

Seminars

in English language

- LS-DYNA general
- Crashworthiness
- Passive Safety
- Metal Forming
- Optimization



Introduction

DYNAmore GmbH has established itself in the recent years as a competence centre for the Finite-Element software LS-DYNA and for the optimization software LS-OPT. Typical application areas of the products include very complex tasks which require profound background knowledge. Therefore, DYNAmore developed a comprehensive range of seminars in order to ensure a sustainable transfer of the required knowledge.

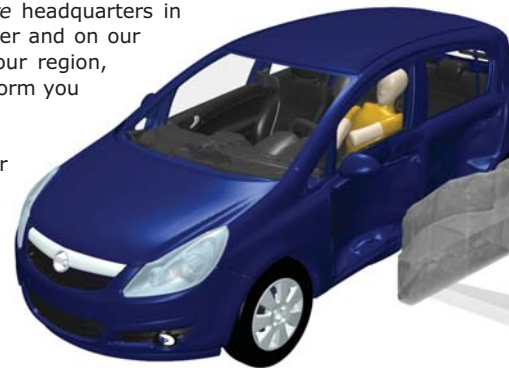
For the first time, we offer selected seminars also in English language in Germany and in other European countries. This brochure gives you a survey on the seminars and their contents. All our trainers are experienced users and specialists in their field. From time to time, these seminars are held at our distribution partners and in the DYNAmore headquarters in Germany. We will keep you informed on times, places and contents in our DYNAmore newsletter and on our website www.dynamore.de. If you don't find your preferred course in English language in your region, please send us a short e-mail so that we can eventually arrange the course in your region or inform you about courses in other European countries and make contacts for you if necessary.

In addition to this, you have the opportunity to book the seminars listed below exclusively for your enterprise, individual combinations are possible. In addition to the seminars listed below please go to <http://www.dynamore.de/seminars.html> for further expert courses which we organise on request. The seminars can be held at the customer's place, at your local distributor's place or in our head office in Stuttgart. Please contact your local distributor or contact DYNAmore (info@dynamore.de) directly. You will get a non-binding offer as soon as possible.

We are looking forward to welcoming you at one of our seminars.



Courtesy Adam Opel GmbH



■ LS-DYNA – GENERAL

Introduction to LS-DYNA

- What kind of problems can be solved with LS-DYNA?
- Difference between implicit and explicit time integration.
- How to start a simulation?
- Available and recommended element types.
- How to use the various contact definitions?
- Specification of a selected material model.
- How to carry out crash and other dynamic simulations?
- Which input and output files are provided, and what data do they contain?
- Performance of quasi-static simulations.
- Analysis and interpretation of results with LS-PrePost.

Proposed duration: 2 - 3 days

Material Models in LS-DYNA

- Basic aspects of material modeling in the context of the theory of large deformations
- Most commonly used material models in LS-DYNA:
 - Elasto-plastic
 - Visco-elastic
 - Rate-dependent formulations
- Composites
- General aspects of failure modeling in finite elements
- Failure models in LS-DYNA
- Examples problems highlighting different aspects
- Evaluation of example problems using LS-PrePost

Proposed duration: 2 days

Contacts in LS-DYNA

- Overview of available contact formulations
- What are the different contact types good for?
- What do the several options cause?
- How to set-up the different contact types?
- Single-surface, node-to-surface or surface-to-surface?
- How do eroding contacts work?
- Shell and beam thickness in contact, dealing with penetrations
- Contact with element edges
- Contact modeling of spotwelds and bond connections
- Contact using geometric entities
- Information about latest implementations of new contact features

Proposed duration: 1 - 2 days



Courtesy Daimler AG

■ LS-DYNA – CRASHWORTHINESS

Crashworthiness Simulation using LS-DYNA

- Introduction to crash simulation using LS-DYNA, history, possibilities, technical limits, accuracy and reliability problems, future developments
- Modeling techniques for parts of car bodies: mesh-outlay, element quality, flanges and weld spots, contacts, required mesh density as well as mesh quality using different shell elements and integration rules (examples for motor and rail vehicles)
- Modeling techniques for components consisting of other materials than steel: motion of motor, tires, bolts, rubber buffer, etc.
- Selection and description of suitable material models in crashworthiness simulation for soft foams (chair cushions), EA-Foams, rubber and synthetic materials as well as steel panels
- Modeling of barriers under extreme deformation: „small deformation models“ for foam and aluminum honeycomb
- Quality control of models as well as analysis and evaluation of the results
- Modeling of dummies and push-bodies with determination of material parameters
- Airbag simulation, reference geometries, folded airbags
- User subroutines
- Planning and usage of crashworthiness simulation: simple procedures for structural optimization

Proposed duration: 4 days

Component Connections in LS-DYNA

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

Proposed duration: 2 days

■ METAL FORMING

Metal Forming Simulations with eta/DYNAFORM and LS-DYNA

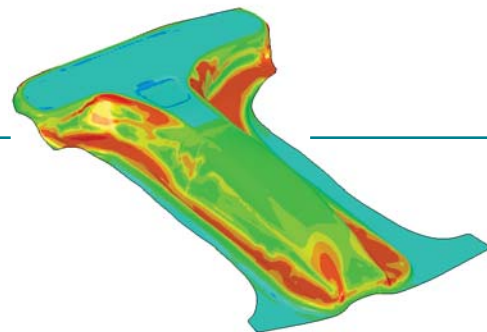
- Introduction to Sheet Metal Forming Simulations
- Preprocessing in eta/DYNAFORM: tool and blank meshing, boundary conditions, trimming, material specifications
- Calculation (explicit, static or dynamic implicit)
- Multi-stage process definition with AutoSetup
- Springback compensation
- Blank size estimation
- Surface defect estimation
- Postforming operations: trimming, hemming, flanging
- Postprocessing with eta/POST
- LS-DYNA-specific options for metalforming
- Application examples

Proposed duration: 2 days

Enhanced Possibilities and Special Settings in LS-DYNA

- Discussion of specific settings and features for the forming process in LS-DYNA
- Analytical and physical draw beat definition
- Contact settings
- Material models (isotropic/anisotropic plasticity)
- Shell element types
- Definition of displacement and force boundary conditions regarding global and local coordinate systems
- Adaptive mesh refinement: minimization of the discretisation error and correct choice of parameters
- Springback simulation settings
- Mapping of metal forming results for crash

Proposed duration: 2 days



Coupled Thermal and Thermal-mechanical Simulation using LS-DYNA

- Introduction and basics of thermal simulations
- Time step control: select timestep size, fully implicate vs. Crank Nicolson
- Boundary Conditions: temperature, flux, convection, and radiation; hand calculated convection heat transfer coefficient
- Nonlinear Problems: solving a solid-liquid phase change problem
- Equation Solvers: Gauss direct and conjugate gradient interactive solvers in LS-DYNA
- Thermal contact for shells and thick shells
- Thermal-stress and thermal-fluid coupling
- Applications: powders, welding, induction heating, thermostat, etc.

Proposed duration: 2 days

■ LS-DYNA – PASSIVE SAFETY

Introduction to Passive Safety Simulations using LS-DYNA

- Overview of current impact load cases (side, frontal, rear)
- Barrier models available in LS-DYNA
- Dummy models available in LS-DYNA, and their validation methods
- Materials, elements and links used for occupant safety simulations
- Use and positioning of dummies
- Definition and fastening of seat belts
- Airbag modeling
- Submodel technology

Proposed duration: 2 - 3 days

Introduction to Pedestrian Safety Simulations using LS-DYNA

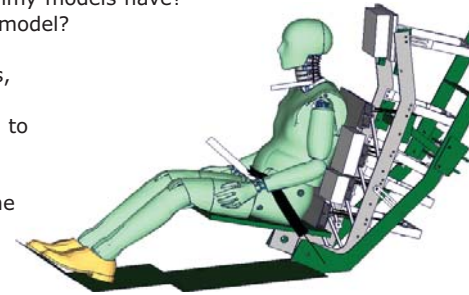
- General issues in the area of pedestrian safety
- Description of impactor models: lower leg, upper leg and head impactors (assembly and materials used)
- Overview on certification tests
- Discussion of the different impact scenarios
- Workshop with example problems

Proposed duration: 1 day

LS-DYNA Dummy Modeling

- Which dummy models are available for LS-DYNA?
- When to use the FTSS-, the LSTC- or the FAT-model?
- Which limitations do the dummy models have?
- How to position the dummy model?
- How to model a seat belt?
- How to model pre-tensioners, slip-rings, etc.?
- How can a seat belt be fitted to the dummy model?
- How to avoid difficulties appearing in soft foams of the dummies and seats?

Proposed duration: 1 day



BioRID II Dummy Model

Modeling and Simulation of Airbags

- Introduction
- Basics: airbag technology, tank test, inflator types
- Modeling: folding, initial metric, surrogate model for leakage, calibration
- Overview of alternative approaches for Out-Of-Position-simulations: ALE approach, corpuscular method
- Exercises

Proposed duration: 2 days

■ OPTIMIZATION

Optimization using LS-OPT

- Overview of non-linear optimization methods
- Formulation of an optimization problem: design variables, objective, constraints
- Design of Experiments (DOE)
- Response Surface Method (RSM)
- Application of LS-OPT with the graphical user interface
- Quantification of approximation functions, error indicators
- Multidisciplinary optimization (MDO)
- Variable screening with ANOVA
- Viewing and interpretation of optimization results
- Application of LS-OPT by class examples

Proposed duration: 2 days

Stochastic Analysis using LS-OPT

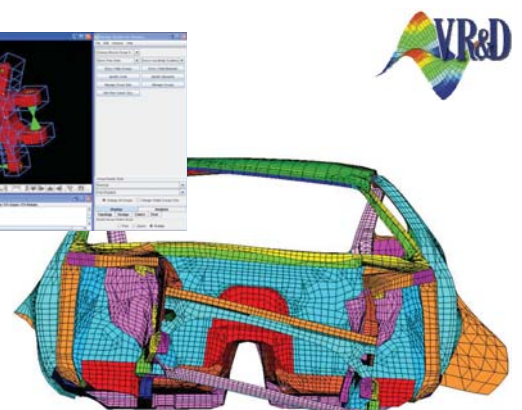
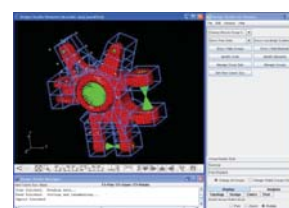
- Introduction, terminology
- Basic principles of statistic and probabilistic theory
- Monte Carlo analysis
- Monte Carlo analysis using Meta-Models
- Statistical distributions
- Reliability analysis
- Interpretation of Ant-Hill plots
- Separation of deterministic and chaotic responses
- Variance and correlation plots
- Postprocessing in LS-OPT and result interpretation
- Visualization of statistical quantities on the FE-model
- Examples

Proposed duration: 1 - 2 days

Structural Optimization using GENESIS

- Introduction to optimizing topology, topometry, topography, sizing and shape
- Pre- and postprocessing using Design Studio for GENESIS
- Visualisation of results using Design Studio for GENESIS
- Optimization taking into account secondary manufacturing parameters
- Optimization of structural self-oscillation (using Mode-Tracking)
- Examples of application

Proposed duration: 2 - 3 days



Support, Service, Consulting

More than 100 customers from the automotive, aerospace and defence industry rely on the competence of DYNAmore in the field of LS-DYNA support, dummy modelling and general FEA consulting. Due to the long lasting experience with LS-DYNA and their cooperation with LSTC, DYNAmore is able to offer customers a profound and deep knowledge of every aspect around LS-DYNA.

DYNAmore is dedicated to support and distribute LS-DYNA and related software products for crash analysis, metal forming and optimization. With the German based company, LS-DYNA users in several European countries have convenient and effective access to the vast experience in LS-DYNA available at DYNAmore, which assures a qualified support of LS-DYNA customers.

Due to cooperations with several partners in Europe we are able to serve and support customers first class even outside of Germany.

e-services

www.dynamore.de

- Description of all DYNAmore software products
- Informational events, conferences
- Download area for software and documentation
- News, information and offers
- Seminar dates and descriptions
- Contact addresses

www.dynalook.com

- Database for download a variety of LS-DYNA publications/case studies (pdf)
- Detailed search option

www.dynaexamples.com

- Huge collection of LS-DYNA examples from different trainings
- Integrated search option for LS-DYNA keywords
- Pictures and animations
- LS-DYNA input decks

www.dynasupport.com

- LS-DYNA support site – in cooperation with LSTC and Engineering Research AB (ERAB)
- FAQs, HowTos, release notes
- Documentation, tutorials

www.lsoptsupport.com

- LS-OPT support site – in cooperation with LSTC
- Optimization, system identification, stochastic analysis
- Documentation, FAQs, HowTos
- Many examples with detailed description

www.es-2.com

- Information, documentation of ES-2 dummy model
- FAQs
- Latest developments

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LS-DYNA

... is one of the most advanced simulation tools for nonlinear structural analysis!

The general-purpose, implicit and explicit finite element program is employed to analyze the nonlinear static and dynamic response of three-dimensional inelastic structures. Its fully automated contact analysis capabilities and error-checking features have enabled users worldwide to solve successfully many complex crash and forming problems.

The main applications are:

- Large Deformation Dynamics and Contact Simulations
- Crashworthiness Simulation
- Occupant Safety Systems
- Metal Forming
- Metal, Glass, and Plastics Forming
- Multi-physics Coupling
- Failure Analysis

LS-PREPOST

... is a full featured post-processor for all types of LS-DYNA simulations. The graphic user interface was carefully crafted to create a user friendly environment. It supports the latest OpenGL standards to provide fast rendering for fringe plots and animation results. It also handles the ASCII output data and links it to the input files and animations.

LS-OPT

... is a powerful Tool for Optimization and Stochastic Analysis. LS-OPT is a stand alone optimization software and can be linked to any simulation code. It is perfect suitable in combination with LS-DYNA. LS-OPT provides a clearly arranged graphical user interface (GUI) for definition of optimization and stochastic analysis problems.

GENESIS

... is a fully integrated finite element analysis and design optimization software package, written by leading experts in structural optimization. Analysis is based on the finite element method for static, normal modes, direct and modal frequency analysis, random response analysis, heat transfer, and system buckling calculations. No special knowledge of optimization technology is required.

eta/DYNAFORM

... is a streamlined, sheet metal forming simulation tool. DYNAFORM reduces the tryout time and costs that are associated with the tooling design and development cycle. Designed to be easy to use, DYNAFORM contains numerous automated functions to aid in even the most complex forming problems. Its applications include: Tool Surface Modeling, Finite Element Mesh Generation, Draw Bead Force Prediction, Binder Wrap Analysis, Draw Die Simulation, Trimming Operations, Spring Back Simulation, Multiple Stage Tooling Simulation and more.

FEEDBACK FORM

Please complete this feedback form and send it to DYNAmore or to your local distributor either by fax or letter mail – or simply send an e-mail.

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Your local distributor:

Please contact me, I am interested in following seminar(s)

- Introduction to LS-DYNA
- Material Models in LS-DYNA
- Contacts in LS-DYNA
- Crashworthiness Simulation using LS-DYNA
- Component Connections in LS-DYNA
- Introduction to Occupant Safety Simulation using LS-DYNA
- Introduction to Pedestrian Safety Simulation using LS-DYNA
- LS-DYNA Dummy Modeling
- Modelling and Simulation of Airbags
- Forming Process Simulation using eta/DYNAFORM and LS-DYNA
- Advanced Metal Forming Simulation using LS-DYNA
- Coupled Thermal and Thermal-mechanical Simulation using LS-DYNA
- Optimization using LS-OPT
- Robustness Analysis using LS-OPT
- Structural Optimization using GENESIS

Please quote for an inhouse seminar.

I would like to attend as a delegate.

Please contact me, I am interested in LS-DYNA

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