MAKINGITREAL WINTER 2013 Issue 10

MAKINGITREAL

INSIDE THIS ISSUE

MSC Software® Simulating Reality, Delivering Certainty™

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2013 AUSTRALASIAN ENGINEERING SIMULATION CONFERENCE - WRAP UP!

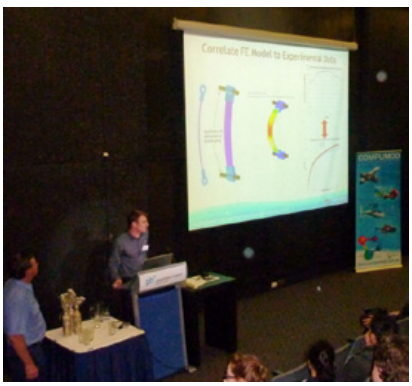
May 30 saw the Compumod sponsored 2013 Australasian Simulation Conference held at the Powerhouse Museum in Sydney. This conference also marked a celebration of 50 years of MSC Software and we were pleased to have Mr Alias Isa, Regional Director of MSC Software to provide an introduction and overview of the past 50 years of MSC Software's achievements. This was followed by around 70 attendees listening to a variety of presentations from organisations such as:

- RMS
- Hatch
- ANSTO
- FPR
- Big Tyre
- ALS
- Interfleet
- Australian Aerospace
- Optimised Ortho
- Alden & Assoc
- VI-Grade
- MSC Software

These presentations covered topics from the linear analysis of rolling stock and bridges, to highly non-linear modelling of wheel designs, Fatigue and Failure Analysis plus the diverse use of multi-body dynamics for not only optimising the performance of a V8 Supercar but also as a planning tool for Hip Replacements Surgery.

To wrap up many attendees joined in the lively discussion post conference at the Pumphouse Tavern which ran well into the night (and even the next morning for some!). The consensus appeared to be the conference was a great forum for both information transfer and networking and we look forward to the 2014 event!

Left
Mr Alias Isa presents 50 Years of MSC Software



Mr Bruce Louden and Mr John Shaw presenting for Big Tyre

COMPUMOD CLIENT BIG TYRE WINS GLOBAL SIMULATION CONTEST

Welcome to Issue 10 of the 'Making it Real' Newsletter for Winter 2013.

This issue comes on the back of a very successful 2013 Australasian Engineering Simulation Conference held in Sydney on May 30. It was great to see so many familiar and a lot of new faces attend this years' conference and also very positive to receive excellent feedback on the event. The mix of presentations along with networking opportunities and post conference drinks seems to work well and we intend to again be associated with this event in 2014.

Also in May, Peter Brand (Compumod's Technical Director) and I attended the MSC Software 50th Anniversary conference in Los Angeles. This was a great event with a wide variety of presentations and workshops being held. It was especially pleasing to gain a sneak peak at the latest MSC products under development and we hope to bring you more information about these game changing technologies later in 2013.

I was also very pleased at this conference to be able to present a paper on behalf of Bruce Louden from Big Tyre in Toowoomba. Bruce has developed a revolutionary non-pneumatic wheel for use in the mining industry and last year invested in Patran and Marc in order to be able to accurately simulate its highly non-linear behaviour. Earlier this year Bruce entered his simulation work into the

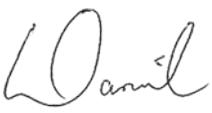
simulating REALITY Contest Winners

Global MSC Software Simulating Reality Competition and was awarded as one of three winners from around the world. The other two winners were NASA and Jaguar so Bruce was in great company!

We have also included in this issue the reprint of an article by General Peter Cosgrove, chairman of the Defence SA Advisory Board, first printed in The Australian in June 2013. In this article Cosgrove makes a great argument as to why we should be undertaking large defence projects such as submarine builds in Australia. It is an argument that could be also easily articulated with regard to other industries such as Rail and Shipping whose decline in local design and manufacture affects all technical and trade jobs in this country. Some food for thought!

Finally once again, it was great to be able to chat with so many CAE colleagues at the conference and we look forward to working with you all in the years ahead to assist you in your simulation activities.

Kind regards



Warwick Marx
Managing Director

Above
Mr Bruce Louden from Big Tyre "Reinventing the Wheel!"

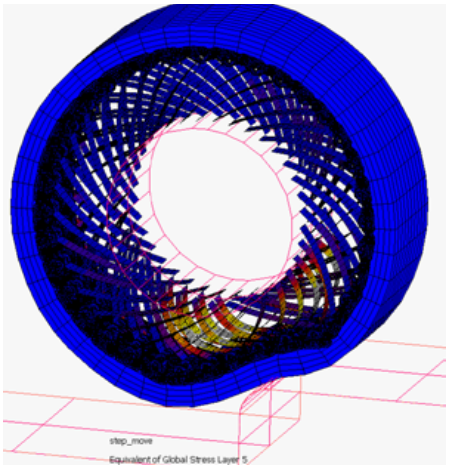


Figure 1
MSC Marc Simulation of Bruce's Design

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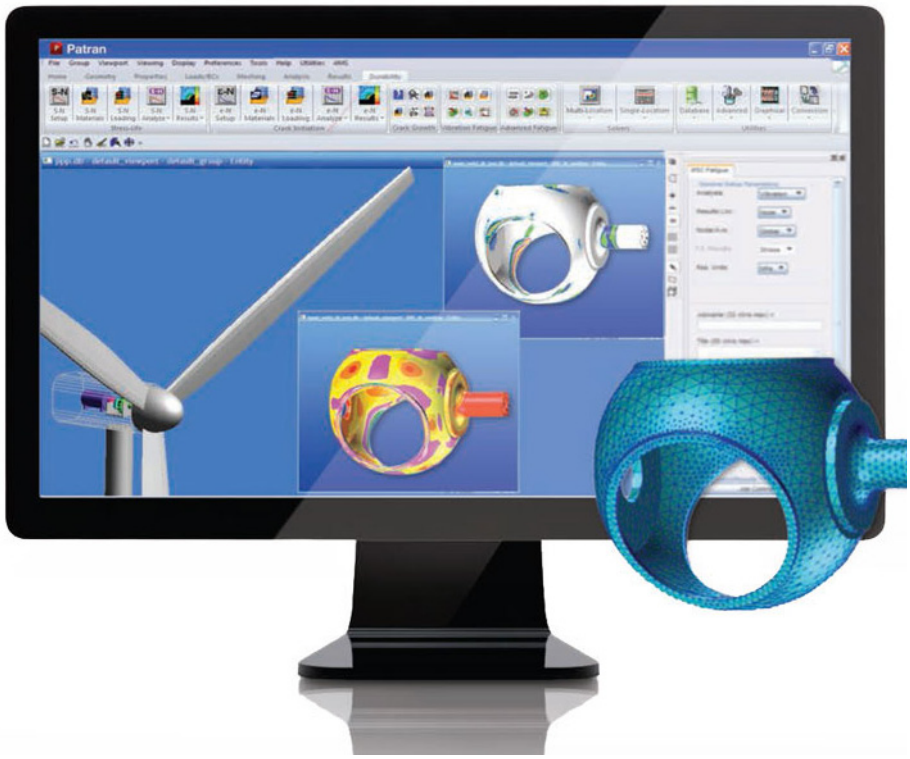
WHAT IS MSC NASTRAN EMBEDDED FATIGUE?



MSC Software has been at the forefront of FE based fatigue and durability products for over 25 years. MSC Fatigue (coupled with Patran) was created in 1990 as a tool for calculating both fatigue damage and crack growth rates from FE models.

Fatigue failures are often identified through testing. However, since the advent of FE based stress solvers, starting with Nastran in the 1960's, attention has focused on the concept of FE based fatigue calculation procedures. MSC Fatigue (1990) was the first such commercial package and spawned a proliferation of similar commercial FE based tools. These methods, both test and FE based, treat the fatigue calculation process as a post processing task and this has been an accepted convention throughout.

MSC Nastran Embedded Fatigue (NEF), which will be available in MSC Nastran version 2013, breaks this convention by coupling the stress and fatigue calculation process into one simultaneous operation. This new immersed capability has wide ranging implications in relation to the way fatigue and reliability is handled within large mechanical engineering organizations. By combining the 2 separate processes into one simultaneous process the need for any kind of intermediate data is removed. Such intermediate files can sometimes be a limiting factor in the size of model that can be handled. With NEF there is no limit, theoretically, to the size of model that can be handled (practically this will be governed by normal Nastran model size limitations).

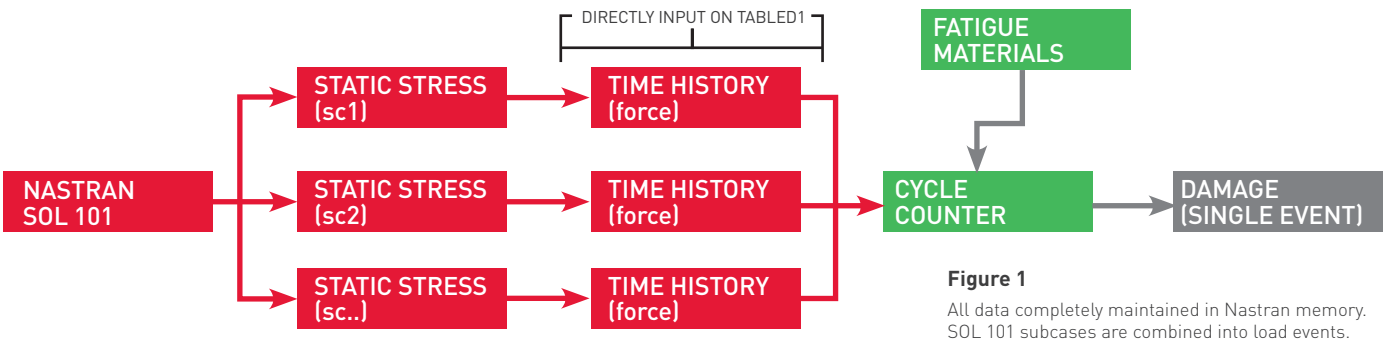
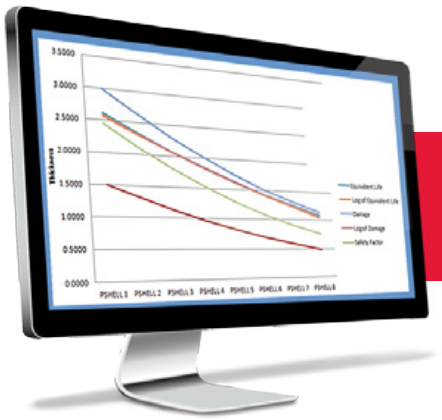
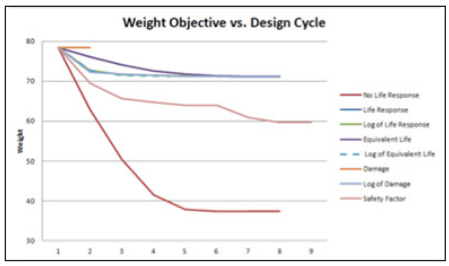


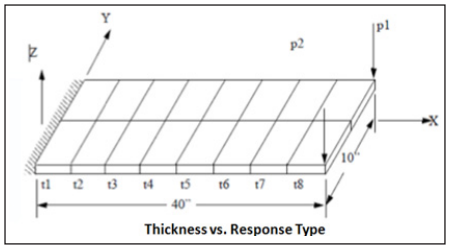
Figure 1

All data completely maintained in Nastran memory. SOL 101 subcases are combined into load events. Load events are combined into duty cycles.

Also, by embedding the process within MSC Nastran, this allows an analyst to include the materials and loading information with the model data in the Nastran input file. This means that model portability becomes much easier. Another significant new capability will also be created by enabling optimization procedures to be coupled with fatigue as the constraint, via a SOL200 type analysis. And finally, because the fatigue process is far more transparent (within this solver embedded process) it will open up the opportunity for an analyst to include a fatigue calculation with every stress run.







LIFE RESPONSE/CONSTRAINT (100,000 Repeats lower bound)

```
DRESP1    22   LIFE   FATIGUE ELEM
DCONSTR   99   22     1.0+5
```

Figure 2
NEF can be combined with Nastran optimization

NASTRAN FATIGUE 2013

Fatigue Solutions	Nastran Solution Routines
Stress-Life solver	SOL 101 - statics
Strain-Life solver	SOL 103 - modal stresses
FOS (both S-N & E-N)	SOL 112 - modal
Critical Plane Method	SOL 200 - optimisation
Parallel processing	
Utilities Tools	Docs: QRG, User Guide, Release Guide

NASTRAN FATIGUE 2013.1/2014

Fatigue Solutions	Nastran Solution Routines
Spot Weld Solver	Super-elements
Seam Weld Solver	

PATRAN (PRE & POST) PREFERENCE FOR NEF 2013

Fatigue Solutions	Nastran Solution Routines
Stress-Life solver	SOL 101
Strain-Life solver	SOL 103
Multi Thread Processing	SOL 112
	SOL 200

Figure 4
NEF release schedule

MSC FATIGUE (GUI DRIVEN)

WHEN TO USE

- Failure investigation.
- Sensitivity studies (eg effect of load change).
- Where stresses are from non Nastran solvers.
- For highly interactive analysis.
- Where a large amount of post processing is anticipated.

NEF (SOLVER EMBEDDED)

WHEN TO USE

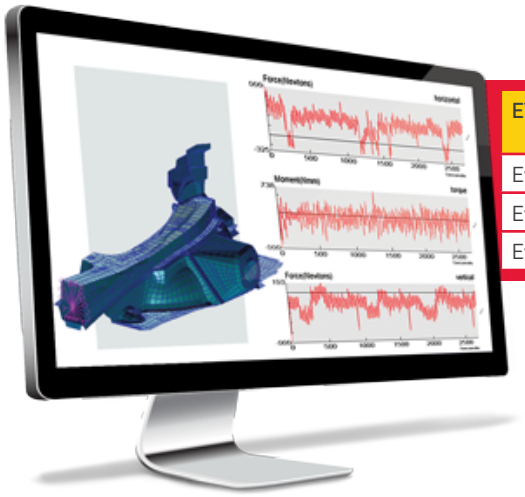
- Well defined processes.
- Large models.
- Many load inputs.
- For optimisation of parts or systems.
- Simpler and more concise file management.
- Extremely fast analysis.
- BDF file auditable process.

Figure 3
When to use MSC Fatigue and when to use NEF

So, in summary NEF offers the following advantages:

- FASTER - Drastically reduces cpu time for large fatigue simulations.
- SMALLER (file sizes) – data within Nastran solver
- SIMPLER – Combines the traditional 2 separate processes.
- PORTABLE - Easier model portability by embedding the process within the MSC Nastran input file.
- TRANSPARENT - The fatigue process is far more transparent by opening up the opportunity for any analyst to include a fatigue calculation with every stress run.
- BETTER DESIGNS – Couples fatigue and optimization.

Nastran 2013 will have updated documentation including the QRG and a new NEF users guide.



EVENT	FTGEVNT ID	NUMBER OF REPEATS
Event A	31	80.0
Event B	32	120.0
Event C	33	5.0

Figure 5
An example from the new NEF users guide for SOL 101 - strain life - complex multiple loading - duty cycles

To find out more about MSC Fatigue please contact Compumod on **1300 965 690** or **info@compumod.com.au**

MSC SOFTWARE PRIZE AWARDED AT UNSW

Peter Brand with the recipient of the MSC Software Prize, Fang Yong Yu and Professor Anne Simmons Head of School, School of Mechanical and Manufacturing Engineering

On June 13, Peter Brand, Compumod Technical Director was pleased to award the 2013 MSC Software Prize to one of the top students in Aerospace Engineering at the University of NSW. Compumod is pleased with its association with many Universities across Australia and New Zealand and wishes Fangyong all the best with his future career.

TIPS AND TRICKS!
CUSTOMISING ADAMS
ADDING YOUR OWN BUTTONS AND MENUS

Did you know that the Adams/View Graphical User Interface (GUI) can be customised? You can add your own menus, macros, dialog boxes, and more. All you need is a basic understanding of what is happening under the hood.

While most users are familiar with the GUI for building and simulating models there is a series of text commands for every action. All processes are implemented in the Adams/View Command Language, a custom script that is readable. For example, the command to modify the default value of an existing design variable would be:

variable modify variable_name=.model_1.DV_2 real=9.4

There is a full description in the Adams electronic documentation installed with the software. Look under **Adams Basic Package > Adams/View > View Command Language**.

While you can type commands into a window for execution most users would prefer to use the GUI. Custom menus, which are great for making pre-defined changes to a model such as one of a specific set of masses for a part, changing a point location, and so forth. Advanced Adams/View users can use the command language to program custom macros for model building or modification.

HERE'S AN EXAMPLE FROM SIMCOMPANION:

KB8016111 that allows a user to convert an existing linear bushing into a nonlinear GFORCE defined with a spline: There are numerous examples of macros in SimCompanion. **Start with KB8020616 for an overview** then search on topics such as "part macro" or "bushing macro." **There is an MSC training class that covers these topics: ADM704b, "Automating Tasks using Adams/View Scripting, Macros, and GUI Customization."**, which Compumod can provide.

TIPS AND TRICKS! [CONTINUED]
ADAMS CUSTOMISATION - EASY TRUCK

Compumod has used the Adams View Language to implement a very user friendly customised menu in Adams Car for building truck configurations and test them against performance based standards. The menu is called **EasyTruck** as shown in the images below, and consists of three sub-menus:

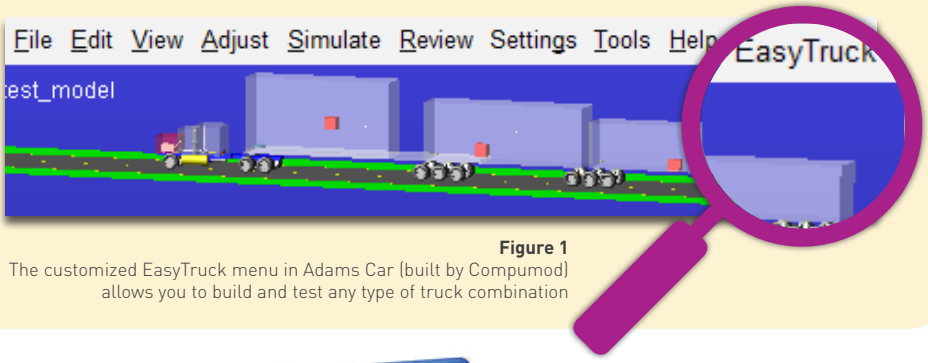
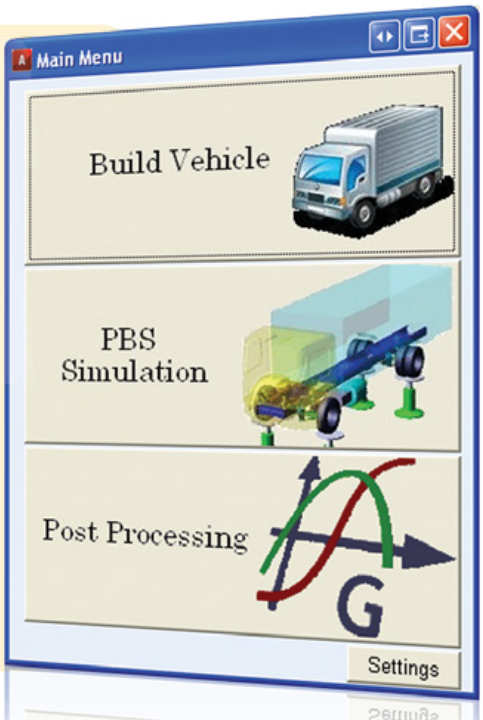


Figure 1
The customized EasyTruck menu in Adams Car (built by Compumod) allows you to build and test any type of truck combination

1. **BUILD VEHICLE**
Allows you to build any type of truck combination with a prime mover, any number of trailers and dollys, parametric dimensions, powertrain, suspension, payload and variable mass;

2. **PBS SIMULATION**
Allows you to test the vehicle against built in performance base standards (like: swept path, gradeability, static rollover etc):

3. **POSTPROCESSING**
Includes automated postprocessing for the PBS simulations.



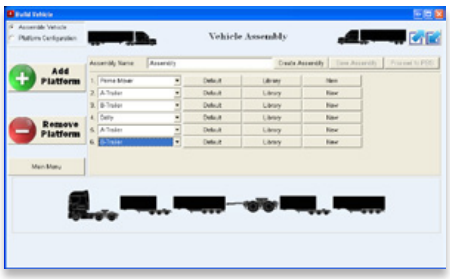


Figure 2
Use the Build Vehicle sub-menu to define any type of truck combination / assembly

Figure 3
Platform configuration Menu to build a Prime Mover, trailer, dolly etc

Figure 4
Example of platform configuration for a B-Trailer

For more information, please contact Peter Brand at peter@compumod.com.au

NO SENSE IN NOT BUILDING THE SUBS OURSELVES

Whenever I am asked why we should build submarines in Australia, my short reply is that we can't afford not to. The longer answer revolves around three central themes - national security, cost and nation building.

BY PETER COSGROVE
Reprinted from *The Australian*
June 10, 2013

Setting aside false perceptions, in reality we have built and maintained one of the most capable conventional submarines in the world.

Australia is a first-world economy that needs and can afford a first-class defence capability.

We are a small nation of 23 million people contained within a vast land mass surrounded by nearly 60,000km of coastline with critical infrastructure and vast oil and gas resources to protect and defend.

Some 90 per cent of Australia's trade, valued in 2011 at nearly $300 billion, is transported by sea.

In this context, submarines are essential strategic defence assets. They are covert, agile, have long reach and deploy a powerful set of weapons and sensors. On the seas, they are our most effective deterrent. This is so now and was so during my time as chief of the defence force.

Australia has a long history of operating submarines. Our design and construction expertise and shipyard infrastructure developed in the past 25 years has positioned us as a world leader in long-range conventional submarine design, manufacture and maintenance.

The high-quality industrial capability generated by the Collins-class submarines project represents a significant, strategic national asset. Current Australian government policy aims for self-reliance in the direct defence of Australia. That doesn't preclude a degree of dependence on allied nations, but it is in our interests to develop, own and keep as much intellectual capital and capability as possible.

The best means of maintaining it is to create a long-term submarine building and sustainment industry for at least half a century or more.

There is nothing to be gained and everything to lose by dealing ourselves out of an industry we have spent 25 years building up.

The cost of building a submarine is proportionately far smaller than the expense of sustaining its 25- to 30-year operational life. The through-life support of each submarine is typically two to three times more than the cost of the initial build.

So there is no advantage in buying off the shelf from another country when the real grunt work, the skilled workforce and the infrastructure required to keep each submarine working are in Australia.

Besides, to outsource would be to export billions of dollars of work to another country's defence-building industry rather than investing in our own.

Our future submarine fleet will be fitted with US combat and weapons systems, and for security reasons this must be done in Australia. To fit an overseas-built hull with a US weapon system in Australia would pose a high risk to national security and it would be costly, if it were even feasible.

In its formative years, Australia excelled at nation-building projects. The Snowy Mountains Scheme, our national road and rail systems, our ports and the creation of corporations such as the GPO, Australian Broadcasting Corporation, CSIRO and Telstra were all born out of visionary policies of a country on the move. As a nation, our capabilities are limited only by our imagination.

Submarine design, engineering, manufacture and sustainment is a massive industry with enormous potential for spin-off industries. That will create at its core many hundreds of hi-tech, high-skilled jobs that will cultivate long-term careers.

Building our next-generation submarines in Australia has bipartisan support. It is akin in size and complexity to building the next generation of space shuttles because these will be the biggest, most complex non-nuclear submarines on the planet.

While Australia bowed out of the space industry many years ago, there is no earthly reason for doing the same with the submarine industry. The fact is, we have spent two decades amassing the skills, the infrastructure and the best defence contractors. It would be a tragic loss to the nation if we were to lose even half of this capability by deciding not to build submarines.

A boom-and-bust approach to strategic industry development is inefficient and wasteful.

There are compelling economic justifications for undertaking big national projects that change expectations, create opportunities and fire up the national imagination. Let's use confidence and common sense and build the subs here.

General Peter Cosgrove is chairman of the Defence SA Advisory Board

TWO DAY TRAINING COURSE
EXPLOSION & ASSOCIATED STRUCTURAL RESPONSE MODELLING

The Warren Centre in association with Compumod and Gexcon AS is excited to be holding a 2 day training course which will introduce the concepts of both explosion modelling and the modelling of the associated structural responses.
This course is a must for anyone undertaking design or simulation in the oil and gas or petrochemical industries.

This two day course will cover:

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- Explosion Preventive Measures Mitigation and Control
- Explicit and Implicit solvers
- Numerical Methods of explosion and structural modelling
- Fluid Structure Interaction
- Ballistics
- Blast and Structural Response
- Structural Protection
- Underwater Explosion

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GexCon's is recognised as one of the world leaders in the field of safety and risk management and advanced dispersion, explosion and fire modelling. Gexcon's experience in this area arises from years of extensive research projects, carrying out safety assessments, performing accident investigations and performing physical testing.

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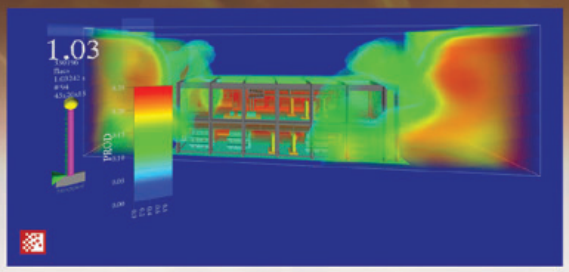

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