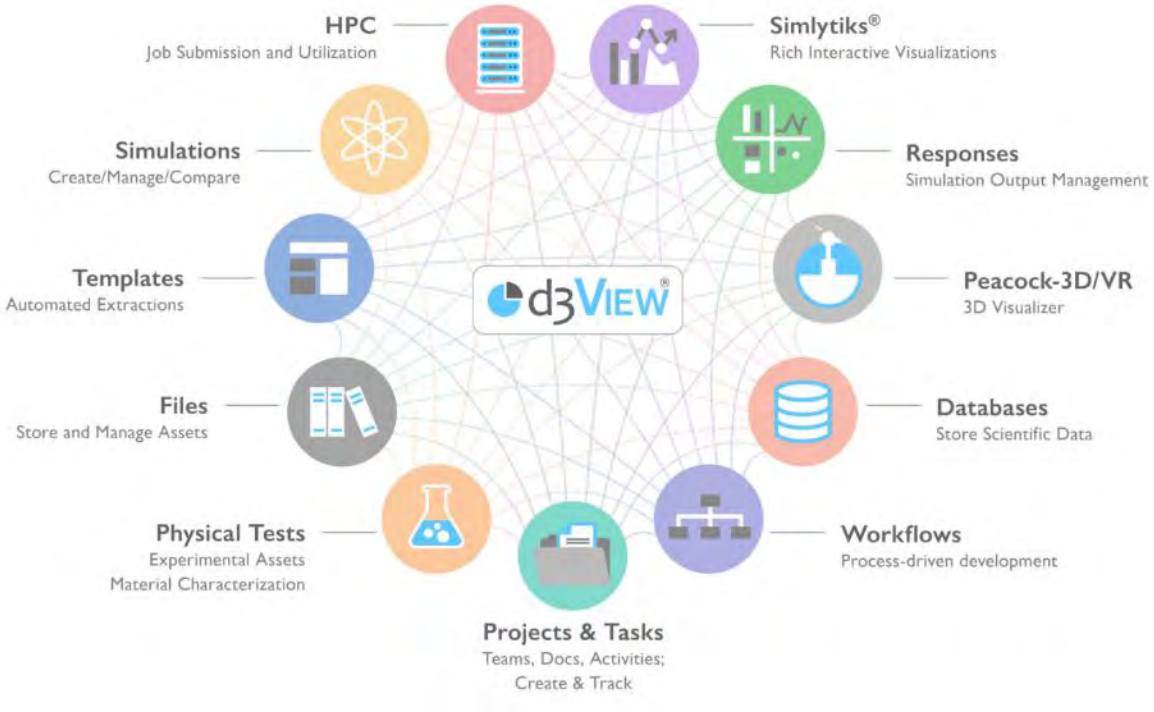
A unique mesh generation environment is composed by:

- proprietary shell meshing algorithms
- high performance and quality volume meshing algorithms
- state-of-the-art boundary layers elements deployment
- Hexahedral dominant meshing
- Acoustic Cavity mesher and the straight forward Wrapping tool
- one-step mesh generation on automatically extracted middle surface
- numerous mesh handling functions.

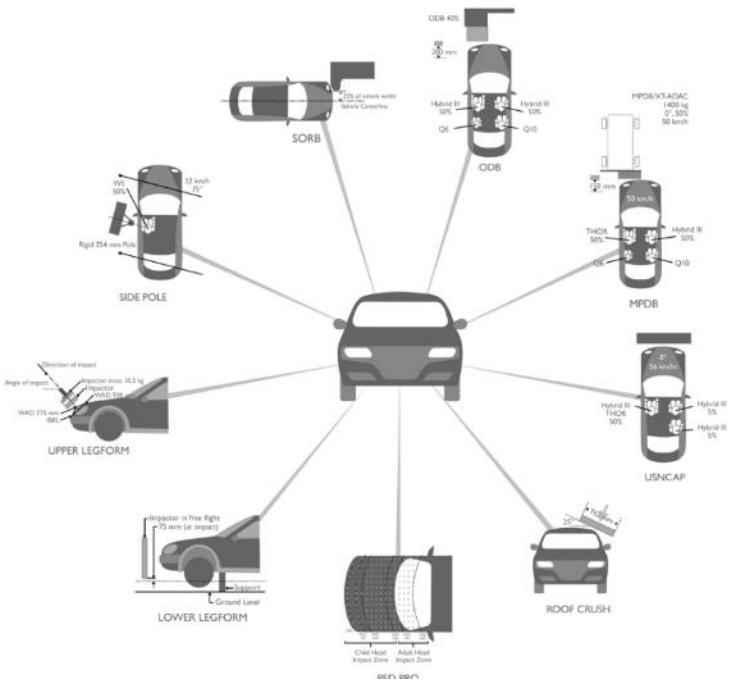
Continue to put more introduction in next month.

d3VIEW is a data to decision platform that provides out-of-the box data extraction, transformation and interactive visualizations. Using d3VIEW, you can visualize, mine and analyze the data quickly to enable faster and better decisions.

d3VIEW Platform Components



d3VIEW Built-In Automotive Templates



www.d3view.com.

For more information email info@d3view.com

Author: Christian Frech christian.frech@dynamore.de

DYNAmore webinars and online-seminars

DYNAmore expands its online offer

More information: www.dynamore.de/seminars

DYNAmore Express webinar series
The current situation presents us all numerous challenges. That's why we have expanded our services around LS-DYNA and adapted to the current situation. Since no on-site seminars can take place currently, various online training courses will be offered until the end of the exceptional situation caused by the coronavirus. In addition to the webinars already offered, there will be webinars on various topics relating to LS-DYNA and LS-OPT. The approximately one-hour webinars can be found under the motto "DYNAmore Express" at www.dynamore.de/en/training/seminars. Participation is free of charge.

DYNAmore Online-Seminars
In addition to the free offers, there are also two online-seminars permanently offered. The online seminars were recorded as video in Stuttgart and correspond to the original seminars in terms of content. After payment of the seminar fees the participants will receive the seminar documents by mail. Access to the videos will be granted with the seminar confirmation.

Please note that for security reasons, each chapter of the course may only be completed once and the password loses its validity after 14 days.

"Introduction to LS-DYNA"
From April 2020, our new online seminar "Introduction to LS-DYNA" will be available. We have divided the three-day seminar into eleven chapters, which can be viewed separately.

Please register at: www.dynamore.de/c2076e

"Crashworthiness with LS-DYNA"
The 4-day seminar with Paul Du Bois was recorded as a video and divided into 15 chapters.

Please register at www.dynamore.de/c2011e

We will inform about new online seminars in the FEA Newsletter and in the DYNAmore Infomail (Registration: www.dynamore.de/infomail-e).

Please note that our onlone-seminars are only available to members of companies. Students and private persons are excluded from use.

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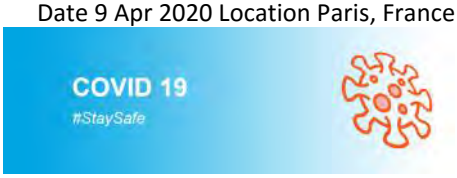
Courtesy of Daimler AG

A leading innovator in Virtual Prototyping software and services. Specialist in material physics, ESI has developed a unique proficiency in helping industrial manufacturers replace physical prototypes by virtual prototypes, allowing them to virtually manufacture, assemble, test and pre-certify their future products.

Helping our customers and partners – ESI's north star is the Covid-19 crisis

Date 9 Apr 2020 Location Paris, France



The Coronavirus is now challenging our business and our way of life all around the world. The health and safety of our colleagues, our customers and partners is of paramount importance for us. Like many companies, we introduced internal measures, some global like travels restrictions and remote work policy; some local tailored to each situation and local regulations. ESI is committed and able to provide the same excellent level of services and technical support to which our customers have become accustomed.

Thanks to the dedication and expertise of our IT & Facilities team, all our employees, globally, have all access and connectivity that offer them the full flexibility of being able to work from anywhere. All our teams, from our account management team to our customer support are 100% reachable to accompany the industry and its teams in the use and implementation of our solutions in infrastructure. Helping maintaining performance and productivity is our main preoccupation.

This situation will surely break down some habits and routines and change our way of seeing things, situations; including complex challenges. What if it accelerates change or spurs innovation? At ESI, we like to see the world in a different light, leading to co-create a new wave of disruptive solutions. We are more than ever motivated to be part of your solution … especially when complex situations occur.

As we respond to this new reality, we will remain focused on driving our business forward and supporting our customers and partners. We will do our best to keep our employees, customers and partners safe and productive. We are committed to maintaining our services and support at a very high level during this uncertain time, and we are available to help in any way we can.

About ESI Group

ESI Group is a leading innovator in Virtual Prototyping software and services. Specialist in material physics, ESI has developed a unique proficiency in helping industrial manufacturers replace physical prototypes by virtual prototypes, allowing them to virtually manufacture, assemble, test and pre-certify their future products. Coupled with the latest technologies, Virtual Prototyping is now anchored in the wider concept of the Product Performance Lifecycle™, which addresses the operational performance of a product during its entire lifecycle, from launch to disposal. The creation of a Hybrid Twin™, leveraging simulation, physics and data analytics, enables manufacturers to deliver smarter and connected products, to predict product performance and to anticipate maintenance needs.

ESI is a French company listed in compartment B of NYSE Euronext Paris. Present in more than 40 countries, and addressing every major industrial sector, ESI Group employs about 1200 high-level specialists around the world and reported annual sales of €139 million in 2018. For more information, please visit www.esi-group.com.

ETA has impacted the design and development of numerous products - autos, trains, aircraft, household appliances, and consumer electronics. By enabling engineers to simulate the behavior of these products during manufacture or during their use, ETA has been involved in making these products safer, more durable, lighter weight, and less expensive to develop.

ACP Process

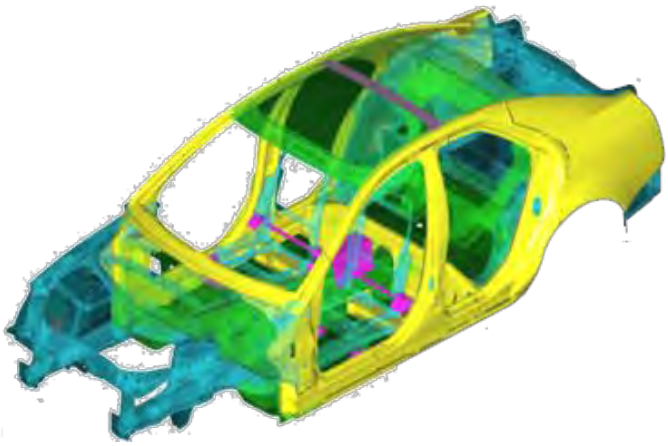
The patented Accelerated Concept to Product (ACP) Process® has revolutionized and streamlined the product development process, through optimization led design. The performance-driven development process relies heavily on simulations to meet timing and budget targets, whereas the traditional processes have been built around a build-test philosophy.

The key benefits of the ACP Process include a demonstrated capability to reduce product development costs significantly, reduce product mass by approximately 20 - 40% and reduce product development time, while improving product performance in terms of stiffness, NVH, crash/safety, durability.

This technique is a proprietary, performance-driven, holistic product design development method, which is based on design optimization. ACP incorporates the use of multiple CAE tools to generate an optimal design solution. 3G Optimization is employed and allows engineers to design a concept model using holistic design approach. It incorporates material types and its properties (Grade and Gauges), Geometry (shape) and manufacturing processes for the optimum weight and performance.

Contrary to conventional methods where just one or a few design concepts are evaluated, with the ACP process hundreds of design concepts under multiple load conditions are evaluated simultaneously. Only those concepts, which meet all of the design targets and manufacturing constraints, are initiated. The resulting concept(s) is designed, analyzed and optimized using loading, manufacturing, material, and cost constraints. CAD data is then generated for the optimal design. Finally, our team takes the design to the production level (preparing it for manufacturing) based on the available manufacturing processes and provides production support.

Using this system, the resulting product meets all performance, mass, cost and manufacturing constraints. Applied at the component, sub-system, or full-system level, significant efficiencies and product improvement are achievable using the ACP Process. In this practice, ETA's expert team revisits process requirements and uses the most advanced technology, tools, and materials to give the client the most lightweight structure possible.



FEA Not To Miss, is a weekly internet blog on helpful videos, tutorials and other Not To Miss important internet postings. Plus, a monthly email blog.

Start your Monday with coffee or tea reading our engineering blog, at the FEA Not To Miss coffee shop.
Postings every Monday on what you have missed

www.feantm.com

Monday 04/13/2020 - Guess where I'm NOT taking my truck on our hill! WHY you ask? Fine, grab your Coffee To Go and we'll drive, flat terrain, over to YouTube to visit Ameen.

Rollover Analysis of Pickup Truck

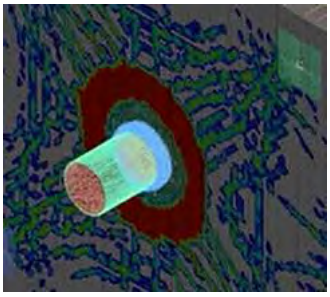
Ameen Topa - LS-DYNA Rollover Analysis. In the starting part of the simulation, the vehicle rolls and falls to the ground due to the gravity load.

Monday 04/06/2020 - AND this week's coffee is called, Pin Ball Wizard with hocolate! and MORE chocolate so grab that to go cup and let's go play!

Self-controlling pinball simulation using LS-DYNA

Sensors in LS-DYNA are used to activate or deactivate other entities, such as boundary conditions and contacts, during an ongoing simulation. You can use sensors to add complexity to your model and make the model more self-controlling.

Monday 03/30/2020 - AND this week's coffee is called, Yuri with a hazlenut impact flavor! Grab that to go cup and we will head like a missle to YouTube. (oh stop groaning, I liked the missle reference)



Yuri Novozilov

Simulation of a soft missile impact on reinforced concrete slab - Sugano impact test

Shanghai Hengstar & Enhu Technology sells and supports LST's suite of products and other software solutions. These provide the Chinese automotive industry a simulation environment designed and ready multidisciplinary engineering needs, and provide a CAD/CAE/CAM service platform to enhance and optimize the product design and therefore the product quality and manufacture.

恒士达科技 Hengstar Tech.

ENHU

Shanghai Hengstar Technology Co., Ltd

Shanghai Enhu Technology Co., Ltd

Contact us for our LS-DYNA training courses and CAD/CAE/CAM consulting service, such as

- Crashworthiness Simulation with LS-DYNA
- Restraint System Design with Using LS-DYNA
- LS-DYNA MPP
- Airbag Simulation with CPM
- LS-OPT with LS-DYNA

Our classes are given by experts from LSTC USA, domestic OEMs, Germany, Japan, etc. These courses help CAE engineers to effectively use CAE tools such as LS-DYNA to improve car safety and quality, and therefore to enhance the capability of product design and innovation.

Consulting - Besides solver specific software sales, distribution and support activities, we offer associated CAD/CAE/CAM consulting services to the Chinese automotive market.

Solutions - Our software solutions provide the Chinese automotive industry, educational institutions, and other companies a mature suite of tools - powerful and expandable simulation environment designed and ready for future multidisciplinary CAE engineering needs.

Shanghai Hengstar provides engineering CAD/CAE/CAM services, consulting and training that combine analysis and simulation using Finite Element Methods such as LS-DYNA.

Shanghai Hengstar Technology Co., Ltd

hongsheng@hengstar.com

http://www.hengstar.com

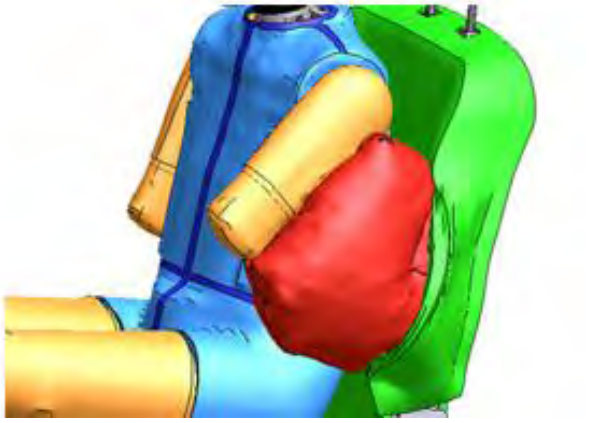
Shanghai Enhu Technology Co., Ltd

http://www.enhu.com

JSOL supports industries with the simulation technology of state-of-the-art. Supporting customers with providing a variety of solutions from software development to technical support, consulting, in CAE (Computer Aided Engineering) field. Sales, Support, Training.

JFOLD Features

Towards more accurate airbag deployment simulation



JFOLD was developed to fold airbags for automotive crash simulation. JFOLD can be used to generate a folded airbag model using LS-DYNA simulation, regardless of the complexity of the geometry.

Airbags are one of the important safety devices for protecting the occupant during an accident: airbags are folded compactly and stored in the interior. The deployment behavior of an airbag depends on the pattern through which it is folded. The risk of occupant injury during airbag deployment, the out-of-position problem, considerably affects the occupant's safety performance.

Recently, the demand for more accurate airbag deployment simulation to improve the occupant's safety has been increasing. Building a folded airbag model with complicated geometry was an issue for CAE engineers to address.

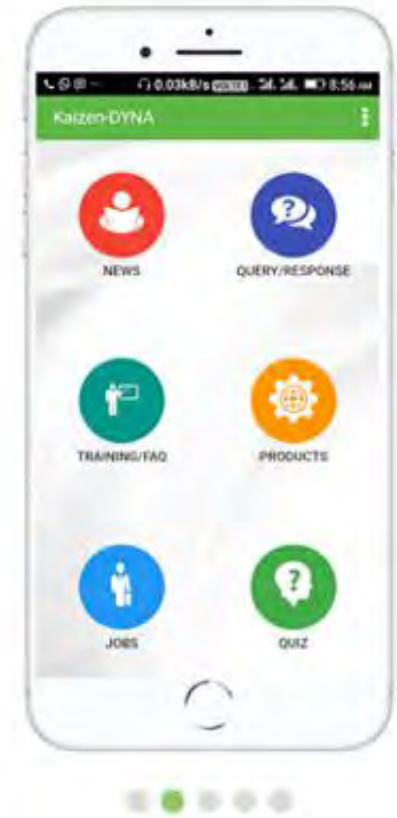
JFOLD can manage the complicated folding process of an airbag using a flowchart in an easy-to-understand tree view. Users can build, manage, and view the airbag models in various folding patterns. The intuitive and interactive GUI facilitates the operation of defining the position and behavior of the folding tools.

KAIZENAT

https://www.kaizenat.com/

KAIZENAT Technologies Pvt Ltd is the leading solution provider for complex engineering applications and is founded on Feb 2012 by Dr. Ramesh Venkatesan, who carries 19 years of LS-DYNA expertise. KAIZENAT sells, supports, trains LS-DYNA customers in India. We currently have office in Bangalore, Chennai, Pune and Coimbatore.

Kaizen-DYNA App



- "Kaizen-DYNA" is a mobile and web based application which is built by Kaizenat Technologies Private Limited (KTPL) to help LS-DYNA users across the world.
- This powerful application helps LS-DYNA users across the world to stay connected and also help each other by sharing their knowledge.
- The key feature of this application is QUERY and RESPONSE. Where a user can post and respond to queries. The best response for each query will be rewarded with a Kaizen score.
- This application also gives an opportunity for the employers to float their LS-DYNA job openings and alert its user's base with a notification.
- "Kaizen-DYNA" quiz program can help LS-DYNA users to update their knowledge score and trend top in the job seekers list.
- It also gives an opportunity for new users to learn LS-DYNA with training materials FAQ modules.
- This application also brings latest news about LS-DYNA and some useful general information.

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LS-DYNA CONFERENCE 2020

16th International LS-DYNA Conference Virtual Event

June 10-11, 2020 | Free Online Live Event

Speakers

Dr. Ajei Gopal
President & CEO, Ansys

Ajei Gopal is president and CEO of Ansys. Ajei has been associated with Ansys since joining the board of directors in 2011.

He previously served as operating partner for Silver Lake Partners, one of the largest technology investors in the world. As senior vice president and general manager of Hewlett-Packard Software, Ajei was directly responsible for $2.6 billion in revenue and leading core business initiatives, including growing license revenue by attracting new customers through organically developed SaaS offerings. As executive vice president for CA Technologies, he directly managed $4 billion in revenue, defined and implemented a winning strategy to compete in SaaS and cloud markets and drove double-digit new license growth for strategic products.

Ajei was the founder, CEO and director of Reefedge Networks, a wireless LAN security company, which was acquired by Symantec. He held several roles at IBM Research and IBM's Software Group and began his career at Bell Communications Research in 1984.

Dr. Prith Banerjee
Chief Technology Officer, Ansys

Prith Banerjee is chief technology officer at Ansys, responsible for leading the evolution of Ansys' technology strategy and championing the company's next phase of innovation and growth.

Prior to joining Ansys, Prith served as senior client partner at Korn Ferry, responsible for IoT and digital transformation in Global Industrial Practice. Before

that, he was executive vice president and chief technology officer at Schneider Electric. Prith also served as managing director of Global Technology Research and Development at Accenture, chief technology officer and executive vice president at ABB, senior vice president of Research at Hewlett-Packard and director at Hewlett-Packard Labs.

Al Hancq

VP Development, Mechanical BU

Al is vice president of development and in charge of the Mechanical Business Unit at Ansys. He has been at Ansys since 1994, starting as an intern on the APDL solver team. Throughout his career at Ansys he has worked on all facets of development.

Highlights including writing the Ansys fatigue module, developing the solver interface for Mechanical, and leading the Mechanical application development team.

THE MUST ATTEND EVENT FOR FEA

From modeling and optimization to biomedical and blast industries, you'll find the latest developments on the LS-DYNA User Conference agenda. Don't just attend — immerse yourself in a tailored learning & interactive experience to build the best set of tools you'll need to succeed in this competitive technology environment.

Full Agenda Coming Soon!

Why Attend

Program:

There's no better way to master the latest technologies and business concepts than by hearing from the global leaders that have experience with the solutions you need.

Exhibits:

Be among the first to see the latest products and solutions, then implement them into your organization and beat your competitors to market.

Network:

Meet industry innovators, thought leaders and technology enthusiasts at exhibits and live chat rooms.

Session Categories

- Aerospace
- Automotive
- Biomedical
- Blast
- Composites
- Computing technology
- Constitutive Modeling
- Connections
- Electromagnetics
- FSI/ALE
- ICFD
- Implicit
- Isogeometric Analysis (IGA)
- Metal Forming Modeling
- NVH
- Occupant Modeling
- Optimization
- Post-Processing
- Simulation
- SPG
- SPH
- Thermal
- THUMS
- Topology & Optimization

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Providing engineering services to the composites industry since 1970. During this time, we have participated in numerous programs that demonstrate our ability to perform advanced composite design, analysis and testing; provide overall program management; work in a team environment; and transition new product development to the military and commercial sectors.

Progressive Composite Damage Modeling in LS-DYNA (MAT162 & Others)

Bazle Z. (Gama) Haque, Ph.D.
Senior Scientist, University of Delaware Center for Composite Materials (UD-CCM)
Assistant Professor of Mechanical Engineering, University of Delaware, Newark, DE 19716
P: (302) 690-4741 | E: bzhaque@udel.edu

2020 Workshops

Webinar Course Dates
March 10, 2020
July 14, 2020
November 17, 2020

In House Course Dates
March 11, 2020
July 15, 2020
November 18, 2020

Cost:
In-House Class: $695 per person
Includes: Coffee, Lunch, Parking, USB with Course Content

email Corinne Hamed for driving direction

Web Conference: $695 per person
Includes: CD with Course Content

Description:

Progressive damage modeling of composites under low velocity impact, and high velocity impact is of interest to many applications including car crash, impact on pressure vessels, perforation and penetration of thin and thick section composites. This course will provide a comparison between available composite models in LS-DYNA for shell and solid elements, e.g., MAT2, MAT54, MAT59, & MAT162. Among these material models, rate dependent progressive composite damage model MAT162 is considered as the state of the art. This short course will include the theory and practice of MAT162 composite damage model with applications to low and intermediate impact velocities, understanding the LS-DYNA programming parameters related to impact-contact, damage evolution, perforation and penetration of thin- and thick-section composites. Printed copies of all lecture notes will be provided along with a CD containing all example LS-DYNA keyword input decks used in this short course.

Topics Covered in this Short Course:
Impact and Damage Modeling of Composites
Application of MAT162 in Engineering and Research Problems
Introduction to Composite Mechanics
Introduction to Continuum Mechanics and Composite Mechanics
Composite Material Models in LS-DYNA for Shell and Solid Elements
Discussion on MAT2, MAT54, MAT59, & MAT162
Theory and Practice in MAT162 Progressive Composite Damage Model for Unidirectional and Woven Fabric Composites
MAT162 User Manual – Version 15A 2015
Progressive Damage Modeling of Plain-Weave Composites using LS-Dyna Composite Damage Model MAT162
Unit Single Element Analysis
Comparison between Different LS-DYNA Composite Models
Sphere Impact on Composite SHELL & SOLID Plates
Low Velocity Impact and Compression after Impact Applications
Modeling the Low Velocity Impact and Compression after Impact Experiments on Composites Using MAT162 in LS-DYNA
Perforation Mechanics of 2-D Membrane and Thin Composites
Penetration Mechanics of Composites and Soft-Laminates
Introduction to LS-DYNA (Document Only)

To register, email Corinne Hamed your full name, and if you're attending in house or web conference.

Oasys Ltd is the software house of Arup and distributor of the LS-DYNA software in the UK, India and China. We develop the Oasys Suite of pre- and post-processing software for use with LS-DYNA.

Oasys Software Version 17 Now Available!

Click the tiles below to download the latest version:

The Oasys LS-DYNA team is pleased to announce the release of the Oasys Suite version 17.0. This new version of the software has exciting new features and updates within PRIMER, D3PLOT, T/HIS, REPORTER and SHELL.

More information about the new version 17 view on our website here.

Working from home? Let us help...

Practical steps and top tips

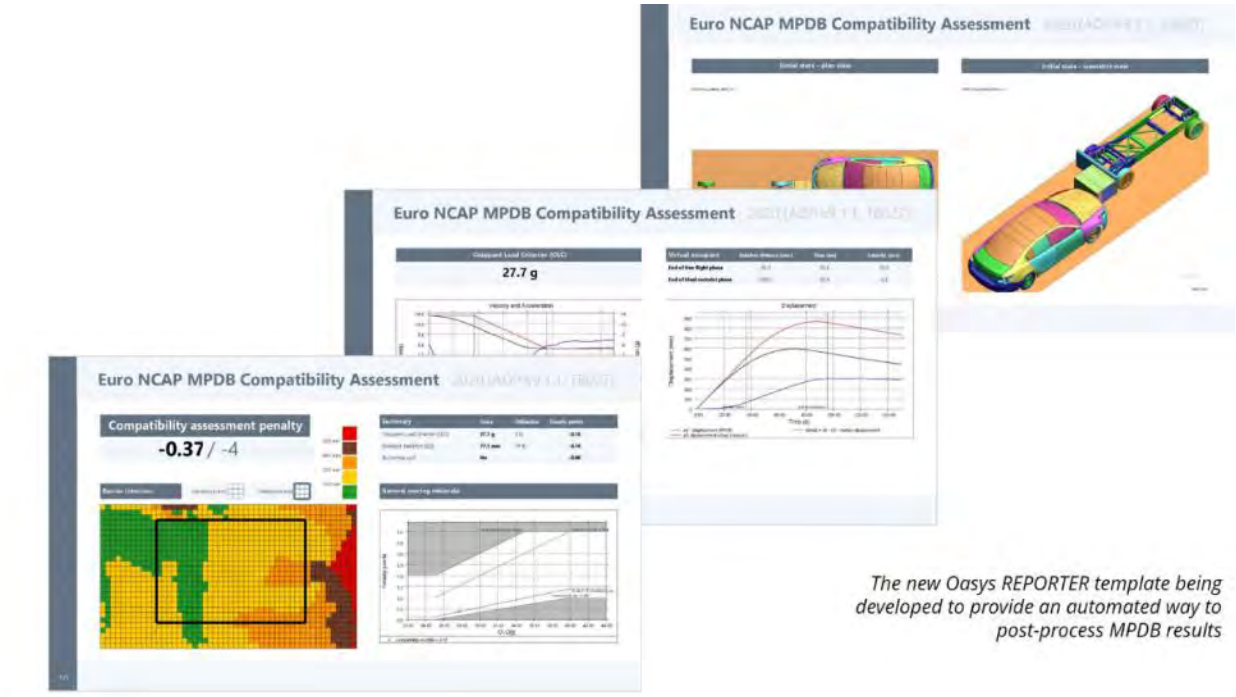
Like you, we're monitoring the news about COVID-19 and doing all we can to support you with your work, both in the office and at home. We've created a page on our website with some practical steps and top tips we can offer. Please view these here. This includes advice for using the Oasys LS-DYNA Environment efficiently when working remotely.

We also know it's important for you to access the Oasys software to continue your work, even from home. We're looking at ways we can offer our clients quick and easy access to the software when not on their usual networks.

You may now download your 'Working from Home' Oasys license here.

If you have any questions about licensing options whilst you're working from home please get in touch

New version 2.0 of the MPDB barrier now available

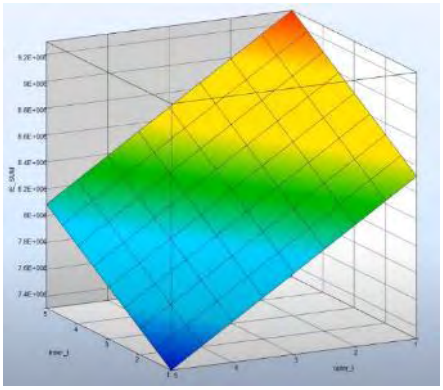


The new Oasys REPORTER template being developed to provide an automated way to post-process MPDB results

Based on feedback from our clients, we have updated the HC behaviour of the MPDB barrier model to increase its stiffness and improve its performance in the regulatory test.

A new Oasys REPORTER template is also being developed to provide an automated way to post-process the MPDB results. The template will work with v2.0 of the barrier model.

Please contact us via dyna.support@arup.com if you have a license for the MPDB and would like to receive the update, or if you're interested in a free trial of the model



Webinar: LS-OPT part 2

Is now available on Oasys LS-DYNA YouTube channel.

Click here to view it.

Predictive Engineering

www.predictiveengineering.com

Predictive Engineering provides FEA and CFD consulting services, software, training and support to a broad range of companies.

FINITE ELEMENT ANALYSIS
Predictive Engineering

Predictive Engineering – Western States ANSYS LS-DYNA Distributor – Your Free Coffee Cup is On Its Way!

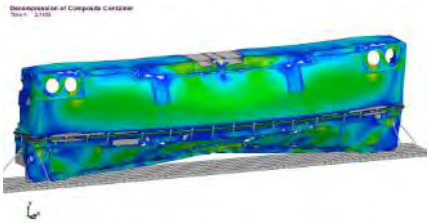
LS-DYNA has been one of Predictive's core analysis tools pretty much since we got started in 1995. It is an amazing numerical workhorse from the basic linear mechanics (think ANSYS or Nastran) to simulating well nigh the impossible. At least that is the way I feel at times when the model is not solving and spitting out arcane error messages and I'm basically questioning my sanity for accepting this project from hell that has a deadline at the end of the week. Which brings me to my favorite project management image – "trough of despair followed by wiggles of false hope then crash of ineptitude and finally the promised land" but I'll leave that for another blog.

For now, let's talk about those free coffee cups. Predictive is now the western states distributor of ANSYS LS-DYNA and provides complete sales, training and services for ANSYS LS-DYNA clients in this region. It is a continuation of our prior setup with LSTC (now ANSYS LST) with the addition of Predictive's ability to offer ANSYS Workbench with LS-DYNA and other ANSYS software tools. So where's my free coffee cup? If you are a current Predictive ANSYS LS-DYNA client, we'll be shipping'em out to you at the end of February and for our new client's – just send us an email or give us a call.

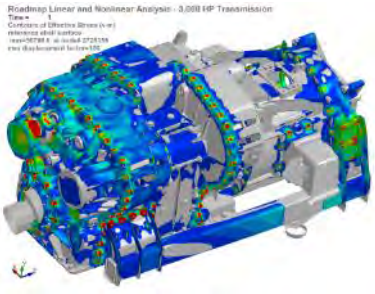
View our portfolio

FEA, CFD and LS-DYNA consulting projects

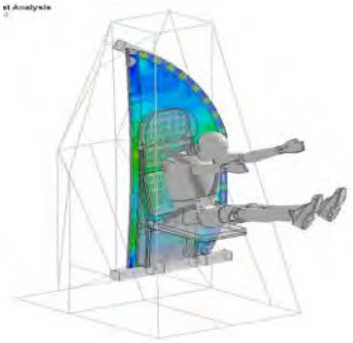
Composite Engineering



Nonlinear Dynamics



Aerospace



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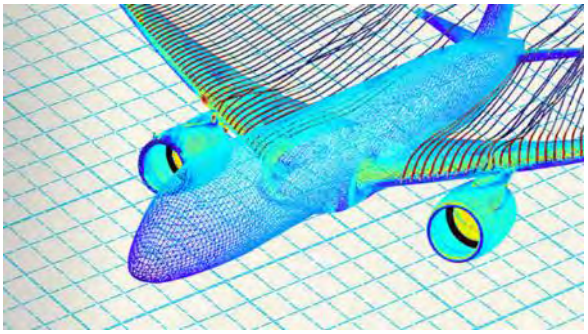
Offering industry-leading software platforms and hardware infrastructure for companies to perform scientific and engineering simulations. Providing simulation platforms that empower engineers, scientists, developers, and CIO and IT professionals to design innovative products, develop robust applications, and transform IT into unified, agile environments.



Platform updates and Software Release notes

February 27, 2020
Automotive,English,Product Info & Tutorials
Robert Combier

March 2020

Few in number, big in punch this month as Rescale's HPC and application team converts fully to WFH. We're excited to add these codes to our platform:

ANSYS 2020.R1 – Major release this month! Rescale is proud to offer ANSYS in its latest iteration, 2020 R1, which offers users improvements to 3D design with Discovery Live, mature additive manufacturing tools, updated electromagnetic toolchains, and more. Read more here.

Gromacs 2020 – The quintessential molecular design tool also gets a substantial revision that was released in January. Coolest addition in our opinion: density-guided simulations of particles into 3D space. Read the full release notes here.

Dymola 2020x – Dassault Systemes CATIA's supremely flexible modeling tool gets a fresh new interface and key solver updates for faster solving times. More info and doc here.

February 2020

Certainly a [Big] month for Rescale with Big Compute 20, but we haven't slowed in our software catalog expansion; lots of great on-demand software has been added to the Rescale Platform this month. Here are the highlights:

Siemens Simcenter 3D 2020.1 – Read Patrick's detailed blog on the advantages this brings Simcenter users, especially for cloud desktop virtualized workflows.

Siemens Simcenter STAR-CCM+ 14.06.013 – Latest revision updated from 14.06.012 in both Mixed and Double Precision.

Future Facilities 6SigmaRoom 14.0.3 – Latest revision updated

ESI Virtual Performance Solution 2019 – Major update from 2018.02

AVL Fire 2019R2 – Latest revision updated from 2019R1

MSC scFLOW 20 – Major update from 14.1 (aligning release version to year)

MSC scSTREAM 20 – Major update from 14.1.201904 (aligning release version to year)

Our full software catalog is **available here.**

LS-DYNA China, as the master distributor in China authorized by LST, an Ansys company, is fully responsible for the sales, marketing, technical support and engineering consulting services of LS-DYNA in China.

仿坤软件 LS-DYNA China

About Shanghai Fangkun Software Technology Ltd.

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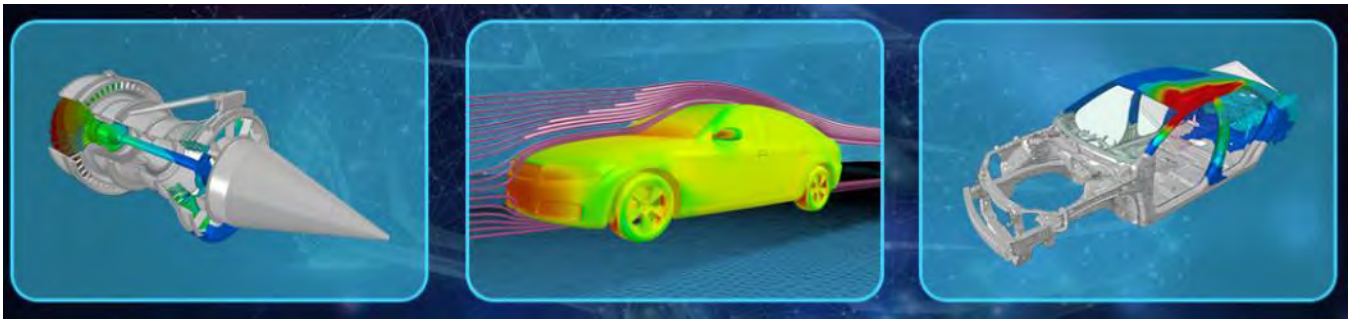
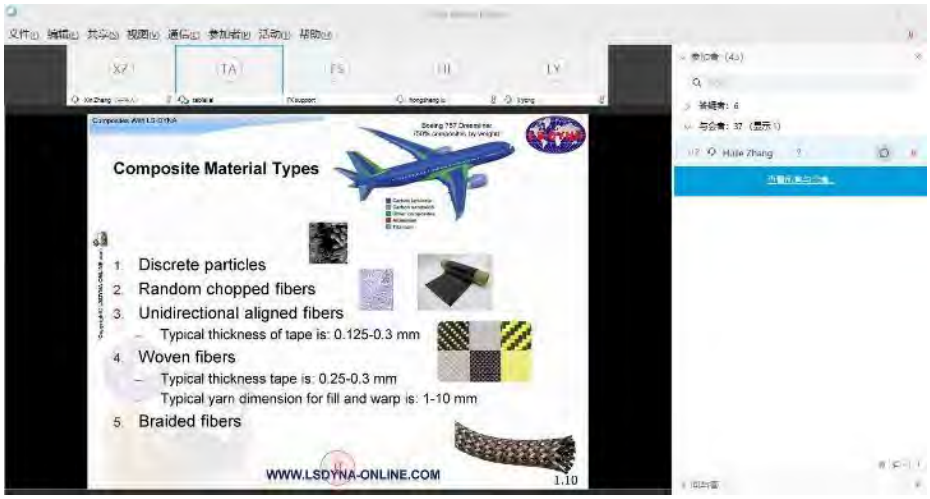
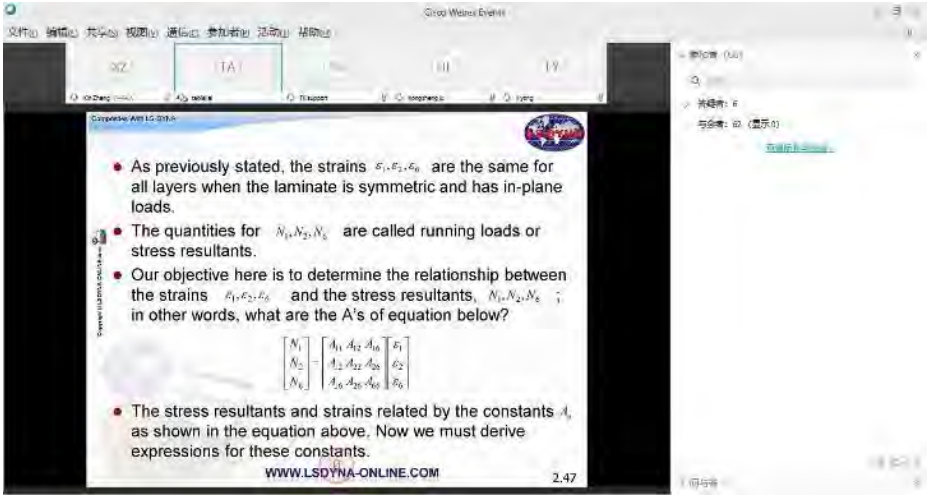


"LS-DYNA composite material model" intro session online training has been successfully held by Shanghai Fangkun and ANSYS China

"LS-DYNA composite material model" intro session online training has been successfully held by Shanghai Fangkun and ANSYS China on 15th -16th April. The instructor, Dr. Al Tabiei gave this course who has been a consultant on the use of large scale finite element simulation for more than 25 years to more than 80 large and small companies and government labs in the US and abroad.

Through 2 days of training, Dr. Al Tabiei gave a brief introduction to mechanics of composite materials & material testing lamina, composite modeling in LS-DYNA, strength and failure, shell elements and transverse shear.





More than 70 participants who come from various institutes, and academic users attended this training by webEx. In two days' event, Dr. Al Tabiei shared advanced knowledge and technologies. Attendees said they learn a lot from this course. All of us are looking forward to take advance course which will still be instructed by Dr. Al Tabiei in July. All LS-DYNA users and those who are interested in are welcome to take our training.

Tel : 021-61261195 54152972
E-mail : marketing@lsdyna-china.com
website: www.lsdyna-china.com

2020 Annual Training & Workshop

Dear LS-DYNA users,

To help users to better understand LS-DYNA software and use LS-DYNA more efficiently, Shanghai Fangkun releases 2020 annual training and workshop plan as following tables. We welcome those who are interested to attend.

Date	Topic	City	Duration
20-21,Feb.	Introduction to LS-DYNA (basic training)	Shanghai	2 days
Mar.	Product design with LS-OPT	Shanghai	1 day
Apr.	Crashworthiness in LS-DYNA	Shanghai	2 days
May	Material models in LS-DYNA (composite, non-metal)	Shanghai	2 days
Jun.	Introduction to LS-DYNA (basic training)	Chongqing	2 days
Jun.	Restraint system in LS-DYNA	Shanghai	2 days
Jul.	Battery multi-physics simulation with LS-DYNA	Shanghai	1 day
Sep.	Implicit analysis in LS-DYNA	Shanghai	1 day
Oct.	Fluid structure interaction with LS-DYNA (ALE, ICFD)	Shanghai	2 days
Nov.	Introduction to LS-DYNA (basic training)	Beijing	2 days
Dec.	User-Defined Materials in LS-DYNA	Shanghai	1 day

2020 LS-DYNA online workshop plan			
Date	**Topic**	**Duration**	**Fee**
13rd Jan.	Introduction to MPDB	3 hours	Free
Apr.	Contact Modeling in LS-DYNA	2 hours	Free
May	SALE method in LS-DYNA	2 hours	Free
Jun.	Introduction to Q series dummies	2 hours	Free
Jul.	NVH, Fatigue, & Frequency Domain Analysis in LS-DYNA	2 hours	Free
Aug.	SPG method in LS-DYNA	2 hours	Free
Sep.	Introduction to LS-PrePost	2 hours	Free
Sep.	Introduction to LS-OPT	2 hours	Free
Oct.	Introduction to LS-Form & Stamp forming	2 hours	Free
Oct.	Performance analysis of bus with LS-DYNA	2 hours	Free
Nov.	LST Dummy & Barrier	2 hours	Free
Nov.	EM method in LS-DYNA	2 hours	Free
Dec.	Summary of fluid structure interaction method in LS-DYNA	2 hours	Free
Dec.	Virtual Proving Ground training	2 hours	Free

Contact: Elva Yu Tel.: 18221209107, 021-61261195 for more detail information
Email: Training@lsdyna-china.com

CAE software sale & customer support, initial launch-up support, periodic on-site support. Engineering Services. Timely solutions, rapid problem set up, expert analysis, material property test Tension test, compression test, high-speed tension test and viscoelasticitiy test for plastic, rubber or foam materials. We verify the material property by LS-DYNA calculations before delivery.

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Engineering Services - Timely solutions, rapid problem set up, expert analysis - all with our Engineering Services. Terrabyte can provide you with a complete solution to your problem; can provide you all the tools for you to obtain the solution, or offer any intermediate level of support and software.

FE analysis

- LS-DYNA is a general-purpose FE program capable of simulating complex real world problems. It is used by the automobile, aerospace, construction, military, manufacturing and bioengineering industries.
- ACS SASSI is a state-of-the-art highly specialized finite element computer code for performing 3D nonlinear soil-structure interaction analyses for shallow, embedded, deeply embedded and buried structures under coherent and incoherent earthquake ground motions.

CFD analysis

- AMI CFD software calculates aerodynamics, hydrodynamics, propulsion and aero elasticity which covers from concept design stage of aerocraft to detailed design, test flight and accident analysis.

EM analysis

- JMAG is a comprehensive software suite for electromechanical equipment design and development. Powerful simulation and analysis technologies provide a new standard in performance and quality for product design.

Metal sheet

- JSTAMP is an integrated forming simulation system for virtual tool shop based on IT environment. JSTAMP is widely used in many companies, mainly automobile companies and suppliers, electronics, and steel/iron companies in Japan.

Pre/ Post

- **PreSys** is an engineering simulation solution for FE model development. It offers an intuitive user interface with many streamlined functions, allowing fewer operation steps with a minimum amount of data entry.
- **JVISION** - Multipurpose pre/post-processor for FE solver. It has tight interface with LS-DYNA. Users can obtain both load reduction for analysis work and model quality improvements.

Biomechanics

- **The AnyBody Modeling System™** is a software system for simulating the mechanics of the live human body working in concert with its environment.



2020 Jeep Gladiator

The Fast Lane Truck (TFLtruck) Names 2020 Jeep® Gladiator, 2020 Ram Power Wagon Winners of Gold Winch Award

April 16, 2020 , Auburn Hills, Mich

- **2020 Jeep® Gladiator Rubicon wins Gold Winch award for Best Mid-size Off-Road truck in its first attempt**
- **2020 Ram Power Wagon takes home Gold Winch award for Best Heavy Duty Off-Road truck**
- **FCA is home to the most off-road-capable pickup trucks in the industry**

The 2020 Jeep® Gladiator has earned the Gold Winch award as the Best Mid-size Off-Road truck of the year. The 2020 Ram Power Wagon has earned the Gold Winch award as the Best Heavy Duty Off-Road truck of the year.

"The competition was very tough this year. In the end, the Jeep Gladiator Rubicon stood above the rest based on its raw off-road capability and the fun aspect of top-down doors-off adventure driving. The final decision was unanimous," said Andre Smirnov, managing editor at TFLtruck.com." The Ram Power Wagon won the 2020 Gold Winch award due to its laser focus on off-road capability and equipment. It still has the best suspension flex, many trim options and an included winch to boot."

For Gold Winch evaluations, TFLtruck's editors tested vehicles on grueling paths in Colorado, reaching high elevations with terrain that varies from loose gravel to rocks and snow. Jeep Gladiator Rubicon's overall performance on-road combined with its legendary capability and open-air freedom unanimously won judges over.

Judges noted the Ram Power Wagon's off-road capability and equipment, such as the unique suspension, 2-inch factory lift, locking front and rear differentials, disconnecting front sway bar and a 12,000 lb. winch, put it over the top of its respective category. After all votes were counted, the 2020 Jeep Gladiator Rubicon and 2020 Ram Power Wagon were determined to be the winners of each respective segment.

2020 Ram Heavy Duty

Gold Winch award-eligible trucks include 2020 model-year pickups (or trucks from previous model years that have not significantly changed for 2020). Trucks are only eligible for the award if they were tested before March 1, 2020.

About TFLtruck

TFLtruck is the most popular online video reviews, news and views publication. Millions of truck buyers watch TFLtruck video reviews and tests every month. This includes the signature "TFL Ike Gauntlet" extreme towing test, which challenges trucks to the absolute maximum of their performance capability. Simply put — TFLtruck is All Trucks All The Time.

FCA

Fiat Chrysler Automobiles (FCA) is a global automaker that designs, engineers, manufactures and sells vehicles in a portfolio of exciting brands, including Abarth, Alfa Romeo, Chrysler, Dodge, Fiat, Fiat Professional, Jeep®, Lancia, Ram and Maserati. It also sells parts and services under the Mopar name and operates in the components and production systems sectors under the Comau and Teksid brands. FCA employs nearly 200,000 people around the globe. For more details regarding FCA (NYSE: FCAU/ MTA: FCA), please visit www.fcagroup.com.

LS-DYNA - Resource Links

LS-DYNA Multiphysics YouTube

https://www.youtube.com/user/980LsDyna

FAQ LSTC

ftp.lstc.com/outgoing/support/FAQ

LS-DYNA Support Site

www.dynasupport.com

LS-OPT & LS-TaSC

www.lsoptsupport.com

LS-DYNA EXAMPLES

www.dynaexamples.com

LS-DYNA CONFERENCE PUBLICATIONS

www.dynalook.com

ATD –DUMMY MODELS

www.dummymodels.com

LSTC ATD MODELS

www.lstc.com/models www.lstc.com/products/models/mailinglist

AEROSPACE WORKING GROUP

http://awg.lstc.com

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DYNAmore	www.dynamore.de/en/training/seminars
Dynardo	http://www.dynardo.de/en/wost.html
ESI-Group	https://myesi.esi-group.com/trainings/schedules
ETA	http://www.eta.com/training
KOSTECH	www.kostech.co.kr
ANSYS LST	www.lstc.com/training
LS-DYNA OnLine - (Al Tabiei)	www.LSDYNA-ONLINE.COM
OASYS	www.oasys-software.com/training-courses
Predictive Engineering	www.predictiveengineering.com/support-and-training/ls-dyna-training

Acoustic radiated power and radiation efficiency calculation with LS-DYNA®

Yun Huang，Zhe Cui

Livermore Software Technology, an ANSYS Company

Abstract

The keyword ***FREQUENCY_DOMAIN_SSD** provides not only convenient solution for steady state vibration analysis for structures, but also raises the possibility for acoustic simulation. For example, it can be used in combination with acoustic boundary element method (keyword ***FREQUENCY_DOMAIN_ACOUSTIC_BEM**) or acoustic finite element method (keyword ***FREQUENCY_DOMAIN_ACOUSTIC_FEM**), to compute the acoustic pressure and sound pressure level for vibro-acoustic problems. In addition, with the option **ERP** for this keyword, one can perform ERP (Equivalent Radiated Power) analysis to get a quick solution for radiated noise, based on the plane wave assumption for the acoustic waves.

A new parameter RADEFF was added to the keyword ***FREQUENCY_DOMAIN_SSD_ERP** to run acoustic radiated power computation for baffled plates, and also computes the radiation efficiency.

With some simple examples, this paper explains the difference between the ERP (equivalent radiated power) and ARP (acoustic radiated power), and shows how to use this new parameter to compute the acoustic radiated power and radiation efficiency for vibrating structures.

Keyword: acoustic, radiated power, radiation efficiency

Introduction

Starting from R7 of 971 version, a keyword *FREQUENCY_DOMAIN_SSD has been introduced in LS-DYNA to run steady state dynamic analysis. It provides vibration response due to harmonic loading in frequency domain. This provides also possibility for some other simulations, for example, acoustic computation. Usually engineers and researchers use finite element method or boundary element method to run acoustic or vibro-acoustic simulation. These methods require explicit finite element or boundary element mesh for the acoustic domain. A complex variable equation system is established and solved for each excitation frequency. As a comparison, the SSD based acoustic approach is much simpler as it does not require any acoustic elements. Based on the vibration results from SSD, one can compute the acoustic intensity on the surface of structures, with some assumptions. Then with an integral on the elements on the surface, one can get estimated radiated acoustic power from the structure. This paper introduces three

methods to compute the radiated acoustic power based on SSD: 1) ERP; 2) ERP with corrected radiation efficiency at lower frequencies; and 3) Using Rayleigh Integral.

Review of the theory for computation of acoustic power

The acoustic intensity is defined as

$$I(r_P) = \mathrm{Re}\left[p(r_P)\cdot v_n(r_P)^*\right]/2 \quad (1)$$

where $p(r_P)$ is acoustic pressure, $v_n(r_P)$ is the normal velocity at the surface.

For ERP, the plane wave assumption is used. As the result,

$$Z = \frac{p}{v_n} = \rho c \quad (2)$$

where ρ is the density of the fluid (e.g. air), c is the sound speed in acoustic fluid. For air, ρ=1.21 kg/m^3 and c = 340 m/s. Z is acoustic characteristic impedance.

With some manipulation of the equation (2), one can get

$$p(r_P) = \rho c v_n \quad (3)$$

So the ERP absolute value can be computed as integral of acoustic intensity over the surface S:

$$W_{ERP} = \int_S I(r_S)dS = \rho c \int_S v_n(r_S)v_n^*(r_S)dS \quad (4)$$

As pointed in reference [1], corrected radiation efficiency for low frequencies is given as

$$\sigma = 1 - \frac{J_1(2kR)}{kR} \quad (5)$$

Where, $k = \omega/c$ is the wave number and R is the radius of a rigid circular piston. In equation (5), the Bessel Function J_1 is dependent on the Helmholtz number kR. With the introduction of the corrected radiation efficiency, the equation (4) can be rewritten as

$$W_{ERP\_c} = \left(1 - \frac{J_1(2kR)}{kR}\right)\rho c \int_S v_n(r_S)v_n^*(r_S)dS \quad (6)$$

For pressure given by Rayleigh Integral, it is given as

$$p(r_P) = \frac{i\omega\rho}{2\pi}\int_S v_n(r_P)\frac{e^{-ikR}}{R}dS \quad (7)$$

And the radiated power by Rayleigh Integral is given as below

$$W_{RI} = \int_S I(r_S)dS = \frac{\omega\rho}{4\pi}\int_{S'}\int_S v_n(r_S)\frac{\sin kR}{R}v_n^*(r_S)dSdS'$$

Keywords

A typical keyword for running ERP and acoustic radiated power by Rayleigh integral is given below. The option _ERP after ***FREQUENCY_DOMAIN_SSD** indicates that the calculation for ERP (Equivalent Radiated Power) is requested. With this option, cards 4, 5 for the keyword ***FREQUENCY_DOMAIN_SSD** are required [2]

```
*FREQUENCY_DOMAIN_SSD_ERP
$#   mdmin     mdmax     fnmin     fnmax    restmd    restdp
         1        20     0.000     0.000
$#   dampf     lcdam     lctyp    dmpmas    dmpstf
  0.010000         0         0     0.000     0.000
$#                                  nerp    strtyp      nout     notyp      nova
                                       1
$#      ro         c    erprlf    erpref    radeff
      1.21      340.        1.                 1
$#     pid      ptyp
         1         2
$#     nid      ntyp       dof       vad       lc1       lc2    lcflag       vid
$# horizontal base acceleration
                                       1         3       200
*DATABASE_FREQUENCY_BINARY_D3SSD
$#  binary
         1
$#    fmin      fmax     nfreq    fspace    lcfreq
      10.     1000.       100
```

To use the corrected radiation efficiency for low frequencies for ERP results, one can set “ERPREF” = -1.

Example: a simplified engine model

This example considers a simplified auto engine model. It has 16041 nodes and 13484 Hexahedron elements. Elastic material is used for this model. The engine model is constrained to a shaker table from the base (see Figure 2). The harmonic excitation is given in x-direction through the shaker table. The range of excitation frequency is 10-1000 Hz, with frequency step 10 Hz. The excitation is given in the form of constant acceleration amplitude 0.02 g, for the whole range of frequency.

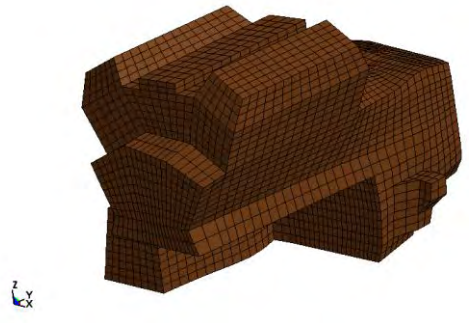


Fig 1. FEM mesh of a simplified auto engine model

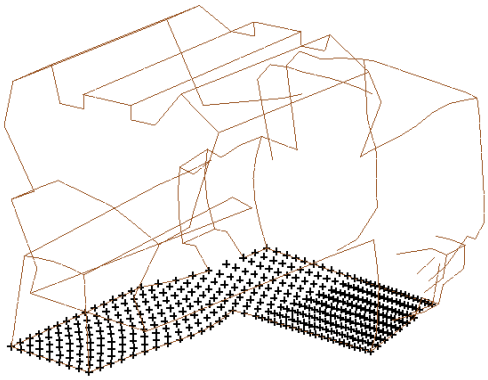


Fig 2. Constraints of the engine model

The whole outer surface of the engine model is taken as the acoustic radiation surface. With ERP option and air density, sound speed in air, as well as the radiation panel defined in card 4 and 5, one can get the ERP results as

1) Binary plot database D3ERP, which shows the ERP density on the surface, and
2) ERP_ABS and ERP_DB for the ERP absolute value, and dB values (if a reference ERP value is provided in the position of ERPREF in card 4).

Particularly, the ERP density fringe plot at frequency 100 Hz and 500 Hz are shown in Figures 3 and 4

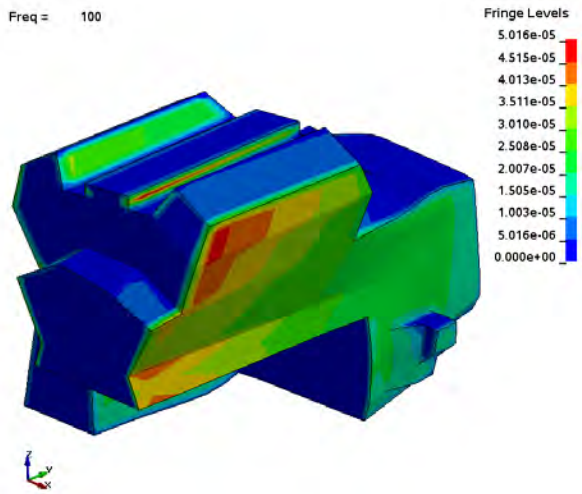


Fig 3. ERP density at frequency 100 Hz

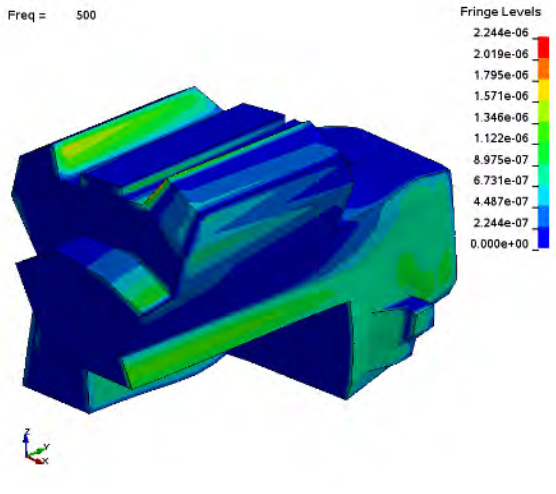


Fig 4. ERP density at frequency 500 Hz

The ERP absolute value for the whole range of frequency 10-1000 Hz can be found in Figure 5.

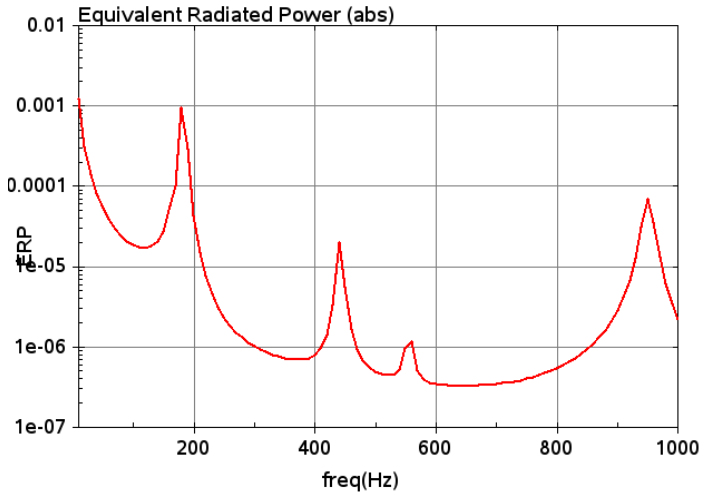


Fig 5. ERP absolute value (watt) vs. frequency

Since the "RADEFF" is set to be 1 in the input deck, LS-DYNA also runs radiated acoustic power calculation based on Rayleigh integral, and calculates the radiation efficiency, which is given as a ratio between the radiated acoustic power based on Rayleigh integral, and the acoustic power based on plane wave assumption (which is ERP absolute value computed before). By setting "ERPREF" = -1, one can also introduce the correction on the radiation efficiency for low frequencies for ERP, and get a "corrected" ERP absolute value. Figure 6 below shows the radiated acoustic power, given by the three methods: 1) classic ERP; 2) ERP with corrected radiation efficiency for lower frequencies; and 3) Rayleigh integral.

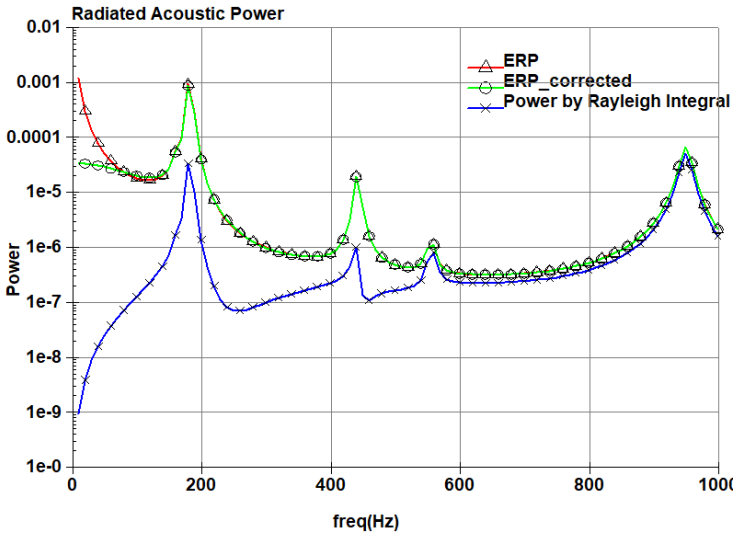


Fig 6. Radiated acoustic power (watt) by classic ERP, corrected ERP and Rayleigh integral

As can be seen in Figure 6, the radiated acoustic power by the classic ERP, the ERP with corrected radiation efficiency at low frequencies, and Rayleigh integral method have a good match at higher frequencies (e.g. frequency over 600 Hz). For the lower frequencies, the radiated acoustic power calculated by the Rayleigh Integral method is much lower than those given by ERP methods (classic one and the one with low frequency radiation efficiency correction). Besides, from Figure 6, one can see that the correction on the ERP absolute value by equation (6) has only influence on the results in low frequency range.

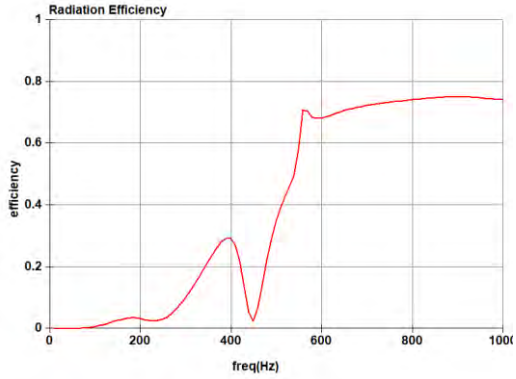


Fig 7. Radiation efficiency

Figure 7 shows radiation efficiency, which is given as a ratio between acoustic power by Rayleigh integral and ERP. One can see that the radiation efficiency is much higher and approaching to 1 for the higher frequency range.

Conclusion

This paper introduces three acoustic radiated power computation methods for vibrating structures, based on the keyword ***FREQUENCY_DOMAIN_SSD**. They are all much cheaper and faster than the standard finite element or boundary element acoustic methods. They help to characterize the structure borne noise quickly. They can be very useful in the early design phase of product development. The three methods are based on different theories and assumptions. It is important for user to understand the difference in the corresponding assumptions in order to use them appropriately.

Reference

1. Münch, H. Equivalent Radiated Power - Sensibilisierung für Grenzen und Potenziale einer akustischen Berechnungsmethode, Master of Science Study Work, Friedrich-Alexander University, Erlangen, (2014).
2. Livermore Software Technology Corporation, LS-DYNA® Keyword User's Manual, 2019.

BETA
SIMULATION SOLUTIONS

BETA CAE Systems. www.beta-cae.com

BETA CAE Systems - ANSA

An advanced multidisciplinary CAE pre-processing tool that provides all the necessary functionality for full-model build up, from CAD data to ready-to-run solver input file, in a single integrated environment. ANSA is a full product modeler for LS-DYNA, with integrated Data Management and Process Automation. ANSA can also be directly coupled with LS-OPT of LST, an ANSYS company to provide an integrated solution in the field of optimization.

BETA CAE Systems μETA

Is a multi-purpose post-processor meeting diverging needs from various CAE disciplines. It owes its success to its impressive performance, innovative features and capabilities of interaction between animations, plots, videos, reports and other objects. It offers extensive support and handling of LS-DYNA 2D and 3D results, including those compressed with SCAI's FEMZIP software.

Solutions for:

Process Automation - Data Management – Meshing – Durability - Crash & Safety NVH - CFD - Thermal analysis - Optimization - Powertrain
Products made of composite materials - Analysis Tools -
Maritime and Offshore Design - Aerospace engineering - Biomechanics

ETA – Engineering Technology Associates www.eta.com
etainfo@eta.com

Inventium Suite™

Inventium Suite™ is an enterprise-level CAE software solution, enabling concept to product. Inventium's first set of tools will be released soon, in the form of an advanced Pre & Post processor, called PreSys.

Inventium's unified and streamlined product architecture will provide users access to all of the suite's software tools. By design, its products will offer a high performance modeling and post-processing system, while providing a robust path for the integration of new tools and third party applications.

PreSys

Inventium's core FE modeling toolset. It is the successor to ETA's VPG/PrePost and FEMB products. PreSys offers an easy to use interface, with drop-down menus and toolbars, increased graphics speed and detailed graphics capabilities. These types of capabilities are combined with powerful, robust and accurate modeling functions.

VPG

Advanced systems analysis package. VPG delivers a unique set of tools which allow engineers to create and visualize, through its modules--structure, safety, drop test, and blast analyses.

DYNAFORM

Complete Die System Simulation Solution. The most accurate die analysis solution available today. Its formability simulation creates a "virtual tryout", predicting forming problems such as cracking, wrinkling, thinning and spring-back before any physical tooling is produced.

ESI Group www.esi-group.com

Visual-Environment is an integrative simulation platform for simulation tools operating either concurrently or standalone for various solver. Comprehensive and integrated solutions for meshing, pre/post processing, process automation and simulation data management are available within same environment enabling seamless execution and automation of tedious workflows. This very open and versatile environment simplifies the work of CAE engineers across the enterprise by facilitating collaboration and data sharing leading to increase of productivity.

Visual-Crash DYNA provides advanced preprocessing functionality for LS-DYNA users, e.g. fast iteration and rapid model revision processes, from data input to visualization for crashworthiness simulation and design. It ensures quick model browsing, advanced mesh editing capabilities and rapid graphical assembly of system models. Visual-Crash DYNA allows graphical creation, modification and deletion of LS-DYNA entities. It comprises tools for checking model quality and simulation parameters prior to launching calculations with the solver. These tools help in correcting errors and fine-tuning the model and simulation before submitting it to the solver, thus saving time and resources.
Several high productivity tools such as advanced dummy positioning, seat morphing, belt fitting and airbag folder are provided in **Visual-Safe,** a dedicated application to safety utilities.

Visual-Mesh is a complete meshing tool supporting CAD import, 1D/2D/3D meshing and editing for linear and quadratic meshes. It supports all meshing capabilities, like shell and solid automesh, batch meshing, topo mesh, layer mesh, etc. A convenient Meshing Process guides you to mesh the given CAD component or full vehicle automatically.

Visual-Viewer built on a multi-page/multi-plot environment, enables data grouping into pages and plots. The application allows creation of any number of pages with up to 16 windows on a single page. These windows can be plot, animation, video, model or drawing block windows. Visual-Viewer performs automated tasks and generates customized reports and thereby increasing engineers' productivity.

Visual-Process provides a whole suite of generic templates based on LS-DYNA solver (et altera). It enables seamless and interactive process automation through customizable LS-DYNA based templates for automated CAE workflows.

All generic process templates are easily accessible within the unique framework of Visual-Environment and can be customized upon request and based on customer's needs.

Visual*DSS* is a framework for Simulation Data and Process Management which connects with Visual-Environment and supports product engineering teams, irrespective of their geographic location, to make correct and realistic decisions throughout the virtual prototyping phase. Visual*DSS* supports seamless connection with various CAD/PLM systems to extract the data required for building virtual tests as well as building and chaining several virtual tests upstream and downstream to achieve an integrated process. It enables the capture, storage and reuse of enterprise knowledge and best practices, as well as the automation of repetitive and cumbersome tasks in a virtual prototyping process, the propagation of engineering changes or design changes from one domain to another.

JSOL Corporation www.jsol.co.jp/english/cae/

HYCRASH

Easy-to-use one step solver, for Stamping-Crash Coupled Analysis. HYCRASH only requires the panels' geometry to calculate manufacturing process effect, geometry of die are not necessary. Additionally, as this is target to usage of crash/strength analysis, even forming analysis data is not needed. If only crash/strength analysis data exists and panel ids is defined. HYCRASH extract panels to calculate it's strain, thickness, and map them to the original data.

JSTAMP/NV

As an integrated press forming simulation system for virtual tool shop the JSTAMP/NV meets the various industrial needs from the areas of automobile, electronics, iron and steel, etc. The JSTAMP/NV gives satisfaction to engineers, reliability to products, and robustness to tool shop via the advanced technology of the JSOL Corporation.

JMAG

JMAG uses the latest techniques to accurately model complex geometries, material properties, and thermal and structural phenomena associated with electromagnetic fields. With its excellent analysis capabilities, JMAG assists your manufacturing process.

LST

Livermore Software Technology, an ANSYS Company
www.lstc.com

LS-DYNA

A general-purpose finite element program capable of simulating complex real world problems. It is used by the automobile, aerospace, construction, military, manufacturing, and bioengineering industries. LS-DYNA is optimized for shared and distributed memory Unix, Linux, and Windows based, platforms, and it is fully QA'd by LST, an ANSYS company. The code's origins lie in highly nonlinear, transient dynamic finite element analysis using explicit time integration.

LS-PrePost

An advanced pre and post-processor that is delivered free with LS-DYNA. The user interface is designed to be both efficient and intuitive. LS-PrePost runs on Windows, Linux, and Macs utilizing OpenGL graphics to achieve fast rendering and XY plotting.

LS-OPT

LS-OPT is a standalone Design Optimization and Probabilistic Analysis package with an interface to LS-DYNA. The graphical preprocessor LS-OPTui facilitates definition of the design input and the creation of a command file while the postprocessor provides output such as approximation accuracy, optimization convergence, tradeoff curves, anthill plots and the relative importance of design variables.

LS-TaSC

A Topology and Shape Computation tool. Developed for engineering analysts who need to optimize structures, LS-TaSC works with both the implicit and explicit solvers of LS-DYNA. LS-TaSC handles topology optimization of large non-linear problems, involving dynamic loads and contact conditions.

LST, AN ANSYS COMPANY Dummy Models

Anthropomorphic Test Devices (ATDs), as known as "crash test dummies", are life-size mannequins equipped with sensors that measure forces, moments, displacements, and accelerations.

LST, AN ANSYS COMPANY Barrier Models

LSTC offers several Offset Deformable Barrier (ODB) and Movable Deformable Barrier (MDB) model.

Material Sciences Corporation www.materials-sciences.com

Materials Sciences Corporation has provided engineering services to the composites industry since 1970. During this time, we have participated in numerous programs that demonstrate our ability to: perform advanced composite design, analysis and testing; provide overall program management; work in a team environment; and transition new product development to the military and commercial sectors. MSC's corporate mission has expanded beyond basic research and development now to include transitioning its proprietary technologies from the research lab into innovative new products. This commitment is demonstrated through increased staffing and a more than 3-fold expansion of facilities to allow in-house manufacturing and testing of advanced composite materials and structures.

Materials Sciences Corporation (MSC) MAT161/162 - enhanced features have been added to the Dynamic Composite Simulator module of LS-DYNA.

This enhancement to LS-DYNA, known as MAT161/162, enables the most effective and accurate dynamic progressive failure modeling of composite structures to enable the most effective and accurate dynamic progressive failure modeling of composite structures currently available.

MSC/LS-DYNA Composite Software and Database -

Fact Sheet: http://www.materials-sciences.com/dyna-factsheet.pdf

- MSC and LSTC have joined forces in developing this powerful composite dynamic analysis code.
- For the first time, users will have the enhanced ability to simulate explicit dynamic engineering problems for composite structures.
- The integration of this module, known as 'MAT 161', into LS-DYNA allows users to account for progressive damage of various fiber, matrix and interply delamination failure modes.
- Implementing this code will result in the ability to optimize the design of composite structures, with significantly improved survivability under various blast and ballistic threats.

MSC's LS-DYNA module can be used to characterize a variety of composite structures in numerous applications—such as this composite hull under blast.

Oasys Ltd. LS-DYNA Environment www.oasys-software.com/dyna

The Oasys Suite of software is exclusively written for LS-DYNA® and is used worldwide by many of the largest LS-DYNA® customers. The suite comprises of:

Oasys PRIMER

Key benefits:

- Pre-Processor created specifically for LS-DYNA®
- Compatible with the latest version of LS-DYNA®
- Maintains the integrity of data
- Over 6000 checks and warnings – many auto-fixable
- Specialist tools for occupant positioning, seatbelt fitting and seat squashing (including setting up pre-simulations)
- Many features for model modification, such as part replace
- Ability to position and depenetrate impactors at multiple locations and produce many input decks automatically (e.g. pedestrian impact, interior head impact)
- Contact penetration checking and fixing
- Connection feature for creation and management of connection entities.
- Support for Volume III keywords and large format/long labels
- Powerful scripting capabilities allowing the user to create custom features and processes

www.oasys-software.com/dyna

Oasys D3PLOT

Key benefits:

- Powerful 3D visualization post-processor created specifically for LS-DYNA®
- Fast, high quality graphics
- Easy, in-depth access to LS-DYNA® results
- Scripting capabilities allowing the user to speed up post-processing, as well as creating user defined data components

www.predictiveengineering.com

Predictive Engineering provides finite element analysis consulting services, software, training and support to a broad range of engineering companies across North America. We strive to exceed client expectations for accuracy, timeliness and knowledge transfer. Our process is both cost-effective and collaborative, ensuring all clients are reference clients.

Our mission is to be honest brokers of information in our consulting services and the software we represent.

Our History

Since 1995, Predictive Engineering has continually expanded its client base. Our clients include many large organizations and industry leaders such as SpaceX, Nike, General Electric, Navistar, FLIR Systems, Sierra Nevada Corp, Georgia-Pacific, Intel, Messier-Dowty and more. Over the years, Predictive Engineering has successfully completed more than 800 projects, and has set itself apart on its strong FEA, CFD and LS-DYNA consulting services.

恒士达科技
Hengstar Tech.

Shanghai Hengstar www.hengstar.com

Center of Excellence: Hengstar Technology is the first LS-DYNA training center of excellence in China. As part of its expanding commitment to helping CAE engineers in China, Hengstar Technology will continue to organize high level training courses, seminars, workshops, forums etc., and will also continue to support CAE events such as: China CAE Annual Conference; China Conference of Automotive Safety Technology; International Forum of Automotive Traffic Safety in China; LS-DYNA China users conference etc.

On Site Training: Hengstar Technology also provides customer customized training programs on-site at the company facility. Training is tailored for customer needs using LS-DYNA such as material test and input keyword preparing; CAE process automation with customized script program; Simulation result correlation with the test result; Special topics with new LS-DYNA features etc..

Distribution & Support: Hengstar distributes and supports LS-DYNA, LS-OPT, LS-Prepost, LS-TaSC, LSTC FEA Models; Hongsheng Lu, previously was directly employed by LSTC before opening his distributorship in China for LSTC software. Hongsheng visits LSTC often to keep update on the latest software features.

Hengstar also distributes and supports d3View; Genesis, Visual DOC, ELSDYNA; Visual-Crash Dyna, Visual-Process, Visual-Environment; EnkiBonnet; and DynaX & MadyX etc.

Consulting

As a consulting company, Hengstar focuses on LS-DYNA applications such as crash and safety, durability, bird strike, stamping, forging, concrete structures, drop analysis, blast response, penetration etc with using LS-DYNA's advanced methods: FEA, ALE, SPH, EFG, DEM, ICFD, EM, CSEC..

Cloud - HPC Services - Subscription JSOL

Contact: JSOL Corporation Engineering Technology Division cae-info@sci.jsol.co.jp

Cloud computing services
for
JSOL Corporation LS-DYNA users in Japan

JSOL Corporation is cooperating with chosen cloud computing services

JSOL Corporation, a Japanese LS-DYNA distributor for Japanese LS-DYNA customers.

LS-DYNA customers in industries / academia / consultancies are facing increased needs for additional LS-DYNA cores

In calculations of optimization, robustness, statistical analysis, we find that an increase in cores of LS-DYNA are needed, for short term extra projects or cores.

JSOL Corporation is cooperating with some cloud computing services for JSOL's LS-DYNA users and willing to provide short term license.

This service is offered to customers using Cloud License fee schedule, the additional fee is less expensive than purchasing yearly license.

The following services are available (only in Japanese). HPC OnLine:

NEC Solution Innovators, Ltd. - http://jpn.nec.com/manufacture/machinery/hpc_online/

Focus - Foundation for Computational Science
http://www.j-focus.or.jp

Platform Computation Cloud - CreDist.Inc.

PLEXUS CAE
Information Services International-Dentsu, Ltd. (ISID) https://portal.plexusplm.com/plexus-cae/

SCSK Corporation - http://www.scsk.jp/product/keyword/keyword07.html

Cloud - HPC Services - Subscription RESCALE

www.rescale.com

Rescale: Cloud Simulation Platform

The Power of Simulation Innovation

We believe in the power of innovation. Engineering and science designs and ideas are limitless. So why should your hardware and software be limited? You shouldn't have to choose between expanding your simulations or saving time and budget.

Using the power of cloud technology combined with LS-DYNA allows you to:

- Accelerate complex simulations and fully explore the design space
- Optimize the analysis process with hourly software and hardware resources
- Leverage agile IT resources to provide flexibility and scalability

True On-Demand, Global Infrastructure

Teams are no longer in one location, country, or even continent. However, company data centers are often in one place, and everyone must connect in, regardless of office. For engineers across different regions, this can cause connection issues, wasted time, and product delays.

Rescale has strategic/technology partnerships with infrastructure and software providers to offer the following:

- Largest global hardware footprint – GPUs, Xeon Phi, InfiniBand
- Customizable configurations to meet every simulation demand
- Worldwide resource access provides industry-leading tools to every team
- Pay-per-use business model means you only pay for the resources you use
- True on-demand resources – no more queues

ScaleX Enterprise: Transform IT, Empower Engineers, Unleash Innovation

The ScaleX Enterprise simulation platform provides scalability and flexibility to companies while offering enterprise IT and management teams the opportunity to expand and empower their organizations.

Rescale Cloud Simulation Platform

www.rescale.com

ScaleX Enterprise allows enterprise companies to stay at the leading edge of computing technology while maximizing product design and accelerating the time to market by providing:

- Collaboration tools
- Administrative control
- API/Scheduler integration
- On-premise HPC integration

Industry-Leading Security

Rescale has built proprietary, industry-leading security solutions into the platform, meeting the needs of customers in the most demanding and competitive industries and markets.

- Manage engineering teams with user authentication and administrative controls
- Data is secure every step of the way with end-to-end data encryption
- Jobs run on isolated, kernel-encrypted, private clusters
- Data centers include biometric entry authentication
- Platforms routinely submit to independent external security audits

Rescale maintains key relationships to provide LS-DYNA on demand on a global scale. If you have a need to accelerate the simulation process and be an innovative leader, contact Rescale or the following partners to begin running LS-DYNA on Rescale's industry-leading cloud simulation platform.

LSTC - DYNAmore GmbH JSOL Corporation

Rescale, Inc. - 1-855-737-2253 (1-855-RESCALE) - info@rescale.com

944 Market St. #300, San Francisco, CA 94102 USA

ESI Cloud Based Virtual Engineering Solutions

www.esi-group.com

ESI Cloud offers designers and engineers cloud-based computer aided engineering (CAE) solutions across physics and engineering disciplines.

ESI Cloud combines ESI's industry tested virtual engineering solutions integrated onto ESI's Cloud Platform with browser based modeling,

With ESI Cloud users can choose from two basic usage models:

- An end-to-end SaaS model: Where modeling, multi-physics solving, results visualization and collaboration are conducted in the cloud through a web browser.
- A Hybrid model: Where modeling is done on desktop with solve, visualization and collaboration done in the cloud through a web browser.

Virtual Performance Solution:

ESI Cloud offers ESI's flagship Virtual Performance Solution (VPS) for multi-domain performance simulation as a hybrid offering on its cloud platform. With this offering, users can harness the power of Virtual Performance Solution, leading multi-domain CAE solution for virtual engineering of crash, safety, comfort, NVH (noise, vibration and harshness), acoustics, stiffness and durability.

In this hybrid model, users utilize VPS on their desktop for modeling including geometry, meshing and simulation set up. ESI Cloud is then used for high performance computing with an integrated visualization and real time collaboration offering through a web browser.

The benefits of VPS hybrid on ESI Cloud include:

- Running large concurrent simulations on demand
- On demand access to scalable and secured cloud HPC resources
- Three tiered security strategy for your data
- Visualization of large simulation data sets
- Real-time browser based visualization and collaboration
- Time and cost reduction for data transfer between cloud and desktop environments
- Support, consulting and training services with ESI's engineering teams

VPS On Demand

ESI Cloud features the Virtual Performance Solution (VPS) enabling engineers to analyze and test products, components, parts or material used in different engineering domains including crash and high velocity impact, occupant safety, NVH and interior acoustics, static and dynamic load cases. The solution enables VPS users to overcome hardware limitations and to drastically reduce their simulation time by running on demand very large concurrent simulations that take advantage of the flexible nature of cloud computing.

Key solution capabilities:

- Access to various physics for multi-domain optimization
- Flexible hybrid model from desktop to cloud computing
- On demand provisioning of hardware resources
- Distributed parallel processing using MPI (Message Passing Interface) protocol
- Distributed parallel computing with 10 Gb/s high speed interconnects

Result visualization

ESI Cloud deploys both client-side and server-side rendering technologies. This enables the full interactivity needed during the simulation workflow along with the ability to handle large data generated for 3D result visualization in the browser, removing the need for time consuming data transfers. Additionally ESI Cloud visualization engine enables the comparisons of different results through a multiple window user interface design.

Key result visualization capabilities:

- CPU or GPU based client and server side rendering
- Mobility with desktop like performance through the browser
- 2D/3D VPS contour plots and animations
- Custom multi-window system for 2D plots and 3D contours
- Zooming, panning, rotating, and sectioning of multiple windows

Collaboration

To enable real time multi-user and multi company collaboration, ESI Cloud offers extensive synchronous and asynchronous collaboration capabilities. Several users can view the same project, interact with the same model results, pass control from one to another. Any markups, discussions or annotations can be archived for future reference or be assigned as tasks to other members of the team.

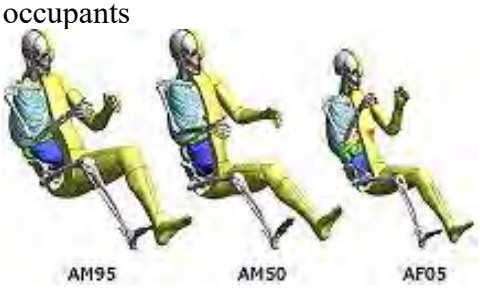
Key collaboration capabilities:

- Data, workflow or project asynchronous collaboration
- Multi-user, browser based collaboration for CAD, geometry, mesh and results models
- Real-time design review with notes, annotations and images archiving and retrieval
- Email invite to non ESI Cloud users for real time collaboration

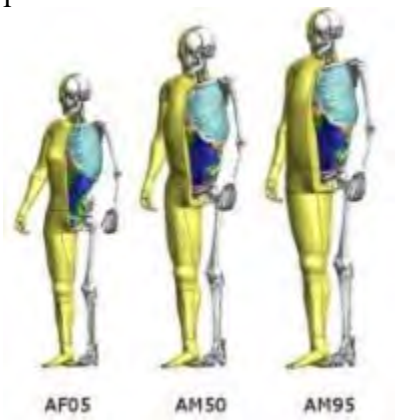
TOYOTA - Total Human Model for Safety – THUMS

The Total Human Model for Safety, or THUMS®, is a joint development of Toyota Motor Corporation and Toyota Central R&D Labs. Unlike dummy models, which are simplified representation of humans, THUMS represents actual humans in detail, including the outer shape, but also bones, muscles, ligaments, tendons, and internal organs. Therefore, THUMS can be used in automotive crash simulations to identify safety problems and find their solutions.

Each of the different sized models is available as sitting model to represent vehicle occupants



and as standing model to represent pedestrians.



The internal organs were modeled based on high resolution CT-scans.

THUMS is limited to civilian use and may under no circumstances be used in military applications.

LSTC is the US distributor for THUMS. Commercial and academic licenses are available.

For information please contact: THUMS@lstc.com

THUMS®, is a registered trademark of Toyota Central R&D Labs.

LST, An ANSYS Company – Dummy Models

Crash Test Dummies (ATD)

Meeting the need of their LS-DYNA users for an affordable crash test dummy (ATD), LSTC offers the LSTC developed dummies at no cost to LS-DYNA users.

LSTC continues development on the LSTC Dummy models with the help and support of their customers. Some of the models are joint developments with their partners.

e-mail to: atds@lstc.com

Models completed and available (in at least an alpha version)

- Hybrid III Rigid-FE Adults
- Hybrid III 50th percentile FAST
- Hybrid III 5th percentile detailed
- Hybrid III 50th percentile detailed
- Hybrid III 50th percentile standing
- EuroSID 2
- EuroSID 2re
- SID-IIs Revision D
- USSID
- Free Motion Headform
- Pedestrian Legform Impactors

Models In Development

- Hybrid III 95th percentile detailed
- Hybrid III 3-year-old
- Hybrid II
- WorldSID 50th percentile
- THOR NT FAST
- Ejection Mitigation Headform

Planned Models

- FAA Hybrid III
- FAST version of THOR NT
- FAST version of EuroSID 2
- FAST version of EuroSID 2re
- Pedestrian Headforms
- Q-Series Child Dummies
- FLEX-PLI

LST, An ANSYS Company – Barrier Models

Meeting the need of their LS-DYNA users for affordable barrier models, LSTC offers the LSTC developed barrier models at no cost to LS-DYNA users.

LSTC offers several Offset Deformable Barrier (ODB) and Movable Deformable Barrier (MDB) models:

- ODB modeled with shell elements
- ODB modeled with solid elements
- ODB modeled with a combination of shell and solid elements
- MDB according to FMVSS 214 modeled with shell elements
- MDB according to FMVSS 214 modeled with solid elements
- MDB according to ECE R-95 modeled with shell elements
- AE-MDB modeled with shell elements
- IIHS MDB modeled with shell elements
- IIHS MDB modeled with solid elements
- RCAR bumper barrier
- RMDB modeled with shell and solid elements

LSTC ODB and MDB models are developed to correlate to several tests provided by our customers. These tests are proprietary data and are not currently available to the public.

All current models can be obtained through our webpage in the LSTC Models download section or through your LS-DYNA distributor.

To submit questions, suggestions, or feedback about LSTC's models, please send an e-mail to: atds@lstc.com. Also, please contact us if you would like to help improve these models by sharing test data.

Social Media

FACEBOOK

BETA CAE Systems
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BETA CAE Systems
CADFEM
DYNAmore Nordic
ETA
ESI Group

YOUTUBE

YOUTUBE Channel	WebSite URL
BETA CAE Systems	www.beta-cae.com
CADFEM	www.cadfem.de
ESI Group	www.esi-group.com
ETA	www.eta.com
Lancemore	www.lancemore.jp/index_en.html
Lenovo	

GOOGLE+

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