DYNA MORE

All seminars are available in English language on demand

2020

Seminars

Information days

Webinars

Support days

Courtesy of Honda R&D Americas Inc

CONTENTS

Seminar descriptions

Info = Free-of-charge information day

Seminars	Information days	Webinars	Support	On site / Individual
Introductions	Crashworthiness	Passive Safety	Forming/Processes	Materials
Basics	Implicit	Multiphysics	Particle Methods	Optimization
Theory	CAE/IT	High Energy	CFD	Pre-/Postprocessing

Dear Users,

In 2020, we have once again expanded our range of seminars and adapted them to the needs of our customers. This year, the seminar „From Explicit to Implicit Simulation Models in LS-DYNA" (page 37) is new in the program. Participants will learn how to convert explicit input decks into implicit ones. The course „Contact Definitions in LS-DYNA"(page 13) is offered for the first time as a two-day seminar. In this way, certain topics can be discussed in more detail and questions can be answered more intensively. We have resumed the training course „Introduction to EFG" (page 39). The focus of this course is the simulation of large deformations, such as those that occur in forging processes. For the first time, you will also find the CFD with STAR-CCM+ training courses offered by DYNAmore sister company CASCATE in this brochure (pages 52 - 54).

The International LS-DYNA Conference in Detroit, USA and the 16th German LS-DYNA Forum in Ulm are the highlights of the year. As always, we offer a wide range of seminars at the conferences. More information on the seminars offered in Detroit can be found at www.lstc.com/2020. The accompanying seminars for the German LS-DYNA Forum can be found on the pages 7, 36, and 38.

We will also offer our popular information and support days as well as our webinars again in 2020. Use these opportunities to inform yourself about various topics and to get in contact with our engineers and developers.

Our vocational trainings for simulation engineers (page 55) are an ideal opportunity for young professionals and engineers who would like to continue their educational training. We offer training packages for nonlinear structural mechanics (crash), occupant safety simulations and metal forming. We are happy to offer you advice. Please contact us.

Our training content can be combined and adapted to your individual wishes and needs. Just ask us, we will be happy to create a tailor-made training package for you.

All changes regarding the seminar organization as well as all news about LS-DYNA, LS-OPT, our partners and about us can be found in our regular newsletter, the „DYNAmore Infomail". Register at www.dynamore.de/newsletter and receive all important information by e-mail.

We hope that you enjoy our training courses and would be pleased to welcome you personally at one of our seminars or information days.

Kind regards,

Dr.-Ing. Maik Schenke

Your contact partner for any questions:

Organization

Carina Sieber

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seminar@dynamore.de

Course Advisor

Dr.-Ing. Maik Schenke

Tel. +49 (0)711 - 45 96 00 - 22
maik.schenke@dynamore.de

Trainings and Information Days	Jan.	Feb.	March	April	May	June	July
INTRODUCTION							
Introduction to LS-DYNA (location: Stuttgart, Germany)		11-13	24-26		5-7	23-25	14-16
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Introduction to Nonlinear Implicit Analyses in LS-DYNA				3[Tu]/27[Z]			17
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Introduction to Isogeometric Analysis with LS-DYNA							
Information day: New Features in LS-DYNA and LS-OPT			18[Tu]			15[V]	
Information day: Cloud Solutions for LS-DYNA							13
BASICS/THEORY							
Element Types and Nonlinear Aspects							
User Interfaces in LS-DYNA		3					
CRASH/SHORT-TERM DYNAMICS							
Crashworthiness Simulation with LS-DYNA			17-20/24-27[G]				
Introduction to Contact Definitions in LS-DYNA			30[V]		11		
Contact modeling in LS-DYNA							27-28
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Failure of Fiber Reinforced Polymer Components			16				
Information day: Simulation of Drop Tests with LS-DYNA							
PASSIVE SAFETY							
Introduction to Passive Safety Simulation with LS-DYNA			12-13				
CPM for Airbag Modeling			27				
LS-DYNA Dummy and Pedestrian Impactor Modeling		4					
Information day: Human Modeling and Biomechanics							
Information day: Certification of Human Models (EuroNCAP TB024)							
METAL FORMING/PROCESS SIMULATION							
Metal Forming with LS-DYNA					12-14/18-20[V]		
Applied Forming Simulation with eta/DYNAFORM	23-24						6-7
Hot Forming with LS-DYNA	21-22						9-10
Introduction to Welding Simulation with LS-DYNA						29	
Introduction to Sheet Metal Forming with OpenForm							8
Introduction to Draping Simulation with LS-DYNA				28-29			
Information day: Welding and Heat Treatment with DynaWeld and LS-DYNA					4		
Information day: Forming Trends in LS-DYNA and eta/DYNAFORM							
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Parameter Identification with LS-OPT						17	
Modeling Polymers and Elastomers in LS-DYNA				20-21			
Simulation of Short Fiber Reinforced Polymers				24	5[G]	15[Tu]	
Simulation of Continuous Fiber Reinforced Polymers				22-23	6-7[G]	16-17[Tu]	
Concrete and Geomaterial Modeling with LS-DYNA							
Simulation of Thermoplastics							3
User Materials in LS-DYNA				27			
Information day: Composite Analysis with LS-DYNA				3			
Information day: Material Characterizations/Measurement Technology							20
Information day: Simulation of Plastics with LS-DYNA							
IMPLICIT							
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NVH, Frequency Domain Analysis and Fatigue with LS-DYNA							
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Discrete Element Method (DEM) in LS-DYNA							
MULTIPHYSICS							
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ICFD - Incompressible Fluid Solver in LS-DYNA							
CESE - Compressible Fluid Solver in LS-DYNA							
Resistive Heating and Battery Modeling							
Electromagnetism in LS-DYNA							
Information day: Multiphysics							
HIGH ENERGY EVENTS							
Methods for Simulating Short Duration Events							
Blast Modeling with LS-DYNA							
Penetration Modeling with LS-DYNA							
Explosives Modeling for Engineers							
OPTIMIZATION							
LS-OPT - Optimization and Robustness			31.3.-2.4.			22-24[V]	
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Structural Optimization with GENESIS							22-23
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SUPPORT/WEBINARS							
Support day: LS-DYNA	17	14		24	22		3
Support day: Occupant Safety			20				24
Webinars – Straightforward Information on LS-DYNA [1]							
SDM SIMULATION DATA MANAGEMENT							
Introduction to SDM and Process Management with LoCo							1-2
Information day: Process Automation and SDM			11				
CFD COMPUTATIONAL FLUID DYNAMICS							
Basic Training STAR-CCM+		3-5					
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Information day: New Features in STAR-CCM+							
Information day: CFD with STAR-CCM+					8		

[1] = Topics / dates online
[2] = Euro pro Teilnehmer zzgl. MwSt.

[Ac] = Aachen (D)
[A] = Attendorn (D)
[B] = Berlin (D)
[D] = Dresden (D)
[I] = Ingolstadt (D)
[U] = Ulm (D)

Aug.	Sept.	Oct.	Nov.	Dec.	Fee[2]	Page	Trainings and Information Days
							INTRODUCTION
	22-24 15-17[T]/28-30[Tu]	20-22	17-19[I]	8-10 1-3[V]	1,575	6	Introduction to LS-DYNA (location: Stuttgart, Germany) Introduction to LS-DYNA (other locations)
	14[T]/21	1[V]		7	525	7	Introduction to LS-PrePost
				11	525	7	Introduction to Nonlinear Implicit Analyses in LS-DYNA
			2		525	8	Introduction to Simulation Technology
	25				525	8	Introduction to Isogeometric Analysis with LS-DYNA
			16[V]		–	9	Information day: New Features in LS-DYNA and LS-OPT
					–	9	Information day: Cloud Solutions for LS-DYNA
							BASICS/THEORY
		6[U]			525	10	Element Types and Nonlinear Aspects
					525	10	User Interfaces in LS-DYNA
							CRASH/SHORT-TERM DYNAMICS
				1-4	2,400	12	Crashworthiness Simulation with LS-DYNA
			6		525	13	Introduction to Contact Definitions in LS-DYNA
					1,050	13	Contact modeling in LS-DYNA
			9-10		1,050	14	Joining Techniques for Crash Analysis with LS-DYNA
					525	14	Failure of Fiber Reinforced Polymer Components
	21				–	15	Information day: Simulation of Drop Tests with LS-DYNA
							PASSIVE SAFETY
	17-18				1,050	16	Introduction to Passive Safety Simulation with LS-DYNA
			25		525	16	CPM for Airbag Modeling
					525	18	LS-DYNA Dummy and Pedestrian Impactor Modeling
			13		-	18	Information day: Human Modeling and Biomechanics
			25		-	19	Information day: Certification of Human Models (EuroNCAP TB024)
							METAL FORMING/PROCESS SIMULATION
			11-13		1,575	20	Metal Forming with LS-DYNA
			9-10		1,050	21	Applied Forming Simulation with eta/DYNAFORM
					1,050	21	Hot Forming with LS-DYNA
					525	22	Introduction to Welding Simulation with LS-DYNA
					525	22	Introduction to Sheet Metal Forming with OpenForm
			26-27		1,050	23	Introduction to Draping Simulation with LS-DYNA
					-	23	Information day: Welding and Heat Treatment with DynaWeld and LS-DYNA
	25				-	24	Information day: Forming Trends in LS-DYNA and eta/DYNAFORM
							MATERIALS
	15-16[V]		16-17		1,050	26	Material Modeling for Metals
			19-20		1,050	26	Damage and Failure Modeling
			23		525	27	Advanced Damage Modeling: Orthotropic Materials
		12[V]	18		525	28	Parameter Identification with LS-OPT
					1,200	28	Modeling Polymers and Elastomers in LS-DYNA
			5		525	30	Simulation of Short Fiber Reinforced Polymers
			3-4		1,050	30	Simulation of Continuous Fiber Reinforced Polymers
		1-2			1,200	32	Concrete and Geomaterial Modeling with LS-DYNA
					525	32	Simulation of Thermoplastics
		23			290	33	User Materials in LS-DYNA
					–	33	Information day: Composite Analysis with LS-DYNA
					–	34	Information day: Material Characterizations/Measurement Technology
			9		–	34	Information day: Simulation of Plastics with LS-DYNA
							IMPLICIT
	28-29		18-19[V]		1,050	36	Implicit Analysis with LS-DYNA
		6[U]			600	36	NVH, Frequency Domain Analysis and Fatigue with LS-DYNA
			26-27				From Explicit to Implicit Simulation Models in LS-DYNA
							PARTICLE METHODS
	17-18				1,200	38	Smoothed Particle Hydrodynamics (SPH) in LS-DYNA
		6[U]			600	38	SPG Method for Manufacturing and Material-Failure Analysis
			24		525	39	Introduction to EFG
	14				525	39	Discrete Element Method (DEM) in LS-DYNA
							MULTIPHYSICS
	15-16				1,200	40	ALE and Fluid-Structure-Interaction
		12-13			1,200	40	ICFD - Incompressible Fluid Solver in LS-DYNA
		19			600	41	CESE - Compressible Fluid Solver in LS-DYNA
		15			600	41	Resistive Heating and Battery Modeling
		14			600	42	Electromagnetism in LS-DYNA
		16			–	42	Information day: Multiphysics
							HIGH ENERGY EVENTS
		5-6			1,200	43	Methods for Simulating Short Duration Events
		12-13			1,200	43	Blast Modeling with LS-DYNA
		14-15			1,200	44	Penetration Modeling with LS-DYNA
		16			600	44	Explosives Modeling for Engineers
							OPTIMIZATION
	14-16		30.11.-2.12[Tu]		1,575	45	LS-OPT - Optimization and Robustness
					600	46	Basics of Industrial Structure Optimization
					1,050	46	Structural Optimization with GENESIS
					–	47	Information day: Optimization, DOE Studies and Robustness
					–	47	Information day: Optimization with ANSA, LS-OPT and META
							PRE- AND POSTPROCESSING
			30		525	48	Introduction to PRIMER for LS-DYNA
					1,050	48	ANSA and METApost for LS-DYNA
							SUPPORT/WEBINARS
	18	2	20		–	49	Support day: LS-DYNA
				4	–	49	Support day: Occupant Safety
			30	7	–	49	Webinars – Straightforward Information on LS-DYNA [1]
							SDM SIMULATION DATA MANAGEMENT
					1,050	51	Introduction to SDM and Process Management with LoCo
			23		–	52	Information day: Process Automation and SDM
							CFD COMPUTATIONAL FLUID DYNAMICS
			2-4		1,575	52	Basic Training STAR-CCM+
					525	53	Battery Simulation in STAR-CCM+
					1,050	53	Multiphase Flow in STAR-CCM+
	30				–	54	Information day: New Features in STAR-CCM+
					–	54	Information day: CFD with STAR-CCM+

[G] = Göteborg (S)
[L] = Linköping (S)
[T] = Traboch (A)
[Tu] = Turin (I)
[V] = Versailles (F)
[Z] = Zurich (CH)

Online registration: www.dynamore.de/seminars
Registration form: page 64
General course information: page 61

INTRODUCTION TO LS-DYNA

Type:
Seminar
Duration:
3 days
Fee:
1,575 Euro
(525 Euro per day, can be booked separately)
Lecturers:
Dr. Filipe Andrade, Pierre Glay, Dr. Tobias Graf, Dr. Martin Helbig, Dr. Nils Karajan, Julien Lacambre Dr. Steffen Mattern, Dr. Maik Schenke, all DYNAmore
Dates:
27-29 January V)
11-13 February
24-26 March
31 March - 2 April Z)
01-02 April Tu)*
05-07 May
11-13 May V)
23-25 June
14-16 July
15-17 September T)
22-24 September
28-30 September Tu)
20-22 October
17-19 November I)
01-03 December V)
08-10 December

I) Ingolstadt
Z) Zurich, Switzerland
Tu) Turin, Italy
T) Traboch, Austria
V) Versailles, France

*Two-day course – only basics

Online registration:
www.dynamore.de/c201e

Basics (days 1 and 2)

The introductory seminar gives a quick, comprehensive introduction to the application of LS-DYNA and is recommended for simulation engineers who want to use LS-DYNA as a finite element code to simulate general nonlinear problems. Prior knowledge is not required.

The main application areas of LS-DYNA are crash simulations, metalforming simulations and the simulation of impact problems and other strongly nonlinear tasks. LS-DYNA can also be used to successfully solve complex nonlinear static problems in cases where implicit solution methods cannot be applied due to convergence problems. The seminar participant works on exercise examples independently to help him/her understand the application of LS-DYNA.

Content
- What kind of problems can be solved using LS-DYNA?
- What is the difference between implicit and explicit time integration and how are both methods used in LS-DYNA?
- How is a simulation started in LS-DYNA?
- What element types are available?
- How are the various contact definitions implemented?
- How are crash simulations and other dynamic calculations executed?
- How can quasi-static problems be handled?
- What input/output data is available and what does it contain?
- How can results be analyzed and compared?

We strongly recommend LS-DYNA novices to attend this seminar. Additionally we recommend the attendance of the seminar “Introduction to LS-PrePost”.

Further Topics (day 3)

To carry out realistic FE simulations, appropriate constitutive models need to be selected with the requirement of an identification of the involved material parameters to reproduce the properties of the materials used. In this regard, there is often a possibility to simplify the overall model if certain areas can be modeled either as rigid bodies or with the aid of discrete elements. Moreover, several components are often joined with connectors which also need to be modeled appropriately, to accurately predict the behavior of the overall system.

The aim of this seminar is to facilitate the novice’s first steps in material modeling. Following this, the most common constitutive models for typical applications are presented such as crash, drop, and impact simulations. A wide range of the material properties of simulation models are explained in detail using simple examples, and thus enabling associated engineering problems to be dealt with competently and quickly. If required, basic material theory can also be discussed. Additionally, the course participants learn how to define rigid bodies and discrete elements in LS-DYNA and what they need to bear in mind when doing so.

Finally, modeling techniques for the most common types of connectors such as spot-welds and bolt connections are shown to demonstrate how they can be represented in a finite element model using LS-DYNA.

Content
- Presentation of the most common material models for metals, foams, elastomers and polymers
- Composition of a material card for a steel material on the basis of test data
- Modeling rigid bodies with LS-DYNA
- Definition of discrete elements and discussion of corresponding material models
- Modeling techniques for common connectors such as spot-welds, adhesive joins, bolt connections, etc.
- Consolidation of learned knowledge using simple exercise examples
- Tips and guidelines regarding the definition of material cards

To attend the module “Further Topics”, we recommend prior attendance at the module “Basics”.

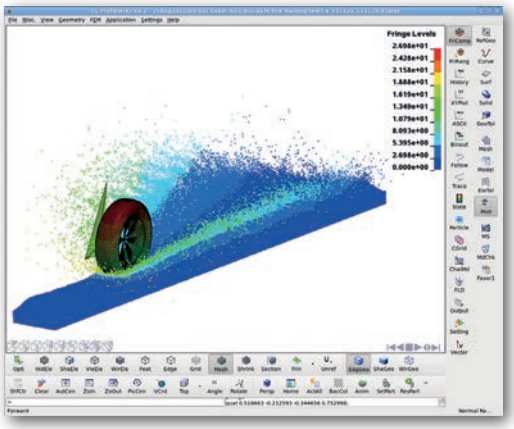
We also offer this seminar in 2020 as an online seminar. Further information can be found at www.dynamore.de

ALSO AVAILABLE IN FRENCH

Courtesy of Dr. Ing. h.c. F. Porsche AG

INTRODUCTION TO LS-PREPOST

LS-PrePost is the pre- and postprocessor of LSTC which can be used to generate or modify LS-DYNA models as well as to visualize the results of finite element analyses that were carried out with LS-DYNA. In particular, LS-DYNA input decks can be loaded into LS-PrePost to edit the keywords cards using the graphical user interface. Over the past years, the capabilities of LS-PrePost have been constantly advanced to account for the latest developments in LS-DYNA. This holds especially for the pre-processing where many new features have been added.



The goal of this one day seminar is to demonstrate the application of LS-PrePost and to explain its practical usage. Attendees will learn how to use the functionality of the graphical user interface with a focus on typical applications.

Content

Preprocessing

- Basic pre-processing operations in LS-PrePost
- Visualizing and editing LS-DYNA input decks
- Working with include structures in the model
- Simple meshing features
- Editing and correction of existing FE meshes
- Checking the quality of the mesh
- Definition of contacts, element types and materials
- Prescribing boundary conditions
- Definition, assignment and visualization of load curves

Postprocessing

- Handling different LS-DYNA output files
- Plot and modification of curves (summation, scaling, filtering)
- Printing and preparing results for presentations
- Color plots of physical quantities on the model (fringe plots)
- Vector plots, cross sections of the model, etc.

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturer:
Silvia Mandel, DYNAmore
Dates:
10 February
23 March
30 March Z)
04 May
22 June
14 September T)
21 September
01 October V)
07 December

Z) Zurich, Switzerland
T) Traboch, Austria
V) Versailles, France

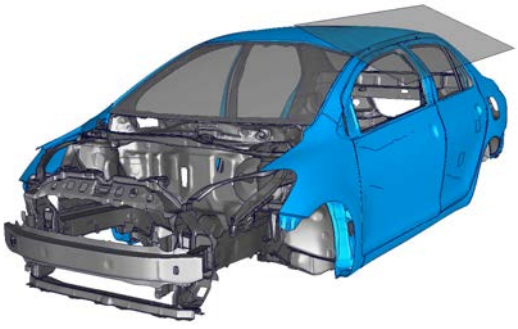
Online registration:
www.dynamore.de/c202e

ALSO AVAILABLE IN FRENCH

INTRODUCTION TO NONLINEAR IMPLICIT ANALYSES IN LS-DYNA

The implicit solver of LS-DYNA is well suited to handle many challenging applications, thereby coping with large deformations, difficult contact situation and material nonlinearities. With respect to the latter, there are many advanced material models available that are suitable for both explicit and implicit analysis. Moreover, the scalability on many CPU cores is very good, which allows for the treatment of large scale problems.

The goal of this one-day seminar is to present a brief, practical introduction to the implicit capabilities in LS-DYNA with a focus on nonlinear structural analysis. The course is suited for users with some previous experience from using LS-DYNA, or for experienced users of other implicit FE-programs.



Content

- Introduction and when to use the implicit solver
- Differences to explicit time integration
- Switching between implicit and explicit integration
- Material models and elements suitable for implicit analysis
- Loads, boundary conditions and constraints
- Contact definitions
- Further tips and tricks
- Implicit Non-linear static analyses and dynamics
- Troubleshooting convergence problems
- Output format and output files
- Selected workshop examples

We strongly recommend LS-DYNA novices prior attendance of the seminar “Introduction to LS-DYNA”. Beginners of numerical simulation we additionally recommend the attendance of the seminar “Introduction to LS-PrePost”.

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
Pierre Glay, Dr. Christoph Schmied, both DYNAmore
Dates:
03 April Tu)
27 April Z)
17 July
11 December

Z) Zurich, Switzerland
Tu) Turin, Italy

Online registration:
www.dynamore.de/c203e

INTRODUCTION TO SIMULATION TECHNOLOGY

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
Dr. Maik Schenke, DYNAmore
Dates:
19 May
02 November

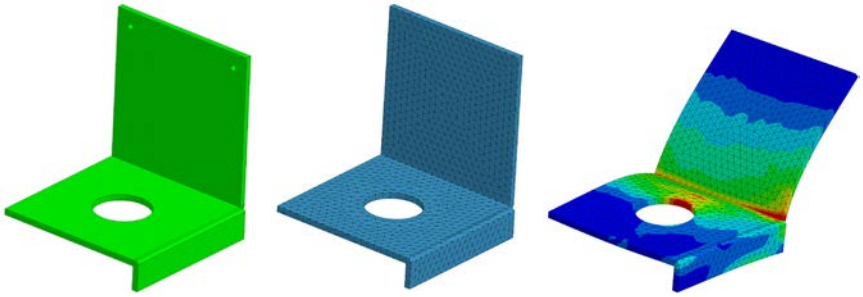
Online registration:
www.dynamore.de/c204e

POPULAR

Nowadays, computer simulations gain more and more importance during product development and research. However, they require a fundamental background in physics, mathematics and numerics acquired over years of education by a simulation specialist.

This course gives an overview and insight into computer simulations especially focusing on non-simulation specialists, such as design and test engineers as well as project managers, who are in contact with computer simulations in their daily work or just want to be informed on this matter. In this regard, the seminar provides a glimpse into the theoretical background and simulation work flow on the one hand and also points out potential pit falls when dealing with computer simulations on the other hand. The complex matter of simulation technology is presented in a rather illustrative manner for accessibility, however, it does not lack the necessary technical background when needed. Moreover, throughout the course, practical exercises will help the participants to assimilate the theoretical content and adopt the mind-set of simulation specialist.

Contents
- Application examples and benefits
- Real-world idealization within a simulation model
- Finite-Element Method (FEM)
- Time-advancing schemes
- Material modeling
- Contact handling
- Joining techniques
- Simulation work flow (incl. practical exercises)



INTRODUCTION TO ISOGEOMETRIC ANALYSIS WITH LS-DYNA

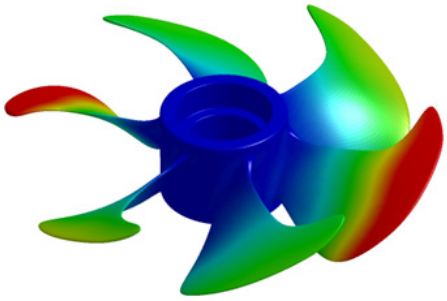
Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
Dr. Stefan Hartmann, DYNAmore
Dates:
25 September

Online registration:
www.dynamore.de/c205e

Isogeometric Analysis (IGA) is a finite element technology in which the geometry description (i.e. shape functions) used in computer-aided design (CAD) is used in the numerical analysis. Besides the potential to better integrate the CAD-models with the subsequent finite element analysis (FEA), the use of higher order shape functions, i.e. non-uniform rational B-splines (NURBS) may yield better results while having the possibility of using larger element sizes. Furthermore, the use of the IGA technology helps reducing the discretization error that may result form the re-parameterization of the CAD design.

This one day class provides an introduction into Isogeometric Analysis (IGA) with Non-Uniform Rational B-Splines (NURBS) in LS-DYNA. Some theoretical background about IGA and NURBS will be presented before exploring the current capabilities in LS-DYNA. Starting with a CAD-file the setup of a suitable model using LS-PrePost will be demonstrated. The class will deal with shells and solids with the main focus on shells.

Contents
- Introduction and Motivation
- Theoretical background
- NURBS surfaces
- NURBS-based shell formulations
- Application of boundary conditions
- Joining of patches
- Model setup
- Post-Processing
- Examples#
- NURBS-based solids in LS-DYNA
- Discussion and outlook



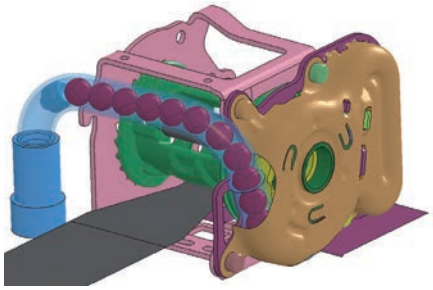
INFORMATION DAY: NEW FEATURES IN LS-DYNA AND LS-OPT

In the course of this information day, new developments in the multi-purpose computation program LS-DYNA and the associated optimization program LS-OPT will be presented. The purpose of this event is, on the one hand, to inform existing users about new developments, and, on the other hand, to provide interested parties who are already experienced with other software products a summary of the possibilities offered by LS-DYNA and LS-OPT.

LS-DYNA is one of the world's leading finite element software systems and is ideally suited for computer simulation of highly nonlinear physical problems in industry and research. Typical applications include crash simulation, metal forming, impact and drop tests, detonations, impact, penetration, fluid-structure interaction, as well as thermomechanical and electro-magnetically coupled problems.

In addition to explicit and implicit time integration and classical FEM, many particle methods such as EFG, SPH, SPG and DEM as well as isogeometric methods are also available. Moreover, the „One Code Strategy" allows many features to be easily interlinked, which means that a simulation can often effectively cover the overall process chain.

LS-OPT, on the other hand, is LSTC's independent optimization program. It is ideally suited for the solution of highly nonlinear optimization problems and is thus best utilized for applications in conjunction with LS-DYNA. However, LS-OPT can be combined with any other software package. Thus, multidisciplinary problems can be solved.



Courtesy of Joyson Safety Systems Aschaffenburg GmbH

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Dates:
18 March [Tu)]
15 June [V)]
16 November [V)]

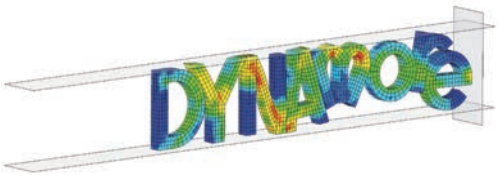
[Tu)] Turin, Italy
[V)] Versailles, France

Online registration:
www.dynamore.de/c206e

ALSO AVAILABLE IN FRENCH

INFORMATION DAY: CLOUD SOLUTIONS FOR LS-DYNA

The idea of cloud technology is becoming more and more popular in the IT world. Due to the efficient usage of available hardware resources, the IT investments can be reduced significantly. The efficient use of the soft- and hardware resources leads to a high cost saving potential for the whole IT budget in both large and small enterprises.



At the information day the possibilities of using cloud technology will be presented. Furthermore requirements related to the usage of LS-DYNA and related products on such platforms will be discussed.

Content
- Introduction to cloud technology
- Services related to grid framework
- How to use LS-DYNA on a grid system
- How to achieve a good performance
- Data integrity

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Dates:
13 July

Online registration:
www.dynamore.de/c207e

ELEMENT TYPES AND NONLINEAR ASPECTS IN LS-DYNA

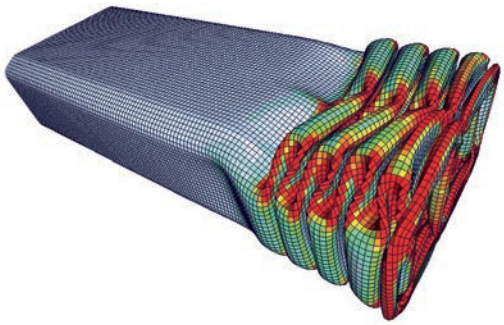
Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
Dr. André Haufe, DYNAmore;
Prof. Dr. Karl Schweizerhof, DYNAmore/KIT
Date:
06 October [U)]

[U)] Ulm

Online registration:
www.dynamore.de/c208e

This seminar is a collection of different topics on nonlinear aspects with respect to LS-DYNA. Emphasis is directed towards element technology and the various specific elements implemented in LS-DYNA. In particular, the theoretical background as well as the corresponding practical usage will be discussed. Additionally, adaptive schemes for nonlinear problems will be presented.

Since more and more implicit features are included in LS-DYNA, the seminar will also provide information on implicit solver technology for linear and nonlinear problems.



This class is intended for participants with pre-existing knowledge in finite element technology and LS-DYNA who would like to learn more about various aspects of nonlinearities and their implementation in LS-DYNA and who are also interested in gaining better insight into the theoretical background.

Content

- Element formulations implemented in LS-DYNA
- Application field and pros/cons of the different element types
- Theoretical background of various element formulations
- General aspects of nonlinear problems in finite element theory
- Solvers for implicit analyses with specific emphasis on LS-DYNA
- Various example problems using LS-DYNA

USER INTERFACES IN LS-DYNA

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturer:
Dr. Tobias Erhart, DYNAmore
Date:
03 February

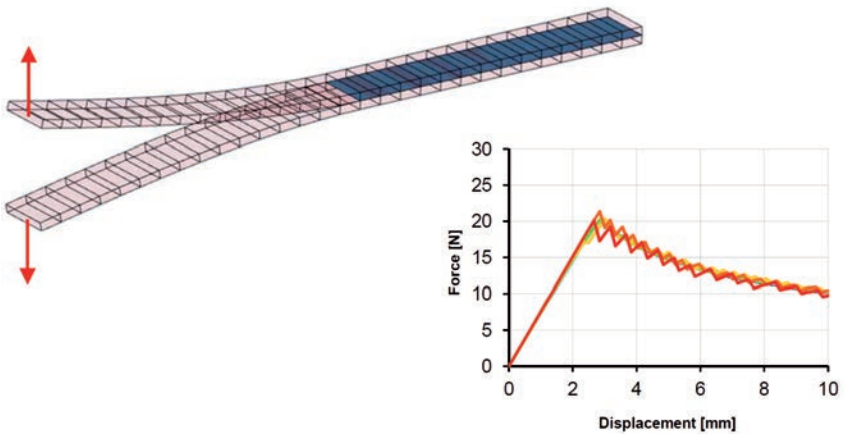
Online registration:
www.dynamore.de/c209e

In addition to the possibility to implement custom material models in the program code, LS-DYNA provides the option to extend or modify the code in various areas by adding your own program routines. For example, user interfaces are available for element formulations, friction models, equation solvers, load application, and airbag sensors.

For this purpose, the user-developed routines are compiled and linked to the corresponding LS-DYNA object files. This seminar is designed for users in both industrial and academic research who intend to integrate their own routines in LS-DYNA and to share their implementation experience with a larger audience.

Content

- Overview of various user interfaces
- Download and overview of the LS-DYNA usermat package
- Explanation of the Makefile, compilation and Fortran files
- User interfaces: structure, subroutines, keyword input
- Discussion on various options and parameters
- Live demos



CRASHWORTHINESS SIMULATION WITH LS-DYNA

Type:
Seminar
Duration:
4 days
Fee:
2,400 Euro
Lecturers:
Suri Bala, LSTC;
Paul Du Bois,
Beratender Ingenieur
Dates:
17-20 March
24-27 March [G)]
01-04 December
Online

[G)] Göteborg, Sweden

Online registration:
www.dynamore.de/c2010e

This is an advanced course and applies to engineers who have experience in the application of explicit programs or basic knowledge in the field of dynamic and nonlinear calculation with implicit programs. The aim of the course is to show how to perform a crashworthiness simulation in the automobile industry using LS-DYNA, whereby the presented methods are transferable to other kinds of crashworthiness simulations (rail vehicles, components of vehicles, airplanes, vans, etc.). Each crashworthiness simulation is a compromise between profitability and accuracy. At the moment there are no guidelines for modeling and calculating crash. Therefore, the user needs to be aware of advantages and disadvantages of different kinds of modeling procedures depending on the purpose of the simulation. In particular, the aim of the course is to show how to perform an accurate and reliable crashworthiness simulation by thorough modeling and to further understand the procedure.

This course is designated for new employees in automotive development departments of car manufacturers and suppliers of the automobile industry as well as engineering companies and other users in related industrial sectors. The course instructor is an expert in crashworthiness simulation and is working for several car manufacturers using different FE-codes worldwide. He is also an excellent and popular teacher.

Content

- Introduction to crash simulation using LS-DYNA
  - Possibilities and technical limits
  - Accuracy and reliability problems
  - Current and future developments
- Modeling techniques for parts of car bodies
  - Timestep control
  - Mesh outlay, quality and convergence
  - Element quality
  - Flanges, weld spots, etc.
- Influence of the mass of components
- Contact definition for crash simulation
- Selection and description of suitable material models for steel materials
- Introduction to modeling techniques for foams and plastics
- Element formulation for shells and volume elements, hourglass stabilization
- Initialization of models, gravity and pretension
- Component models
- Quality control of FE models as well as analysis and evaluation of the results

NOW ALSO ONLINE AVAILABLE

Courtesy of Daimler AG

ONLINE-SEMINAR: CRASHWORTHINESS SIMULATION WITH LS-DYNA

Type:
Online-Seminar
Umfang:
15 Kapitel
Fee:
2,400 Euro
Lecturers:
Paul Du Bois,
Beratender Ingenieur
Dates:
At any time

Online registration:
www.dynamore.de/c2011e

With this course we are expanding our range of services and offering a seminar online for the first time. This gives interested users the opportunity to follow the course on their own computers and at their own convenience. The 4-day seminar with Paul Du Bois was recorded as a video and divided into 15 chapters. The content of the course is therefore identical to that of the seminar in Stuttgart.

please register via our website as you would for a conventional seminar. After we have received your payment we will send you a link and a password with which you can view the course. We will send you the seminar documents by regular mail.
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.

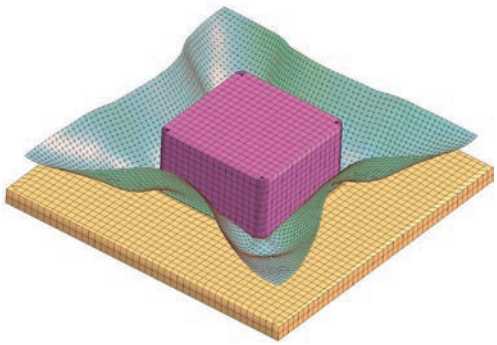
We hope that the offer will appeal to you and look forward to many registrations. If you have any questions about this course, please do not hesitate to contact us.

ONLINE-SEMINAR

Courtesy of Volvo Car Corporation

INTRODUCTION TO CONTACT DEFINITIONS IN LS-DYNA

LS-DYNA offers extensive possibilities to model contact. In total there are more than 30 different contact types available and each type supports numerous special settings. While this generous selection guarantees extreme flexibility for the contact definition, it also requires a great deal of knowledge on the user's part.



Courtesy of Benteler SGL GmbH & Co. KG

The objective of this seminar is to provide the user with a summary of the possibilities and limits of the various contact formulations. In particular, the discussion focuses on the selection of a suitable contact type for the application in question. Furthermore, the effects of the various contact options on the simulation results are explained with examples.

Content

- Which contact types exist in LS-DYNA?
- When do I use which contact formulation?
- How do the various contact formulations differ – how can they be classified?
- Penalty vs. Constraint treatment
- Definition of a contact
- What is an "Automatic contact"?
- How does a single-surface contact work?
- What if a contact does not hold?
- Tied contacts
- Most recent contact options and current developments in LS-DYNA

Prior attendance of the seminar "Introduction to LS-DYNA" is recommended.

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturer:
Dr. Tobias Graf,
Dr. Maik Schenke,
both DYNAmore
Dates:
30 March [V)]
11 May
06 November

[V)] Versailles, France

Online registration:
www.dynamore.de/c2012e

ALSO AVAILABLE IN FRENCH

CONTACT MODELING IN LS-DYNA

In many simulated systems, the contact behavior between different components are an essential part of the process to be modelled. Driven by the increased demands for a wider range of applications of computer simulations, new numerical methods or multi-physical applications, the existing possibilities for contact description in LS-DYNA are constantly being developed further or have been supplemented by new methods.

As a result, over the years LS-DYNA has gained a vast amount of contact-treatment possibilities inside the simulation model. However, due to this variety, it becomes more and more difficult for the user to choose the suitable contact algorithm together with the suitable parameters.

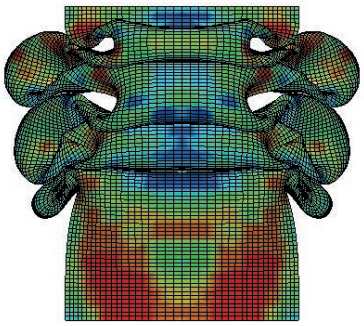
In this seminar the theoretical background of the different contact formulations of LS-DYNA together with the possibilities and limitations of their application will be addressed in detail. This will enable the user to select the appropriate contact type for their application together with the appropriate control parameters.

The course is supported by numerous practical examples, which are intended to deepen the previously conveyed basics in a practical way.

Content

- Theoretical background on contact handling in computer simulations
- Overview on contact formulations in LS-DYNA
- Penalty-, constraint- and tied contacts
- Defining contacts in LS-DYNA
- Contact definitions for specific applications, e. g. forming, crash
- Troubleshooting guidelines

Compared to our course „Introduction to Contact Modeling", this seminar gives a deeper insight into contact modelling with LS-DYNA.



Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
Dr. Tobias Graf,
Dr. Maik Schenke,
both DYNAmore
Dates:
27-28 July

Online registration:
www.dynamore.de/c2013e

NEW

JOINING TECHNIQUES FOR CRASH ANALYSIS WITH LS-DYNA

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
Dr. Markus Feucht, Daimler AG;
Dr. Tobias Graf,
Dr. André Haufe,
Max Hübner,
all DYNAmore
Dates:
09-10 March
21-22 April [G)]
09-10 November

[G)] Göteborg, Sweden

Online registration:
www.dynamore.de/c2014e

POPULAR

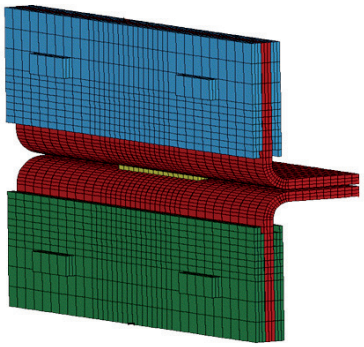
In this seminar you will gain insight into the variety of ways to model and simulate component connections in LS-DYNA. The most frequently used connections, such as adhesive bonding, bolt fastening, welding, spot-weld adhesive bonding or riveting, each require a specific structural and material model for numerical simulation. For this reason, we will thoroughly discuss the load carrying action of the individual connections as well as their structural stability and demonstrate possible modeling approaches (in conjunction with flange models).

Currently used models will be discussed and the reliability of the obtained results wilspp d3plot& ll be critically reviewed with particular emphasis on scenarios that include connection failure. Most recent LS-DYNA releases now include a large number of new features and improvements, especially for welded and bolted connections.

For example, the contact treatment of flanges has been expanded to enable a better assessment of the spot-weld forces at solid and beam elements. Further failure options have also been introduced. In addition, a new keyword is available to model bolted connections, which allows for a simplified definition of prestress. The seminar is designed for engineers with practical simulation experience who wish to broaden their knowledge in the field of connection simulations using LS-DYNA.

Content

- Spot-welds/rivets
  - Options to model spot-welds
  - Discussion of element types and formulations
  - Tied contacts, flange-flange contact
  - Material modeling of spot-welds
  - Definition of damage and failure
  - Analysis of spot-weld forces
- Prestressed and non-prestressed bolted connections
  - Options to model bolted connections
  - Contact formulations for bolts
  - Analysis of bolt forces
  - KEYWORD: INITIAL_STRESS_SECTION for automated bolt prestressing
- Adhesive bonds
  - Types of adhesive bonds: assembly adhesives, structural adhesives
  - Modeling the adhesive joint
  - Element formulation for continuum elements
  - Special hourglass control
  - Application and use of cohesive elements
  - Connection by tied contacts
  - Established and new material models
- Spot-weld adhesive bonding
- Verification and validation of connection technology models
- Spot-weld adhesive bonding



Courtesy of F. Burbulla (Dr. Ing. h.c. F. Porsche AG), A. Matzenmiller (Universität Kassel)

FAILURE OF FIBER REINFORCED POLYMER COMPONENTS IN CRASH ANALYSIS

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
e-Xstream staff member
Date:
16 March

Online registration:
www.dynamore.de/c2015e

Using the software DIGIMAT, anisotropic nonlinear material formulations can be calibrated in dependence upon strain rates and temperature. The micromechanical basis of this concept enables failure indicators to be defined directly at fiber or matrix level of the material, or allows to derive the failure criteria of a material individually from its microstructure with a definition on component level.

Thus, the DIGIMAT material characterization bridges the injection molding simulation, which predicts the position of fibers in a component, with the simulation of structures with LS-DYNA.

By coupling LS-DYNA with DIGIMAT, much more accurate results are obtained when predicting the failure of injection-molded polymer components.

The seminar discusses in detail the coupling of LS-DYNA with DIGIMAT for crash simulations involving glass fiber reinforced polymer components. The user receives an overview of the strategy of the concept.

At the beginning of the course, the required experimental data, the basics of material models as well as their calibration are discussed and failure indicators are defined. Explanations are then given about how to map fiber orientations and link the models to LS-DYNA. To consolidate the learned lessons, the content of the seminar is directly applied to practical examples.

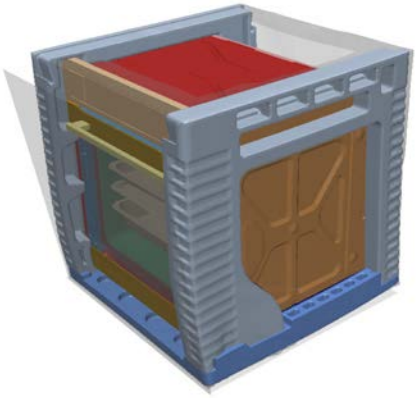
In collaboration with e-Xstream ENGINEERING MSC Software Company

Courtesy of Volvo Cars

INFORMATION DAY: SIMULATION OF DROP TESTS WITH LS-DYNA

Many of the product checks include the testing of impact loading. Typically, the resistance of consumer goods is examined due to an impact after a free fall out of heights that represent their respective usage. Examples of such consumer goods are laptops, cell phones, drilling machines or beverage cartons or cans. Furthermore, the package industry shows a large interest in assuring good impact reliability during transport.

During this information day, the computational possibilities of LS-DYNA will be demonstrated in the context of impact and falling test simulations and application examples will be provided. Special attention will be drawn on the modeling possibilities of LS-DYNA with regard to plastics and foam materials. The approaches for the identification of the associated material parameters will be also be illustrated.



Courtesy of Electrolux Rothenburg GmbH

Content

- Introduction
- Physics for the propagation of stress waves during the drop test
- Characteristics of plastics materials at sudden impact
- Recommendations for the contact formulation during drop tests
- Liquid filled containers
  - Modeling of the liquid, the structure as well as the boundary conditions
  - Methods for fluid-structure coupling in LS-DYNA (ALE, ICFD, SPH, Lagrange elements)
  - Interpretation of the results
- Possible applications and limitation for the simulation of drop tests
- Validation with experimental results
- Examples
  - Analysis of drop tests of an electronic machine with and without packing
  - Impact of a liquid filled package

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Date:
21 September

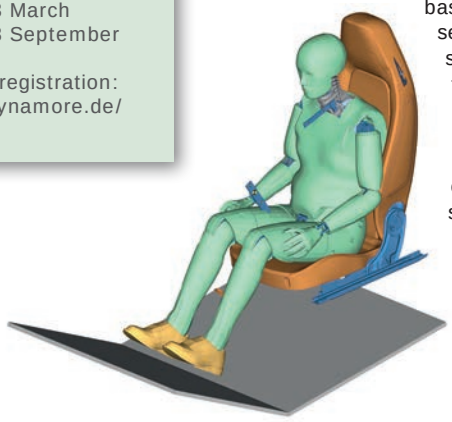
Online registration:
www.dynamore.de/c2016e

INTRODUCTION TO PASSIVE SAFETY SIMULATION WITH LS-DYNA

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
Sebastian Stahlschmidt, Alexander Gromer, Harsh Sharma, Fabian Koch, all DYNAmore
Dates:
12-13 March
17-18 September

Online registration:
www.dynamore.de/c2017e

Particularly due to the growing amount of relevant legislation and consumer tests as well as new technological developments, the field of occupant safety in vehicle technology has become more important and complex. The goal of this seminar is to present the most important features of LS-DYNA with respect to occupant safety simulations. Moreover, insights are provided on how to deal with the various components involved, such as airbags, seatbelts, crash-test dummies and seats. During this training, particular emphasis will be devoted to modeling methods for practical application.



Courtesy of Daimler AG

The seminar will provide the basic knowledge needed to setup an LS-DYNA occupant safety simulation, including the positioning of the dummy model and belt routing with PRIMER, the definition of recommended contacts between the safety systems and the principle set up of airbag models. This seminar is mainly designed for beginners working in the field of occupant safety (especially dealing with side, frontal and rear impact). During the event, attendees will be given the opportunity to apply their acquired knowledge in practical exercises.

Content

- Overview of current impact load cases: side, frontal, rear crash
- Available dummy models in LS-DYNA and their validation methods
- Materials, elements and connections used for occupant safety simulations
- Overview of composition and usage of safety relevant vehicle components
- Focus on airbag models
  - Available model approaches in LS-DYNA
  - Airbag fabric material modelling
  - Dealing with existing airbag models
- Usage of dummies
  - Positioning inside the vehicle
  - Pre stresses in seat models
  - Extraction of dummy model signals
  - Overview injury criteria
- Usage of seat belts
  - Modeling seat belts, belt guides and pretensioner
  - Belt routing approaches
- Joining techniques and contact definitions
- Composition of an occupant safety model

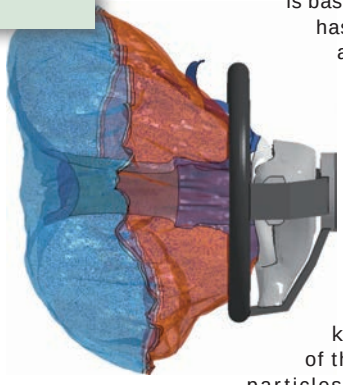
CPM FOR AIRBAG MODELING

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
Fabian Koch, Dr. Steffen Mattern, Sebastian Stahlschmidt, all DYNAmore
Dates:
27 March
25 November

Online registration:
www.dynamore.de/c2018e

Airbags are one of the most important components for occupant safety in motor vehicles. Besides standard airbags for the driver and passenger, more and more different and specified variants such as curtain airbags and knee airbags have been applied recently. Every airbag has to be optimized especially for its particular application. Precise representation of the airbag's behavior regarding deployment and performance are necessary in order to achieve a high quality model of the occupant restraint system.

The one day course presents the fundamentals to build up a model for the simulation of airbags in LS-DYNA. After starting with the less complex uniform pressure (UP) approach, theoretical background and implementation of the newer corpuscular method (CPM) is introduced. The method is based on a particle approach and has become state-of-the-art for all airbag applications due to its accuracy and numerical robustness and efficiency. Nowadays in occupant simulations with LS-DYNA, every airbag is modeled using CPM.



Courtesy of Daimler AG

Besides the description of *AIRBAG_PARTICLE as well as the related keywords regarding definition of the control volume, number of particles, definition of vents, gas properties, etc. further modeling aspects affecting the airbag's behavior are discussed. State-of-the-art techniques as well as most recent implementations in LS-DYNA with their influence on the deployment behavior are presented.

Content

- Introduction to airbag modeling
  - Basics and modeling approaches
- The uniform pressure (UP) method
  - Theoretical background
  - Keywords related to different UP-models
  - Wang-Nefske approach and hybrid gas generators
  - Jetting definition for UP airbag models
  - Merits and limits of UP modeling
- Corpuscular Method (CPM)
  - Theoretical background
  - Keywords and application of CPM
  - Influence of different parameters on the behavior of the airbag
  - Merits and limits of CPM modeling
- Definition and influence of a reference geometry
- Material definition using *MAT_FABRIC (non-linearities, anisotropy, porosity and validation)
- Contact definition and folding simulation
- Model set-up
  - Modeling advices for CPM airbag models
  - Tank tests and airbag validation
  - Process chain for airbag modeling
  - Post processing of results
- Examples

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List of webinars 2020:

Oasys PRIMER

- Automotive loadcase setup tools
- Mesh modification tools
- Human body model positioning in Oasys PRIMER

LS-DYNA®

- Intro to contacts
- LS-OPT
- Advanced implicit
- ICFD and FSI

Oasys D3PLOT

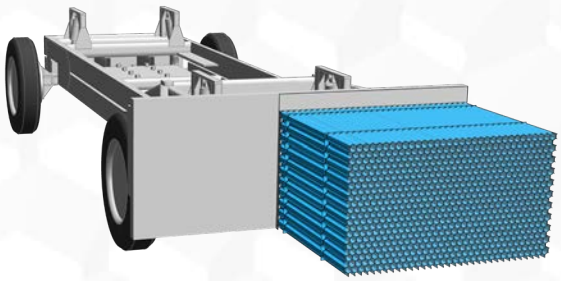
- Oasys POST customisation
- Composite tools (PRIMER and D3PLOT)

Oasys T/HIS

- Oasys T/HIS curve operations and curve history

Oasys REPORTER

- Oasys REPORTER integration



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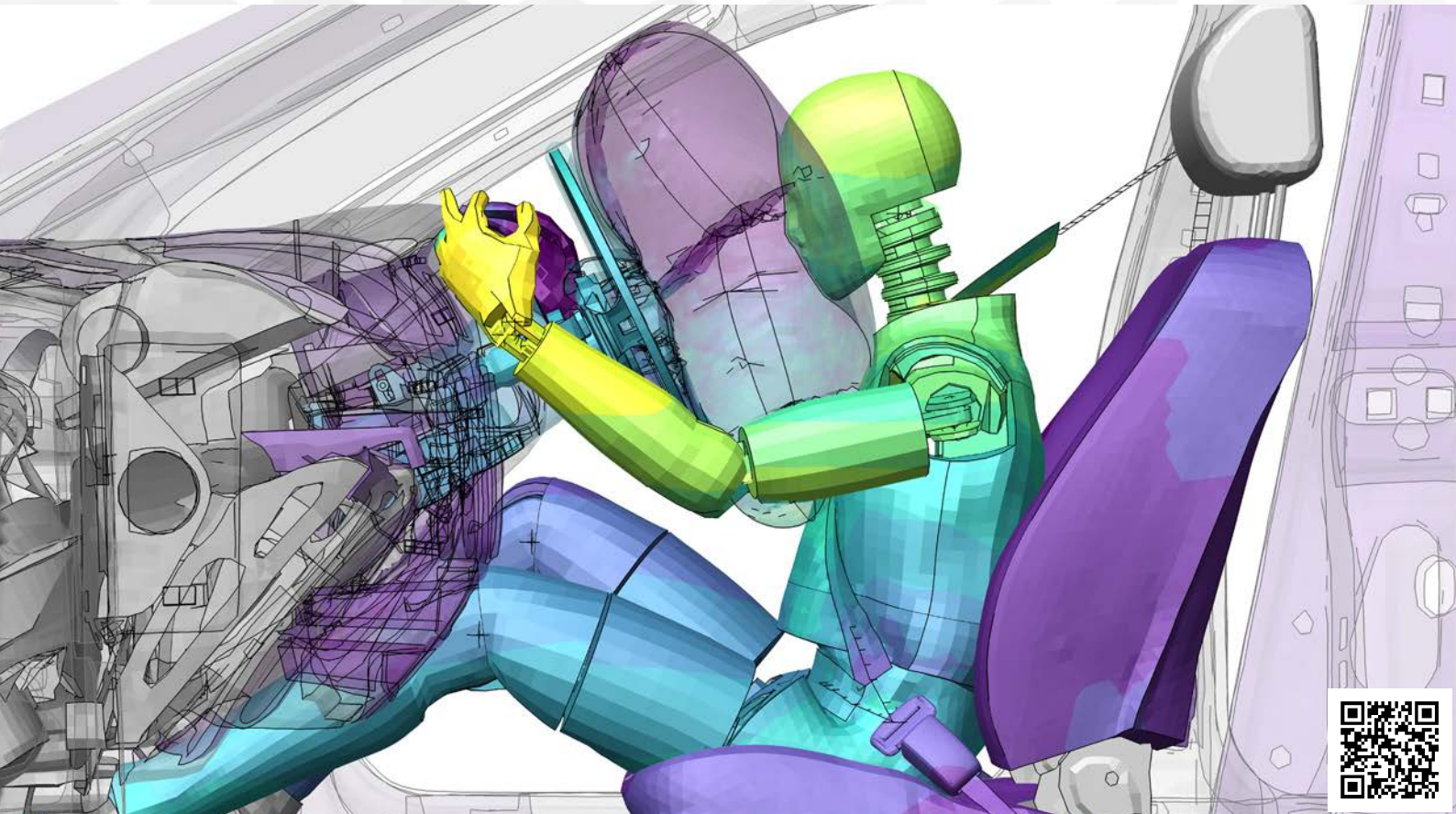
Side and Rear Shell Barriers

WG17 Arup Pedastrian Upper Legform Model

For further enquiries please contact
dyna.support@arup.com

https://www.oasys-software.com/dyna



LS-DYNA DUMMY AND PEDESTRIAN IMPACTOR MODELING

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
Alexander Gromer, Sebastian Stahlschmidt, both DYNAmore
Date:
04 February

Online registration:
www.dynamore.de/c2019e

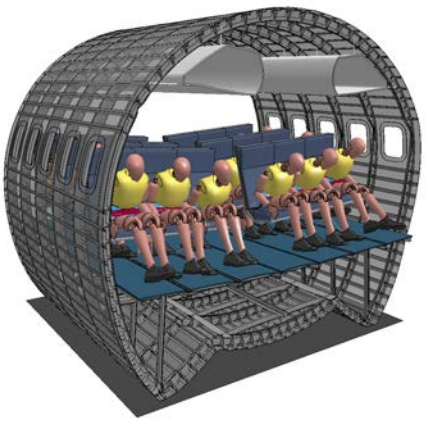
The aim of the seminar is to give participants an overview of how LS-DYNA crash test dummy models and pedestrian impactors can be implemented successfully in passive safety.

The course is recommended for engineers interested in analyzing side, front or rear impacts or pedestrian safety. Other related problems, such as the behavior of seats under a dynamic loading of the dummies, are also discussed. To measure the loads affecting a pedestrian from a collision, a range of impactors have been developed which can be shot/projected at the front of the vehicle in various test configurations. Moreover, an overview of the available impactors is given.

All instructors have years of experience working on the development of FAT side impact dummy models, which are used throughout the world, and recently also on the FAT rear impact dummy model BioRID 2. These models have been developed in collaboration with the German automotive industry.

Content

- Dummy models available for LS-DYNA
- Differences between front impact dummy models from FTSS and LSTC
- When should which model be used?
- FAT side impact dummy models
- FAT rear impact dummy model BioRID 2
- Limits of modeling dummies
- Positioning dummies in vehicles
- Modeling seat belts, belt deflectors and belt pre-tensioners
- Putting the seat belt on the dummy
- Characterization of the impactor model: head, hip and leg impactors (construction and materials used)
- Comparison of impactor models from different software manufacturers
- How to avoid problems when modeling soft foams



Courtesy of Deutsches Zentrum für Luft- und Raumfahrt DLR e.V.

INFORMATION DAY: HUMAN MODELING AND BIOMECHANICS

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Date:
13 November

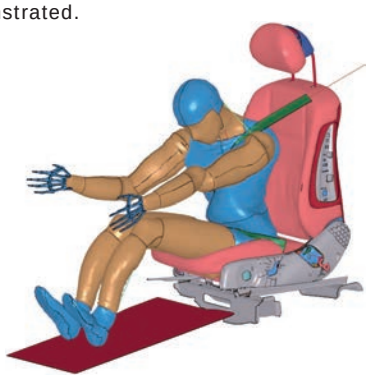
Online registration:
www.dynamore.de/c2020e

THUMS™, developed by Toyota Motor Corporation and Toyota Central R&D Labs

The human body is a complex biological system, in which various physical phenomena are acting simultaneously on various length scales. For instance, from a microstructural point of view, skin tissue exhibits a porous structure, which allows for a motion of the interstitial fluid within the pore space to re-establish the internal electro-chemical equilibrium disturbed by an externally applied load. The fluid motion causes a strongly time-dependent material behavior, similar to that of viscous materials. Similar processes can be found in many other biological tissues as well, such as ligaments, tendons, cartilage, bones and the intervertebral disc.

Thus, when it comes to crash tests and crash simulations a proper representation of the human body is vital for a reliable prediction of possible injuries, which, in turn, requires a broad fundamental background of the undergoing biomechanical processes.

The information day focuses on both the real-world representation, e. g. as a crash-test dummy, and the computer model, using, for instance, the popular Total Human Model for Safety (THUMS), which was developed by Toyota Central R&D Labs Inc., Toyota System Research Inc. and Toyota Motor Company in collaboration with universities. On the one hand, its goal is to bridge the gap between the human biology and its representing models by providing a platform to exchange knowledge between the experts and interested people working on the various fields of human modelling, i. e. biology, dummy development and virtual-human modelling. On the other hand, the possible modeling approaches with LS-DYNA are demonstrated.



Courtesy of Daimler AG

INFORMATION DAY: CERTIFICATION OF HUMAN MODELS ACCORDING TO EURONCAP TB024

In the past years, more and more vehicles have been equipped with active bonnet hoods to improve the protection of pedestrians in the event of a collision. The bonnet hood is pyrotechnically erected after a pedestrian impact has been sensed in order to create additional deformation space between the bonnet hood and components in the engine compartment. In order to provide the best possible protection, the bonnet hood must be fully upright before contact with the pedestrian.

The contact time between pedestrian and hood is verified with the use of human models that represent the kinematics of pedestrians of different sizes. Since the 2018 EuroNCAP, there is a new certification process for the human models that are used in the simulation, in which the biofidelity of the models for four different generic vehicles has to be proven by a comparison with a given corridor. The certification process currently includes the AM50, from 2019 and it will be supplemented by the 6YO.

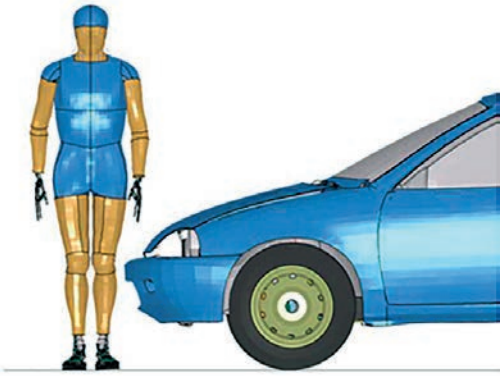
On the information day the certification process as well as the calculation possibilities of LS-DYNA in this process are shown.

Contents

- Introduction
- Presentation of the new certification process for human models according to EuroNCAP TB024
- Presentation of the generic vehicle models
- Evaluation Procedure with the EuroNCAP Template

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Date:
25 November

Online registration:
www.dynamore.de/c2021e



METAL FORMING WITH LS-DYNA

Type:
Seminar
Duration:
3 days
Fee:
1,575 Euro
(525 Euro per day, can be booked separately)
Lecturers:
Pierre Glay, Dr. André Haufe, Dr. Bernd Hochholdinger, Matthias Merten, all DYNAmore
Dates:
12-14 May
18-20 May [V)]
11-13 November

[V)] Versailles, France

Online registration:
www.dynamore.de/c2022e

ALSO AVAILABLE IN FRENCH

Basics (days 1 and 2)

This seminar covers the basics for the simulation of sheet metal forming processes with LS-DYNA and provides tips for daily practical use. Herein, the forming-specific settings and features in LS-DYNA will be addressed.

The course begins with a brief introduction to LS-DYNA and a detailed description of the necessary keywords, respective settings and best practice for forming simulations. In particular, the typical forming process steps will be reviewed and the respective simulation setup will be presented in detail. Furthermore, an overview of commonly used material models for forming simulations will be given and the procedure for the creation of two material cards with anisotropic material behavior will be discussed for shell and solid elements. Another focus lies on the critical examination and verification of the simulation results as well as the possibile ways to overcome potential problems with alternative approaches and methods. Short workshop examples are repeatedly conducted during the seminar to consolidate the acquired knowledge through practical application directly at the computer. LS-PrePost will be used to setup the forming simulations.

The goal of the seminar is to enable the user to select the correct settings and parameters for successful simulations of sheet metal forming processes with LS-DYNA. The seminar is aimed at both beginners and experienced users in the field of metal forming, who want to learn how to use LS-DYNA in the context of sheet metal forming or who want to deepen their existing knowledge.

Content
- Introduction to LS-DYNA
- Forming-specific settings and features
  - Basic control cards
  - Special control cards
- Adaptive Mesh Refinement:
  - Minimization of discretization errors
  - Proper selection of the parameters
- Contact definitions for forming simulation
- Element types and their properties
- Overview of frequently used material models for sheet metal forming
- Description of material models MAT_036 and MAT_103
- Output Control in LS-DYNA

Courtesy of BMW Group

- Procedure for the simulation of multi-stage forming processes
- Basic control cards for LS-DYNA/Implicit
- Gravity simulation (implicit static or dynamic)
- Forming simulation
- Trimming simulation
- Springback simulation (implicit static)
- Simulation of post forming operations
- Analytical drawbeads

Courtesy of Ford Forschungszentrum Aachen GmbH

Advanced Forming Simulation (day 3)

On the third day, typical procedures for the setup of complex forming simulations are discussed and the creation of the respective input decks is shown with the functionality of LS-PrePost. Moreover, further contact settings are shown which enable the definition of a direction-dependent coefficient of friction as a function of contact pressure, relative velocity and temperature.

The training concludes with recommendations for the simulation setup of the individual process steps with a focus on common mistakes in creating the respective stages and the corresponding troubleshooting procedures.

Content
- Possible procedure for the simulation setup
- Parameterization of input decks and automatic positioning
- Advanced control card settings
- Advanced contact settings
- Recommendations for the individual process stages
- Advanced troubleshooting procedures
- Workshop to create parameterized input decks

APPLIED FORMING SIMULATION WITH ETA/DYNAFORM

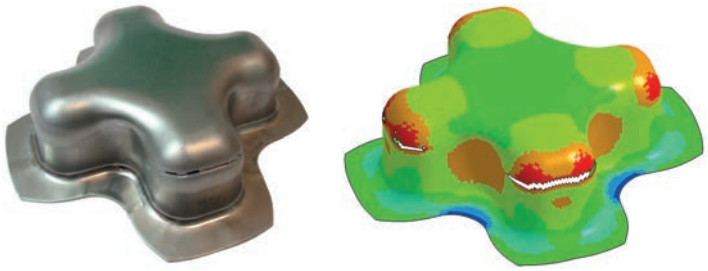
This seminar provides an introduction to the simulation of sheet-metal and hydroforming processes with eta/DYNAFORM and LS-DYNA. All steps required to set up a LS-DYNA forming simulation are covered. The eta/DYNAFORM program is a special preprocessor for simulation of forming processes with LS-DYNA. Moreover, the program LS-PrePost is presented for postprocessing purposes. The seminar is practice-oriented, with an emphasis on industrial applications. This seminar is suitable for users from the area of metal forming who wish to learn how to use eta/DYNAFORM and LS-DYNA to simulate sheet-metal forming processes or who wish to deepen existing knowledge.

Content

- Introduction to the simulation of sheet metal forming processes
- Introduction to the software eta/DYNAFORM
- Preprocessing with eta/DYNAFORM
  - Meshing of the tool geometry and the blank
  - Definition of the blank: Selection of the material model, choosing an element type, setting symmetry boundary conditions
  - Definition of the tools: Selection of the contact formulation, defining friction
  - Positioning of the tools
  - Applying force- and displacement-boundary conditions on the tools
  - Definition of draw beads
  - Definition of adaptive meshing
  - Determination of the sheared blanks
  - Trimming of the sheet with eta/DYNAFORM
- Starting simulations and job control of the LS-DYNA runs
- Multi-stage process definition: Gravity loading analysis, binder closing, drawing simulation
- Forming limit diagram
- Postprocessing with LS-PrePost (thickness distributions, plastic strains, etc.)
- Application examples

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
Peter Vogel,
DYNAmore
Dates:
23-24 January
06-07 July
09-10 November

Online registration:
www.dynamore.de/c2023e

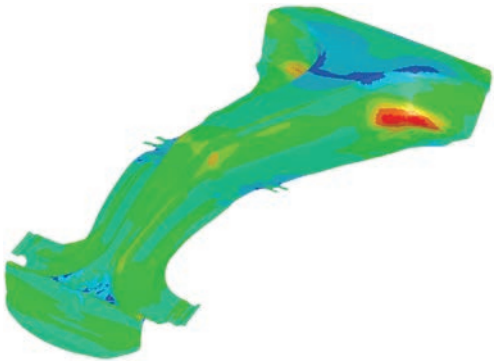


Courtesy of LKR - Leichtmetallkompetenzzentrum Ranshofen GmbH / AMAG Rolling GmbH

HOT FORMING WITH LS-DYNA

In this seminar, participants are taught the basics of thermal and thermomechanically coupled simulations using LS-DYNA. In addition, the definition and basic forms of heat transfer will be reviewed.

Due to its increasing relevance, special attention will be given to the application of thermal and coupled simulations of hot and cold forming processes. Among other things, the available material models will be described covering plasticity, viscoplasticity, anisotropy, and structural transformation of steel. Besides the modeling methods of the main physical effects, a focus is placed on illustrating efficient modeling techniques that are adapted to the calculation task at hand.



Courtesy of ThyssenKrupp Steel Europe AG

Content

- Basics of thermal computations
- Linear and nonlinear simulations
- Heat transfer during contact
- Thermomechanical coupling in LS-DYNA
- Material models for coupled calculations
- Temperature-dependent elasticity, viscoplasticity and anisotropy
- Thermomechanically coupled forming simulation
- Incorporate microstructural transformations during hot forming
- Calculation of the cooling or warming of hot forming tools
- Special applications in process simulation
  - Localized heat treatment of aluminum components
  - Heating by welding,
  - Induction heating, etc.

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
Dr. Bernd Hochholdinger,
Dr. Thomas Klöppel,
both DYNAmore
Dates:
21-22 January
09-10 July

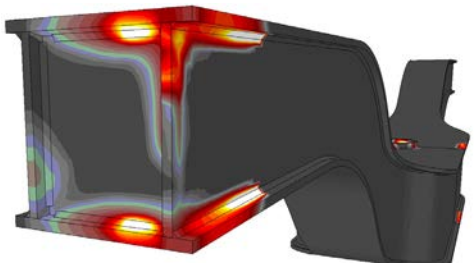
Online registration:
www.dynamore.de/c2024e

INTRODUCTION TO WELDING SIMULATION WITH LS-DYNA

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
Dr. Tobias Loose, DynaWeld;
Dr. Thomas Klöppel, DYNAmore
Dates:
29 June

Online registration:
www.dynamore.de/c2025e

Due to recent developments in LS-DYNA, the complete welding process can be captured. In this regard, the numerical simulation can be performed in several stages where, for instance, the cooling process as well as the associated warping of the structural components can be computed after each welding stage. Moreover, the choice of a suitable material law also allows for the consideration of microstructural transformations in the welding zone itself or in the heat-affected zone. The resulting residual stress states and any remaining plastic strains can then be taken into account both in the next welding stage as well as in a subsequent usability simulation. With these features at hand, it is possible to virtually represent the entire process chain.



Courtesy of DynaWeld

The aim of this seminar is to give the participants a brief introduction to the thermomechanical coupled simulation with LS-DYNA. Herein, the required forms of heat sources and heat transfer for a successful welding simulation will be discussed and their definition in LS-DYNA is shown.

Content
- Introduction
- Material models for welding simulations (*MAT_270)
- Heat source computation with SimWeld
- Interface between SimWeld and LS-DYNA
- Modeling heat sources in LS-DYNA
- Implicit solver settings for welding simulations
- Time step size control
- Mechanical and thermal contact
- Structured organization of an input deck for several welding stages
- Post-processing

In collaboration with dynaweld

INTRODUCTION TO SHEET METAL FORMING WITH OPENFORM

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
GNS staff member
Date:
08 July

Online registration:
www.dynamore.de/c2026e

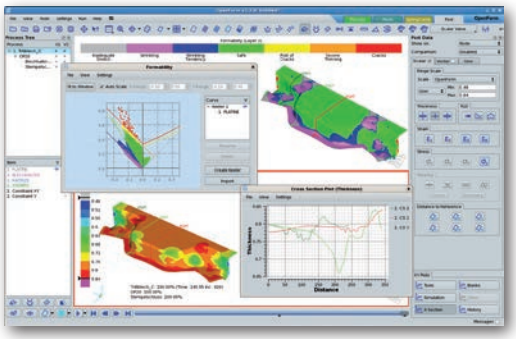
OpenForm is a solver-independent graphical user interface (GUI) designed to aid the generation of input decks for numerical forming simulations as well as to evaluate the numerical results in an intuitive and simple fashion.

Based on an internal standardized metalanguage, the so-called “OpenForm Process Language” OFPL, the mechanical process to be simulated is described consistently regardless of the required solver-specific numerical parameters. Thus, the forming process described in OpenForm can be used simultaneously with different solvers.

The structure of the forming process is captured hierarchically using graphical templates and then translated and exported in the corresponding solver nomenclature using internal converters of OpenForm.

The basic components of these process templates are formed by “items”, which are in turn assembled in process “steps” to ultimately become “operations”. For LS-DYNA, there already exist many such templates in OpenForm to deal with cold and hot forming of traditional form blanks as well as tailor rolled (TRB), welded (TWB) or sandwich blanks.

Content
- Concept of OpenForm
  - Preprocessing
  - Generation of a forming process
  - Description of the physical process
  - Creation/Modification of geometric entities
  - Selection of numerical parameters
- Postprocessing
  - Evaluation of the forming results
  - General visualization
  - Special evaluation
  - Comparison with measured data and other results
- Customization of the GUI in OpenForm



OpenForm is a commercial product of GNS.

In collaboration with gns

INTRODUCTION TO DRAPING SIMULATION WITH LS-DYNA

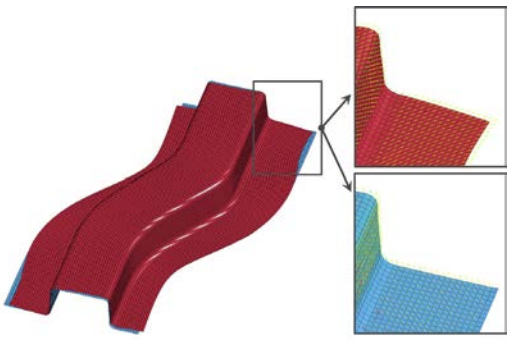
Increasing demands for light-weight structures have made continuous fiber reinforced composite a widely used material in different industries. Due to their typical strongly pronounced anisotropy, the final properties of the parts are dominated by the fiber orientation found in the structure and, thus, by the manufacturing process.

A draping process step defines the fiber orientation in most of the manufacturing processes used today. This particular step includes the forming of a textile that is either dry or only coated by a fluid-like matrix. In order to analyze producability of a part or to predict folds in or the properties of a part in an early stage of the design-process, it is of crucial importance to include the draping in a numerical simulation. Depending on the used matrix material the temperature distribution cannot be neglected in the analysis.

This seminar introduces material models available in LS-DYNA that are tailored for draping and the modeling techniques they are based on. Furthermore, necessary input keyword cards and settings for the process simulation are presented. In particular, the possibilities of a coupled thermal-mechanical simulation are discussed in detail. The results of the draping step need to be transferred to following process stages or the structure analysis in order to close the virtual process chain. In this context, the mapping tool ENVYO is briefly presented.

Content

- Introduction to composite materials
- Explanation of anisotropy and direction definitions
- Material modelling
  - Modeling approaches for UD, NCF and woven fabrics
  - Material models in LS-DYNA
- Process simulation
  - Necessary input cards
  - Contact settings
- Simulation of coupled thermal-mechanical processes
  - Introduction to the thermal solver in LS-DYNA
  - Specifics of a coupled forming simulation
- Closed simulation process chain using ENVYO



Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
Dr. Thomas Klöppel,
Christian Liebold,
both DYNAmore
Dates:
28-29 April
26-27 November

Online registration:
www.dynamore.de/c2027e

INFORMATION DAY: WELDING AND HEAT TREATMENT WITH DYNAWELD AND LS-DYNA

Due to the increasing importance of simulations with welding processes and other heat treatments, numerous extensions have been implemented in LS-DYNA. It is now possible to calculate the complete process chain in several stages.

New material models *MAT_CWM and *MAT_GENERAL_PHASE_CHANGE are provided for welding and heat treatment in LS-DYNA which enable both an efficient warpage prediction and a detailed residual stress and structure calculation. LS-DYNA furthermore offers special heat source functions for shells and solids with energy input control and special welding contacts such that all welding processes can be captured.

Courtesy of DynaWeld

The preprocessor DynaWeld is used to create complex material cards for LS-DYNA. Herein, the import of data from WeldWare, JMatPro or Sysweld is possible as well as a user-defined input.

This information day aims at simulation engineers who want to obtain an overview of the available tools in LS-DYNA, DynaWeld and SimWeld that can used for model building as well as simulation of welding and heat treatment processes.

Content

- Welding simulation and its inclusion in process simulations
- Simulation of special welding methods
  - Spot welding
  - Stud welding
  - Friction welding
  - Friction stir welding
  - Induction straightening
- Heat source computation for MSG welding (interface between SimWeld and LS-DYNA)
- Heat treatment and press hardening
- Further developments in LS-DYNA

In collaboration with dyna weld

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Dates:
04 May

Online registration:
www.dynamore.de/c2028e

POPULAR

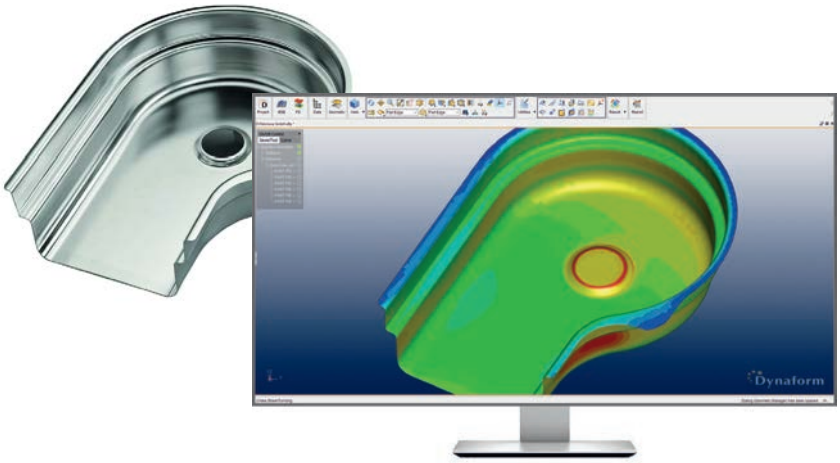
INFORMATION DAY: FORMING TRENDS IN LS-DYNA AND ETA/DYNAFORM

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Date:
25 September

Online registration:
www.dynamore.de/c2029e

The software eta/DYNAFORM is an effective pre- and postprocessor that has been especially designed for forming simulations. Together with the solver LS-DYNA, it forms a complete package, which fully covers all forming simulation requirements.

Applications, such as determining preliminary sheet metal blanks, generating tool geometries and compensating for springback are covered by the main functions of the software package. Further functions allow for the definition of complete multistep forming processes based on blank positioning under the influence of gravity right up to simulating springback. Typical output of the simulation include sheet metal thickness distributions, forming forces, the amount and direction of springback or compensated tool geometries as well as the prediction of tear and fold formation.



Courtesy of Egro Industrial Systems AG

The event addresses interested tool designers and method developers in the field of metal forming who wish to be kept up to date about the latest trends and developments in LS-DYNA and eta/DYNAFORM.

This information day presents the latest topics concerned with forming simulation using LS-DYNA and eta/DYNAFORM. Herein, new requirements, new developments and the current possibilities and limits of various concepts will be discussed.

For more information and event schedules sign up for our information mail or visit us on our website www.dynamore.de.

Content

- Integration of forming simulations into the development process
- Process characterization
- Add-ons and pre-simulation
- Trimming and cutting
- Analyzing calculations
- Calculating springback

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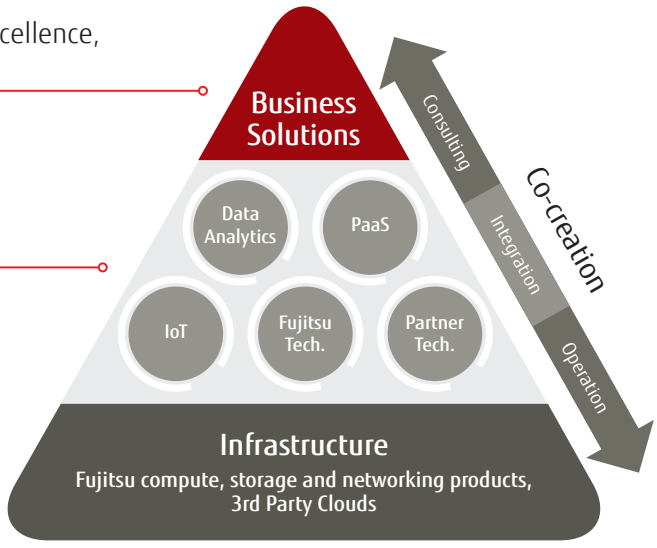

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Contact us at **00800-37210000**
or via email at **cic@ts.fujitsu.com**

MATERIAL MODELING FOR METALS

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
Dr. Filipe Andrade,
Dr. André Haufe,
Dr. Thomas Münz,
all DYNAmore
Dates:
23-24 April [Tu)]
15-16 June
15-16 September [V)]
16-17 November

[Tu)] Turin, Italy
[V)] Versailles, France

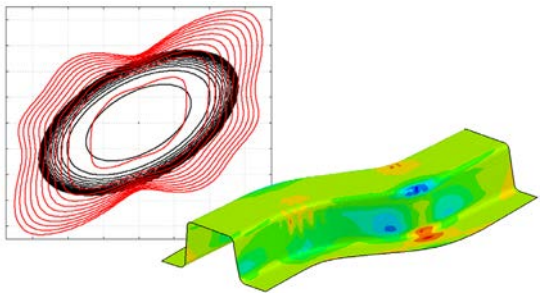
Online registration:
www.dynamore.de/c2030e

ALSO AVAILABLE IN FRENCH

The aim of this class is to give practical guidelines for the application of the most commonly used material formulations. The focus will be especially on the underlying basic theory as well as on the assumptions made for the corresponding material formulations.

Moreover, besides the practical information about particular input formats and the relevance of special settings, the algorithmic background of the various models will also be highlighted. Finally, diverse applications for the most commonly used metallic material models in LS-DYNA will be illustrated with the help of simple examples.

Prior attendance at the class "Introduction to LS-DYNA" is strongly recommended.



Content
- Review of rheological models
- Stress and strain measures
- Concepts of computational plasticity
- Presentation of the von Mises model
- Selection of LS-DYNA material models based on von Mises plasticity
- Description of *MAT_024
- Calibration of isotropic hardening curves
- Discussion on some metallic alloys
- Plasticity with isotropic damage (*MAT_081)
- A material model for transformation induced plasticity alloys (*MAT_113)
- Presentation of a Gurson-based material model in LS-DYNA (*MAT_120)
- A material model with tension-compression asymmetry (*MAT_124)
- A Generalized Yield Surface model for tension/compression/shear asymmetry (*MAT_224_GYS)
- Review of anisotropic concepts (e.g. R-Values)
- Barlat 1989 model in LS-DYNA (*MAT_036)
- Retrieving Tresca's yield criterion in LS-DYNA
- A Hill-based model for transverse anisotropy (*MAT_037)
- The _NLP_FAILURE option
- Barlat 2000 anisotropic model (*MAT_133)
- Aretz 2004 anisotropic model (*MAT_135)
- Short review of kinematic hardening
- A simple plasticity model with mixed hardening (*MAT_003)
- Extension of *MAT_024 to account for mixed hardening (*MAT_225)
- Overview of the mapping capabilities in LS-DYNA

DAMAGE AND FAILURE MODELING

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
Dr. Markus Feucht,
Daimler AG;
Dr. Filipe Andrade,
Dr. André Haufe,
Dr. Mikael Schill,
all DYNAmore
Dates:
23-24 March [Tu)]
18-19 June
19-20 November

[Tu)] Turin, Italy

Online registration:
www.dynamore.de/c2031e

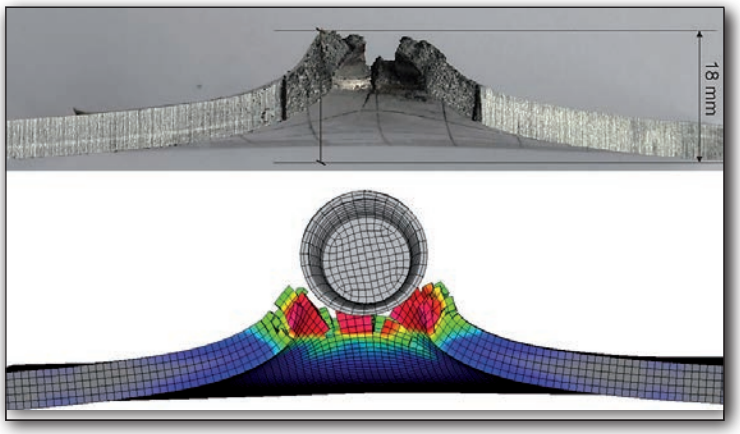
POPULAR

This two-day seminar will discuss and clarify issues related to the complex adjustment of material models considering damage and failure. Starting with the design process of the experimental layout, the seminar will embrace everything to the point of actually creating material cards using LS-DYNA, thereby reflecting the entire verification and validation process.

Herein, a detailed explanation of the conversion of experimental data into true Cauchy stresses and logarithmic strains will be given. Moreover, the dependency of deformations on anisotropy and triaxiality will be discussed under inclusion of the complex descriptions of failure.

Of particular interest will be the influence of the model reduction with shell elements and their influence on failure models of, e.g., Wierzbicki, on the basis of Gurson, Johnson-Cook and extended Barlat models.

The influence of the element size dependency on the failure behavior will be presented in the context of strain and energy equivalence. The issues of material stability and softening will be discussed in detail using the Gurson material model. Exercise examples illustrate the theoretical findings.

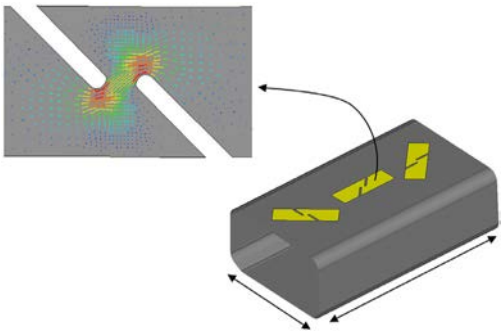


Courtesy of FVV (Forschungsvereinigung Verbrennungskraftmaschinen e.V.) und Inprosim GmbH

ADVANCED DAMAGE MODELING: ORTHOTROPIC MATERIALS

This one-day course is intended for engineers and researchers who already have relevant experience in the area of material damage and failure. Therefore, the main goal of this class is to present the current modeling capabilities of LS-DYNA regarding the simulation of complex degradation phenomena typically observed in materials that are used in industrial applications.

For instance, the use of aluminum extrusions in the automotive industry has significantly increased over the last years, especially due to their low density and excellent energy absorption under crash loadings. However, such materials exhibit a highly orthotropic behavior both in plasticity and in failure for which an orientation-dependent damage accumulation is necessary for accurate results. Polymers are a further example of materials that, under certain circumstances, require a more advanced treatment of the damage modeling than the typically applied scalar damage models.



In this class some important concepts regarding orthotropic and anisotropic damage are reviewed as well as typical modeling approaches found in literature. Advanced damage models implemented in LS-DYNA are then presented in detail.

In particular, attention is devoted to the modular damage/failure model in *MAT_ADD_GENERALIZED_DAMAGE for which some simple application examples are shown.

Prior attendance at the class “Damage and Failure Modeling” is strongly recommended.

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
Dr. Filipe Andrade,
Dr. André Haufe,
both DYNAmore
Dates:
25 May
23 November

Online registration:
www.dynamore.de/c2032e

PARAMETER IDENTIFICATION WITH LS-OPT

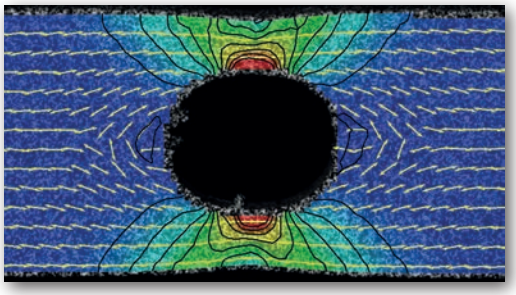
Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturer:
Charlotte Keisser,
Katharina Witowski,
both DYNAmore
Dates:
17 June
12 October [V)]
18 November

[V)] Versailles, France

Online registration:
www.dynamore.de/
c2033e

ALSO AVAILABLE IN FRENCH

The use of new materials, such as plastics, composites, foams, fabrics or high-tensile steels demands the application of highly complex material models. These material formulations are generally associated with numerous material parameters. The optimization program LS-OPT is ideally suited for identifying these parameters. In the identification process, an automatic comparison is carried out between the experimental results and the simulation results of LS-DYNA. Thereafter, the error between experiments and simulations is minimized.



In this seminar, a brief introduction to LS-OPT is given with a focus on the application of LS-OPT to determine material parameters. No prior knowledge about optimization or the application of LS-OPT is required.

Content

- The optimization problem for the parameter identification
  - Objective function: minimization of deviations between simulations and experiments (least-squares principle)
  - Constraints
  - Optimization variables
  - Normalization and weighting
- Brief introduction to LS-OPT
- Graphical User Interface (GUI)
- Simultaneous adaptation of several experiments (e.g. tensile, shear and biaxial tests)
- Starting LS-DYNA simulations and job control in LS-OPT
- Analysis and evaluation of optimization results
- Execution of examples

MODELING POLYMERS AND ELASTOMERS IN LS-DYNA

Type:
Seminar
Duration:
2 days
Fee:
1,200 Euro
Lecturer:
Prof. Dr. Stefan
Kolling,
TH Mittelhessen
Dates:
20-21 April

Online registration:
www.dynamore.de/
c2034e

POPULAR

For a variety of industrial applications, polymers (i.e. thermoplastics, foams and rubber materials) have become more and more important. Especially foams are widely used in the automotive industry because of their energy absorbing properties and their beneficial stiffness to density ratio.

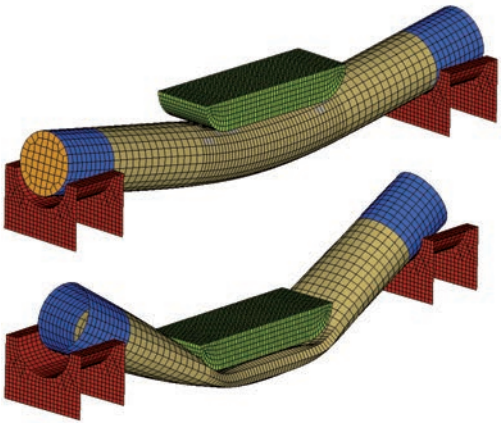
Compared to other commonly used materials, such as steel or aluminum, the material behavior of foams is much more complex. Rubber and glue materials are in general nonlinear elastic. Especially for rubber materials, rate-dependency and damage have a great influence on the hysteresis formation. Thus, these properties need to be considered in the constitutive material formulation. Moreover, thermoplastics exhibit a very complex material behavior ranging from viscoelasticity to viscoplasticity with fundamental differences to the properties of metallic materials.

Following this, the reproduction of the material behavior of thermoplastics, foams, glue and rubber materials within a finite element analysis represents a challenging task for the simulation expert. The program LS-DYNA offers its users a wide range of material models that have been developed exclusively for the modeling of these materials. The choice and the application of such special material models requires thorough knowledge of the theoretical as well as the numerical background.

The goal of this seminar is to provide an overview of the available material models for thermoplastics, foams, rubbers and glues in LS-DYNA and to give guidance to apply them properly. Additionally, their practical usage will be discussed and the theoretical background of these models will be presented. The topics of parameter identification, experimental set-up and evaluation of experimental results will also be addressed. Small example problems will illustrate various application cases of the material models implemented in LS-DYNA.

Content

- Presentation of various applications
- Discussion of the material behavior of polymers
- Foams:
  reversible, crushable and semi-crushable foams; appropriate material models; preparation of test results
- Rubber materials:
  quasi-static and dynamic behavior; incompressibility; experimental set-up; data preparation; parameter identification
- Glue materials:
  structural glue, installation glue, screen glue; modeling of glue lines; material behavior and material modeling of glue; experiments for the evaluation of material parameters
- Thermoplastics:
  material models for small and large deformations; experimental set-up, data preparation; validation and verification



Courtesy of Dow Deutschland Anlagengesellschaft mbH

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SIMULATION OF SHORT FIBER REINFORCED POLYMERS

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturers:
Dr. Thomas Klöppel,
Christian Liebold,
both DYNAmore
Dates:
24 April
05 May G)
15 June Tu)
05 November

G) Göteborg, Sweden
Tu) Turin, Italy

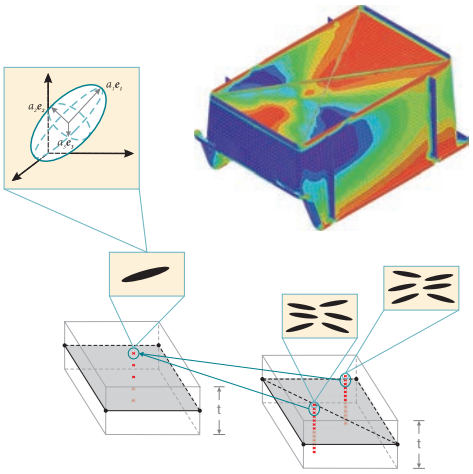
Online registration:
www.dynamore.de/
c2035e

Besides standard plastic materials, more and more short and long fiber reinforced plastic materials are used to manufacture automotive components, aircraft parts, sports equipment and standard household appliances. Since the local properties of this group of materials are highly dependent on the production process, not only are new material models necessary, which allow for the consideration of the complex load bearing capabilities and damage mechanisms of these materials properly, but also new modeling techniques which allow for the closure of the simulation process chain for these materials.

Short fiber reinforced composite components are usually manufactured using an injection or compaction process. Thereby, carbon or glass fibers with a length of approximately 0.1 mm to 1.0 mm are brought into final shape together with a resin material. Strong local anisotropies in such material lead to complex structural mechanic effects which need to be captured within the simulation. In this course material models available in LS-DYNA are introduced and discussed.

As the consideration of the manufacturing process of such components plays an important role to be predictive in the structural analysis, different ways to consider results from other software tools used for the process simulation will be introduced. The simulation process chain is closed for this specific group of materials using the software tool ENVYO. Thereby, several homogenization strategies and the respective input parameters will be discussed and illustrated in application examples.

Contents
- Introduction to composite materials
- Anisotropy and definition of directions
- Material modeling
  - Material models for short fiber reinforced composites in LS-DYNA
  - Failure criteria established by Tsai-Hill, Tsai-Wu and *MAT_GENERALIZED_DAMAGE
- Evaluation of process simulation results, especially injection molding
- Homogenization strategies
  - Mori-Tanaka, self-consistent method
  - Closure-Approximations
- Introduction into ENVYO to close the simulation process chain for short fiber reinforced composites



SIMULATION OF CONTINUOUS FIBER REINFORCED POLYMERS

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
Dr. Thomas Klöppel,
Christian Liebold,
both DYNAmore
Dates:
22-23 April
06-07 May G)
16-17 June Tu)
03-04 November

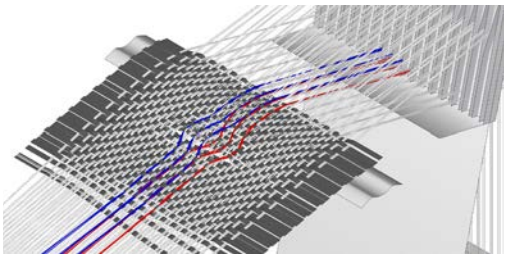
G) Göteborg, Sweden
Tu) Turin, Italy

Online registration:
www.dynamore.de/
c2036e

UPDATE

Increasing requirements on resistance and durability in conjunction with weight reduction have advanced the development of composite materials very strongly within the last decades. Composites are no longer only used for special applications or subordinate components, but increasingly for components in volume production. Hence, concepts are in demand to capture the complex mechanisms of load transfer and failure within numerical simulations.

A very important subgroup of “composites” consists of long fiber reinforced composite materials. They typically consist of high-strength carbon or glass fibers which are unidirectionally embedded in thin layers of an epoxy resin matrix.



Courtesy of Deutsches Institute für Textil- und Faserforschung

This seminar gives an overview on potential modeling techniques of this subgroup. The strong anisotropy of these composite structures leads to a complex mechanical behavior which has to be captured in the simulation. Therefore, the available material models in LS-DYNA are introduced and discussed in-depth. Some of these models are implemented and co-developed with the support of DYNAmore employees. Furthermore, different methods of modeling the phenomena of delamination are shown. The applicability and limits are demonstrated by means of small numerical examples.

Content
- Introduction to composite materials
- Laminate theory
- Structure modeling and model assumptions
- Material modeling
  - Discussion of existing material models in LS-DYNA
  - Failure criteria of Chang-Chang, Tsai-Wu and Hashin
- Modeling of delamination
  - Cohesive-elements and tiebreak contact
- General effects by means of examples
- Visualization of simulation results with LS-PrePost

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CONCRETE AND GEOMATERIAL MODELING WITH LS-DYNA

Type:
Seminar
Duration:
2 days
Fee:
1,200 Euro
Lecturer:
Dr. Len Schwer,
Schwer Engineering
& Consulting Services
Language:
English
Date:
01-02 October

Online registration:
www.dynamore.de/
c2037e

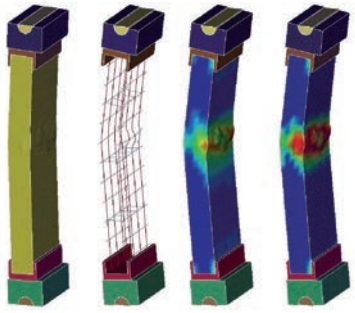
Constitutive models for concrete and geomaterials (rock and soil) are typically based on the same mathematical plasticity theory framework used to model common metals. However, the constitutive behavior of concrete and geomaterials differs from that of metals in three important ways:

1. They are (relatively) highly compressible, i.e., pressure-volume response
2. Their yield strengths depend on the mean stress (pressure), i.e. frictional response
3. Their tensile strengths are small compared to their compressive strengths.

These basic differences give rise to interesting aspects of constitutive modeling that engineers trained in classical metal plasticity may not be familiar with. The course starts from the common ground of introductory metal plasticity constitutive modeling and successively builds on this base adding the constitutive modeling features necessary to model concrete and geomaterials. The LS-DYNA constitutive models covered are adequate for modeling most types of rock, all concretes, and a large class of soils. The course is intended for those that are new to concrete & geomaterial constitutive modeling, but will also be useful to those seeking a more in-depth explanation of the LS-DYNA concrete and geomaterial constitutive models covered.

A significant portion of the course is devoted to understanding the types of laboratory tests and data that are available to characterize concrete and geomaterials. Unlike most metals, whose strength is characterized by a single value obtained from a simple uniaxial stress test, concrete and geomaterial characterization requires a matrix of laboratory tests. A knowledge of how these tests are performed, the form and format, of typical laboratory test data, and the interpretation of the data for use with a concrete or geomaterial constitutive model is essential to becoming a successful concrete & geomaterial modeler.

The basic mathematics of the LS-DYNA concrete and geomaterials constitutive models are covered with an emphasis on how the mathematics can aid the modeler in fitting constitutive models to the available laboratory data. The mechanics of the constitutive model are emphasized to provide the modeler with the insights necessary to easily separate cause and effect in these complicated constitutive models. Exercises in fitting the LS-DYNA concrete and geomaterial constitutive models to typical laboratory data are used to illustrate the data and the constitutive models.



Courtesy of Schwer Engineering

SIMULATION OF THERMOPLASTICS WITH LS-DYNA

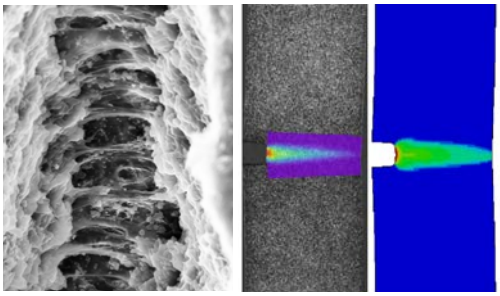
Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturer:
Dr. Martin Helbig,
DYNAmore
Date:
03 July

Online registration:
www.dynamore.de/
c2038e

NEW

This one-day course is aimed at LS-DYNA users who are involved in the practical modelling of thermoplastic polymers. After a short theoretical introduction to the mechanical behaviour of thermoplastics, the tests that are necessary to identify the parameters of various constitutive models will be shown. The evaluation of experiments for material characterization will be discussed in detail and how to generate material cards from the experimental data will be shown.

The focus is set on phenomenological constitutive models where the range of applicability is explained in detail. The application of the discussed models is demonstrated by exercises.



Content

- Mechanical behavior of polymer materials
  - Non-reversible deformations
  - Damage mechanisms of thermoplastics
- Continuum Mechanical Basics
  - Deformation measures
  - Volumetric expansion
  - Plastic transverse contraction
  - Strain and stress measures
- Experimental characterization of unreinforced and reinforced thermoplastics
  - Based on tensile tests
  - Based on bending tests
- Modeling
  - Isochoric constitutive behaviour with von Mises plasticity (*MAT_024)
  - Visco-plastic constitutive behaviour with *MAT_024
  - Different flow behavior in tensile and compressive loading: *MAT_124 and *MAT_187 (SAMP-1)
  - Thermoplastics with increasing macroscopic volume with SAMP-1 (*MAT_187)
  - Fiber-reinforced thermoplastics with anisotropic elastic and plastic deformation behavior (*MAT_157)
  - Damage modeling of thermoplastics with *MAT_ADD_EROSION (GISSMO)

USER MATERIALS IN LS-DYNA

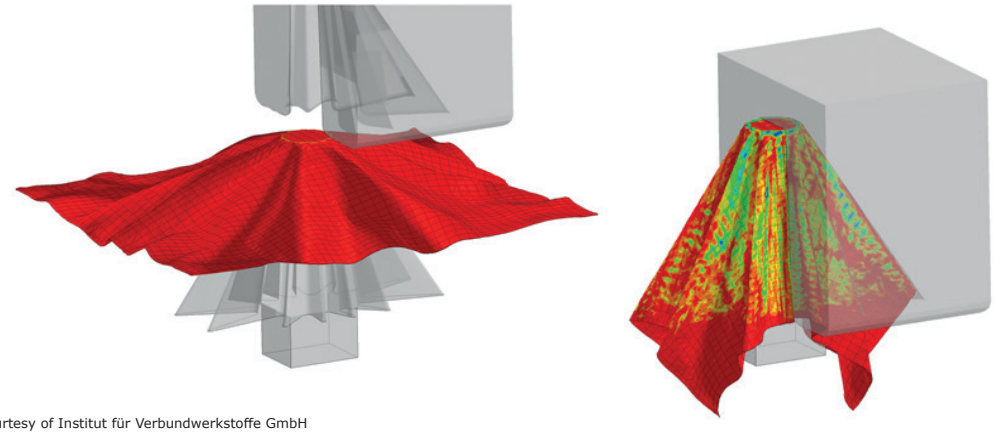
LS-DYNA offers the possibility to implement custom material models into the code of the program. In this regard, the user-developed material routines will be compiled and linked with the corresponding LS-DYNA object-files. The seminar aims at users from industrial as well as academic research facilities who would like to integrate their own material models in LS-DYNA and are interested in discussing their experience with the implementation in a wider circle of users.

Content

- Demonstration of the development procedure
  - Recommended compiler and compiler options
  - Potential additionally required libraries
- Access to data structures
- Implementation of a custom material routine in LS-DYNA
- On request, your custom models can be discussed and edited during the seminar

Type:
Seminar
Duration:
1/2 day
Fee:
290 Euro
Lecturer:
Dr. Tobias Erhart, DYNAmore
Dates:
27 April
23 October

Online registration:
www.dynamore.de/c2039e



Courtesy of Institut für Verbundwerkstoffe GmbH

INFORMATION DAY: COMPOSITE ANALYSIS WITH LS-DYNA

Due to the increasing importance of lightweight construction, where the aim is not only to economize on weight but also to improve rigidity and strength, the use of composite materials has increased dramatically over recent years. If considerations are made regarding the use of such materials for crash-relevant components, the requirements of simulation tools increase enormously - especially in automotive construction. As a consequence, numerous enhancements have been implemented in LS-DYNA.

The aim of this information day is to inform participants about the state of the art in simulating composite materials. In particular, an overview of existing options in LS-DYNA for simulating composite materials is given and current developments will also be discussed. A further focus will be on the presentation of the software DIGIMAT, which allows for the analysis of the microstructure of composite materials. The possibility of coupling DIGIMAT with LS-DYNA will also be addressed.

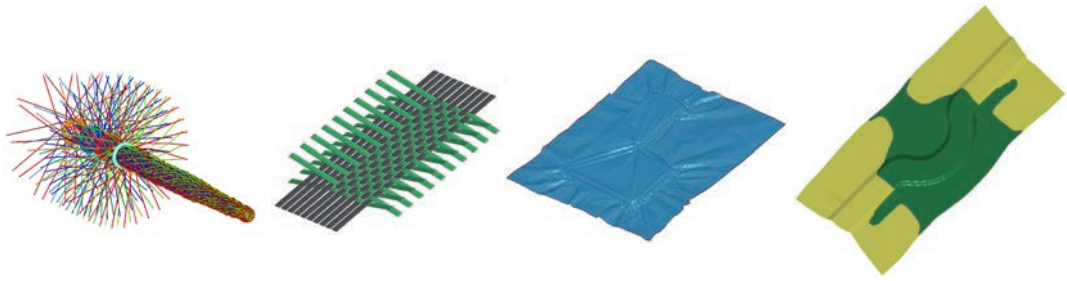
Content

- Overview of techniques to model composite materials in LS-DYNA
- Insight into the latest developments in LS-DYNA regarding composite materials (material formulations, elements, delamination mechanisms)
- Visualization of simulation results
- Overview of the application of DIGIMAT for composite materials
- Coupling DIGIMAT with LS-DYNA

In collaboration with e-Xstream engineering, MSC Software Company

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Lecturers:
DYNAmore and e-Xstream staff member
Language:
German/English
Dates:
03 April

Online registration:
www.dynamore.de/c2040e



micro — meso — macro

INFORMATION DAY: MATERIAL CHARACTERIZATIONS AND MEASUREMENT

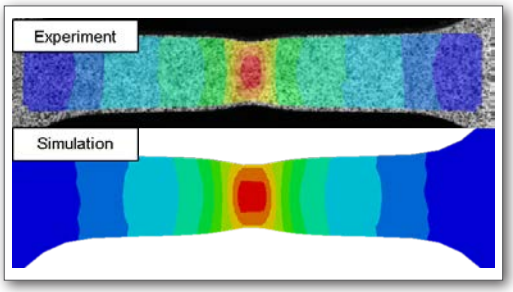
Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Lecturers:
DYNAmore
staff member
Date:
20 July

Online registration:
www.dynamore.de/
c2041e

NEW

Increasing requests on the forecast quality of numerical simulations, as well as the development of new materials are the new challenges for the characterization of mechanical material parameters.

For example, numerical production and process simulation and the subsequent transfer of pre-strains, pre-damages and sheet thinning to crash simulation require an increasingly complex characterization of the mechanical material parameters. The deformation and damage behavior of components made of fiber-reinforced thermoplastics can also be predicted much better if anisotropic and viscoplastic material properties are taken into account. For large deformations or highly plastic material behavior (e.g. for thermoplastics), it is no longer sufficient to describe the material behavior only with material parameters such as poissons ratio, young's modulus or yield stress. More complex material descriptions that are capable of describing the deformation and damage behavior of the materials will eventually become necessary, specifically for the application and the type of load in the component as accurately as possible.



For this purpose, the necessary mechanical properties are determined by means of suitable experiments, which provide the basis for the material card in the further calibration process. Typically, the experiments performed are simulated with the material card and the virtual results are compared with the experimental measurements. The forecasting quality of the material card can be successively optimized with the aid of a „reverse engineering process".

On the information day the following topics will be presented and deepened:

- Which experiments are necessary to describe a material sufficiently precise?
- Method of optical strain measurement (Digital Image Correlation)
- How are strains measured and stresses determined?
- How is a yield curve created from this?
- How can anisotropic material behavior in metals and plastics be detected, characterized and taken into account in the simulation?
- How to create a simple MAT24 card?
- How is strain rate dependence determined and defined in the simulation?
- Insight into material characterization with the help of „Full-Field Calibration (FFC)"
- Requirements for the calibration of complex material models

INFORMATION DAY: SIMULATION OF PLASTICS WITH LS-DYNA

Type:
Information day
Duration:
1/2 day (morning)
Fee:
Free of charge
Date:
09 November

Online registration:
www.dynamore.de/
c2042e

Today, mechanically loaded plastic components are used in nearly all engineering environments. In recent years, their use has particularly increased in the automotive industry. Herein, extremely complex material models are needed to model such components realistically in a finite element simulation.

Plastics are usually much more complicated in their material behavior than, for example, steel or aluminium. Frequently encountered properties of plastics are nonlinear elasticity, viscoelasticity, viscoplasticity, strain rate-dependent failure and anisotropic material behavior. Moreover, the usual von Mises flow criterion is normally insufficient for a description of elastoplasticity.

During this information day, experts will report on their experience with material modeling and the simulation of plastics. Part of the lectures will be different experiments for the identification of material parameters and classification of different plastic types.

Application examples from the calculation of relevant components will also be covered in the presentations. DYNAmore experts will provide information on current possibilities and the latest developments in LS-DYNA regarding the material modeling of plastics. In a final discussion, participants will have an opportunity to ask questions and to exchange their experience with others.

Content

- What are the problems when modeling plastics?
- Discussion of elastic, visco-elastic and visco-plastic material models
- Failure/localization/softening
- Classification of plastics
- Material models in LS-DYNA
- Experimental techniques:
  - Quasi-static, dynamic experiments
  - Local strain measurement
- Identification of material parameters
- How does the manufacturing process influence the mechanical behavior of plastics?
- User subroutines with custom material laws
- Examples of use

IMPLICIT ANALYSIS WITH LS-DYNA

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
Pierre Glay,
Dr. Christoph Schmied,
both DYNAmore
Dates:
11-12 March [V)]
26-27 May
28-29 September
18-19 November [V)]

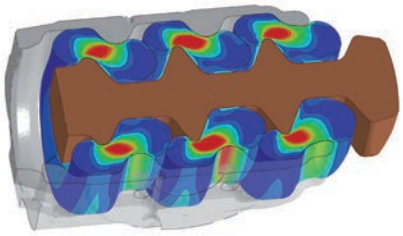
[V)] Versailles, France

Online registration:
www.dynamore.de/c2043e

ALSO AVAILABLE IN FRENCH

In recent years, the simulation possibilities in LS-DYNA using implicit time integration have been enhanced extensively. The main areas of application for implicit analyses include linear and nonlinear static computations, natural frequency analyses, springback, lengthy transient simulations, systems with preload, etc. The aim of the seminar is to give participants an overview of the possibilities and limits of implicit simulations using LS-DYNA. In particular, attention will be devoted to the required input cards for such simulations.

The seminar is recommended for engineers intending to use LS-DYNA to carry out implicit simulations. In addition, experienced "explicit users" learn about what to bear in mind when converting explicit into implicit input decks. Examples will be given during the seminar to illustrate the functionality of the implicit options.



Courtesy of Dellner Couplers AB

Content
- Differences between explicit and implicit: theory, application, examples
- Input syntax for implicit control cards
- Linear static analysis: options, linear elements, boundary constraints, direct/iterative solvers, accuracy
- Dynamic analysis: Newmark method, input parameters, lumped/consistent mass matrix
- Nonlinear analysis: solution methods (Newton, BFGS, arclength), convergence, tolerances, output, automatic step size strategy
- Eigenvalue analysis: options, modeling aspects, intermittent output
- Modal analysis, linear buckling
- Frequency response function
- Switching: implicit/explicit, explicit/implicit
- Element types for implicit: linear and nonlinear elements
- Material models for implicit analyses
- Contact types for implicit: options, Mortar contact
- Troubleshooting convergence problems
- Summary with checklist of most important settings for implicit calculations

Basic knowledge of LS-DYNA or prior attendance at the seminar "Introduction to LS-DYNA" is recommended.

NVH, FREQUENCY DOMAIN ANALYSIS AND FATIGUE WITH LS-DYNA

Type:
Seminar
Duration:
2 days
Fee:
1,200 Euro
Lecturer:
Dr. Yun Huang, LSTC
Language:
English
Date:
06 October [U)]

[U)] Ulm

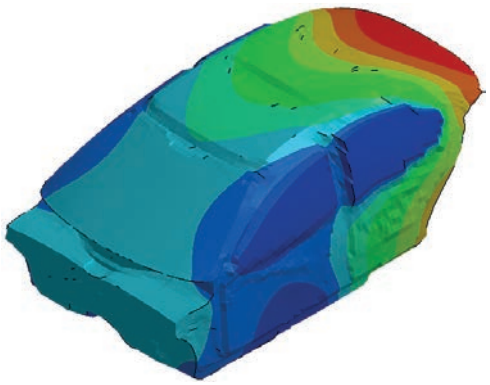
Online registration:
www.dynamore.de/c2044e

COURSE LANGUAGE ENGLISH

The objective of the training course is to introduce the frequency domain vibration, fatigue and acoustic features of LS-DYNA to users, and give a detailed look at the application of these features in vehicle NVH simulation.

This course is recommended for engineers who want to run NVH or other frequency domain vibration, fatigue and acoustic simulation problems with LS-DYNA. This course is useful for engineers and researchers who are working in the area of vehicle NVH, aircraft/spacecraft vibro-acoustics, engine noise simulation, machine vibration testing and simulation, etc.

Content
- Introduction
  NVH theory and lab testing technology, overview of LS-DYNA frequency domain features and applications, frequency domain vs. time domain, Fourier transforms
- Frequency Response Function (FRF)
  Modal superposition method, damping, nodal force/resultant force FRF
- Steady State Dynamics (SSD) with harmonic loading
- Large mass method for enforced motion, Equivalent Radiated Power (ERP), mode expansion with LS-PrePost
- Random vibration with PSD loading
  Correlated and uncorrelated multiple PSD excitations, acoustic wave, pre-stress condition
- Acoustics
  Rayleigh method, Kirchhoff method, BEM, FEM, acoustic panel contribution analysis, vibro-acoustic problems, Muffler transmission loss analysis, ATV and MATV techniques, acoustic eigenvalue analysis, incident waves, half-space problem, weighted SPL, radiated sound power
- Response spectrum analysis
  Input earthquake spectrum, modal combination methods (SRSS, CQC, etc.), multi input spectra
- Fatigue
  Fatigue analysis in harmonic/random vibration environment, Miner's rule, S-N curves, Dirlik method
- Advanced topics
  SEA (Statistical Energy Analysis), brake squeal analysis; NVH based on IGA
- Workshop



FROM EXPLICIT TO IMPLICIT SIMULATION MODELS IN LS-DYNA

Product development today means satisfying requirements within a variety of fields like crash safety, durability and sound comfort for a passenger car. In a CAE-driven development process, this puts high demands on the multi-disciplinary capabilities of analysis tools. The one-code strategy of LS-DYNA provides a complete solution for these demands, making it possible to use the same analysis model for many different load cases, from large-deformation rapid events like drop test and crash analyses to non-linear quasi-static analyses, and linear dynamics in the frequency domain.

Many possibilities exist to reuse the same models developed for rapid events and explicit time integration for non-linear quasi-static analyses and linear statics with only minor modifications. Many users could benefit from taking advantage of these.

This course addresses the conversion of an existing explicit LS-DYNA model to an implicit version of it. In detail, it focuses on how to set up non-linear implicit analyses in LS-DYNA starting from explicit (crash-worthiness-type) models. It is a hands-on course with many workshop examples, ranging from basic set-up of linear stiffness analyses to more involved non-linear sub-system analyses.

Practical troubleshooting tips and guidance on how to avoid many common pitfalls are also given.

No previous knowledge of implicit analyses in LS-DYNA is required, as the course starts out on a basic level in this filed, but basic knowledge of LS-DYNA or prior attendance at the seminar „Introduction to LS-DYNA“ is recommended.

Content

- Basic set-up using control card templates
- Contacts
- Multiple load steps
- Elements and materials for implicit analyses
- Advanced set-up: possible control card modifications
- Troubleshooting convergence issues
- Conversion examples

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturer:
Dr. Anders Jonsson, DYNAmore Nordic;
Dr. Christoph Schmied, DYNAmore
Dates:
28-29 May
26-27 November

Online registration:
www.dynamore.de/c2045e

NEW

SMOOTHED PARTICLE HYDRODYNAMICS (SPH) IN LS-DYNA

Type:
Seminar
Duration:
2 days
Fee:
1,200 Euro
Lecturer:
Prof. Mhamed Souli,
University of Lille
Language:
English
Dates:
19-20 February
02-03 July [V)]
17-18 September
06 October [U)]

[V)] Versailles, France
[U)] Ulm

Online registration:
www.dynamore.de/c2046e

ALSO AVAILABLE IN FRENCH

Attendees of this seminar will be introduced to the theoretical basics of the meshless method "Smoothed Particle Hydrodynamics" (SPH) and receive guidance for its practical application in LS-DYNA. The seminar will thoroughly illustrate the necessary configurations in the LS-DYNA input deck to realize a successful nonlinear SPH simulation and will furthermore clarify the differences to conventional FEM. Due to the true meshless nature of SPH, the method is perfectly suitable in situations with very large deformations. Typical applications of SPH in LS-DYNA include impact simulations of fluids or solids or other scenarios where it is essential to capture the momentum exchange accurately. Attendees will learn the application of the SPH with the aid of many workshop examples.

The course instructor Prof. Mhamed Soul of the University of Lille is a long-term software developer at LSTC and is frequently implementing new features for the methods ALE and SPH in LS-DYNA. This seminar is geared towards engineers who have already worked with LS-DYNA and would like to use SPH as a meshless method.

Content

- Introduction
- General possibilities/applications
- Development and classification of the method
- Principal idea of the SPH method
  - Particle approximation of field functions
  - Characteristic length scales
  - Renormalization
  - Tension instability and possible countermeasures
  - Available formulations
  - Comparison of SPH with FEM
- Symmetry boundary conditions
- Contact modeling
  - SPH to FEM
  - SPH to SPH
  - SPH to DEM
- Conversion of finite elements to SPH at failure
- Input parameters
  - Control settings
  - Output settings
- Pre- and postprocessing with LS-PrePost
- Sample applications

INTRODUCTION TO SMOOTHED PARTICLE GALERKIN METHOD FOR MANUFACTURING AND MATERIAL-FAILURE ANALYSIS

Type:
Seminar
Duration:
1 day
Fee:
600 Euro
Lecturers:
Dr. Wei Hu,
Dr. Cheng-Tang Wu,
beide LSTC
Language:
English
Date:
06 October [U)]

[U)] Ulm

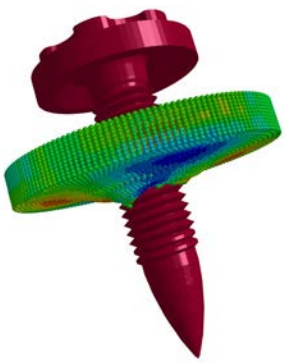
Online registration:
www.dynamore.de/c2047e

COURSE LANGUAGE ENGLISH

This one-day class will introduce the Smoothed Particle Galerkin (SPG) method and its application in manufacturing and material failure analysis. The SPG method is developed for modeling large deformation and material failure in semi-brittle and ductile materials in three-dimensional solid structures, in which a bond-based failure mechanism is utilized to model material failure. This method can be used to bridge the Lagrangian FEM and is exclusively available in LS-DYNA. The class will provide the fundamental background, LS-DYNA keywords, practical applications (in analyzing relatively low speed manufacturing processes such as metal cutting, FDS, SPR and high velocity impact penetration on concrete and metal targets) with some experimental validations and latest developments.

Content

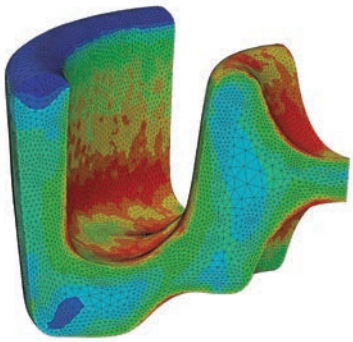
- Overview and introduction
  - Overview of LS-DYNA meshfree methods:
    - General features, capability and applicability of different meshfree kernels
  - Introduction to LS-DYNA SPG method
    - Motivation, fundamentals, keywords
  - Examples of SPG in non-failure analysis
    - Elastic wave propagation & Taylor impact
- SPG for ductile failure analysis in manufacturing processes
  - Input deck for SPG failure analysis:
    - Control cards, SPG parameter cards, contact cards, material cards
    - SPG bond failure mechanism
  - Applications of SPG in destructive manufacturing analysis
    - Metal cutting, machining, riveting, friction drilling, FDS
    - Convergence study and sensitivity study to SPG parameters
- SPG for impact penetration and fragmentation analysis
  - LS-DYNA keywords for SPG analysis of impact and fragmentation phenomena
    - Control cards, SPG parameter cards, contact cards, material cards
    - SPG self-contact algorithm to prevent material fusion and self-penetration
  - Numerical simulations of impact penetration and fragmentation processes
    - Penetration and perforation of metal targets
    - Perforation of multi-layered targets
    - Penetration and perforation of concrete targets
    - Convergence study and sensitivity study to SPG parameters



INTRODUCTION TO EFG

Structural deformations usually occur when particularly soft materials like rubber or foam are subjected to stress, or when metals are massively formed, such as during forging or extrusion. Their simulation requires numerical calculation methods that are superior to conventional methods. One of these methods is the Element Free Galerkin (EFG) method.

The participants of this seminar receive an introduction to the theoretical basics and background of the EFG method. Furthermore, the required settings in the LS-DYNA input deck, which are required for the realization of a successful nonlinear EFG simulation, will be discussed in detail.



Especially, the new possibilities of local adaptivity in combination with implicit time integration and coupling to thermal analysis will be addressed. Additionally, the possibilities of fracture simulations using discontinuous EFG formulation will be discussed. The course includes practical exercises to deepen the basics.

Content
- Introduction to the EFG method
- Comparison of EFG to SPH and FEM
- Overview of keywords
- Global and local adaptivity in EFG
- Exercises
- Applications possibilities

Type:
Seminar
Duration:
1 days
Fee:
525 Euro
Lecturers:
Dr. Maik Schenke, DYNAmore
Date:
15 May
24 November

Online registration:
www.dynamore.de/c2048e

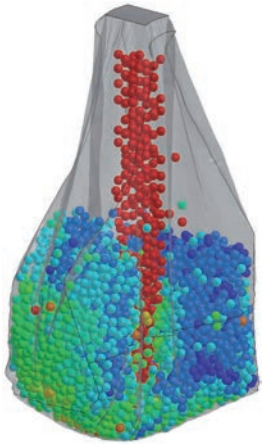
DISCRETE ELEMENT METHOD (DEM) IN LS-DYNA

The discrete element method (DEM) is usually applied to predict the behavior of different types of granular media during mixing processes, storage and discharge or transportation on belts. Herein, the interaction of the spherical particles with themselves as well as their surrounding deformable or rigid structures can be taken into account. Friction coefficients as well as spring and damper constants can be defined in normal and tangential direction. Wet particles can be estimated with the aid of a capillary force model and a certain roughness of the spherical particles can be achieved by introducing a rolling friction.

A continuum-mechanical description can be obtained with the introduction of “bonds” between the particles. Herein, the required mechanical behavior of the bonds is automatically computed by LS-DYNA using the parameters given in the material card. With the definition of a fracture energy release rate of the bonds, fracture mechanics of brittle materials can be studied.

Attendees of this seminar will obtain an overview of the involved material cards of a successful DEM simulation. For a better understanding of the involved parameters, simple examples will be presented addressing particle-particle as well as particle-structure interaction. Finally, the associated experiments will be discussed that are needed to determine the involved parameters.

Content
- Introduction to granular materials
- Involved keywords and their options
- Setting up DEM simulations with deformable/rigid structures
- Physical meaning of the parameters and their experimental determination
- Practice examples



Type:
Seminar
Duration:
1 days
Fee:
525 Euro
Lecturers:
Dr. Nils Karajan, Dr. Maik Schenke, both DYNAmore
Date:
14 September

Online registration:
www.dynamore.de/c2049e

ALE AND FLUID-STRUCTURE-INTERACTION IN LS-DYNA

Type:
Seminar
Duration:
2 days
Fee:
1,200 Euro
Lecturer:
Prof. Mhamed Souli, University of Lille
Language:
English
Dates:
17-18 February
30 June - 1 July [v)]
15-16 September

[v)] Versailles, France

Online registration:
www.dynamore.de/c2050e

ALSO AVAILABLE IN FRENCH

In this seminar, you will receive comprehensive information about the latest developments in LS-DYNA to analyze fluids and, in particular, the fluid-structure interaction using its Arbitrary Lagrangean Eulerian (ALE) capabilities. Attendees will learn about the theoretical background, how fluids are implemented in LS-DYNA using ALE, and will gain a deeper understanding of these concepts with the aid of many hands-on examples.

The seminar is directed towards advanced LS-DYNA users, who would like to solve problems in the fields of aquaplaning, tank sloshing, tank dropping (partially and completely filled), bird strike, viscous flow, ship collision, underwater explosion and acoustics in air and water. Prior knowledge of fluid dynamics is not required.

The course instructor Prof. Mhamed Souli of the University of Lille is a longtime program developer at LSTC who implements new features for ALE/SPH in LS-DYNA.

Content
- Basic theoretical background
  - Navier-Stokes equation
  - Mass- and energy balance
- Selection of material models
- Selection of equations of state
- Discretization and numerical Solution
  - Lagrangean formulation
  - Eulerian formulation
  - ALE formulation
  - Moving Eulerian mesh
  - Operator-Split method
  - Advection schemes
  - Algorithms for mesh smoothing
- Multi-material ALE
  - Pressure relaxation based on volume fractions
  - Interface reconstruction
- Fluid-structure interaction
  - Constraint method
  - Penalty method
  - Leakage and methods to avoid it
- Vibro-Acoustic
- Explosions
- Practice examples

Courtesy of Hankook Tire Co.

ICFD - INCOMPRESSIBLE FLUID SOLVER IN LS-DYNA

Type:
Seminar
Duration:
2 days
Fee:
1,200 Euro
(600 Euro per day, can be booked separately)
Lecturer:
Iñaki Çaldichoury, LSTC
Language:
English
Dates:
12-13 October

Online registration:
www.dynamore.de/c2051e

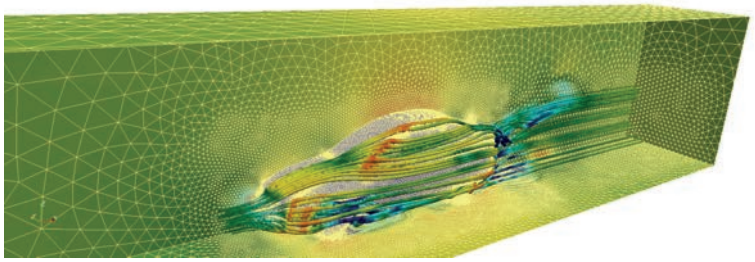
COURSE LANGUAGE ENGLISH

This course provides an introduction to the incompressible fluid solver (ICFD) in LS-DYNA. It focuses on the solution of CFD problems, where the incompressibility constraint may be applied, e. g. ground vehicle, aerodynamics, hemodynamics, free-surface problems, ship hydrodynamics, etc. The solver may run as a stand-alone CFD solver, where only fluid dynamics effects are studied, or it can be coupled to the solid mechanics solver to study loosely or strongly coupled fluid-structure interaction (FSI) problems.

The first day of the course includes a presentation of the general principles and applications of the solver, a step by step guide to setting up a simple CFD problem, advanced feature introduction (FSI, conjugate heat transfer) and so forth. A brief review of basic fluid mechanics and CFD concepts are also offered such that no expert knowledge of fluids is required. The second day will deal with the newly implemented features and advanced applications.

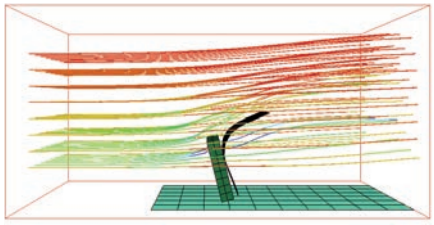
Introduction to the ICFD solver in LS-DYNA (Day 1)
- General principles and supported applications
- Step by step keyword description
- Setting up a pure CFD problem for aero-dynamics
  - Setting boundary conditions
  - Fluid volume mesher
  - Mesh refinement tools
- Strong and loose FSI coupling
- Thermal coupling and conjugate heat transfer
- Computation of the heat transfer coefficient

Advanced topics and new features (Day 2)
- Advanced controlling and monitoring tools
- Turbulence modeling
  - New models and picking the right one
  - Law of the wall and boundary layer
- Non Newtonian flows
- Flow in porous media
- DEM coupling
- New postprocessing tools in LS-PrePost



CESE – COMPRESSIBLE FLUID SOLVER IN LS-DYNA

Compressibility effects in fluid mechanics are typically considered significant if the Mach number of the flow exceeds 0.3 or if the fluid undergoes very large pressure changes. The most distinct phenomenon associated with high speed flows is the existence of shock waves or non-isentropic solutions.

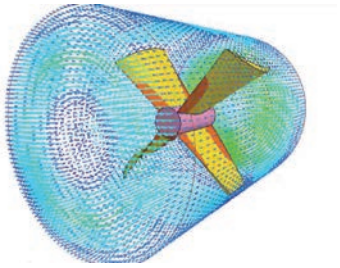


The new compressible flow solver CESE in LS-DYNA is based on a novel numerical framework originally proposed by Dr. Chang of the NASA Glenn Research Center. The method exhibits many non-traditional features, including a unified treatment of space and time, the introduction of a conservation element (CE) and a solution element (SE), and a novel shock capturing strategy without using a Riemann solver, which is able to simultaneously capture both strong shocks and small disturbances. Moreover, the spatial gradients are treated as unknowns which allows for more accurate solutions of the shock waves than normal second order schemes.

So far, this method has been used to solve many different types of flow problems, such as detonation waves, shock/acoustic wave interaction, cavitating flows, and chemical reaction flows. In LS-DYNA, it has been extended to also solve fluid-structure interaction (FSI) problems with the embedded (immersed) boundary approach or moving (fitted) mesh approach.

Contents

- Introduction
- General Principles
- The CE/SE scheme
- Setting up a pure CFD/CESE problem
- Setting up an FSI/CESE problem
- Advanced capabilities
- Post treatment
- Documentation



Type:
Seminar
Duration:
1 day
Fee:
600 Euro
Lecturer:
Iñaki Çaldichoury, LSTC
Language:
English
Date:
19 October

Online registration:
www.dynamore.de/c2052e

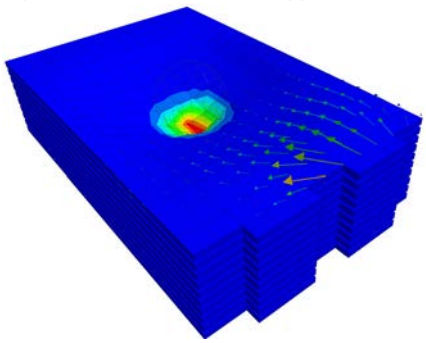
COURSE LANGUAGE ENGLISH

RESISTIVE HEATING AND BATTERY MODELING

This course is based on the Electromagnetics (EM) solver of LS-DYNA. The EM module computes the Maxwell equations and is embedded into LS-DYNA following LSTCs one-code strategy, thereby allowing for an efficiently coupling to the solid-mechanics and the thermal solver.

The seminar presents the solver's general principles and a complete keyword description for setting up simulation models to compute inductive and resistive heating problems as well as to model batteries.

By doing so, the Randles-circuit approach will be used to describe the charging and discharging process as well as the accompanying heat production.



Contents

- Resistive heating solver
  - Principles
  - Solid and thermal coupling
  - Source terms and case studies
  - Contact and Erosion
  - Wire modeling
- Resistive Spot Welding (RSW)
  - Physical concept and industrial background
  - Numerical modeling
- Battery module
  - Simulation objectives
  - Randle circuits
  - Solid and Tshell-element models

Type:
Seminar
Duration:
1 day
Fee:
600 Euro
Lecturer:
Iñaki Çaldichoury, LSTC
Language:
English
Date:
15 October

Online registration:
www.dynamore.de/c2053e

COURSE LANGUAGE ENGLISH

ELECTROMAGNETISM IN LS-DYNA

Type:
Seminar
Duration:
1 day
Fee:
600 Euro
Lecturer:
Iñaki Çaldichoury, LSTC
Language:
English
Date:
14 October

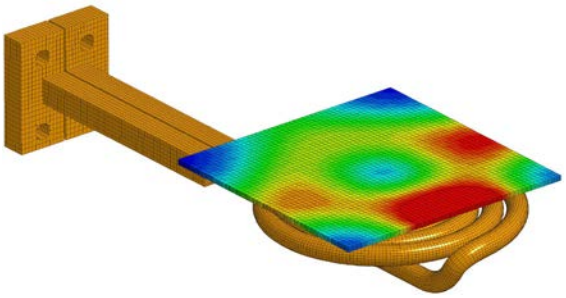
Online registration:
www.dynamore.de/c2054e

COURSE LANGUAGE ENGLISH

This course provides an introduction to the Electromagnetics (EM) solver in LS-DYNA. Herein, the Maxwell equations are solved in the Eddy-Current approximation, which is suitable for cases where the propagation of electromagnetic waves in air (or vacuum) can be considered as instantaneous. The solver is coupled with the solid mechanics and thermal solvers of LS-DYNA allowing the simulation and solution of applications such as magnetic metal forming, welding, bending, induced heating, resistive heating and so forth.

The course includes a presentation of the solver's general principles and applications, a complete keyword description for setting up an Eddy-Current problem, an introduction to the more advanced features (Inductive heating problems, exterior magnetic field, magnetic materials and so forth) as well as an advanced description of the available controlling tools to ensure a safe analysis. Key electromagnetic concepts are reviewed throughout the course and a general knowledge about electromagnetics is therefore appreciated but not mandatory.

Contents
- Introduction and applications
- General principles
- Maxwell equations
- FEMSTER library
- FEM and BEM coupled system
- Setting up a EM problem step by step
- The EM timestep
- Circuits
- EM materials and equation of states
- Advanced functionalities
- Controlling and monitoring the analysis



Courtesy of Institut für Verbundwerkstoffe GmbH

INFORMATION DAY: MULTIPHYSICS

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Date:
16 October

Online registration:
www.dynamore.de/c2055e

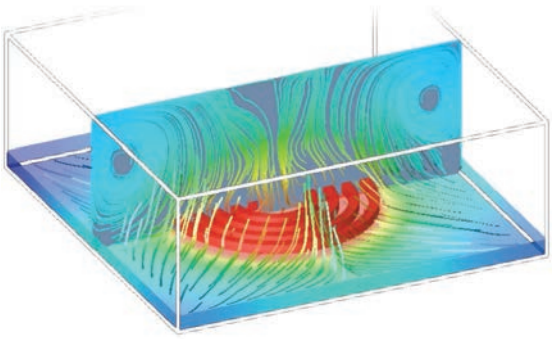
The modern term "Multiphysics" can be understood as a synonym for the solution of generally coupled problems. Following this, multiphysical applications are often classified according to the nature of their coupling in terms of a weak or strong interaction of the involved processes, methods, materials, physical fields or scales as well as combinations thereof.

Moreover, the interacting quantities may result in either volume- or surface-coupled problems. Thus, the success of multiphysical simulations strongly depends on the coupling abilities of the underlying simulation platform. In the case of LS-DYNA, this is achieved in a unified simulation environment.

The goal of this information day is to highlight the basic difficulties with the set-up of multiphysical simulations and to provide suitable solutions by embracing the available discretization schemes in space and time in LS-DYNA. In particular, a great variety of finite elements in a Lagrangean, Eulerian or Arbitrary-Lagrange-Eulerian formulation can be coupled with boundary elements, isogeometric elements or even meshfree methods like SPH, EFG or DEM.

Moreover, implicit as well as explicit time integration schemes are provided and can be combined depending on the strength of the coupling.

On the basis of practical examples, an overview on the current coupling abilities in LS-DYNA is given. Herein, the attention is mainly on the mutual interaction of solids and fluids with thermal and electromagnetical fields.



METHODS FOR SIMULATING SHORT DURATION EVENTS

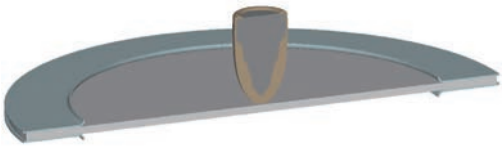
Most applications of LS-DYNA are for complex, and often combined, physics where nonlinearities due to large deformations and material response, including failure, are the norm. Often the goal of such simulations is to provide predictions which will ultimately be used to guide product development and safety assessments.

Insights into modeling and simulation are illustrated through examples and numerous modeling 'tricks' and options are discussed. An emphasis is placed on modeling techniques, guidelines for which technique(s) to select, which techniques work well and when, and possible pitfalls in modeling choice selections. Simulation credibility is demonstrated through solution of multiple models, with associated multiple solvers, required checks of global and local energies, and mesh refinement strategies.

This two day class provides instruction on the selection and use of the LS-DYNA solvers used for analyzing blast and penetration related problems. It is intended for the LS-DYNA analysts possessing a comfortable command of the LS-DYNA keywords and options associated with typical Lagrange analyses. The training class will attempt to provide the analyst with the additional tools and knowledge required to make appropriate modeling decisions and convey the level of confidence in predictive results.

Contents
Day 1
- Introduction to modeling & simulation - verification & validation
- Explicit & implicit - choosing an appropriate time integrator
- 3d Multi-Material Arbitrary Lagrangian Eulerian (MM-ALE)
- 1d and 2d-axisymmetric MM-ALE with mapping and adaptivity

Day 2
- Contact – which type to use, when, and why
- Fluid Structure Interaction
- Smoothed Particle Hydrodynamics (SPH)
- Stress initialization or preloads



Type:
Seminar
Duration:
2 days
Fee:
1,200,- Euro
Lecturers:
Paul Du Bois, Consultant;
Dr. Len Schwer, Schwer Engineering & Consulting Services
Language:
English
Date:
05-06 October

Online registration:
www.dynamore.de/c2056e

COURSE LANGUAGE ENGLISH

BLAST MODELING WITH LS-DYNA

Blast events form a class of simulation environments well suited to the solution capabilities of LS-DYNA. LS-DYNA is unique in offering the analyst the choice of Lagrange, Eulerian (ALE), Simple Engineering solvers, and combinations of these solvers for simulating high energy events such as blast loading. In addition to air blast, the traditional focus of blast modeling, buried explosive charges, have recently become important in the design of troop transportation.

This class focuses on the application of LS-DYNA for the simulation of high energy events. The analysis methods, and modeling, are illustrated through case studies. An emphasis is placed on modeling techniques: guidelines for which technique(s) to select, insights into which techniques work well and when, and possible pitfalls in modeling choice selections.

Sufficient mathematical theory is presented for each technique to provide the typical user with adequate knowledge to confidently apply the appropriate analysis technique. However, this training class is not a substitute for the in-depth treatments presented in the associated LS-DYNA training class, i.e. „ALE/Eulerian & Fluid Structure Interaction."

Mach Stem Formation
Courtesy of Schwer Engineering & Consulting Services

Type:
Seminar
Duration:
2 days
Fee:
1,200,- Euro
Lecturers:
Paul Du Bois, Consultant;
Dr. Len Schwer, Schwer Engineering & Consulting Services
Language:
English
Date:
12-13 October

Online registration:
www.dynamore.de/c2057e

COURSE LANGUAGE ENGLISH

PENETRATION MODELING WITH LS-DYNA

Type:
Seminar
Duration:
2 days
Fee:
1,200,- Euro
Lecturers:
Paul Du Bois,
Consultant;
Dr. Len Schwer,
Schwer Engineering
& Consulting Services
Language:
English
Date:
14-15 October

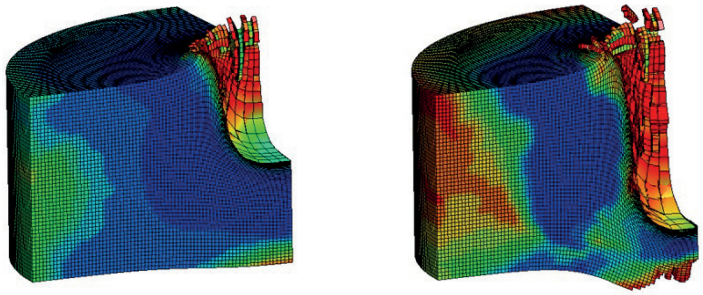
Online registration:
www.dynamore.de/
c2058e

COURSE LANGUAGE ENGLISH

Penetration events form a class of simulation environments well suited to the solution capabilities of LS-DYNA. LS-DYNA is unique in offering the analyst the choice of Lagrange, Eulerian (ALE) and Meshfree Methods, and combinations of these methods, for simulating high energy events such as penetration and perforation. In addition to high energy, these events are typically associated with large deformations, damage, and failure both on the material and structural level. During the past decade successful modeling of such damage and failure has moved steadily from a „Black Art" to a widely accepted engineering practice.

This class focuses on the application of LS-DYNA for the simulation of high energy events. The analysis methods, and modeling, are illustrated through case studies. An emphasis is placed on modeling techniques: guidelines for which technique(s) to select, insights into which techniques work well and when, and possible pitfalls in modeling choice selections.

Sufficient mathematical theory is presented for each technique, especially meshfree methods, to provide the typical user with adequate knowledge to confidently apply the appropriate analysis technique. However, this training class is not a substitute for the in-depth treatments presented in the associated LS-DYNA training classes, i.e. „ALE/ Eulerian & Fluid Structure Interaction" and „Mesh-Free Methods (SPH-EFG)", respectively.



Courtesy of French-German Research Institute of Saint-Louis (ISL)

EXPLOSIVES MODELING FOR ENGINEERS

Type:
Seminar
Duration:
1 day
Fee:
600 Euro
Lecturers:
Paul Du Bois,
Consultant;
Dr. Len Schwer,
Schwer Engineering
& Consulting Services
Language:
English
Date:
16 October

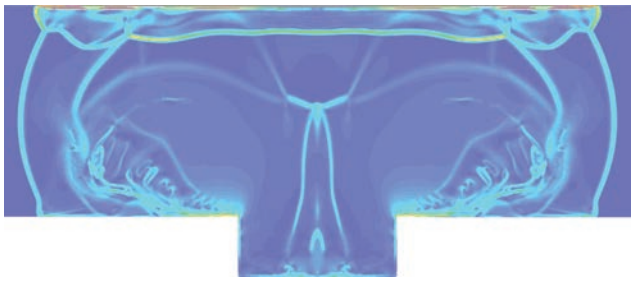
Online registration:
www.dynamore.de/
c2059e

COURSE LANGUAGE ENGLISH

This class focuses on the application of LS-DYNA to model explosives. LS-DYNA simulations involving explosives can be modeled on several engineering levels from simple application of equivalent pressure histories via *LOAD_BLAST_ENHANCED, explicit inclusion of explosive charges using Equations-of-State and detonation via *INITIAL_DETONATION, and detonation of explosive due to impact using *EOS_IGNITION_AND_GROWTH_OF_REACTION_IN_HE. The analyst selects the appropriate degree of model sophistication to satisfy the intended use of the model results.

The modeling methods are illustrated through case studies with sufficient mathematical theory to provide the user with adequate knowledge to then confidently apply the appropriate modeling method.

This training class is intended for the LS-DYNA analyst possessing a comfortable command of the LS-DYNA keywords and options associated with typical Lagrange and Multi-Material Arbitrary Lagrange Eulerian (MM-ALE) analyses.



Courtesy of Rheinmetall Landsysteme GmbH

LS-OPT - OPTIMIZATION AND ROBUSTNESS

LS-OPT is an independent comprehensive, optimization program which is designed and developed by LSTC. It is ideal for solving strongly nonlinear optimization problems and is thus highly suitable for the usage in combination with LS-DYNA. However, LS-OPT can also be combined with any other solver, which offers the possibility to also solve multi-disciplinary problems.

LS-OPT is based on very effective response surface methods and also offers other genetic algorithms. Moreover, the program includes stochastic methods to assess the robustness of FE models and to illustrate dependencies between optimization variables and objective functions. The definition of the optimization problem is supported with the aid of a comfortable graphical user interface.

The aim of this course is to give participants a comprehensive overview of the practical application of stochastic methods and robustness analysis using LS-OPT. Additionally, basic knowledge of statistics and probability will be given and the methods implemented in LS-OPT will be discussed.

Type:
Seminar
Duration:
3 days
Fee:
1,575 Euro
(525 Euro per day, can be booked separately)
Lecturers:
Dr. David Aspenberg, Charlotte Keisser, Katharina Witowski, all DYNAmore
Dates:
31 March - 2 April
22-24 June V)
14-16 September
30 Nov - 2 Dec. Tu)

Tu) Turin, Italy
V) Versailles, France

Online registration:
www.dynamore.de/c2060e

ALSO AVAILABLE IN FRENCH

Introduction and Optimization (2 days)

The seminar gives an introduction to the program LS-OPT. General theoretical aspects of the Response Surface Method are presented and the possibilities of applying this method in LS-OPT are explained. In particular, the application of LS-OPT in combination with nonlinear FE solvers will be discussed in more detail. Seminar participants will be given the chance to implement their newly-acquired knowledge with the aid of hands-on workshop examples.

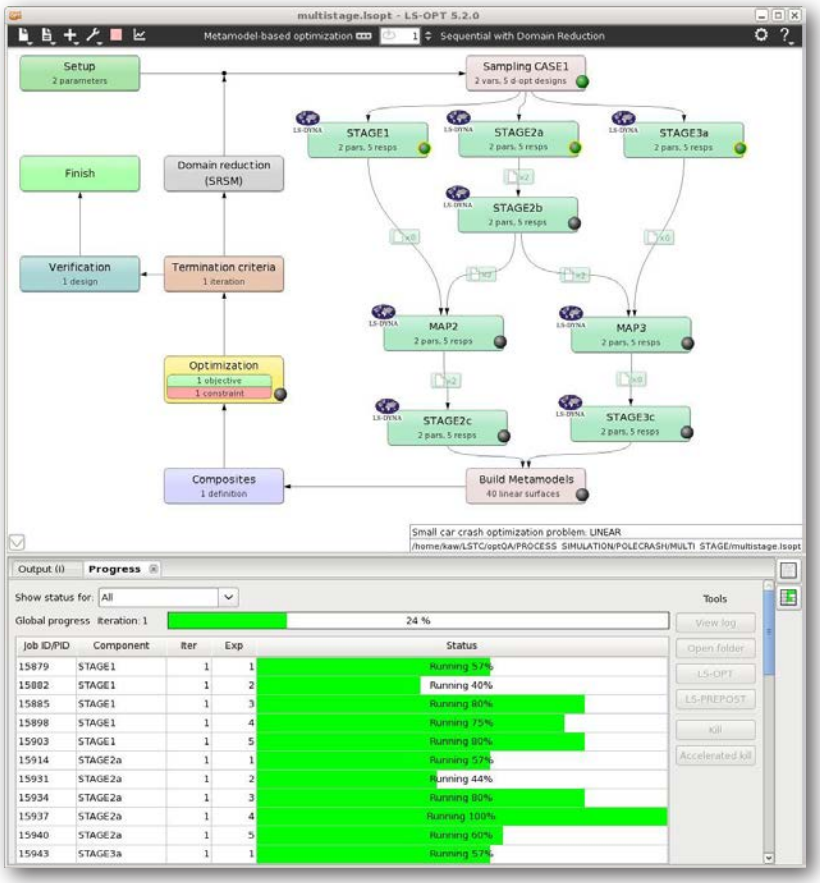
Content
- Overview of optimization methods for strongly nonlinear problems
- Formulation of an optimization problem (objective function, constraints, design variables, etc.)
- DOE (Design of Experiments)
- Theory of the Response Surface Method (RSM)
- Interpretation of approximation errors of metamodels
- Multidisciplinary Optimization (MDO)
- Sensitivity analysis (ANOVA, Sobol)
- Parameter Identification
- Multi-objective Optimization (MOO, Pareto frontiers)
- LS-OPT graphical user interface
- Visualization of optimization results in LS-OPT
- Application examples

Robust Design (1 day)

Methods for stochastic analysis to judge the robustness of FE models as well as influences of design variables on responses have been implemented in LS-OPT. These features allow answering questions such as:

- What is the probability of a specific failure limit being exceeded?
- Is my solution robust or does a minor variation of my input variables lead to a completely different result?
- Is the dependence between input variables and the response (solution) chaotic or predictable?
- Is there a correlation between variables and responses or between responses and responses?

To attend the module “Robust Design”, prior attendance at the module “Introduction and Optimization” is recommended.



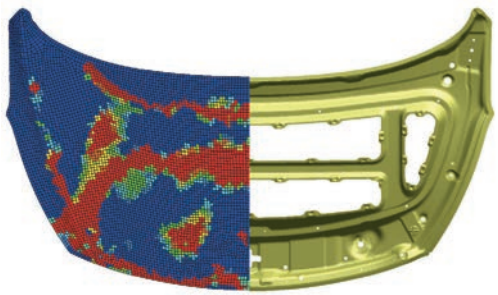
BASICS OF INDUSTRIAL STRUCTURAL OPTIMIZATION

Type:
Seminar
Duration:
1 day
Fee:
600 Euro
Lecturer:
Dr. Stefan Schwarz,
Dr. Ing. h.c. F.
Porsche AG
Date:
30 March
14 May

Online registration:
www.dynamore.de/
c2061e

The aim of this class is to provide interested users of optimization software with background information on optimization strategies and the associated algorithms.

There are many different terms for the available methods in the field of optimization, e. g. topology, topography and topometry optimization, which are often hard to categorize for the user. These methods are usually applied in combination with linear finite element analyses. For the optimization of nonlinear systems, special gradient-based methods (numerical/analytical), response surface methods, or genetic and stochastic search methods are frequently applied.



Courtesy of Hyundai Motor Company

The aim of this class is to discuss the capabilities and limits of these methods such that the participants learn how to distinguish between the different structural optimization techniques. How the methods work as well as their practical application will be illustrated with examples particularly from the automotive industry.

Content
- Introduction to the basics of mathematical optimization
- Classification and explanation of different methods
- Selection of the right method based on the application
- Capabilities and limititations of the different methods
- Effectivity analysis of the algorithms
- Pros and cons of the methods
- Correct definition of an optimization problem
- Interpretation of results

STRUCTURAL OPTIMIZATION WITH GENESIS

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturers:
VR&D and DYNAmore
staff member
Date:
22-23 July

Online registration:
www.dynamore.de/
c2062e

GENESIS is an integrated FE analysis and optimization software program from Vanderplaats R&D. Among other things, GENESIS can be used to carry out comprehensive linear static structural analyses, perform time and frequency dynamic analyses, determine normal modes and natural oscillations as well as calculate heat transfer problems and composite structures. GENESIS enables conceptual designs of shape, form and material to be optimized providing the user with highly-efficient methods for topology, topometry, topography, sizing and shape optimization.

The implemented optimization strategies (DOT, BIGDOT) and the close interaction of FE analysis with the optimization algorithms allow the identification of an optimal design both efficiently and reliably. This is also the case for complex problems, generally requiring only a few FE analyses. The execution and analysis of an optimization is fully graphically supported by Design Studio for GENESIS.

Corvette Daytona ProtoTypee – Designed and built: Pratt & Miller
Courtesy of Vanderplaats Research and Development, Inc.

The seminar gives an introduction to the GENESIS program and to the graphical user interface Design Studio for GENESIS. The various optimization concepts (topology, topometry, topography, sizing and form optimization) as well as areas of application are presented and discussed. Selected problems are also solved by participants using GENESIS during the seminar.

Content
- Introduction to topology, topometry, topography, sizing and form optimization
- Pre- and postprocessing with Design Studio for GENESIS
- Visualization of results using Design Studio for GENESIS
- Optimization, taking manufacturing constraints into account
- Optimization of natural structural oscillations/ vibrations (with mode tracking)
- Application examples

In collaboration with VR&D

INFORMATION DAY: OPTIMIZATION/DOE/ROBUSTNESS

On this information day, several presentations will be given on examples of use as well as on solution strategies addressing optimization problems, sensitivity studies, design studies with meta-models or robustness and reliability investigations. Moreover, new developments in our software products LS-OPT and GENESIS will be illustrated as well as planned future developments are discussed.

With the aid of specific examples, new applications will be presented that demonstrate the practical usability of our software solutions. This stimulates participants to consider areas of application where LS-OPT or GENESIS can be effectively implemented as optimization software.

The optimization program LS-OPT

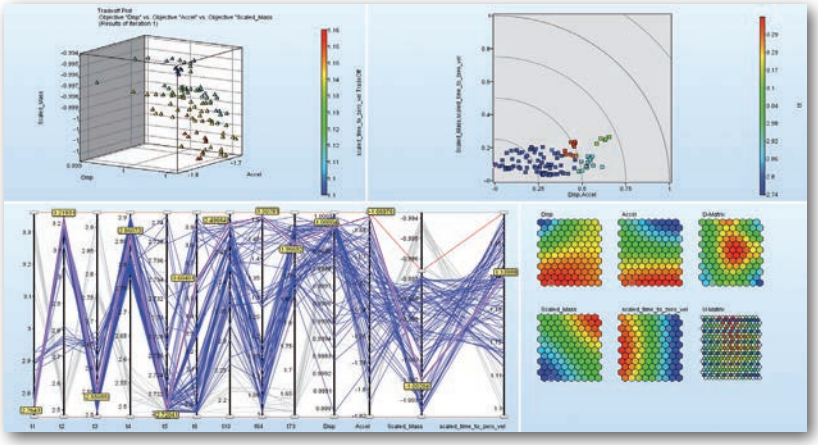
- is ideally suited for solving strongly nonlinear optimization problems and can thus be optimally combined with LS-DYNA,
- functions on the basis of the highly efficient Response Surface Method,
- contains stochastic methods for assessing the robustness of FE models and for determining dependencies between disturbance variables and system answers,
- enables significant and insignificant variables to be identified (variable screening, sensitivity analyses),
- can simultaneously combine several FE applications of different analysis types with different definitions of variables (multidisciplinary optimization (MDO)),
- is based on a clearly-arranged graphical user interface which enables optimization problems to be defined in a very simple way.

GENESIS of Vanderplaats R&D

- is a fully-integrated FE analysis and optimization software program,
- enables conceptual designs of shape, form and material to be optimized by providing the user with highly-efficient methods for topology, topometry, topography, sizing and shape optimization
- is ideally suited to optimize linear problems with a large number of design variables (>1 million),
- has an intuitively operated graphical user interface,
- is almost 100% compatible with Nastran.

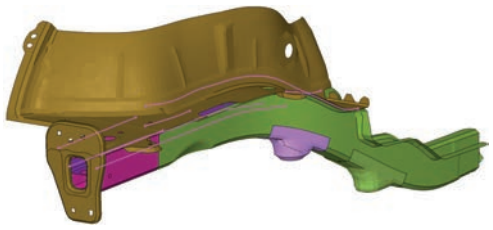
Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Date:
08 July

Online registration:
www.dynamore.de/c2063e



INFORMATION DAY: OPTIMIZATION WITH ANSA, LS-OPT AND META

The current versions of LS-OPT and ANSA support simple coupling between ANSA and LS-OPT. For example, ANSA offers excellent possibilities to realize parameterized changes of FE meshes by means of morphing technologies. The control parameters for morphing are passed to LS-OPT, where they are controlled and modified. Thus, form optimizations or robustness analyses taking into account geometrical changes can be realized straightforward. Following this, any desired optimization variable can be defined in the FE input files in ANSA and can be passed to the optimization process in LS-OPT.



Courtesy of Audi AG

Moreover, the META postprocessor from BETA CAE Systems can be used to extract simulation results, which can then be automatically imported by LS-OPT as history or response quantities. This is of particular interest, if FE solvers other than LS-DYNA are to be used for optimization.

This information day shows how ANSA and META can be used in combination with LS-OPT to realize optimization and stochastic analyses. Examples from industrial practice will also be presented.

Content

- Short introduction to the morphing technologies of ANSA, Live demo with examples
- Application of the task manager in ANSA for the optimization
- Definition of design variables in ANSA
- Interface in LS-OPT for ANSA
- Use of META for simulation data extraction for LS-OPT
- Practical examples

In collaboration with LASSO

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Date:
23 March

Online registration:
www.dynamore.de/c2077e

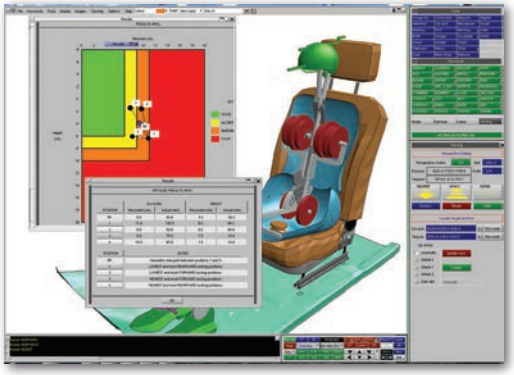
INTRODUCTION TO PRIMER FOR LS-DYNA

Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturer:
Daniel Keßler,
DYNAmore
Language:
German
Dates:
18 May
30 November

Online registration:
www.dynamore.de/
c2064e

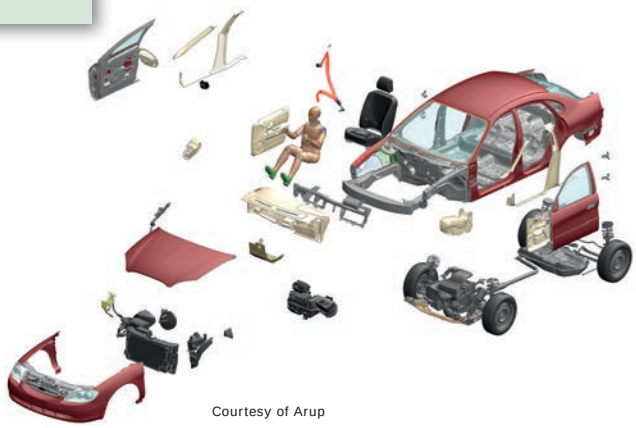
The PRIMER preprocessor provided by our partner Arup is a high-performance solution to process and control LS-DYNA models. In addition to the range of features usually offered by a preprocessor, PRIMER can be used to adjust very specific LS-DYNA settings, such as all available contact options, special joints, and highly complex material models.

PRIMER has been specially and exclusively designed for LS-DYNA as a FE solver. In many cases, PRIMER is also applied to check LS-DYNA models for errors or to remove redundant entries that may cause problems. In addition, the program offers a range of special properties to model occupant safety simulations, such as dummy positioning, seat adjustment, seatbelt fitting, or airbag folding.



Participants of this seminar will learn the practical use of PRIMER. All important functions are described and demonstrated with the aid of workshop examples such that everybody will enhance their capabilities in the safe operation for different areas of application.

In collaboration with ARUP



Courtesy of Arup

ANSA AND METAPOST FOR LS-DYNA

Type:
Seminar
Duration:
2 days,
can be booked
separately
Fee:
1,050 Euro
Ort:
Stuttgart/Leinfelden-
Echterdingen
Date:
06-07 February

Online registration:
www.dynamore.de/
c2065e

The two-day seminar is suitable for engineers who are interested in using LS-DYNA in connection with the preprocessor ANSA and the postprocessor METApost.

Besides its excellent meshing capabilities, ANSA offers an extensive interface to LS-DYNA. Speakers from LASSO and DYNAmore will give participants an insight into the entire simulation process chain using ANSA – LS-DYNA – METApost.

Courtesy of BETA CAE Systems

Content 1st day: ANSA preprocessing
- Which problems can be solved with LS-DYNA?
- How is a LS-DYNA input deck generated with ANSA?
- Which element types are available in LS-DYNA, how are they defined in ANSA?
- How are different contact options adjusted in ANSA, what do these options mean?
- How can a material model be specified?

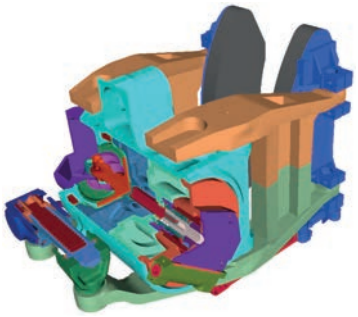
Content 2nd day: METApost postprocessing
- Introduction to the LS-DYNA interface of METApost:
  - 3-d result evaluation and x-y plots with METApost
  - Exercises
- Interpretation of results
- Important plausibility checks
- Result evaluation with practical crash-examples

Please note:
The seminars ANSA and METApost can be booked independently and will held on on request. Please contact us.

In collaboration with LASSO

SUPPORT DAY: LS-DYNA

At the support days you are invited to come to our office in Stuttgart-Vaihingen bringing along the output of your LS-DYNA simulation as well as your input decks. It has been proven that a direct consultation with you at the screen is the easiest way to answer your questions. Together with you, our experienced employees of DYNAmore will directly attempt to optimize your input decks or to solve problems in your simulation. Also very often, the questions are simply on how to model and solve a specific problem using LS-DYNA or what other modeling techniques and possibilities are offered by LS-DYNA.



Courtesy of Knorr-Bremse Systeme für Schienenfahrzeuge GmbH

Take advantage of this service, as we are certain that we can resolve many uncertainties or misunderstandings in the usage of LS-DYNA. You can simply bring along your CAD data or drawings to discuss your problem or you may also provide your data in advance. This would allow us to prepare even better for our conversation.

Please register ahead of time for the support days – ideally with a specification of the load case.

Type:
Support day
Duration:
1/2 day
Fee:
Free of charge
Dates:
17 January
14 February
24 April
22 May
03 July
18 September
02 October
20 November

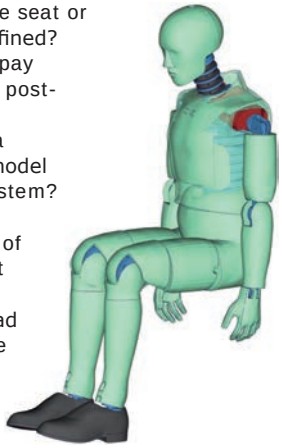
Online registration:
www.dynamore.de/c2066e

SUPPORT DAY: OCCUPANT SAFETY

On the occasion of the occupant safety support days, you can bring your own LS-DYNA simulations or input decks to our headquarters in Stuttgart-Vaihingen. The support days will mainly focus on questions regarding the handling and analysis of dummy models. Experienced members of the DYNAmore staff will be available to discuss your specific needs and to find solutions to your problems. Questions will be dealt with on a confidential basis without any other customers being present as a matter of course.

Exemplary questions
- How can I position a model?
- How accurate are the results?
- Do I require any prestress in the model?
- Is the model for the seat or door sufficiently refined?
- What do I have to pay attention to during post-processing?
- Have I developed a sufficiently exact model for my restraint system?

Please register ahead of time for these support days – ideally with a specification of the load case, such that we are able to prepare for your visit.

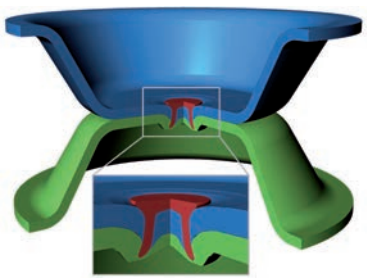


Type:
Support day
Duration:
1/2 day
Fee:
Free of charge
Dates:
20 March
24 July
04 December

Online registration:
www.dynamore.de/c2067e

WEBINARS – STRAIGHTFORWARD INFORMATION ON LS-DYNA

During the webinars, already established as well as new developments in LS-DYNA will be presented and their usage will be explained. On the one hand, the goal is to inform LS-DYNA users about new features and on the other hand, to provide an overview of the capabilities of LS-DYNA to interested users, who already have experience with other finite element solvers.



Particular focus will be drawn on new software versions, thereby outlining the resulting new application possibilities. Moreover, background information will be given on future developments and trends. Following this, the selection of topics for the webinars is dynamically adapted to current demands and will be announced on short notice in our newsletter as well as on our website www.dynamore.de.

The following topics will be offered as a webinar in 2020 (further topics and dates will be announced shortly):

- envyo (30 November)
- SDM Simulation Data Management (7 Dec.)

Type:
Webinar
Duration:
approx. 60-90 min.
Fee:
Free of charge

Online registration:
envyo:
www.dynamore.de/c2068e
SDM:
www.dynamore.de/c2078e

empowering
CAE processes

SCALE
IT-Solutions for CAE

+ PRODUCTS

- **CadMe**
  Support meshing processes and data provision for CAD/CAE
- **LoCo**
  Comprehensive simulation data management solution for CAE processes
- **CAViT**
  Integrated post data management for tests and simulation
- **Status.E**
  Monitoring of requirements and project status in product development

+ IT-SERVICES

+ CONSULTING

INTRODUCTION TO SIMULATION DATA AND PROCESS MANAGEMENT WITH LOCO

The software system LoCo is a work environment for managing simulation data and processes. In particular, the distributed development through simulation, across locations within a company or with external development partners, is greatly supported by LoCo.

Simulation models are managed in LoCo and provided to users via a graphical user interface in a structured manner. Due to the integrated version management, any changes made by the user to the simulation models can be tracked. So-called "History Trees" show all changes during the development process. In addition, LoCo provides an environment for the integration of arbitrary, user-specific specialized CAE processes like model/load case construction, quality control, parameter studies, linked simulations, etc.

On the first day, the seminar provides participants the basic knowledge of how to use LoCo. In-depth knowledge in the application of LoCo is dealt with on the optional second day. The usage of the software and the realization of workflows for the daily work as a design engineer will be presented in detail.

Day 1 (base)

- Introduction to LoCo, overview
- Use of the graphical user interface
  - Browser
  - Grid
  - Property view
  - Notification console
  - History trees
  - Inbox
  - Job status
  - Menus
- Tutorials, workshop
  - Setup Wizard
  - Adding and editing Includes
  - Definition of parameters / attributes
  - Construction of runs
  - Working with the history graph

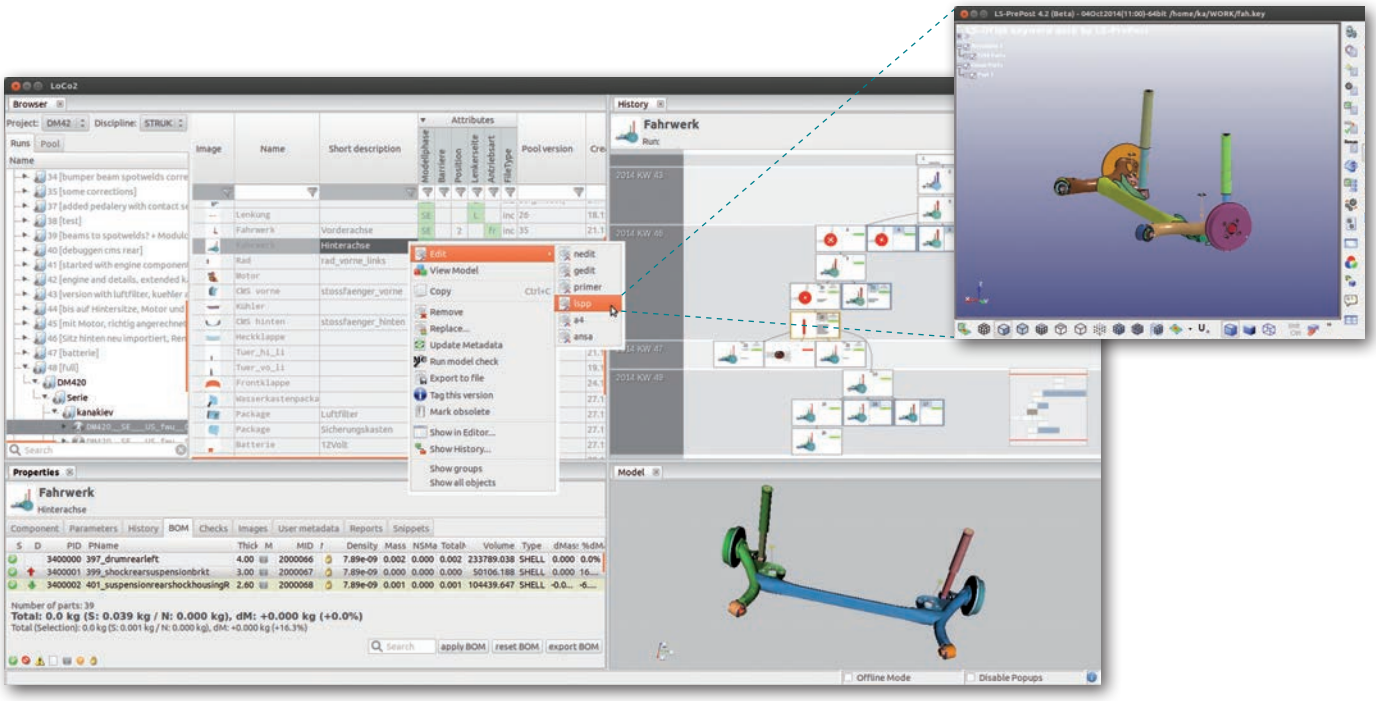
Day 2 (construction)

- Modeling recommendations
- Merge and Compare
- Management of attributes
- Creating and configuring new projects
- Error analysis (Notification console)
- Parameter (DOE) studies, Optimization and robustness with LoCo and LS-OPT
- Python interface
- Representing individual processes of departments and disciplines in LoCo (depending on the group of participants)

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
(525 Euro per day, can be booked separately)
Lecturers:
SCALE GmbH staff member
Date:
01-02 July

Online registration:
www.dynamore.de/c2069e

SCALE
IT-Solutions for CAE



LoCo graphical user interface – model processing using the example of LS-PrePost

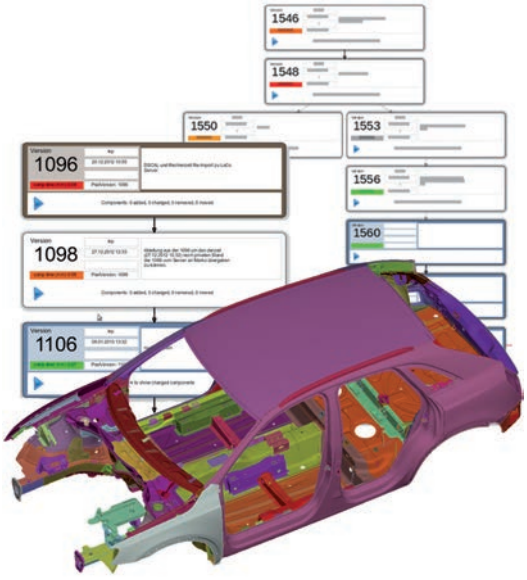
INFORMATION DAY: PROCESS AUTOMATION AND SIMULATION DATA MANAGEMENT (SDM)

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Dates:
11 March
23 November

Online registration:
www.dynamore.de/c2070e

SCALE
IT-Solutions for CAE

Today, simulation data management (SDM) is a highly relevant topic in computer-aided engineering (CAE) of vehicles. While a few years ago, the input of a vehicle model to analyze its crashworthiness consisted of only one large file. Today, such models are constructed using modules which consist of numerous separate components. Following this, the overall input file for the finite-element solver is assembled on the basis of such model components, e.g. airbags, doors, dummies, etc.



Courtesy of Audi AG

Moreover, the number of load cases that need to be investigated by simulation engineers is also constantly increasing.

Among others, the administration of these model components in a multi-user environment as well as the automated simultaneous preparation of several load cases for simulation are demanding challenges for a SDM system. The automated data flow from CAD to CAE, i.e. from the geometrical representation to meshed components, is another important subject. This also includes the demand for consistent and transparent metadata relating to the process chain CAD - Pre-SDM - assembly - simulation - post processing.

Simulation data/process management can basically be divided into three sections:

- Linking CAD-CAE, i.e. batch processing to meshing/discretization of component geometries (Pre-SDM)
- Load case compilation and input (includes) data management (assembly)
- Management of simulation results (Post-SDM)

The event will be held in collaboration with partner companies. The above-mentioned topics from process automation and simulation data management will be jointly discussed.

BASIC TRAINING STAR-CCM+

Type:
Seminar
Duration:
3 days
Fee:
1,575 Euro
Lecturers:
Daniel Grimmeisen,
Marc S. Schneider,
beide CASCATE
Language:
English/German
Date:
03-05 February
02-04 November

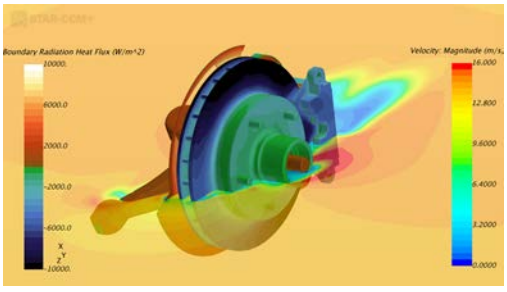
Online registration:
www.dynamore.de/c2071e

CASCATE

NEW

STAR-CCM+ is a powerful and widely used tool for Computational Fluid Dynamics (CFD) and multiphysics simulation, including advanced capabilities like complex multiphase flow, reacting flow and electromagnetism.

This three-day introductory course provides an introduction to CFD simulation with STAR-CCM+. It includes some basics of numerical fluid mechanics, essential topics like mesh generation, typical physics models and guidelines for quality assessment, as well as a thorough introduction to the workflow inside STAR-CCM+. After the course, the participants will be familiar with the use of STAR-CCM+ and should able to tackle their own CFD problems.



Basic knowledge of engineering simulation, e.g. in structural mechanics or maybe even in CFD with other tools, is advantageous but not required. This course is meant for everyone who has not used STAR-CCM+ before, or has not used it in a long time, and / or for everyone who has little to no experience with CFD.

The course is designed to provide a lot of hands-on experience. Theory is presented in lectures, but most of the time, participants work by themselves on training examples while being guided and supported by the trainer. All hands-on examples are well documented and explained step-by-step, and the full documentation is made available to the participants.

Content
- Basics of fluid mechanics and turbulence
- Introduction to the user interface and basic concepts
- Geometry processing
- Mesh generation
- Physics modeling
- Solver run and quality assessment
- Efficient workflows and automation

BATTERY SIMULATION IN STAR-CCM+

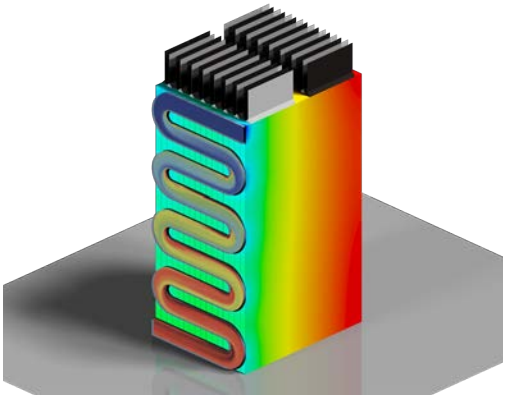
Current trends, for example in the automotive industry, generate strong growth in demand for electric motors. Lithium-ion batteries are primarily used for energy storage. This seminar will show how such batteries can be virtually designed, tested, and coupled into multiphysics simulations.

Battery Design Studio is a tool that describes lithium-ion batteries digitally according to manufacturer specifications or custom specifications of material parameters. The cell chemistry is taken into account via physical models or via equivalent circuit models. A cell defined in this way can be run through a large number of tests that simulate, for example, the charge/discharge behavior, thermal behavior or cell aging. Thus, the suitability of the cell for the application desired by the user can be tested.

Once battery cells have been created in Battery Design Studio, they are imported into the STAR-CCM+ multiphysics software. There they can be arranged into a module and integrated into a power circuit. Cooling fins or cooling channels are modeled to simulate the real cooling process. Thus, spatially resolved thermal quantities and flow quantities in battery and cooling fluid can be determined.

This seminar introduces the workflow for thermal battery simulation. First, a battery cell is modeled in Battery Design Studio and subjected to cell-specific tests. The cell is then imported into STAR-CCM+, assembled into a battery module and discharged. The heat released under the prescribed load is then dissipated through a cooling channel.

Content
- Introduction to Lithium-Ion Batteries
- Modeling cell chemistry in Battery Design Studio
- Battery cell testing in Battery Design Studio
- Creating battery modules in STAR-CCM+
- Thermal simulation of the battery module in STAR-CCM+



Type:
Seminar
Duration:
1 day
Fee:
525 Euro
Lecturer:
Daniel Grimmeisen, CASCATE GmbH
Date:
13 July

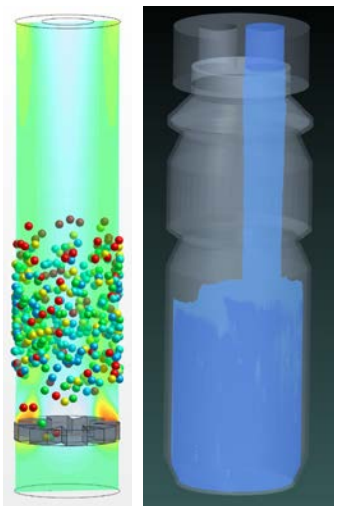
Online registration:
www.dynamore.de/c2072e

CASCATE

NEW

MULTIPHASE FLOW IN STAR-CCM+

STAR-CCM+ provides a large variety of models for the simulation of multiphase flows. This two-day course provides an introduction to multiphase modeling capabilities within STAR-CCM+. It covers Eulerian descriptions (including the widely used "Volume of Fluid" method), Lagrangian descriptions for moving particles, the Discrete Element Model (DEM) for particles with contact forces (e.g. for modeling granular media), fluid film modeling and several interactions between the models.



Basic knowledge in CFD and some experience with fluid simulation in STAR-CCM+ are required. This course is meant for everyone who wants to get to grips with the simulation of complex multiphase flows in STAR-CCM+.

The course is designed to provide a lot of hands-on experience. Theory is presented in lectures, but most of the time, participants work by themselves on training examples while being guided and supported by the trainer. All hands-on examples are well documented and explained step-by-step, and the full documentation is made available to the participants.

Content
- Overview of different concepts of multiphase modeling
- Eulerian multiphase models
  - Volume of Fluid (VOF)
  - Multiphase segregated flow ("Full Euler")
- Lagrangian multiphase models
  - Lagrangian Particles
  - Discrete Element Method (DEM)
- Fluid Film
- Several interactions between the models listed above, including
  - Droplet impingement
  - Film stripping
  - Resolved fluid film
  - Several types of coupling forces between particles and background flow

Type:
Seminar
Duration:
2 days
Fee:
1,050 Euro
Lecturer:
Daniel Grimmeisen, CASCATE GmbH
Language:
English/German
Date:
20-21 July

Online registration:
www.dynamore.de/c2073e

CASCATE

NEW

INFORMATION DAY: NEW FEATURES IN STAR-CCM+

Type:
Information day
Duration:
1 day
Fee:
Free of charge
Lecturers:
Daniel Grimmeisen,
Marc S. Schneider,
beide CASCATE
Language:
German
Date:
30 September

Online registration:
www.dynamore.de/
c2074e

CASCATE

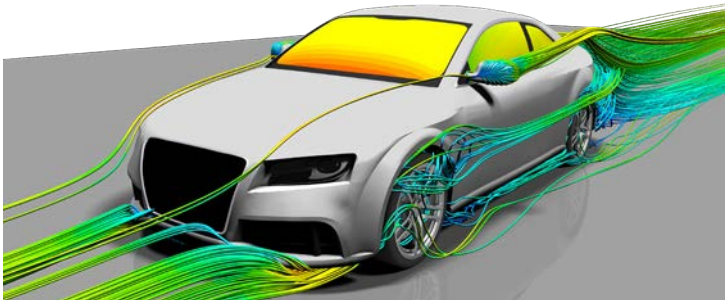
NEW

STAR-CCM+ is an established multiphysics simulation software with users in all branches of industry. As a result, the tool has already reached a high level of maturity and robustness. Nevertheless, developments and requirements of the industry on the one hand and new scientific findings on the other hand make it necessary to continuously provide improvements and extensions of the functional scope of the software.

Therefore, updated versions of STAR-CCM+ are released three times a year, containing updates to all areas of the software. It is difficult for the user to keep track of all developments. Often, innovations that would simplify the user's own workflow or could extend the software's application area are overlooked.

This information day gives an overview of selected new features. Topics that are relevant for registered seminar participants can also be discussed Depending on the direction in which the development of the software progresses, focus will be on particularly highlighted topics.

Content
- New features in STAR-CCM+ in the last versions
- Focus topics according to the software development



INFORMATION DAY: CFD MIT STAR-CCM+

Type:
Information day
Duration:
1/2 day
Fee:
Free of charge
Lecturers:
Daniel Grimmeisen,
Marc S. Schneider,
beide CASCATE
Language:
German
Date:
08 May

Online registration:
www.dynamore.de/
c2075e

CASCATE

NEW

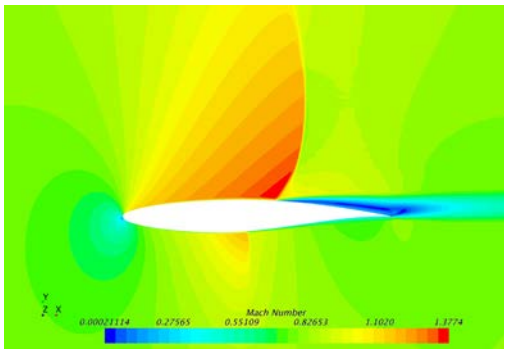
Computational Fluid Dynamics (CFD) enables the analysis of fluid dynamics at an early stage of product development in order to understand flow behavior and to optimize it by targeted design. CFD has become indispensable in many areas of product development, and the steadily growing availability of large computing capacities allows very complex problems from industrial reality to be solved within a justifiable amount of time and resources.

STAR-CCM+ is one of the leading tools for CFD and far beyond. Extensive possibilities for modeling phenomena such as complex interacting and / or reacting multiphase flows, electromagnetism, radiation or battery applications open up application perspectives in almost any industrial environment.

This information day provides an overview of CFD with STAR-CCM+. Not only will the opportunities for application be discussed, but also the necessary prerequisites and resources. There will be enough time for the participants to discuss their individual questions.

The information day is aimed at all those who have no experience with CFD and / or STAR-CCM+ in industrial applications. No previous knowledge is required.

Content
- Flow simulation: Short overview of the available methods
- Live-Demo: Sample application in STAR-CCM+
- CFD in industry - areas of application, opportunities and limitations
- Why STAR-CCM+?
- Hands-On-Demo and time for questions



VOCATIONAL TRAININGS FOR LS-DYNA SIMULATION ENGINEERS IN VARIOUS APPLICATION AREAS

This offer gives you the chance to receive complete comprehensive instruction in your field of application. This includes training packages for certified simulation engineers in the fields of nonlinear structural mechanics (crash), occupant safety and metal forming. We would be happy to provide conceptual advice regarding comprehensive solutions for vocational trainings to become a simulation engineer using LS-DYNA. Please get in touch with us.

LS-DYNA FOR NONLINEAR STRUCTURAL MECHANICS (CRASH)

Professional education to become a certified simulation engineer in nonlinear structural mechanics using LS-DYNA

This package offers you an efficient option to receive comprehensive training as a nonlinear structural simulation engineer using LS-DYNA. After taking part in these seminars, you will have the necessary know-how to meet industrial requirements as a simulation engineer. On completion of all seminars within the package, you will receive a certificate declaring you a qualified LS-DYNA simulation engineer in nonlinear structural mechanics.

Courtesy of Opel Automobile GmbH

Seminars

- Introduction to LS-DYNA: Basics - 2 days
- Introduction to LS-DYNA: Advanced Topics - 1 day
- Introduction to Contact Definitions in LS-DYNA - 1 day
- Joining Techniques for Crash Analysis with LS-DYNA - 2 days
- Modeling Metallic Materials - 2 days

Package price: 3,890 Euro

LS-DYNA FOR OCCUPANT SAFETY SIMULATIONS

Professional training to become a certified simulation engineer in occupant safety simulation using LS-DYNA

With this package, you receive comprehensive training for the computational design of occupant safety systems. After attending these seminars you will have the necessary know-how to meet industrial requirements as a simulation engineer in occupant safety. On completion of all courses within the package, you will receive a certificate declaring you a qualified LS-DYNA simulation engineer in occupant safety simulation.

Seminars

- Introduction to LS-DYNA: Basics - 2 days
- Introduction to Contact Definitions in S-DYNA - 1 day
- Introduction to Passive Safety Simulation with LS-DYNA - 2 days
- LS-DYNA Dummy and Pedestrian Impactor Modeling - 1 day
- CPM for Airbag Modeling - 1 day

Package price: 3,400 Euro

Courtesy of Daimler AG

LS-DYNA FOR METAL FORMING

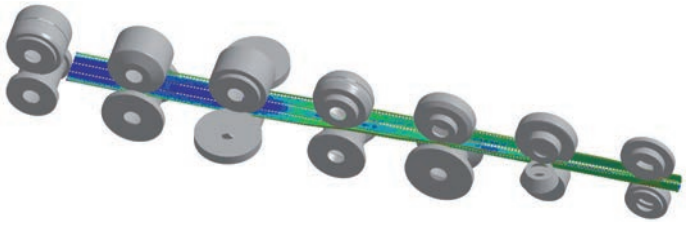
Professional training to qualify for a certified simulation engineer in metal forming using LS-DYNA and eta/DYNAFORM

After taking part in these seminars you will be able to carry out forming simulations in an industrial environment as a simulation engineer. On completion of all seminars within the package, you receive a certificate declaring you a qualified LS-DYNA simulation engineer in forming processes.

Seminars

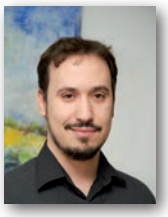
- Introduction to LS-DYNA: Basics - 2 days
- Introduction to LS-DYNA: Advanced Topics - 1 day
- Introduction to Contact Definitions in LS-DYNA - 1 day
- Applied Forming Simulation with eta/DYNAFORM - 2 days
- Metal Forming with LS-DYNA - 2 days

Package price: 3,890 Euro



Courtesy of Ubeco GmbH

DYNAMORE LECTURERS



Dr. Filipe Andrade
Areas of expertise:
Material modeling, FE theory
Academic studies:
Mechanical engineering

Dr.-Ing. Tobias Erhart
Software developer LS-DYNA
Areas of expertise:
FE theory, material modeling
Academic studies:
Civil engineering

Dr.-Ing. Dirk Freßmann
Development and support THUMS
Areas of expertise:
Human models, FSI
Academic studies:
Civil engineering

Diplôme d'Ingénieur Pierre Glay
Areas of expertise:
Forming and process simulations
Academic studies:
Mechanical engineering

Dr.-Ing. Tobias Graf
Areas of expertise:
Joining techniques, material modeling
Academic studies:
Civil engineering

Prof. Dr. rer. nat. Ulrich Göhner
Manager software solutions
Area of expertise:
Computational fluid dynamics (CFD)
Academic studies:
Mathematics

Daniel Grimmeisen (M.Sc)
Area of expertise:
Multiphysics
Academic studies:
Aerospace engineering

Dipl.-Ing. Alexander Gromer
Areas of expertise:
Occupant safety, dummy models
Academic studies:
Mechanical engineering

Dr.-Ing. Stefan Hartmann
Software developer LS-DYNA
Areas of expertise:
Composites, FE theory
Academic studies:
Civil engineering

Dr.-Ing. Andre Haufe
Manager process simulation
Areas of expertise:
Material modeling, forming simulations, joining techniques
Academic studies:
Civil engineering

Dr.-Ing. Martin Helbig
Area of expertise:
Material characterization
Academic studies:
Civil engineering

Diplôme d'Ingénieur Charlotte Keisser
Area of expertise:
Optimization
Academic studies:
Informatics and Applied Mathematics

Dr. Bernd Hochholdinger
CEO DYNAmore Swiss GmbH
Area of expertise:
Thermal forming processes
Academic studies:
Civil engineering

Ph.D. Anders Jonsson
Areas of expertise:
Linear and non-linear implicit analyses, fatigue
Academic studies:
Mechanical engineering

Dipl.-Ing. (FH) Daniel Kessler
Support PRIMER
Areas of expertise:
Crash, occupant safety, seats
Academic studies:
Civil engineering

Dr.-Ing. Thomas Klöppel
Software developer LS-DYNA
Areas of expertise:
Composites, FE theory
Academic studies:
Mathematics

Fabian Koch M.Sc.
Area of expertise:
Occupant safety, dummy models
Academic studies:
Mechanical engineering

Dipl.-Ing. Christian Liebold
Area of expertise:
Composites
Academic studies:
Aerospace engineering

Dipl.-Ing. Silvia Mandel
Area of expertise:
Occupant safety, pre-/postprocessing
Academic studies:
Mechanical engineering

Dr.-Ing. Steffen Mattern
Area of expertise:
Crash
Academic studies:
Civil engineering

Dipl-Ing. Mathias Merten
Area of expertise:
Forming and process simulations
Academic studies:
Mechanical engineering

Dr.-Ing. Heiner Müllerschön
CEO SCALE GmbH
Areas of expertise:
Optimization, processes, SDM
Academic studies:
Civil engineering

Dr.-Ing. Maik Schenke
Manager trainings
Area of expertise:
Multiphysics
Academic studies:
Aerospace engineering

Marc S. Schneider (M.Sc)
Area of expertise:
Aerodynamics, multiphase flow
Academic studies:
Mechanical engineering

Prof. Dr.-Ing. Karl Schweizerhof
Area of expertise:
FE theory
Academic studies:
Civil engineering

Dipl.-Ing. Sebastian Stahlschmidt
Manager occupant simulation
Areas of expertise:
Occupant safety, dummy models
Academic studies:
Civil engineering

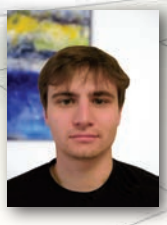
Dipl.-Ing. (FH) Peter Vogel
Manager deep drawing simulations
Area of expertise:
Forming simulations
Academic studies:
Mechanical engineering

Dipl.-Math. Katharina Witowski
Software developer LS-OPT
Area of expertise:
Optimization
Academic studies:
Mathematics

EXTERNAL LECTURERS

Dipl.-Ing. Paul Du Bois
Consultant
Lecturer of the seminars:
- Crashworthiness Simulation with LS-DYNA
- Methods for Simulating Short Duration Events
- Blast Modeling with LS-DYNA
- Penetration Modeling with LS-DYNA
- Explosives Modeling for Engineers

Dr.-Ing. Tobias Loose
DynaWeld GmbH
Lecturer of the seminar:
- Introduction to Welding Simulation with LS-DYNA



Iñaki Çaldichoury
Livermore Software Technology Corporation (LSTC) – software developer LS-DYNA
Lecturer of the seminars:
- Electromagnetism in LS-DYNA
- ICFD – Incompressible Fluid Solver
- CESE – Compressible Fluid Solver

Dr.-Ing. Stefan Schwarz
Dr. Ing. h.c. F. Porsche AG
Lecturer of the seminar:
- Basics of Industrial Structure Optimization

Dr.-Ing. Markus Feucht
Daimler AG
Lecturer of the seminars:
- Joining Techniques for Crash Analysis with LS-DYNA
- Damage and Failure Modeling

Dr. Len Schwer
Schwer Engineering & Consulting Services
Lecturer of the seminars:
- Crashworthiness Simulation with LS-DYNA
- Methods for Simulating Short Duration Events
- Blast Modeling with LS-DYNA
- Penetration Modeling with LS-DYNA
- Explosives Modeling for Engineers

Dr. Wei Hu
Livermore Software Technology Corporation (LSTC) – software developer LS-DYNA
Lecturer of the seminar:
- Meshfree EFG, SPG and Advanced FE Methods for Structural Analyses

Prof. Mhamed Souli
University of Lille
Lecturer of the seminars:
- ALE and FSI in LS-DYNA
- Smoothed Particle Hydrodynamics (SPH) in LS-DYNA

Dr. Yun Huang
Livermore Software Technology Corporation (LSTC) – software developer LS-DYNA
Lecturer of the seminar:
- NVH, Frequency Domain Analysis and Fatigue with LS-DYNA

Dr. Cheng-Tang Wu
Livermore Software Technology Corporation (LSTC) – Software-Entwickler LS-DYNA
Lecturer of the seminar:
- Meshfree EFG, SPG and Advanced FE Methods for Structural Analyses

Prof. Dr.-Ing. Stefan Kolling
Technische Hochschule Mittelhessen
Lecturer of the seminar:
- Modeling of polymers and elastomers in LS-DYNA

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www.dynalook.com

- More than 2.250 technical LS-DYNA papers to download

www.dynaexamples.com

- Comprehensive collection of examples of various LS-DYNA training seminars
- Images, animations, LS-DYNA input decks

www.dummymodels.com

- Technical information about LS-DYNA dummy models

www.lsoptsupport.com

- LS-OPT support site
- Examples, documents
- FAQs, HowTo´s

www.dynasupport.com

- LS-DYNA support site
- Tutorials, release notes
- FAQs, HowTo´s

www.scale.eu

- CAE data management (SDM)
- Process integration/automation
- Optimization

www.youtube.com /lstcanddynamore

- Tutorials
- Animations

www.ls-dynacloud.com

- HPC Cloudsolution for LS-DYNA

www.dynamore.de

- Software products and FE models
- Download area for software and documentation
- Current information and offers
- Seminar dates, booking and descriptions
- FE and IT services
- Conference information
- Contact addresses

ABOUT DYNAmore

DYNAmore GmbH – Gesellschaft für FEM-Ingenieursdienstleistungen – is the largest distributor of LS-DYNA simulation software worldwide. But we offer far more in the way of services: in addition to our guaranteed, expert support in all areas of application for the LS-DYNA and LS-OPT software packages, we offer FEM calculation services as well as general consulting on any questions concerning structural dynamics.

Furthermore, our fields of expertise include pilot and development projects for simulating nonlinear dynamic problems, software development for solver technologies and simulation data management as well as consulting and support for modern, massively parallel computer systems.

More than 800 customers, both in Germany and abroad and from industry and research are convinced by our expertise – they include numerous automotive manufacturers and suppliers.

DYNAmore's head office is located in Stuttgart, but we also have offices in Berlin, Sindelfingen, Wolfsburg, Dresden, Langlingen and Ingolstadt and affiliate companies in Sweden, France, Italy, Switzerland and the USA.

LS-DYNA – one solution for many nonlinear problems

LS-DYNA is one of the world's leading finite element software systems for the numerical simulation of highly-complex, nonlinear dynamic processes, such as

- Crash
- Occupant safety
- Metal forming
- Impact and drop tests
- Snap-though buckling
- Penetration problems
- Fluid structure interaction
- Thermo-mechanical coupling
- Explosion

The program is intensively used in the automotive, aircraft and aerospace industries. Further areas of application include biomechanics, shipbuilding, locomotive construction, civil engineering, the defense industry and the consumer goods industry. A wide range of problems can be solved by LS-DYNA simply using standard PC.

LS-PrePost – definition and evaluation of simulations

LS-PrePost is a pre- and postprocessor which can be used to modify input decks and to visualize results computed by LS-DYNA. An intuitive graphical user interface simplifies its use. Options for handling and visualizing LS-DYNA input decks are available to help you prepare input data.

LS-OPT – optimization / robustness analysis of nonlinear systems

LS-OPT combines optimization algorithms with an optimization environment which automatically generates and analyzes variants and visualizes the obtained results. The program is designed for nonlinear problems and can include LS-DYNA as well as other solvers to enable multidisciplinary optimization. LS-OPT is not only used for optimization purposes but also for robustness analyses.

FEMZIP

This software allows to drastically reduce the storage size of simulation results, thus enabling the results to be viewed, sent and archived faster.

Validated FE models for standard load cases

FE models
In vehicle assessment, tests are carried out under comparable conditions. To successfully achieve this, accurately specified barriers and dummies are used for testing. DYNAmore develops and distributes FE models for such test pieces.

Dummy models
To compute occupant values, DYNAmore develops the following models for the automotive industry (PDB): ES-2, ES-2re, BioRID-2 and WorldSID. The portfolio is completed by models developed by the hardware dummy manufacturer Humanetics and by LSTC.

Pedestrian safety models
We supply impactor models from various manufacturers for assessing pedestrian safety during vehicle collisions.

Barrier models
The impact on the structure of a vehicle is often due to a barrier. We supply finite element models for all standard barriers, which are developed by our partners Arup and LSTC or within the scope of a working group by Daimler, Dr. Ing. h.c. F. Porsche, Lasso and Peng.

Human models
Besides the dummy models, there is also the option of using human models to investigate vehicle safety. The models distributed by DYNAmore are developed in Japan by Toyota.

Simulating forming processes

Metal forming in LS-DYNA
With LS-DYNA, DYNAmore provides a solution to meet high accuracy requirements in the computation of sheet metal and pipe forming. Quite a few automotive and supplier companies investigate the manufacturability and springback of a component using LS-DYNA before constructing a tool. Main applications include deepdrawing, stretch-forming, pipe bending, hydroforming and thermal deep drawing.

eta/DYNAFORM
An integrated pre- and postprocessor system for forming processes is combined in eta/DYNAFORM. In a user environment, eta/DYNAFORM combines mesh generation, the computation of binder forces, binder closing, deep drawing simulation, trimming processes, the computation of springback and multistep processes.

Simulation services

The staff at DYNAmore has a wealth of experience in computing nonlinear problems. We see ourselves as a suitable contact partner for:

- Nonlinear statics and dynamics
- Crash analysis
- Developing dummy models
- Component tests
- Passive safety, pedestrian safety
- Metal forming
- Implicit analyses using LS-DYNA
- Optimization, robustness analyses
- Flow simulation
- Fluid-structure interaction
- etc.

Software development

SDM and Process Integration
With our subsidiary SCALE we develop software for CAE IT infrastructure. For example, our Software LoCo offers you a good platform for collaborative engineering. Furthermore, we develop on behalf of clients, predominantly from the automotive industry, custom software solutions in the fields of simulation data management (SDM), process integration, process automation and optimization.

Development in LS-DYNA
DYNAmore is an experienced contact partner regarding the development of new features in LS-DYNA. Together with our customers, we integrate failure models into material laws, develop interfaces, create material models for foams and integrate new element technologies.

Development of DYNAtools and additional software
DYNAmore supplies a wide range of additional tools which facilitate working with LS-DYNA and LS-OPT. The tools are developed in close cooperation with the automotive manufacturers Audi, Daimler, Dr. Ing. h.c. F. Porsche and Adam Opel.

Material Competence Center

The mechanical properties of many materials that are required for simulation are unknown. Defining these precisely is typically very expensive and often involves a considerable wait.

In contrast, the experiments we select in accordance with specific requirements provide a quick and reliable basis for generating predictive material cards for polymers, metals and composite materials.

DYNAmore AT A GLANCE

Portfolio

- Software solutions
- Method development
- Support and consulting
- Calculation service
- IT solutions for CAx process and data management
- Training courses and information events
- Conferences

Facts

- About 150 employees
- Subsidiary companies in Germany, Sweden, Italy, France, Switzerland and USA
- Offices in Ingolstadt, Dresden, Berlin, Langlingen, Wolfsburg, Linköping, Göteborg, Turin, Versailles, Zurich and Dublin/Ohio
- For five customers on-site
- Over 800 international customers from industry and research (amongst them almost all OEMs)
- Worldwide use of our dummy models
- FEM experience since the beginning of the 80s
- Active development of LS-DYNA and LS-OPT

Support – Consulting – Sales – Training Courses

Products
All products mentioned are used and further developed by DYNAmore in day-to-day project work. This enables us to provide highly practice-related advice on your tasks. According to your requirements, you receive a tailormade package comprising anything from software licensing right up to the handover of component responsibility by DYNAmore.

Support
The software you obtain from us is supported by highly experienced members of staff. You can contact each individual expert directly on the phone anytime. We also provide in-house support on request.

Test license
You can test any of our products free of charge. You then decide to rent the software, buy it or use it via a web portal. All standard platforms are supported.

Training courses
Besides offering numerous seminars on the various areas of application of LS-DYNA and LS-OPT, DYNAmore also holds other seminars concerned with pre- and postprocessing topics. All seminars can be aligned individually to company requirements and can also be held at your company premises if required.

Events
In order to promote the exchange of information, DYNAmore regularly organizes events such as user meetings, information days and webinars on a range of different subjects.

ORGANIZATION

Seminar locations

Unless otherwise stated, events are held in our headquarters in Stuttgart, Germany:

- Industriestr. 2, 70565 Stuttgart
  Tel.: +49 (0)711 - 45 96 00 - 0

Other seminar locations:

- Office Dresden
  Pohlandstraße 19, 01309 Dresden
  Tel.: +49 (0)351 - 31 20 02 - 0
- Office Ingolstadt
  Friedrichshofener Str. 20, 85049 Ingolstadt
  Tel.: +49 (0)841 - 1 29 43 24
- Office Berlin
  Stralauer Platz 34, 10243 Berlin
  Tel.: +49 (0)30 - 20 68 79 10
- DYNAmore Swiss GmbH
  Technoparkstrasse 1, 8005 Zürich, Schweiz
  Tel.: +41 (0)44 - 5 15 78 90
- DYNAmore Nordic AB
  Brigadgatan 5, 587 58 Linköping, Schweden
  Tel.: +46 (0)13 - 23 66 80
- DYNAmore Nordic AB
  Office Göteborg
  Bror Nilssons gata 16, 417 55 Göteborg, Schweden
  Tel.: +46 (0)31 - 3 01 28 60
- DYNAmore Italia S.r.l.
  Piazza Castello 139, 10124 Turin, Italien
  Tel.: +39 335 157 05 24
- DYNAmore France SAS
  21 av. de Paris, 78000 Versailles, France
  Tel.: +33 (0)1 70 29 08 18
- DYNAmore Corporation
  565 Metro Place South, Suite 300, 43017 Dublin, OH, USA
- 4a engineering GmbH (Partner in Österreich)
  Industriepark, 8772 Traboch, Österreich
  Tel.: +43 (0)38 42 - 4 51 06 - 6 00

Seminars on request / in-house seminars

All courses can be individually compiled. We would also be happy to consider your special requirements. For example, the contents of seminars can be adapted to your company's specific needs, or alternatively the course can be held parallel to a project selected by you. We are also pleased to give seminars on your premises. Please get in touch with us.

Seminar fees

See seminar description. All seminar fees quoted are per participant and seminar and do not include statutory value-added tax. Seminar fees are due on application and include seminar documents, drinks during breaks and lunch. In the case of individual training courses, we also take the liberty of calculating the preparation time.

Reductions

We give a 50 % reduction to members of universities and public research institutions. Students may attend the seminars free of charge if there are vacancies (please show your enrolment certificate). We charge a contribution fee of € 50 per day.

Course times

Seminars: 9:00 - 17:00 (unless otherwise indicated).
Information days: usually 13:30 - approx. 17:00.

Speakers

Seminars are only given by experienced experts.

Language

Unless otherwise stated, all seminars will be given either in German or English language on an on-demand basis at short notice. Please indicate your preferred language during registration.

Cancellation of a seminar by a participant

Up to two weeks before the start of the seminar: no charge
Up to two week before the start of the seminar: 50 %
Less and non-attendance: complete seminar fee
Substitute participants will be accepted.

Cancellation of a seminar by the organizer

If less than four applications without reduction were received, we reserve the right to cancel a seminar. In such a case, all participants who have applied for the course will be notified at the latest one week before commencement of the seminar.

Registration

Please apply either using the registration form on page 61 or register online under www.dynamore.de or just send us an email to seminars@dynamore.de. You will be sent a registration confirmation as well as information regarding directions and hotels. Please note that all seminars and the seminar language will be confirmed separately.

Data protection and competition law declaration of consent

With your registration you allow us the use and the processing of your data for the seminar organization and for promotional purposes. You may at any time revoke these commitments. For this, please contact DYNAmore GmbH by fax, telephone or in writing.

Further information

Seminars on the Internet
You will find current information and new developments concerning LS-DYNA on our website www.dynamore.de. There, you may also find up-to-date details about our seminars, information days and webinars as well as additional or modifications to dates and further information events.

Newsletter
If you would like to be informed by email about current events and new developments in the LS-DYNA world, we would be happy to send you our "DYNAmore News". To register, please send us an email to infomail@dynamore.de.

Contact partner

Organization
Carina Sieber
Tel.: +49 (0)711 - 45 96 00 - 0
seminar@dynamore.de

Course Advisor
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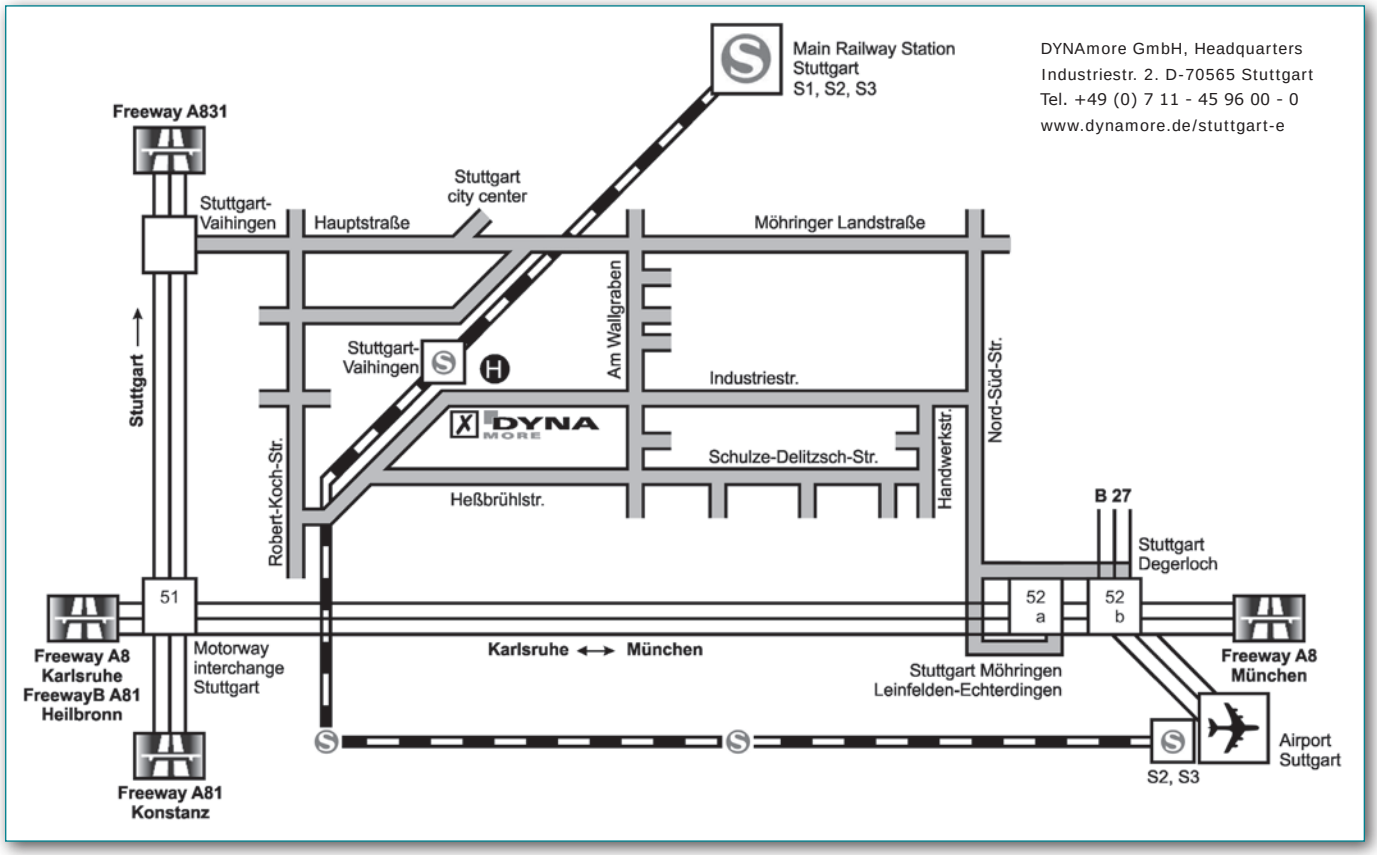
DYNAmore HEADQUARTERS



DYNAmore GmbH, Headquarters
Industriestr. 2. D-70565 Stuttgart
Tel. +49 (0) 7 11 - 45 96 00 - 0
www.dynamore.de/stuttgart-e

Arriving by car

From the direction of Munich
Take the freeway A8 to Stuttgart, exiting at Möhringen/Degerloch/LE-Leinfelden. Follow signposts marked Möhringen/LE-Echterdingen, Industriegebiet Vaihingen/Möhringen. The DYNAmore headquarters are located opposite the train (S-Bahn) station.

From the direction of Frankfurt/Karlsruhe/Heilbronn/Singen
Take the freeway A8 towards Munich (München), exit at Möhringen/Vaihingen/LE-Leinfelden. Follow signposts marked Industriegebiet Vaihingen/Möhringen. The DYNAmore headquarters are located opposite the tram station.

Arriving by public transport

Stuttgart Airport
Take the train (S-Bahn) "S2" in the direction of Schorndorf or the S-Bahn "S3" in the direction of Backnang and alight in either case at the stop marked Stuttgart-Vaihingen. The DYNAmore headquarters are located opposite the train station.

Stuttgart Main Railway Station
Take the train (S-Bahn) "S1" in the direction of Herrenberg or the S-Bahn "S2" or "S3" in the direction of the airport and alight at the stop marked Stuttgart-Vaihingen. The DYNAmore headquarters are located opposite the train station.

More information about the S-Bahn timetable can be found under: www.vvs.de

DYNAmore Headquarters

Imprint

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E-Mail: info@dynamore.de
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Managing Directors
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Court of registration/Seat: Stuttgart
Registration Number: HRB 765839

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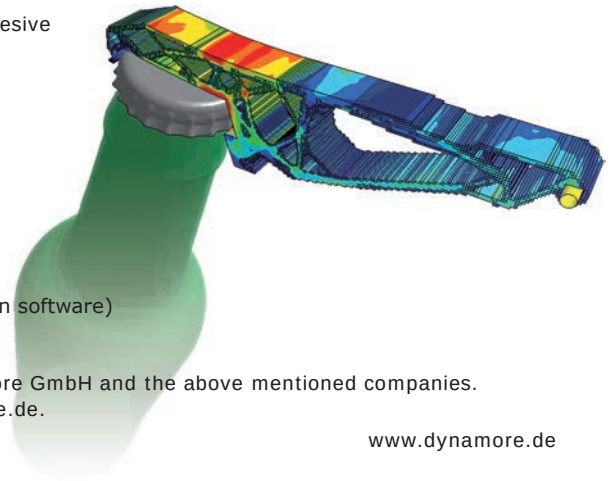
DIPLOMA OR MASTER THESES ...

at DYNAmore in collaboration with the following companies:
Opel Automobile GmbH, Audi AG, Daimler AG, Dr. Ing. h.c. F. Porsche AG, ...

We would be pleased to offer you a range of exciting topics for your diploma or master thesis related to current developments in the latest FE technologies using LS-DYNA. Especially in the field of crashworthiness simulations, LS-DYNA is one of the world's leading FE programs and used for this purpose by many leading automotive manufacturers. As a result of the close collaboration between DYNAmore GmbH and Opel Automobile GmbH, Audi AG, Daimler AG and Dr. Ing. h.c. F. Porsche AG, challenging tasks are constantly arising. Exemplary topics could address:

- Material modeling of composites, foams, plastics, layers of adhesive
- Modeling of joining techniques
- Simulation of welding processes
- Simulation of sheet metal and bulk forming processes
- Hot forming taking into account phase transitions
- Extensions for human models
- 3d skeletal muscle modeling in biomechanics
- Modeling of coupled multiphysic problems
- Fluid-structure interaction
- Particle mechanics
- Comparison of new simulation methods
- Optimization and robustness analysis with LS-OPT (optimization software)
- Software development for process integration



The preparation of the thesis will be in collaboration with DYNAmore GmbH and the above mentioned companies.
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- ❑ Contact Modeling
- ❑ Joining Techniques for Crash Analysis
- ❑ Failure of Fiber Reinforced Polymer
- ❑ Info: Drop Tests

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- ❑ Introduction to Passive Safety Simulation
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- ❑ Info: Forming Trends

Materials
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- ❑ Damage and Failure Modeling
- ❑ Adv. Damage Modeling: Orthotropic Materials
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- ❑ Short Fiber Reinforced Polymers
- ❑ Continuous Fiber Reinforced Polymers
- ❑ Concrete and Geomaterial Modeling
- ❑ Simulation of Thermoplastics
- ❑ User Materials
- ❑ Info: Composite Analysis
- ❑ Info: Material Characterizations/Measurement
- ❑ Info: Simulation of Plastics

Implicit
- ❑ Implicit Analysis
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- ❑ From Explicit to Implicit Simulation Models

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- ❑ SPG - Manufacturing/Material-Failure
- ❑ Introduction to EFG
- ❑ Discrete Element Method (DEM)

Multiphysics
- ❑ ALE and Fluid-Structure Interaction
- ❑ ICFD - Incompressible Fluid Solver
  Optional: ❑ only 1st day ❑ only 2nd day
- ❑ CESE - Compressible Fluid Solver
- ❑ Resistive Heating and Battery Modeling
- ❑ Electromagnetism
- ❑ Info: Multiphysics

High Energy Events
- ❑ Short Duration Events
- ❑ Blast Modeling
- ❑ Penetration Modeling
- ❑ Explosives Modeling for Engineers

Optimization
- ❑ LS-OPT - Optimization/Robustness
  Optional: ❑ only 1st and 2nd day
  ❑ only 3rd day
- ❑ Basics of Structure Optimization
- ❑ Structural Optimization with GENESIS
- ❑ Info: Optimization
- ❑ Info: Optimization ANSA, LS-OPT, META

Pre- and Postprocessing
- ❑ Introduction to PRIMER for LS-DYNA
- ❑ ANSA and METApost for LS-DYNA

Support/Webinars
- ❑ Support day: LS-DYNA
- ❑ Support day: Occupant Safety
- ❑ Webinar
  - ❑ ENVYO (3 June)
  - ❑ LS-DYNA New Features (23 Sept.)
  - ❑ Composite Analysis (11 Nov.)

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May 31 - June 2, 2020, Detroit, Michigan, USA

The International LS-DYNA Conference in Detroit is the world's largest LS-DYNA conference with over 900 participants and approximately 200 presentations. This year the event will take place for the first time at the Detroit Marriott at Renaissance Center in the heart of Detroit.

In addition to the technical presentations, keynote presentations by high-class speakers from industry and academia are also part of the program. The event will be accompanied by a hardware and software exhibition. In addition, numerous seminars are offered at the conference.

More information
www.lstc.com/2020
www.dynamore.de/int-2020

Detroit Marriott at the Renaissance Center

16th GERMAN LS-DYNA FORUM

October 7 - 9, 2020, Ulm, Germany

We are pleased to invite you to the 16th German LS-DYNA Forum from October 7-9, 2020.

For the first time since 2012 the forum will take place in Ulm again. The forum is the ideal opportunity for exchange of experience for all users of LS-DYNA, LS-OPT and LS-TaSC.

Important dates

Abstract submission:	May 29, 2020
Author's notification:	July 3, 2020
Two-page abstract:	September 7, 2020
Conference date:	October 7 - 9, 2020

More information
www.dynamore.de/forum2020-e

Maritim Hotel and Conference Center Ulm

2nd FRENCH LS-DYNA USER DAY

November 16, 2020, Versailles, France

Due to the great success of the first French LS-DYNA User Day in 2019, the second edition of the event will take place in 2020.

Also this year you can expect numerous presentations of our French customers as well as own presentations on all new developments around LS-DYNA. We look forward to welcoming many attendees to our offices in Versailles.

More information
www.dynamore.de/france-forum-2020

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