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The 10th International
LS-DYNA® Users Conference
June 8-10, 2008
Dearborn, Michigan USA



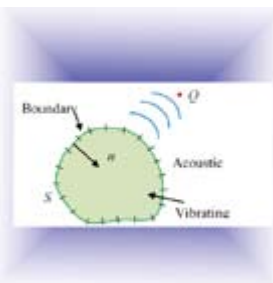
INTEL

LS-DYNA® And Intel®
Cluster Ready
Training Seminars



LSTC

A New Acoustic Solver
Based on
Boundary Element Method
in LS-DYNA®



FEA INFORMATION RESOURCE MAGAZINE



FEA Information Announcements

Welcome, CRIL TECHNOLOGY (Groupe ALYOTECH France)

Distributors of:

LS-DYNA, LS-PREPOST, LS-OPT - ETA/DYNAFORM, ETA/VPG -
 ANSYS Products - ANSYS/CivilFEM - BEASY Products - OASYS/PRIMER -
 MEDINA - FTSS Dummy Models FAT/DYNAMORE Dummy Models -
 ARUP Barrier Models

Classes announcement from CRIL - For Information: nima.edjtemai@alyotech.fr

- Crash & Impact
 By : Paul Du Bois
 Place : Paris, Date : February 5 to 8, 2008
- Concrete & Geomaterial Modeling with LS-DYNA
 By : Len Schwer
 Place : Paris, Date : May 20 & 21, 2008
- LS-DYNA Modeling of Blast & Penetration
 By : Len Schwer & Paul Du Bois
 Place : Paris, Date : May 22 & 23, 2008

Sincerely,

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 Marsha Victory mv@feainformation.com - President
 Anthony Giaccana feanswer@aol.com - Business Manager
 Wayne Mindle – Graphic Design

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LS-DYNA® And Intel® Cluster Ready Training Seminars

Faster, More Efficient Deployment of LS-DYNA/MPP on Intel Based Clusters



When you're purchasing your next cluster, LSTC suggests you look to an Intel® Cluster Ready certified cluster for faster, more efficient deployment of LS-DYNA/MPP.

Intel Corporation recently launched, with LSTC's support, Intel® Cluster Ready (www.intel.com/go/cluster), a program and technology that helps simplify the deployment, usage and management of clustered computer systems by providing a standardized and replicable way to build clusters running high performance computing applications like LS-DYNA/MPP.

John Hallquist, CEO of LSTC, states "LSTC is confident that...[the] Intel® Cluster Ready program will be welcomed by LS-DYNA worldwide users. Our MPP customers and their IT support staffs will no longer be required to expend resources bringing their clusters online. Set-up and configuration time will be significantly decreased or eliminated entirely as a result of Intel's certification solution. "

The fact that LS-DYNA/MPP has been tested to run on clusters certified as Intel® Cluster Ready means you no longer have to worry "if" LS-DYNA/MPP will run on an Intel® Cluster Ready cluster; instead, you can focus on the features and performance of LS-DYNA/MPP you need to get your job done. Intel® Cluster Ready enables this unique value to LSTC's customers for a wide range of cluster configurations, ranging from 4 to 64 nodes, from any of the system

suppliers listed on the Intel® Cluster Ready web page (<http://softwarecommunity.intel.com/articles/eng/1314.htm>).

To learn more about Intel® Cluster Ready you can go to

<http://softwarecommunity.intel.com/articles/eng/1296.htm>

or request a joint LSTC and Intel training session by contacting Marsha Victory marsha@lstc.com at 925 449 2500.

LSTC Intel® Cluster Ready Training Seminars

LSTC is currently establishing seminar schedules for Intel® Cluster Ready training seminars at LSTC offices in California and/or Michigan. The seminars will demonstrate how users can maximize the benefits offered by the Intel® Cluster Ready program and FAQ on LS-DYNA installation.

If you have seminar suggestions, are interested in attending, or have any questions, feel free to send them to Marsha Victory – marsha@lstc.com

During these sessions, attendees will discover how the Intel® Cluster Ready program and technology package makes it easier to design, build, sell,

program, acquire, and deploy clusters built with Intel components

About Intel® Cluster Ready

Key elements of the Intel® Cluster Ready program include:

- **Specification**— The Intel® Cluster Ready Specification ensures that components in a cluster certified as Intel® Cluster Ready conform to industry standards, or, when no appropriate standards exist, implement best-of-class practices. The specification eliminates sources of variability that do not impact performance, usability, or utility.
- **Certification**— Every ISV application to be registered as Intel® Cluster Ready must be tested on an Intel® Cluster Ready certified cluster with realistic workloads. Of particular importance to you, ISV's like LSTC must

describe any software dependencies beyond those required by the Intel® Cluster Ready Specification; this ensures the smooth installation and proper execution of LS-DYNA/MPP on any certified cluster.

- **Tools**— The Intel® Cluster Checker, a extensible tool provided free-of-charge on all clusters certified as Intel® Cluster Ready, checks the configuration and performance of the cluster. Cluster Checker provides a full range of tests, analyzing important aspects of cluster organization, functionality, and performance, ensuring consistent cluster-wide operation. When problems are found, the Intel® Cluster Checker provides detailed per-component diagnostic information in addition to the overall pass-fail status. This reporting greatly simplifies problem resolution, allowing you to quickly address the problem's source.

TOPCRUNCH www.topcrunch.org for Intel Results

Vendor/Submitter Org.	Computer/Interconnect	Processor	#Nodes x #Processors per Node x #Cores Per Processor = Total #CPU	Time (Sec)	Benchmark Problem	Submission Date
Intel/Intel	S5000PAL/Infiniband	Intel® Xeon® Quad Core 2.8Ghz X5365	4 x 2 x 4 = 32	55103	car2car	11/12/2007

December Featured Paper

LS-DYNA Used To Analyze The Manufacturing of Thin Walled Cans

Author: Joachim Danckert – Dept. of Production – Aalborg University

i9joach@production.aau.dk

ABSTRACT

The ironing process and the backward can extrusion process are widely used for the manufacturing of thin walled cans. In the ironing process the die is commonly made with a cylindrical die land and in backward can extrusion the punch is commonly made with a cylindrical punch land.

LS-DYNA has been used in the analysis of the influence, which the die land and the punch land have. The results suggest that a small misalignment of the die land, respectively the punch land may cause the process to become unstable resulting in uneven can height and uneven can wall thickness. Simulations also suggest that it is possible, by making minor changes to the geometry of the die land respectively the punch land, to make the process significantly more robust with regard to the influence from a small misalignment of the land.

The results obtained from the LS-DYNA simulations are in good agreement with experimentally obtained results.

Keywords:

Ironing,

Backward can extrusion

FEM

Process robustness

Participants Benchmarks on TopCrunch

TopCrunch.org for Complete Vendor submitted benchmarks

Computer/Interconnect	Processor	#Nodes x #Processors per Node x #Cores Per Processor = Total #CPU	Time (Sec)	Benchmark Problem
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Vendor Submitter Org: INTEL/INTEL Submission Date 11/12

S5000PAL/Infiniband	Intel® Xeon® Quad Core 2.8Ghz X5365	4 x 2 x 4 = 32	55103	car2car
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Vendor Submitter Org HP/HPSubmission Date 11/19

CP3000/ConnectX	Intel Dualcore Xeon 3.0 GHz BL460c	64 x 2 x 2 = 256	13117	car2car
CP3000/ConnectX	Intel Dualcore Xeon 3.0 GHz BL460c	32 x 2 x 2 = 128	17738	car2car

December - LS-DYNA Support Site Metal Forming FAQ

Question:

During the forming analysis I found that some elements in the blank became distorted. How can this problem be solved?

Answer:

Mesh distortion can arise from several sources. The following list are some possible reasons. The user should check his input deck against each of them.

Too coarse a blank mesh (and sometimes too coarse a tool mesh);

Too infrequent an adaptive refinement increment;

Too large a time step;

Bad contact treatment;

Hourglassing and possibly incorrect hourglass control;

There are several commonly ways to reduce hourglass mode, i.e.

a) Use element type 16. The element type 2 (BT element) only has one integration point in the plane of the element and it is easier to excite an hourglass mode. Element type 16 has four integration points in the plane of element and is more resistant to the hourglass mode

b) Use hourglass control (the card of *HOURLASS).

c) Use a suitably fine mesh to prevent overpenetration;

d) Increase the adaptive frequency

e) Use small time step

f) Change to a different contact formulation.

MetalForming Magazine, Tooling Technology: New Ways to Use FEA Data, November 2007

By Al Foote, Compass Technologies

...Die designers routinely employ finite-element analysis (FEA) for forming analysis or die simulation, but FEA data can provide much more. Using FEA "incremental application" this company simulates part surface-finish quality and more...

...Isatec personnel realized that most of the variables contributing to surface roughness were already available for analysis within the company's DYNAFORM die-simulation system, from ETA....



[Complete Article](#)

A New Acoustic Solver Based on *Boundary Element Method* in LS-DYNA®

© Yun Huang (huang@lstc.com)

1. Introduction

A new acoustic solver based on boundary element methods (BEM) has been implemented in LS-DYNA. This solver provides a unique environment to predict acoustic pressure and sound pressure level in an acoustic medium

generated by vibrating structures, which are excited by impact, explosion, or self-vibration. This new feature has application in various industries, such as automotive, aerospace and civil engineering.

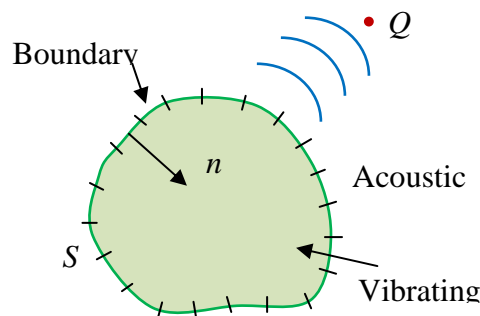


Figure 1. Description of the problem

This method addresses the problem of a vibrating structure which is surrounded by an acoustic fluid as shown in Figure 1. For an interior problem, the surface of the structure constitutes the external boundary enclosing the acoustic fluid. The surface of the vibrating structure is denoted by S . It also forms the surface of the acoustic fluid where the integral equation is considered. A group of boundary elements, S , can be defined using `*SET_SEGMENT`, `*SET_PART` or `*PART`. In the same manner, the field points, Q , constituting the observation points can be defined using `*SET_SEGMENT` or `*SET_NODE`. The acoustic pressure at a field point Q is calculated. If the user is interested in the *sound pressure level* (in dB), then a reference pressure (e.g., $20 \mu\text{Pa}$ for air) has to be provided as an input variable. Otherwise, only the acoustic pressure (e.g., in Pa) will be calculated.

A set of boundary element methods have been developed in LS-DYNA to solve this problem. They include variational and collocation boundary

element methods. Two approximate methods: Rayleigh method and Kirchhoff method have been also implemented. The methods are based on the use of the Helmholtz integral equation, which expresses the acoustic pressure at a field point in terms of integrals on the surface of vibrating structures.

The transient structural response is computed first in time domain by finite elements. By applying the Fast Fourier Transform, the values on the surface (e.g. normal velocity) is transformed into frequency domain. The obtained result is taken as boundary condition for the acoustic part of the vibro acoustic problems, which are solved by the boundary element methods or the approximate methods.

Some techniques have been introduced to accelerate the BEM computation. They include 1) a fast iterative solver based on Low Rank Approximation for sub-matrices; 2) MPP implementation; and, 3) a Restart option.

A uniform surface velocity in the frequency domain can also be provided by the user. In this case, a LSDYNA nonlinear FEM analysis is skipped and

the acoustic solvers are performed directly to provide a solution of acoustic pressure in the field.

2. Keywords

*BOUNDARY_ELEMENT_METHOD_ACOUSTIC

Please see LS-DYNA Keyword User's Manual for details.

3. Vibrating plate example

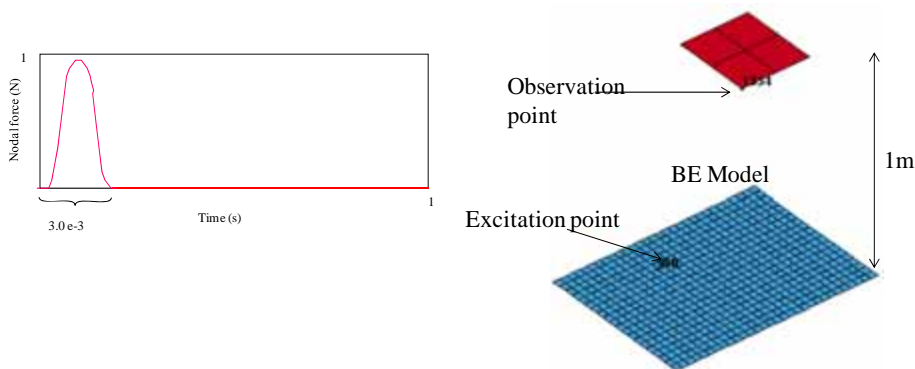


Figure 2. Vibrating plate model

The vibrating plate is assumed to be elastic and clamped at its edges. The size of the plate is $0.6\text{m} \times 0.9\text{m} \times 0.001\text{m}$, $E=210\text{GPa}$, $\rho_s=7800\text{ kg/m}^3$, $\nu=0.3$. For air, the following material properties are used: $\rho=1.21\text{ kg/m}^3$, $c=340\text{ m/s}$. A pulse nodal force is applied on the plate for 3 ms (see Figure 2). The vibration is recorded for 1s.

The Kirchhoff, Rayleigh or Boundary Element method were used for this problem. We have considered two 3D meshes as depicted in Figure 3 in order to compare the solution of Kirchhoff method to the FEM of LS-DYNA.

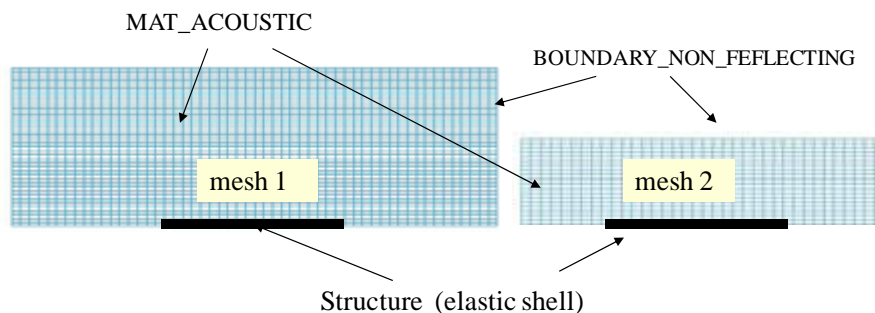


Figure 3. 3D FEM meshes for acoustic layer

Figure 4 shows a comparison between the results given by LS-DYNA for mesh 1 and mesh 2 to the solution given by the Kirchhoff method. To use FEM acoustics of LS-DYNA, a non reflecting

boundary condition has to be imposed for the acoustic layer. Good agreement is obtained between the Kirchhoff method and the result given by the *MAT_ACOUSTIC card of LS-DYNA.

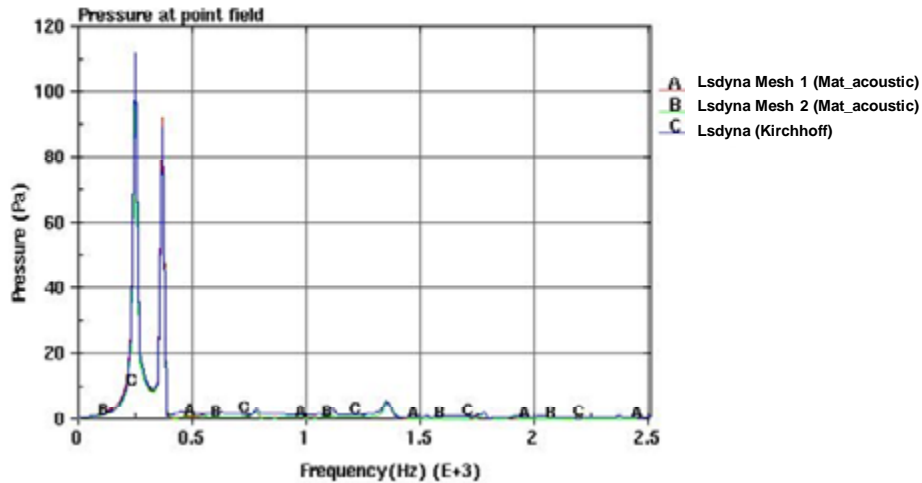


Figure 4. Comparison of Kirchhoff method to FEM of LS-DYNA

Figure 5 shows that for the plate problem, the Rayleigh method represents a good approximation of BEM. This is because the surface plate

is plane. Since this plate is not mounted into a rigid baffle, there is still some difference between BEM and the Rayleigh results.

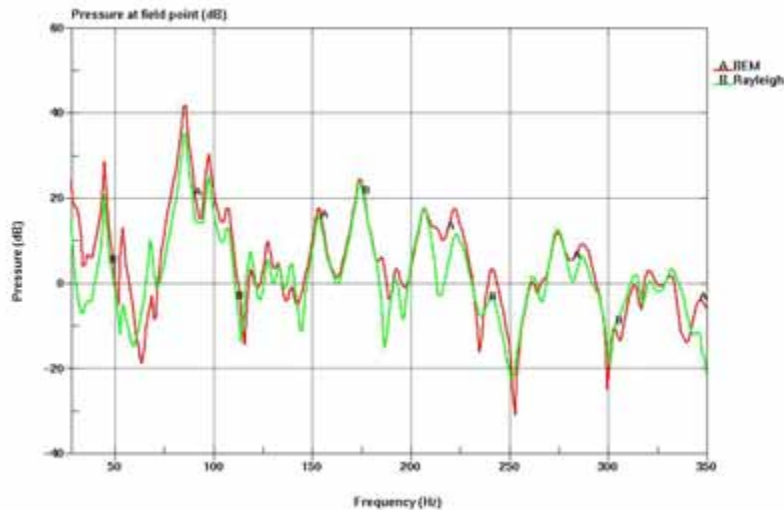


Figure 5. Comparison between BEM and Rayleigh method

4. Pulsating sphere example

The second example is a pulsating sphere of radius 1m in an infinite acoustic domain (air). The normal velocity amplitude is assumed to be unit.

In order to calculate the external radiation of the pulsating sphere we can use BEM as well as the Kirchhoff method. The sphere surrounded by air is modelled by shell elements. In contrast with BEM, in the Kirchhoff method, a fluid layer with non reflecting boundary condition is merged

to the vibrating structure (see Figure 6). The sphere is excited uniformly by a harmonic velocity of 100 Hz. The sphere is defined as a rigid material. The following material properties are used for air: $\rho=1.21 \text{ kg/m}^3$, $c=340 \text{ m/s}$. Figure 7 represents the variation of the pressure outside the sphere for points at different distances from the sphere center. A good agreement between LS-DYNA results and theoretical solutions is achieved.

When BEM is used, only the shell mesh is considered in the model. In Figure 8, we have compared the numerical solution given by LS-DYNA and theory for a pulsating sphere of unit radius.

The pressure is calculated for a frequency range 10 to 1000 Hz at a point distant from the sphere center of 4 m. LS-DYNA BEM compares well with the analytical solution.

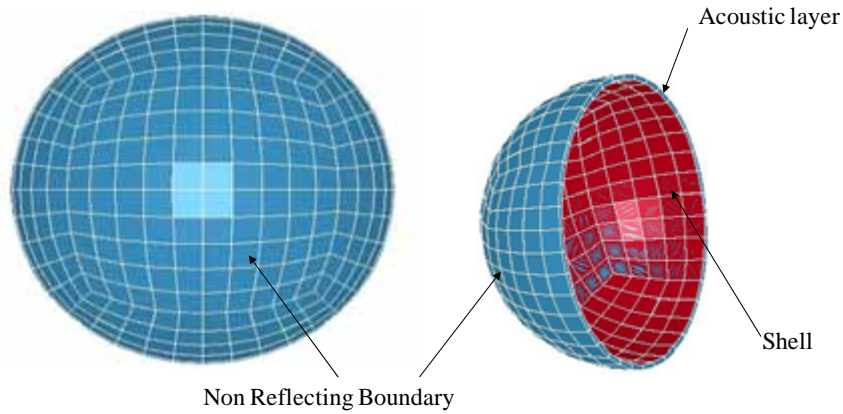


Figure 6. Pulsating sphere model used in case of Kirchhoff method

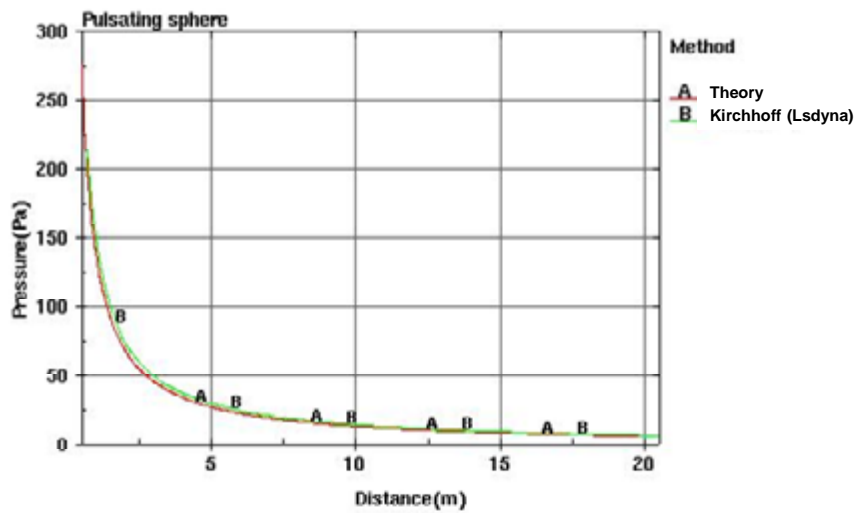


Figure 7. External radiated pressure from a pulsating sphere at 100Hz using Kirchhoff method

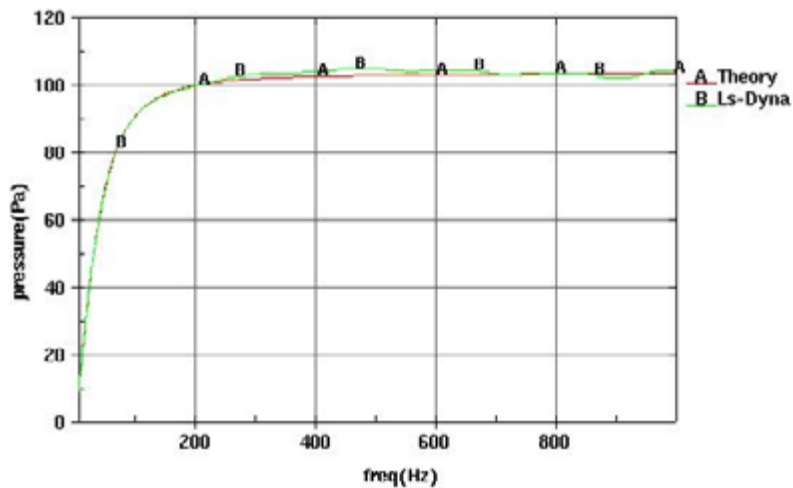


Figure 8. Variation of external radiated pressure of a pulsating sphere with respect to frequency: validation of LS-DYNA BEM

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2. Wu TW. Boundary element acoustics: Fundamental and computer codes. Advances in boundary elements, Southampton, Boston, WIT press, 2000.
3. LS-DYNA Keyword User's Manual version 971, Livermore Software Technology Corporation, Livermore, 2007.

Questions? Please contact

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Yahoo Group Yammerings

Note: LS-DYNA Yahoo Group is neither owned nor operated by LSTC, and LSTC has no control over the content.

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The LS-DYNA Yahoo Group archive contains a wealth of information that can be helpful to any LS-DYNA user. We suggest you review the archives when you are seeking help on any topic related to LS-DYNA. *NOTE: Questions and responses may have been edited for clarity & brevity.*

This installment of "Yahoo Yammerings" features several questions and responses from the past month of postings to the LS-DYNA Yahoo Group:

- Solid elements for bending simulations?
- What is the difference between *CONTACT_FORCE_TRANSDUCER_PENALTY and *CONTACT_AUTOMATIC_SURFACE_TO_SURFACE?

Solid elements for bending simulations?

I have used shell elements for bending simulations. To include the effects of shot peening, I need to use solid elements. Are solid elements applicable for bending?

Reply by Kevin Brown

Yes, solid elements can be used for bending. In fact, some would argue that solid elements are better than shells for bending because they consider the through-thickness stresses. It is recommended that you use at least 3 layers of solid elements through-the-thickness.

What is the difference between:

*CONTACT_FORCE_TRANSDUCER_PENALTY
*CONTACT_AUTOMATIC_SURFACE_TO_SURFACE

Reply by Denis Corkery

*CONTACT_AUTOMATIC_SURFACE_TO_SURFACE is one of many contact definitions that can be used to create a contact between a master and slave part or set of parts. The force between the contact pair can then be monitored provided that the relevant force output switches have been activated on the contact card.

*CONTACT_FORCE_TRANSDUCER_PENALTY provides a means of monitoring a force between a contact pair but does not go as far defining the contact. This is useful in a

single surface contact (e.g., *CONTACT_AUTOMATIC_SINGLE_SURFACE) where originally it was not possible to monitor the forces between contact pairs due to the non-existence of a master set. In this case, the FORCE_TRANSDUCER could be used to create contact pairs of interest from which the contact forces can then be extracted.

In your case, the FORCE_TRANSDUCER card is not required as the SURFACE_TO_SURFACE card already creates the force output you desire (unless you wish to specify a sub-set of the contact parts).

Reply by Jim Kennedy

The following was copied from the URL:

<http://www.dynasupport.com/support/tutorial/contact.modeling/contactoutput>
To obtain RCFORC data when single surface contacts are used, one or more force transducers should be added via the *CONTACT_FORCE_TRANSDUCER_PENALTY command. A force transducer does not produce any contact forces and thus does not affect the results of the simulation. A force transducer simply measures contact forces produced by other contact interfaces defined in the model. One would typically assign a subset of the parts defined in a single surface contact to the slave side of a force transducer. No master side is defined. The RCFORC file would then report the resultant contact forces on that subset of parts.

LS-DYNA Yahoo Groups

There are over 2440 subscribers from all over the world, and this list seems to grow by a hundred new subscribers ever few months; no small testament to the rapidly growing popularity of LS-DYNA. The group currently averages about 270 messages per month, i.e. about 10 messages per day. You can subscribe to the group by sending an email request to LS-DYNA-subscribe@yahoogroups.com or by visiting the Yahoo Groups web site <http://groups.yahoo.com>

Generally, the quickest/best responses are to those questions posed with the most specifics. General questions such as "How do I use XXX feature?" either go unanswered, or are answered by Jim Kennedy with links to appropriate references in the growing LS-DYNA related literature, e.g. see the archive of LS-DYNA Conference proceedings at www.dynalook.com

Invitation - "Shell and spatial structures under contact"

Dear colleagues,

Within the 6th IASS international *conference on the computation of shell and spatial structures – spanning nano to mega* taking place at Cornell University in Ithaca, NY May 28-31 2008, we are organizing a session on "Shell and spatial structures under contact" and are cordially inviting you to submit and present a paper.

In this session we are looking for contributions related to shell and spatial structures involving contact in any fashion.

A list of topics is given as follows: Contact algorithms, geometrical approaches in contact mechanics, high-order FE for contact, impact loading, contact support, sheet

metalforming, strengthened shells, debonded layered shells, delamination within contact, folding of shells, contact in crashworthiness analysis, contact in spatial structures including beams. The contributions may be devoted to methods development as well as to interesting applications.

We know that we are fairly late concerning the expected schedule, however, we are asking you to submit a one page abstract to the official website <http://www.iassiacm2008.us> and mail a copy directly to us by January 10., 2008. Besides that we would be grateful for any information whether you have the time and a contribution to accept this invitation.

With kind regards

Karl Schweizerhof and Alexander Konyukhov

ETA China Demonstrates LS-DYNA Copyright © Grace Su



ETA China demonstrated how to apply LS-DYNA into a variety of industries, at ISEC2007.

ETA-China's booth provided a user friendly atmosphere and provided answers to technical questions from many LS-DYNA existing and potential customers.

For complete LS-DYNA sales, service, training, consulting and technical support contact
Grace Su
Software Customer Services **ETA-China**
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<mailto:msu@eta.com.cn>

Calibration and experimental validation of LS-DYNA composite material models by multi objective optimization techniques

Stefano Magistrali*, Marco Perillo**

* Omega Srl, Research and Innovation Centre, Tortona fraz. Rivalta Scrivia (AL) - Italy

** EnginSoft SpA, Florence - Italy

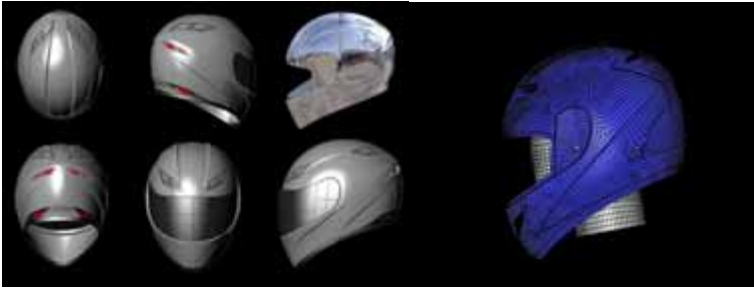
Numerous authors have documented efforts over the past two decades to understand the complex behavior of laminated composite structures under transient loading conditions. These efforts were made to identify and characterize the relevant failure mechanisms, to understand their interactions, and to be able to predict the extent of damage within a given composite system under a set of specified loading conditions. These studies identify some parameters as basic design parameters, i.e. material parameter (matrix, reinforcement and interfaces between layers), stacking sequence, laminate thickness, striker geometry.

Complexity increases when using a virtual prototyping approach, where the accurate comparison of simulation results with experimental material results is crucial to represent real material behaviour and to achieve optimum. A new virtual prototyping procedure is defined in order to take advantage of numerical prediction and cost-efficient simple material experimental tests for model calibration. In fact, calibration of material models, able to reproduce the effective impact behaviour of real

composite materials, is essential in order to simulate impact or crashworthiness problems. It allows either to understand variable influences on composite dynamic structural responses or to get improved performance solutions for industrial case studies. Furthermore, this approach permits to comprehend the effects of non-physical numerical input parameters on a composite structural response in terms of numerical robustness, accurate prediction and computational efficiency of numerical models.

A virtual prototyping procedure using a parametric numerical model can be used as well for the product optimization phase that needs a multi-objective and multi-disciplinary approach for composite structures.

The virtual prototyping procedure requires numerical investigations performed by LS-DYNA which has been developed especially for impact and non-linear dynamic simulations, in combination with the multi-objective and multi-disciplinary integrated platform modeFRONTIER employed for the calibration and optimization actions



In this example, the virtual prototyping procedure is tested to design (and to predict reliability crashing behavior of) motorcycle protective equipments: PTW helmet experience is shown.

Experimental quasi-static tensile and impact tests (usually used for evaluating basic mechanical characteristics and energy adsorption capabilities) were conducted over two different simple square samples of composite laminates, and four different types of sandwich laminates, in order to calibrate

LS-DYNA composite material numerical models: Starting from and based on the material physical properties derived from the test results.

LS-DYNA model parameters, model constrains and objectives defining the problem have been studied and analysed by using modeFRONTIER.

modeFRONTIER allows to handle a huge number of information deriving from different sources, and to obtain quickly the best model configuration comparison to experimental ones. The tool permits to understand the effect of inputs, to find and define accurate model configuration as well as model sensitivity to those parameters thus leading to reliable numerical models for impact simulations, offering also an understanding of the effect of numerical input parameters and variables on composite and sandwich laminates structural responses in terms of absorbed energy, maximum

energy, maximum force and curve morphology.

Two different types of autoclave-moulded composite laminates and four types of autoclave-moulded Kevlar – Carbon skins sandwich laminates with PVC, PMI, PU and Honeycomb cores were used.

All the impact tests were conducted in-house according to ASTM 3763 on 110 x 110 mm square samples using a Fractovis CEAST drop tower. The transient response of each of the laminates was recorded in terms of load, energy, velocity and deflection.

Analysed laminates were modelled by shell elements with Belytschko–Tsai formulation. A multi-layered shell was used with one integration point per layer. The different composite materials were modelled using material type 58 which implements a smooth failure surface. A shell-brick-shell model was used for modelling the sandwich configuration with 2 eight-node hexa solid elements for the core (material type 63).

Simulations of quasi-static tensile test on composite laminates were performed with LS-DYNA to evaluate how the material model could manage the coupling of stresses.

The effect of the mechanical characteristics of the materials involved and of the reduction factors over both composite and sandwich laminates structural responses was managed and investigated. Data

resulting from the mechanical characterization with statistical variability ranges were used as input parameters. On the other hand, the reduction factors were set as variables in a defined range. Objectives of the optimization were the matching of all the reference parameters between points on experimental and numerical F-t and E-t curves. Two main tools were used for the multi-objective analysis: Pareto's frontier and Student's chart.

The multi-objective analysis demonstrates a good compliance, with a delta less than 5% between numerical and experimental results for all the reference parameters and the curve morphology in case of pure composite samples whereas a delta of 6 % for the worst sandwich configuration is found.

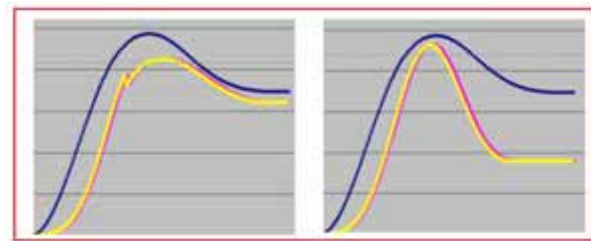
This approach allows defining only one set of reduction factors for each material: This means that the correct way to approach the definition of material input parameters for composites in LS-DYNA is to calibrate the reduction factors via numerical drop test simulations.

Synthetically, the virtual prototyping procedure created for composite structure impact design is tested on an impact resistance approach project: PTW helmet. The procedure adopted an integrated experimental-numerical method for the calibration of LS-DYNA input parameters for material model 58 and 63, by means of the integrated platform modeFRONTIER. Material model 58 was used for modelling woven fabrics while material model 63 was used for crushable foam modelling.

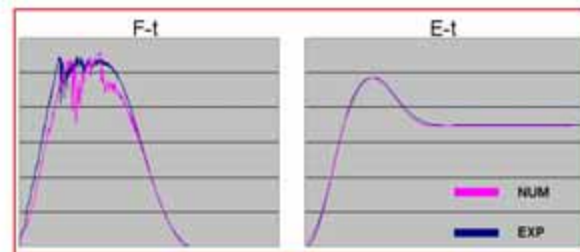
In a previous project in the same area not shown here, the approach was made with a Trial and Test method: The results obtained proved that it is

not possible to achieve contemporarily each target (Maximum Energy and Adsorbed Energy) without applying a real multi-objective methodology.

The obtained results provide a general indication of the quality of the procedure used for calibrating numerical input parameters needed for confident impact simulation of simple or complex composites or sandwich structures.



Trial and Test better solution



Virtual prototyping approach solutions

A design methodology has been developed to validate the numerical prediction of the energy absorption capability of a composite or sandwich laminate, through the combined use of experimental, numerical and optimization tools: Experimental tests were conducted over different types of composite laminates and sandwich laminates in order to calibrate LS-DYNA composite material model input parameters.

LS-PrePost Support Site

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

2007

November 26

Added *Shell intersect* option to the Curves Interface to create curves at the intersection of shell parts

November 21

Moved Shift/Ctrl options from the General Selection Interface to a Rendering Hot-Button

November 21

Added some options (Frin, Plan) to the General Selection Interface

LS-DYNA DEMO Support Site

[LS-DYNA Demo Support Site](#)

All you need to get started with a free full version of LS-DYNA, LS-OPT and LS-PrePost.

After filling out the demo form, downloading the software and sending in the lstdc.log file you will be ready to start modeling, learning, practicing.

Starting out modeling is not always an easy task and therefore the demo period comes with technical support, as well as many links on-line for immediate assistance.

Links:

- [LS-DYNA PrePost Support Site](#)
- [LS-DYNA Support](#)
- [LS-DYNA Technical Conference Papers](#)
- [LS-DYNA Examples](#)
- [LS-DYNA Application Site](#)
- [LS-DYNA AVI Lib](#)
- [LS-OPT Website](#)
- [LS-DYNA Consulting Companies](#)
- [LS-DYNA Classes - CA and MI](#)

Participant LS-DYNA Resource Page (alpha order)

Fully QA'd by Livermore Software Technology Corporation

SMP and MPP Hardware and OS

HP

HP PA-8X00	HP-UX 11.11. and above
HP IA-64	HP-UX 11.22 and above
HP Opteron	Linux CP4000/XC
HP Alpha	True 64

IBM

IBM 4/5	AIX 5.1, 5.2 5.3
IBM Power 5	SUSE 9.0

INTEL

INTEL IA32	Linux, Windows
INTEL IA64	Linux
INTEL Xeon EMT64	Linux, Windows 64

NEC

NEX SX6	Super-UX
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SGI

SGI Mips	IRIX 6.5X
SGI IA64	SUSE 9 w/Propack 4 Red Hat w/ Propak 3

SUN

SUN Sparc	5.8 and above
SUN Opteron	5.8 and above

Participant LS-DYNA Resource Page (alpha order)

Fully QA'd by Livermore Software Technology Corporation

MPP and Interconnect MPI

HP

	O/S	HPC Interconnect	MPI Software
HP PA8000	HPUX		
HP IA64	HPUX		
HP Alpha	True 64		

IBM

	O/S	HPC Interconnect	MPI Software
IBM Power 4/5	AIX 5,1, 5.2, 5.3		
IBM Power 5	SUSE 9.0		LAM/MPI

INTEL

	O/S	HPC Interconnect	MPI Software
INTEL IA32	Linux, Windows	InfiniBand (Voltaire), MyriCom	LAM/MPI, MPICH, HP MPI, SCALI
INTEL IA64	Linux		LAM/MPI, MPICH, HP MPI
INTEL Xeon EMT 64	Linux	InfiniBand(Topspin, Voltaire), MyriCom, PathScale InfiniPath	LAM/NPI, MPICH, HP MPI, INTEL MPI, SCALI

NEC

	O/S	HPC Interconnect	MPI Software
NEX SX6	Super-UX		

SGI

SGI Mips	IRIX 6.5 X	NUMAlink	MPT
SGI IA 64	SUSE 9 w/Propack 4 RedHat w/Propack 3	Numalink, InfiniBand(Voltaire)	MPT, Intel MPI, MPICH

SUN

Sun Sparc	5.8 and above		
Sun Opteron	5.8 and above		LAM/MPI

LS-DYNA Resource Page - Participant Software

Interfacing or Embedding LS-DYNA - Each software program can interface to all, or a very specific and limited segment of the other software program. The following list are software programs interfacing to or having the LS-DYNA solver embedded within their product. For complete information on the software products visit the corporate website.

ANSYS - ANSYS/LS-DYNA ANSYS/LS-DYNA

Built upon the successful ANSYS interface, ANSYS/LS-DYNA is an integrated pre and postprocessor for the worlds most respected explicit dynamics solver, LS-DYNA. The combination makes it possible to solve combined explicit/implicit simulations in a very efficient manner, as well as perform extensive coupled simulations in Robust Design by using mature structural, thermal, electromagnetic and CFD technologies.

AI*Environment:

A high end pre and post processor for LS-DYNA, AI*Environment is a powerful tool for advanced modeling of complex structures found in automotive, aerospace, electronic and medical fields. Solid, Shell, Beam, Fluid and Electromagnetic meshing and mesh editing tools are included under a single interface, making AI*Environment highly capable, yet easy to use for advanced modeling needs.

ETA – DYNAFORM

Includes a complete CAD interface capable of importing, modeling and analyzing, any die design. Available for PC, LINUX and UNIX, DYNAFORM couples affordable

software with today's high-end, low-cost hardware for a complete and affordable metal forming solution.

ETA – VPG

Streamlined CAE software package provides an event-based simulation solution of nonlinear, dynamic problems. eta/VPG's single software package overcomes the limitations of existing CAE analysis methods. It is designed to analyze the behavior of mechanical and structural systems as simple as linkages, and as complex as full vehicles.

MSC.Software - MSC.Dytran LS-DYNA

Tightly-integrated solution that combines MSC.Dytran's advanced fluid-structure interaction capabilities with LS-DYNA's high-performance structural DMP within a common simulation environment. Innovative explicit nonlinear technology enables extreme, short-duration dynamic events to be simulated for a variety of industrial and commercial applications on UNIX, Linux, and Windows platforms. Joint solution can also be used in conjunction with a full suite of Virtual Product Development tools via a flexible, cost-effective MSC.MasterKey License System.

MSC.Software - MSC.Nastran/SOL 700

The MSC.Nastran™ Explicit Nonlinear product module (SOL 700) provides MSC.Nastran users the ability access the explicit nonlinear structural simulation capabilities of the MSC.Dytran LS-DYNA solver using the MSC.Nastran Bulk Data input format. This product module offers unprecedented capabilities to analyze a variety of problems involving short duration, highly

dynamic events with severe geometric and material nonlinearities.

MSC.Nastran

Explicit Nonlinear will allow users to work within one common modeling environment using the same Bulk Data interface. NVH, linear, and nonlinear models can be used for explicit applications such as crash, crush, and drop test simulations. This reduces the time required to build additional models for another analysis programs, lowers risk due to information transfer or translation issues, and eliminates the need for additional software training.

MSC.Software – Gateway for LS-DYNA

Gateway for LS-DYNA provides you with the ability to access basic LS-DYNA simulation capabilities in a fully integrated and generative way. Accessed via a specific Crash workbench on the GPS workspace, the application enhances CATIA V5 to allow finite element analysis models to be output to LS-DYNA and then results to be displayed back in CATIA. Gateway for LS-DYNA supports explicit nonlinear analysis such as crash, drop test, and rigid wall analysis.

Oasys software for LS-DYNA

Oasys software is custom-written for 100% compatibility with LS-DYNA. Oasys PRIMER offers model creation, editing and error removal, together with many specialist functions for rapid generation of error-free models. Oasys also offers post-processing software for in-depth analysis of results and automatic report generation.

EASi-CRASH DYNA

EASi-CRASH DYNA is the first fully integrated environment for crashworthiness and occupant safety simulations with LS-DYNA, and covers the complete CAE-process from model building and dataset preparation to result evaluation and design comparisons.

EASi-CRASH DYNA can be used for concept crash, FE crash and coupled rigid body/FE crash simulations in conjunction with MADYMO.

Full capability to handle IGES, CATIA V4, CATIA V5, UG and NASTRAN files.

APTEK

The MMCD is a graphics-based and menu-driven program that interfaces with the LS-DYNA library of material models and the LS-OPT optimization code. The core of the MMCD is the driver, which calculates the stress-strain behavior of material models driven by combinations of strain increments and stress boundary conditions, i.e. pure shear stress, and combinations of uniaxial, biaxial, and triaxial compression and tension. MMCD input and output is accessed via pre- and post-processors; graphical user interfaces (GUIs) for easily selecting the material model parameters and load histories, and for plotting the output in both two (stress-strain curves) and three (yield surfaces) dimensions. The pre-processor, driver, and post-processor are combined into a web downloadable software package that operates seamlessly as a single code.

FEA Information Participants – Company name takes you directly to Website

OASYS Ltd: Markets engineering software products. Consulting engineers, planners and project managers working in all areas of the built environment.

JRI Solutions Ltd.: Specializing in Research & Consulting; System Consulting, Frontier Business, System Integration and Science Consulting.

Hewlett Packard: Personal computing, mobile computing, network management, 3-D graphics and information storage.

ANSYS Inc.: Develops, markets, supports and delivers collaborative analysis optimization software tools.

SGI: Silicon Graphics, Inc., is a leader in high-performance computing, visualization, and storage.

MSC.Software: Information technology software and services provider.. Products & services used to enhance & automate the product design/manufacturing process.

NEC: A history of more than 100 years of leadership/innovation in the core high-technology sectors of communications, computers/electronic components

INTEL: For more than three decades, Intel Corporation has developed technology enabling the computer and Internet revolution that has changed the world.

Engineering Technology Associates, Inc.: Provides engineering & IT services & has created the streamlined simulation software packages DYNAFORM and VPG

ESI Group: A software editor for the numerical simulation of prototype and manufacturing process engineering in applied mechanics.

Microsoft: For customers solving complex computational problems, Microsoft Windows Compute Cluster Server 2003 accelerates time-to-insight.

BETA CAE Systems S.A.: Specialized in the development of state of the art CAE pre- and post-processing software systems.

FEA Information Participants – **Company name takes you directly to Website**

[SUN Microsystems Inc.](#): Provides network computing infrastructure solutions that include computer systems, software, storage, and services.

[Detroit Engineered Products](#): A Michigan based engineering consulting and software products firm specializing in the area of Product Development products and solutions.

[APTEK](#): Among the software developed APTEK develops and licenses an interactive program for driving LS-DYNA material models - the Mixed Mode Constitutive Driver (MMCD).

[PANSAS](#): High performing Parallel Storage for scalable Linux clusters. Delivering exceptional scaling in capacity and performance for High Performance Computing (HPC) organizations.

[Intelligent Light](#): A world leader in the development and delivery of software for computational fluid dynamics (CFD) users. We help the world's best engineering and research organizations maximize the productivity and impact of their CFD capabilities

LS-DYNA Software Distributors - Alphabetical order by Country

Australia	<u>Leading Engineering Analysis Providers</u>
Canada	<u>Metal Forming Analysis Corporation</u>
China	<u>Arup</u>
France	<u>CRIL TECHNOLOGY (Groupe ALYOTECH France)</u>
Germany	<u>CAD-FEM</u>
Germany	<u>DynaMore</u>
India	<u>Oasys, Ltd.</u>
India	<u>Cranes Software International Limited (CSIL),</u>
Italy	<u>EnginSoft Spa</u>
Japan	<u>The Japan Research Institute</u>
Japan	<u>ITOCHU Techno-Solutions Corporation</u>
Korea	<u>Korean Simulation Technologies</u>
Korea	<u>Theme Engineering</u>
Netherlands	<u>Infinite Simulations Systems B.V.</u>
Russia	<u>State Unitary Enterprise - STRELA</u>
Sweden	<u>Engineering Research AB</u>
Taiwan	<u>Flotrend Corporation</u>
USA	<u>Engineering Technology Associates, Inc.</u>
USA	<u>Dynamax</u>
USA	<u>Livermore Software Technology Corp.</u>
UK	<u>ARUP</u>

Consulting and Engineering Services

Australia Manly, NSW	<u>Leading Engineering Analysis Providers (LEAP)</u> Greg Horner info@leapaust.com.au 02 8966 7888
Canada Kingston, Ontario	<u>Metal Forming Analysis Corp. - (613) 547-5395</u> Chris Galbraith galb@mfac.com
France	<u>CRIL TECHNOLOGY (Groupe ALYOTECH France)</u> +33.(0)1.30.67.23.44 produit@alyotech.fr
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USA Corvallis, OR	<u>Predictive Engineering - (1-800) 345-4671</u> George Laird george.laird@predictiveengineering.com
USA Troy, MI	<u>Detroit Engineered Products</u>
USA Troy, MI	<u>Engineering Technology Associates, Inc.</u> (248) 729-3010 sales@eta.com
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USA	Dr. Bhavin V. Mehta	Ohio University
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USA	Dr. Ala Tabiei	University of Cincinnati

Informational Websites

The LSTC LS-DYNA Support site: www.dynasupport.com

LS-DYNA Support Site	FEA Informationwebsites
LS-DYNA Examples (more than 100 Examples)	LS-DYNA Conference Site
TopCrunch – Benchmarks	LS-DYNA Publications to Download On Line
LS-DYNA Publications	LSTC LS-PrePost Tutorials
CADFEM GmbH Portal	