

MAKINGITREAL



MSC SOFTWARE ACQUIRES COMPOSITE MATERIAL SIMULATION LEADER e-Xstream

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MSC Software
Simulating Reality, Delivering Certainty™
BUSINESS PARTNER



In September this year MSC Software announced the acquisition of e-Xstream engineering. e-Xstream is the leader in advanced materials simulation used across industries to engineer innovative material systems and enable their optimal use to boost

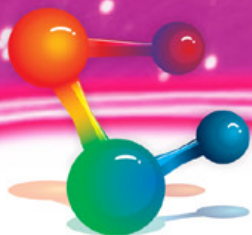
“ WE ARE DELIGHTED TO JOIN FORCES WITH MSC TO BOOST OUR GLOBAL REACH AND CONTINUE OUR LEADERSHIP IN THE AREA OF ADVANCED MATERIALS AND COMPOSITE SIMULATION FOR AEROSPACE, AUTOMOTIVE AND MANY OTHER INNOVATIVE INDUSTRIES

product performance. Its holistic offering uses nonlinear micro-mechanics to model a broad range of materials and physics, taking

into account their manufacturing processes. e-Xstream's Digimat™ product interfaces with most FEA structural analysis codes including MSC Nastran™, Marc™, Abaqus™ and ANSYS™. By employing material simulation, the testing required to validate advanced materials can be reduced to levels that allow the practical application of these materials in current designs.

Combined with MSC's simulation tools, e-Xstream's technology allows material simulation to be carried throughout the engineering enterprise to enable advanced failure prediction and the application of computed margins on structural component parts in situ. Instead of characterizing material margins to apply generically to the parts of a structural system, companies can design components with margins

■ MSC SOFTWARE ACQUIRES e-Xstream



Welcome to Issue 8 of the 'Making it Real' Newsletter for Summer 2012. It has been a busy few months at Compumod with our 30th anniversary party in August followed by more recently our co-hosting of a number of seminars on the rise of China with respect to engineering design.

Last month we were fortunate enough to have Mr Eric Favre Vice President Asia Pacific join us for a lunch Seminar in conjunction with The Warren Centre in Sydney and a breakfast seminar in conjunction with SAE-A in Melbourne.

You can read more about these seminars in a separate article on [page 5](#) but one common conclusion from the discussion during both seminars was that for Australia to remain competitive and relevant we have to be involved in more innovation and R&D.

China is moving rapidly from simply manufacturing to now undertaking their own advanced design activities. Australia may not be able to always compete with Chinese manufacturing but over many years we have proven again and again the value that we bring to innovation and the design of new products. There are many examples of Australian engineers designing world beating products such as Cochlear, Resmed, Nautitech, Bishop, Orbital and the list goes on. What is required is continued investment into R&D and new product design and also the encouragement of young people to enter careers in engineering.

Whilst currently mining may dominate our economy it is essential if we want to avoid deskilling our nation that innovation is not forgotten along the way.

If you would like more information on what Eric presented or would like to discuss how Compumod can assist your organisation utilise advanced simulation tools to aid innovation please let me know.

As the year rapidly draws to a close I would like to wish all of you and your families a safe and happy Christmas holidays and all the best for 2013.

Warwick Marx

Warwick Marx
Managing Director

MSC SOFTWARE ACQUIRES e-Xstream CONTINUED FROM P1

computed directly on the part accounting for design critical loads. The promise of advanced material systems can now be realized in practical engineering.

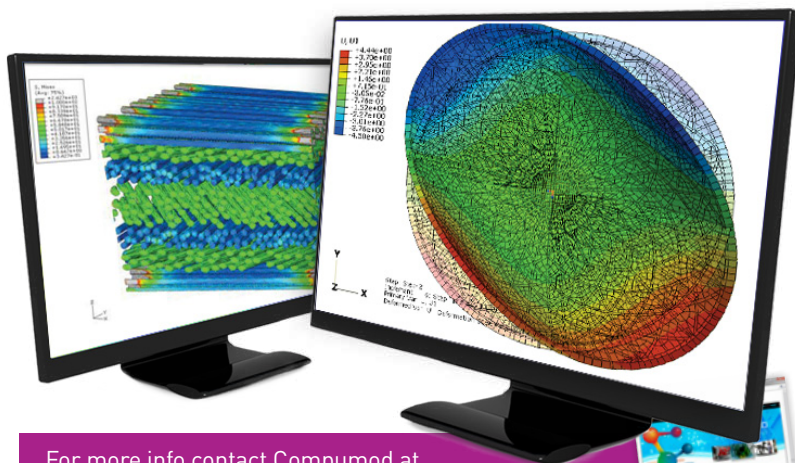
"e-Xstream is an extraordinary company and the joining of our organizations represents important new possibilities for our users," said Dominic Gallelo, President & CEO of MSC Software. "Entering a new material into a product can cost manufacturers tens of millions in physical testing, which limits product possibilities. Our goal is to blur the boundary between material engineering and structural engineering, allowing for more pervasive use of advanced materials while helping manufacturers to dramatically reduce the cost of physical testing needed to validate a new material system."

"We are delighted to join forces with MSC to boost our global reach and continue our leadership in the area of advanced materials and composite simulation for aerospace, automotive and many

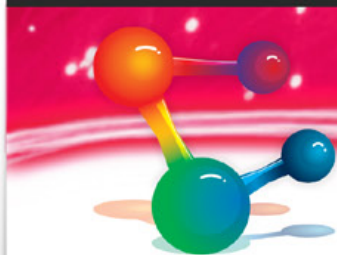
other innovative industries," said Roger Assaker, Co-founder & CEO of e-Xstream. "We remain committed to our entrepreneurial high-tech culture to develop, deploy and support advanced material modelling solutions that help all our customers to engineer and use advanced materials with their designs using MSC's or any other CAE solution."

e-Xstream engineering uniqueness comes from its holistic approach to support multiple:

- ▶ Materials: chopped fibre reinforced plastics or continuous fibre composites
- ▶ Physics: mechanical, thermal and electric
- ▶ Product performance: stiffness, strength, fatigue
- ▶ Manufacturing technologies: injection, compression or draping
- ▶ Material simulation technologies: Mean-Field or Finite Element



For more info contact Compumod at info@compumod.com.au or call 1300 965 690



AN INTERVIEW WITH ACOUSTICS EXPERTS JEAN-LOUIS MIGEOT & JEAN-PIERRE COYETTE

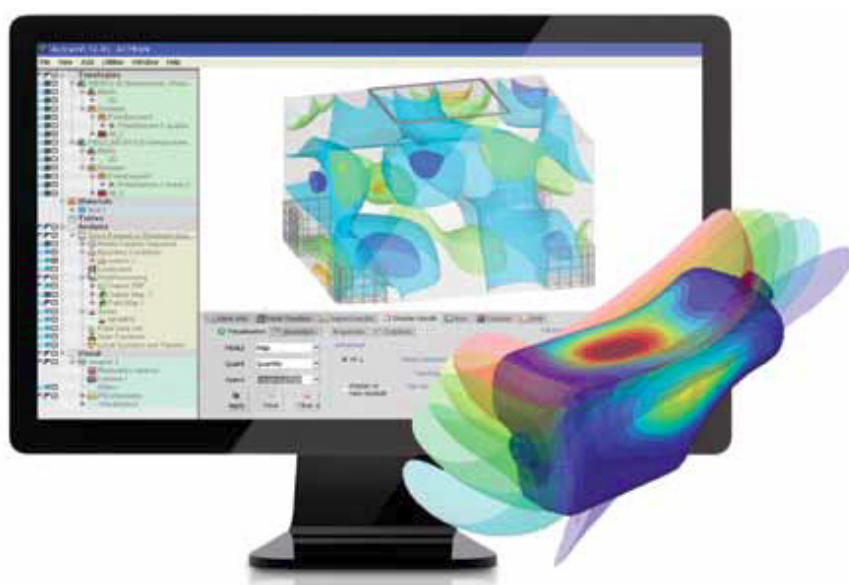


Figure 1
Acoustic panel installed inside the nacelle

Jean-Louis Migeot and Jean-Pierre Coyette are the co-founders of Free Field Technologies (FFT), the Belgian company that develops the Actran acoustic CAE software product and that has joined MSC Software last Fall.

In this interview which has been reprinted from an original article in MSC Software's *Simulating Reality* Magazine we learn more about noise, acoustics and the use of Actran in industry.

SR: Why is acoustics so important to engineers today?

Jean-Pierre: We are all living in a noisy environment: in our office, at home, while travelling. We are constantly exposed to pleasant and less pleasant sounds generated by every single object that surrounds us. At home our dishwasher, vacuum cleaner, hair dryer and washing machine combines with traffic noise flowing through the window to create a constant noise background. Our car is a real "noise factory" and we hear contributions from subsystems as diverse as the powertrain, the air

conditioning unit, the tire and of course the high pitch noise of the air flowing around the car. Our office is buzzing with noise as well: from computers, printers, telephones, copiers and colleagues.

Jean-Louis: And yet ...did you notice that much progress has been made in quietening all these devices? Sure, the overall noise level is still high but mainly because we have more cars, more fans, more machines of all kinds, but each individual sound source has been dramatically reduced over the last ten to twenty years. Try driving a 1970's vintage car, running a vacuum cleaner from the 1960's or flying aboard a Caravelle, and you'll measure the progress made by acoustical engineers!

SR: True, we can all think of the many noise sources around us we'd like to quiet! But is this public annoyance sufficient to explain the major investments made by many corporations in acoustical engineering?

Jean-Louis: This fight for lower noise levels has in fact been driven by

three complementary forces: noise regulations which have become more and more stringent in all industries and all countries, market analysis which has shown that the acoustic quality of a product is an important sales argument and, in more specific cases, the identification of noise as a source of vibrations that can lead to failure.

Acoustical engineering was thus progressing in order to meet customer requirements, respect norms and standards and just meet resistance constraints.

SR: Noise has thus become a design attribute on par with stress, fatigue, crashworthiness, fluid dynamics or thermal efficiency?

Jean-Pierre: Exactly, noise has evolved, over the last two decades, from something that was "fixed at the end of the design process" to just another design attribute integrated in the concurrent engineering process: noise had to be designed, controlled, understood ...and it had to follow the "right first time" philosophy. Engineers in search for innovative noise reduction solutions needed to perform simulations, and acoustic CAE tools started to appear in the early 1990's.

Jean-Louis: Acoustic CAE tools like Actran are now mainstream and are part of the daily work of engineers across all industries and regions: automotive, aerospace, defense, railway, home appliances, energy, audio and

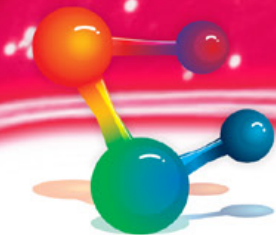


Figure 2

Assembly of the physical prototype of the fan in the anechoic chamber

communications. Acoustic simulation tools are fully integrated in the overall CAE process, connected upstream with CAD and mesh generation tools, and in CFD tools for aeroacoustic predictions and structural vibration analysis tools for vibro-acoustics prediction.

SR: Has Actran permeated in all industries?

Jean-Pierre: The transportation industry [automotive, aerospace] is a primary user of acoustic simulation technology and they had a pioneering role in acoustic CAE in the late 1980's. Actran is for instance used in applications as diverse as powertrain noise radiation analysis, optimal design of air intake and exhaust lines components, prediction of airborne and structure-borne noise from tires, absorption and insulation analysis of individual trim components, vibro-acoustic analysis of layered windshields, air-conditioning noise analysis, transmission or aero-dynamic sources through side windows and, in combination with MSC Nastran, prediction of the global vibro-acoustic response of the trimmed vehicle body. The use of Actran is not restricted to the vehicle OEM but is now very common among the many layers of suppliers.

Jean-Louis: Actran and acoustic CAE also contributes to reducing noise in many other products. Recent projects performed by Free Field Technologies include refrigerator pump noise reduction, acoustic resonance in burners, prediction of the noise generated by an industrial centrifugal fan or predicting the impact noise from the rain on a steel tile.

And let's not forget audio equipment from loudspeakers, telephones, hearing-aid devices or microphones.

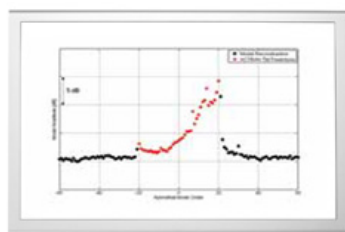


Figure 3a

Acoustic measurements in the CMDIb section

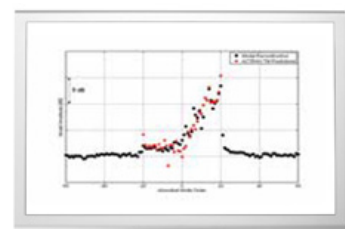


Figure 3b

Acoustic measurements in the CMDIa section

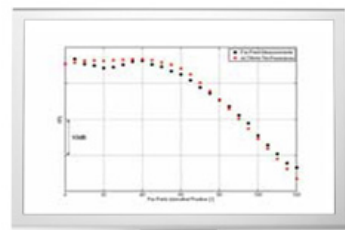


Figure 3c

Acoustic measurements in the far field

Jean-Pierre: Also, now that much progress has been made in quietening many products, sound quality issues start to appear: the focus is no longer on simply reducing the noise level but in improving its quality, in making a product "sound right". The sound must be pleasing, discrete yet audible, in line with the image that the product carries. Actran is for instance used to understand a camera shutter noise and in shaping the associated spectrum to meet given specifications.

SR: To complete our interview, could you describe a recent, real-life, user case?

Jean-Louis: Well, a very loyal customer of ours, Alenia Aermacchi, recently published an interesting case study. Alenia Aermacchi has been a research partner and an Actran user since 2003 when they collaborated with Free Field

Technologies in the MESSIAEN project, a European-funded research programme on "Methods for the Efficient Simulation of Aircraft Engine Noise" also involving Rolls-Royce, Airbus, Liebherr Aerospace and Turbomeca.

Jean-Pierre: The company from Venegono Superiore in northern Italy is engineering and producing aircraft engine nacelles which are lined with advanced materials aimed at absorbing part of the noise generated by the engine fan (see figure 1). The material is made of a thin resistive cover layer backed by resonators. One of the Actran modules, Actran TM, is ideally suited to predict the efficiency of such liners and is the reference acoustic simulation tool of the aircraft engine industry.

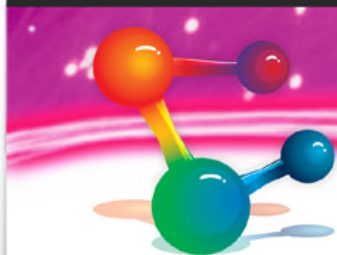
TM indeed features a special source model well suited to represent the engine fan (duct modal basis), includes a convected wave propagation operator to take into account the effect of the background flow on the propagation of the sound waves and has a unique capability for handling the liner and its interaction with the sound waves and the grazing flow.

Jean-Louis: The modelling process used by Alenia Aermacchi involves three steps: (1) creation of an axisymmetric acoustic mesh of the air inside and outside the nacelle (infinite elements are added on the edge of the finite element mesh to represent far field radiation), (2) the background flow is calculated and (3) the propagation of selected components of the fan source is computed (see figure 2). Simulation results have been successfully compared with measurements taken in the AneCom test chamber (figure 3).

SR: Thank you Jean-Pierre and Jean-Louis for this quick introduction to acoustic CAE and an interesting user case!

For more information on Actran please visit contact Compumod on **1300 965 690** or **info@compumod.com.au**





REVIEW: FROM MADE IN CHINA TO CREATED IN CHINA

In mid November Compumod were fortunate to have Mr Eric Favre Vice President Asia Pacific join us for a lunch Seminar in conjunction with The Warren Centre in Sydney and a Breakfast seminar in conjunction with SAE-A in Melbourne.

Eric Favre is responsible for all MSC Software businesses in the Asia Pacific region, which includes China, Korea, India, Australia/New Zealand, Taiwan and the ASEAN countries.

Prior to MSC.Software's appointment, Eric was Vice President Asia Pacific at Dassault Systemes, where he was responsible for managing the DELMIA (digital manufacturing) business. During his tenure at Dassault, he also oversaw the CATIA business across major regions in Asia. In 2003, Eric moved to Shanghai, where he assumed the position of Vice President at Tecnomatix. Eric pioneered this business in Greater China and managed the South Asia region, where he achieved significant business growth until the subsequent acquisition of Tecnomatix. Eric's ten-year tenure at Tecnomatix included sales leadership positions in France and later across Western Europe, where he led the explosive growth through new customer acquisitions and penetration into industries including aerospace, automotive and electronics.

Eric started as a design engineer at Du Pont Engineering Polymers and was soon promoted to a sales position. He then joined PTC in France and presided over the territory sales for several years. Eric graduated as a mechanical engineer from one of the most famous Grandes Ecoles in France, Arts and Metiers (ENSAM).



Mr Eric Favre

Vice President Asia MSC Software



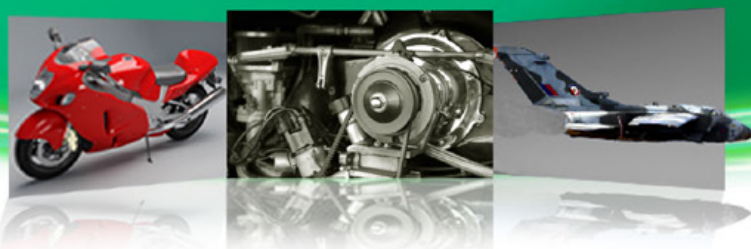
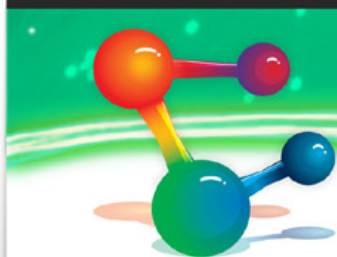
Image Eric presenting at the Lunch Seminar in Sydney

Eric's presentation included:

- ▶ China's manufacturing growth path over the past three decades
- ▶ China's campaigns / policies to support manufacturing competence improvements
- ▶ Trends of PLM (growth rate and growth by industry)
- ▶ Simulation technology growth rate and which industry it has been invested
- ▶ A case study showing an example of what one company has done to develop cars independently of the West

If you would like more information on this presentation or how Compumod can assist your company use advanced simulation software to compete with an innovative China please contact info@compumod.com.au or call 1300 965 690





MSC FATIGUE RELOADED!

Historically, nearly all fatigue calculations were performed using test-based procedures. More recently, analytical procedures have become more widely accepted, and in the last 20 years CAE-based techniques have become more prominent. MSC Fatigue has pioneered the CAE-based fatigue sector.

MSC Fatigue is a general purpose, state-of-the-art, fatigue and fracture analysis software package that works with stress and/or strain results from finite element analyses. The primary environment for MSC Fatigue is Patran and the solver for MSC Fatigue is provided by nCode.

MSC is also working on a fatigue solution inside Nastran. This product will allow fatigue calculations to be performed at the same time (and in the same place) that the stress function is produced. This will enable, faster, more efficient calculations to be performed and will allow new types of analysis to be included such as optimization for fatigue. Nastran Fatigue will be launched in 2013.

Figure 1 shows the fatigue environment in Patran. The idea is that you do your stress analysis first, then use the fatigue module to combine the stress result with an appropriate loading signal and a material from the extensive fatigue database to compute the life of the structure. The images below show examples of some of the modules in MSC Fatigue.

- ▶ Updated GUI and environment
- ▶ Repackaging of entry level product (with Stress-Life & Strain-Life modules).
- ▶ New DTLIB based module in 2012

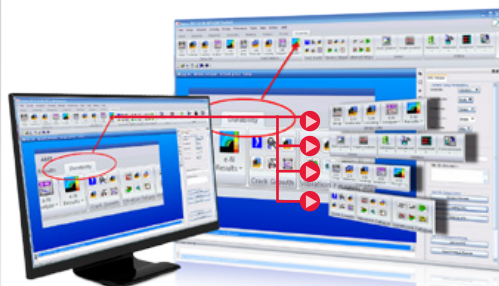


Figure 1
New menus for MSC Fatigue in Patran 2012 and updated nCode DTLIB library

MSC Shaker (new in ver. 2012)

MSC Fatigue Shaker predicts the fatigue life of components subjected to a single input random vibration load or sine sweep - a typical example of which would be a shaker table test. Shaker tables are routinely used to "proof test" components before sign-off. Typical input loads could be displacement, velocity or acceleration PSD's.

The module works for a single input loading only and the following methods are available:

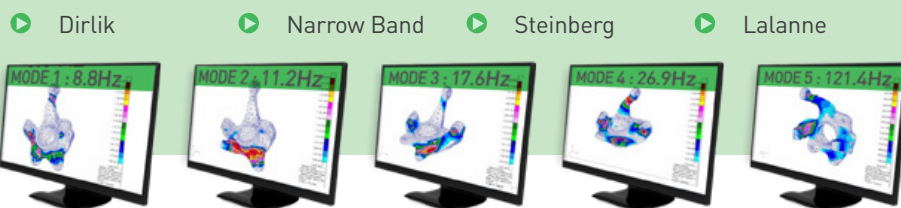


Figure 2 MSC Fatigue 2012 offers a new module for shaker table tests

MSC Fatigue Spot Welds (new solver in ver. 2011)

No attempt to directly calculate stresses in the spot weld, instead we use moments and forces in equivalent beams from which structural stresses are derived.

MSC Fatigue Spot Weld uses the Rupp, Storzel and Grubisic algorithms for computing stresses in each spot-weld nugget and in adjacent sheets.

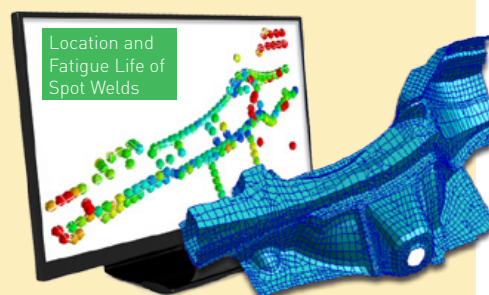
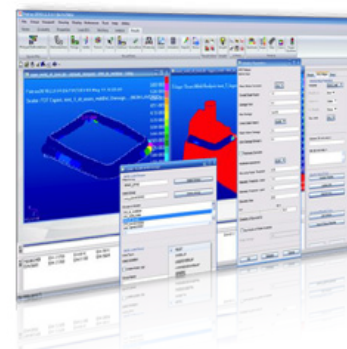


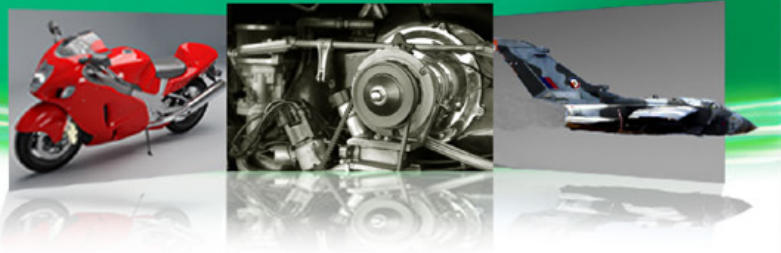
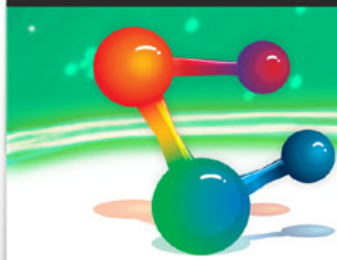
Figure 3 MSC Fatigue has a new solver for fatigue in spot welds

FE Model of Car Body Component

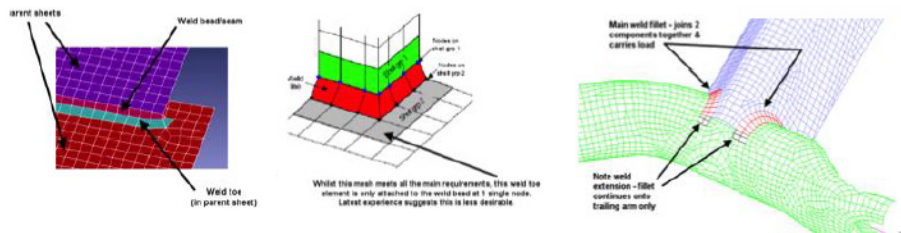
MSC Fatigue Seam Welds (new solver in ver. 2011)

MSC Fatigue includes, as standard, the traditional weld classification approach (BS5400/BS7608 etc) for the fatigue design of weldment details. Using this type of approach there is no attempt to model the weld detail. Instead, "component" S-N curves are used which have the weld classification detail (loading and geometry) built in to the S-N detail. This approach can, however, be awkward and time consuming to implement for thin sheet steels commonly used for automotive manufacturing because the level of integration with FE is minimal.





More recent work has focused on calculating the equivalent structural stress in the weld detail. The method implemented in MSC fatigue is based on the method developed by Fermer et al. Ref: SAE 982311



MSC Fracture

The underutilised under used crack growth tools embedded in MSC Fatigue provide sophisticated crack growth modeling tools for estimating life to grow a crack through a structure. Features include:

- ▶ Kitagawa minimum crack sizing
- ▶ Fracture toughness failure criterion
- ▶ Mean stress correction

- ▶ User-defined life units
- ▶ Rain flow cycle counting with cycle re-ordering
- ▶ Initial and final crack length specifications
- ▶ Plane stress correction
- ▶ Notch effects modeling
- ▶ Retardation and closure effects modeling

$$da/dN = C(\Delta K)^m \text{ (Paris Law)}$$

- ▶ Modified Paris law modeling based on effective stress intensity range
- ▶ Fracture mechanics triangle solutions (stress- stress intensity- crack length)
- ▶ Graphical interface to NASA/ FLAGRO 2.03 (via MSC Patran or MSC Fatigue Pre & Post)

Compliance Function (Y) Library

Standard specimens

- ▶ Single edge crack in tension
- ▶ Single edge crack in pure bending
- ▶ Double edge crack in tension
- ▶ Center cracked plate in tension
- ▶ Center cracked square plate in tension
- ▶ Three-point bend specimen
- ▶ Compact tension specimen
- ▶ Round compact tension specimen
- ▶ Wedge opening load specimen
- ▶ Quarter circular corner crack tension specimen

Cracks at holes

- ▶ Single crack at a hole in tension
- ▶ Double crack at a hole in tension
- ▶ Surface crack at a hole in tension

Elliptical, semi-elliptical cracks in plates

- ▶ Surface cracks in tension
- ▶ Surface cracks in bending
- ▶ Embedded cracks in tension
- ▶ Embedded cracks in bending
- ▶ Surface and embedded cracks on combined loading

Cracks at corners

- ▶ Quarter elliptical corner crack in tension
- ▶ Quarter elliptical corner crack at a hole in tension

Cracks in solid cylinders

- ▶ Circumferential crack on tension
- ▶ Straight crack in tension
- ▶ Semi-circular crack in tension
- ▶ Crack at thread in tension
- ▶ Straight crack in bending
- ▶ Semi-circular crack in bending

Cracks in hollow cylinders

- ▶ Internal surface crack under a hoop stress
- ▶ Circumferential crack in thin-walled tube in tension

Cracks in welded plate joints

- ▶ Weld toe surface cracks in tension
- ▶ Weld toe surface cracks in bending
- ▶ Weld toe embedded aacr<s in tension
- ▶ Weld toe embedded aacr<s in bending
- ▶ Surface cracks in combined tension and bending

Cracks in welded tubular joints

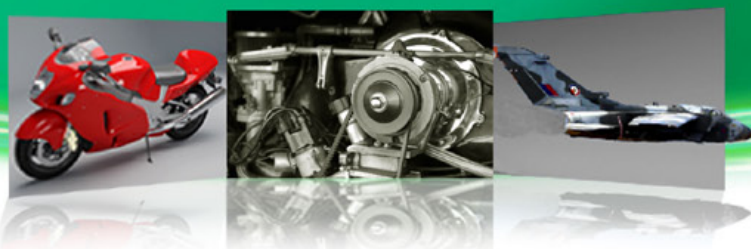
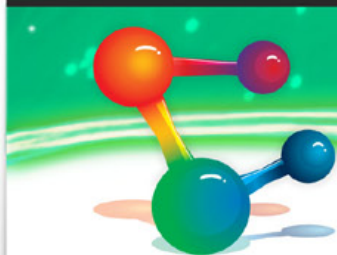
Cracks at spot welds in tension

User parametric definitions

$$K = Y\sigma(\pi a)^{1/2}$$

Figure 5

The fracture mechanics module in MSC Fatigue



MSC Strain Gauge

MSC Fatigue Strain Gauge allows the creation of virtual Software Strain Gauges within an MSC Nastran finite element (FE) model. These gauges can be used to produce analytical response time histories from the FE model under the effect of multiple time varying applied loads. Stress and strain time histories may be extracted at any point on the FE model surface, based on either standard or userdefined strain gauge definitions. The results obtained from the Software Strain Gauge may be based on static, transient, or quasi-static FE loading.

MSC Fatigue Wheels

Aircraft wheels play a major role in the takeoffs and landings of an aircraft, whether it's a 747 loaded with 568 passengers, the Space Shuttle, or an F-16 Fighting Falcon. Repetitive landings, takeoffs and associated taxi runs subject the wheels to a considerable spectrum of operational loads that the wheels must withstand time and again. Ensuring that a wheel meets stress and load criteria over time is an important part of the product development process and typically is accomplished by testing physical prototypes. However, building and testing a prototype is expensive and time consuming and wheel development programs often require several prototypes be evaluate before the production design is finalized.

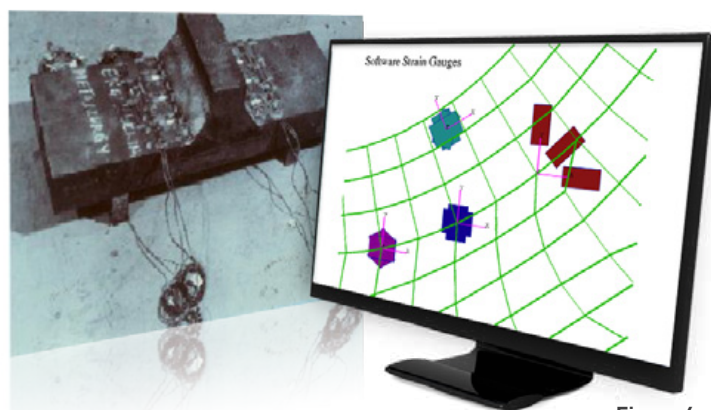


Figure 6

MSC Fatigue provides virtual strain gauges

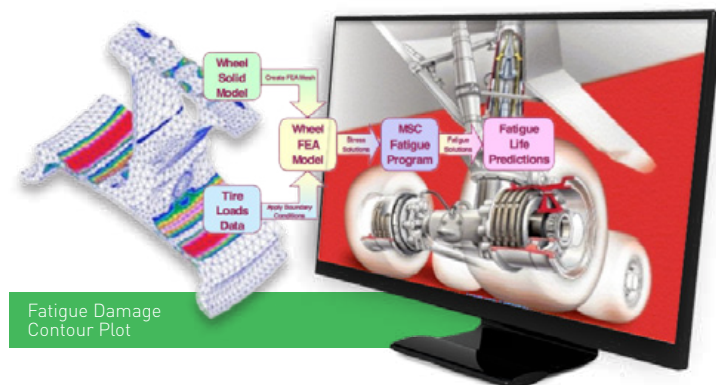


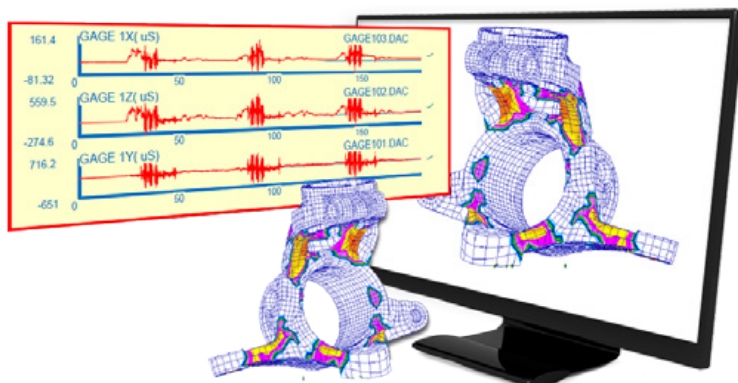
Figure 7

MSC Fatigue Wheels

MSC Fatigue Multiaxial

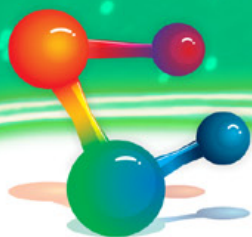
Some components have multiaxial loads inputs, and some of those have multiaxial stresses and strains in critical locations. In these situation uniaxial methods may give poor answers needing bigger safety factors. MSC Fatigue includes sophisticated stress state assessment tools to test for the presence of secondary stresses and non-stationary stresses. MSC Fatigue then has available several methods for multiaxial fatigue calculations which include:

- ▶ 6 Critical Plane Methods & 1 Total Life Factor of Safety Method
- ▶ Wang-Brown method, with and without mean stress correction
- ▶ Normal Strain, Shear Strain, SWT-Bannantine and Fatemi-Socie Critical plane methods.



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





MANAGEMENT IN A DAY TRAINING COURSE

Previously delivered through the University of Sydney Centre for Continuing Education, Compumod is pleased to be able to offer its clients this unique one day training course.

Through the use of case studies, **Management in a Day** delivers a practical summary of business fundamentals and modern management practices. The course places emphasis on creating business and personal metrics as well as continuous improvement in all aspects of business operations.

- ▶ Gain a better understanding of business finance, budgeting, cash flows, balance sheets and P&L.
- ▶ Set up and control metrics to continuously measure business and human performance.
- ▶ Use back of the envelope calculations to forecast revenue and predict company performance.
- ▶ Find out about the legal framework within which business must operate.

Topics Covered Include:

Budgeting and Cash Flow

Creating Business Budgets, Cash Flow, Return on Investment, Forecasting and Managing Cash Flow, Financial Reporting, Pricing Models, Price Elasticity, Business Analysis, Benchmarking

Business Operations

Business Performance Metrics, Accounts Receivable Strategies, Trade Practices & Privacy Act, Anatomy of a Contract, Operating Terms & Conditions, Intellectual Property

Sales and Marketing

Marketing is Everything!, Product Lifecycles, The Sales Value Proposition, Interview Strategies, Effective Customer Management, Forecasting Revenue (Sales Pipelines), Managing a Sales Team

This is a perfect course for people entering into management positions or alternatively anyone wanting to understand more about how a business works.

Contact Compumod at info@compumod.com.au or call **1300 965 690** for more details.



INTERNATIONAL CAE MASTER'S DEGREE

Did you know you can now study online for a Master's Degree in **The theoretical & practical application of finite element method and CAE simulation?**

This Master's Degree, presented jointly by the **Spanish Open University ETSII/UNED** and **Ingegiber** in Spain has its genesis back in 1993 when the two organisations unified their wide experience using numerical analysis methods in different research areas and professional engineering applications.

The objective was, and still is, to prepare specialists in the use of Finite Element Method (FEM) and CAE Simulation for practical professional application.

The course which is approximately 40% theory and 60% application and practices was offered for the first time in Australia in 2012 with a number of students having now completed their first year of study."

Students who complete the course will be eligible for a Postgraduate Degree from the UNED, which is the largest

University in Spain with more than 200,000 students.

To date more than 2,500 postgraduates have participated in this Master course, which clearly demonstrates that the course has obtained wide prestige and recognition over the years.

The multi-dimensional curriculum is aimed not just at acquiring knowledge but also at developing critical thinking and analytical ability and facilitating research at every stage of the course.

The course offers three different degree options (Expert, Specialist and Master's) to pursue your training through core and elective subjects.

If you are interested contact us on info@compumod.com.au and we would be happy to send through further details.



TIPS AND TRICKS!

DESIGN OF EXPERIMENTS USING ADAMS/INSIGHT

Adams/Insight is a powerful design-of-experiments software system. Adams/Insight lets you design sophisticated experiments for measuring the performance of your mechanical system. It also provides a collection of statistical tools for analysing the results of your experiments so that you can better understand how to refine and improve your system. Within the Adams analysis environment, there are conduits between Adams/Insight and the other Adams products (for example: Adams/Car and Adams/Chassis). These conduits streamline the process by taking advantage of the inherent parametric strengths of the vertical application.

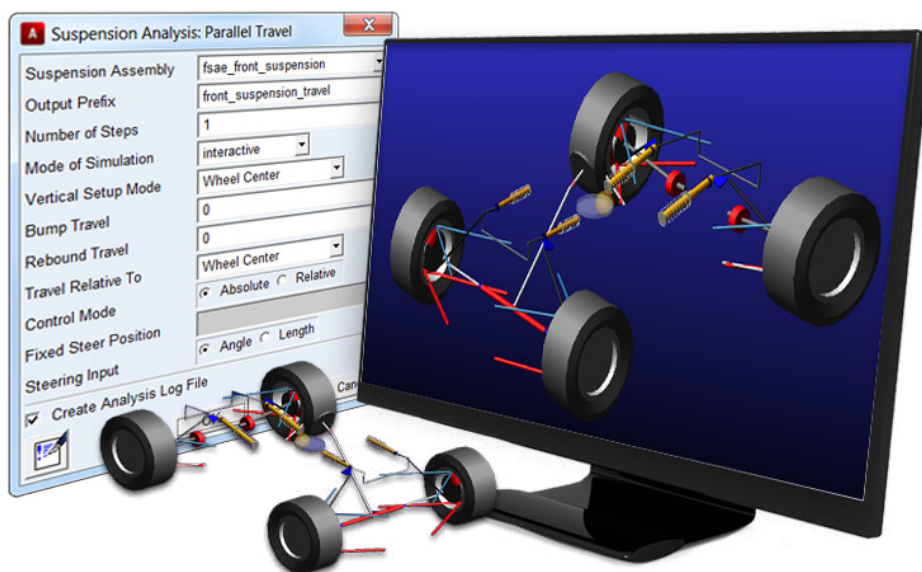
The following example demonstrates how to use Adams/Insight by changing suspension hardpoints to optimize roll-axis position/inclination of a formula SAE vehicle shown on the right. We will simulate a parallel wheel travel on the Formula SAE front suspension assembly changing the inboard upper control arm points to get the desired front roll centre heights using Adams/Insight.

This example shows you how to:

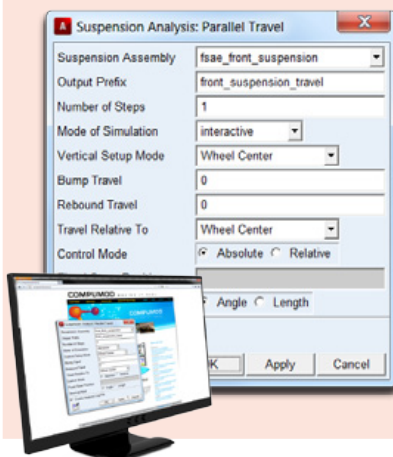
- ▶ Run a basic D.O.E. using Adams/Insight
- ▶ Fit results to the data acquired
- ▶ Use the fitted result to acquire the optimal points

Here are the basic steps to complete this example.

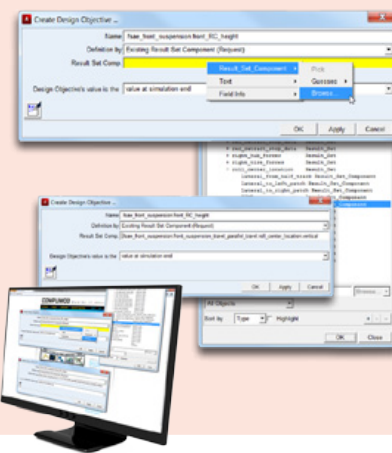
- 1 What we will do with the front suspension assembly is to determine what inboard upper control arm points will give us the following roll center heights that we want to test: 0, 25, 50, 75, 100, 125, 150, 175, 200, 225

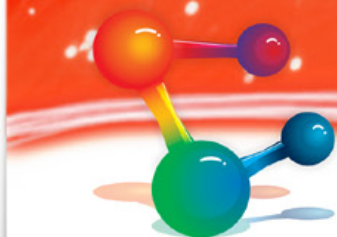


- 2 Simulate a parallel suspension travel as shown below



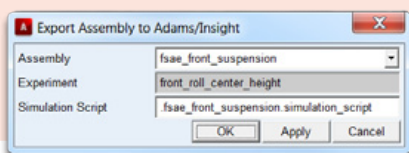
- 3 Create a design objective that will find the roll center height at the end of the simulation. Go to Simulate -> DOE Interface -> Design Objective -> New...4.



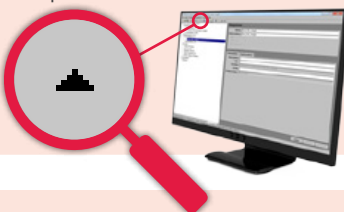


TIPS AND TRICKS! [CONTINUED]

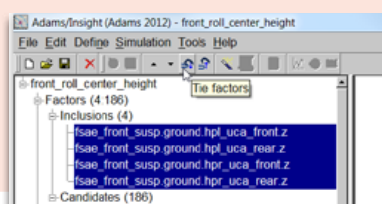
- 4 Export the simulation to Adams/Insight by clicking **Simulate -> DOE Interface -> Adams/Insight -> Export...** Fill the box out as follows.



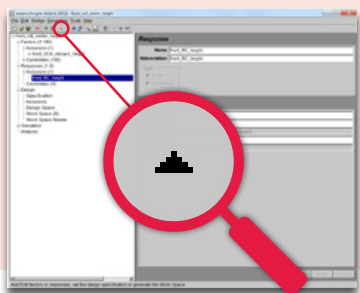
- 5 Promote all of the inboard upper control arm z hardpoints to factor inclusions from candidates by selecting each one and pressing the promote button.



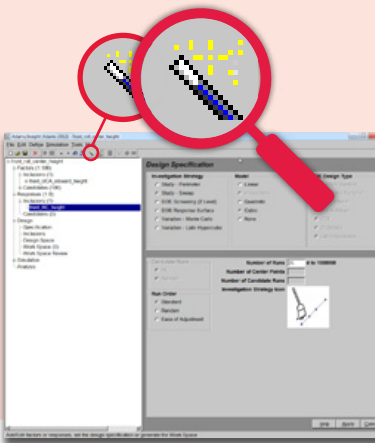
- 6 Highlight all of the points below and press the tie button to tie the hardpoints together.



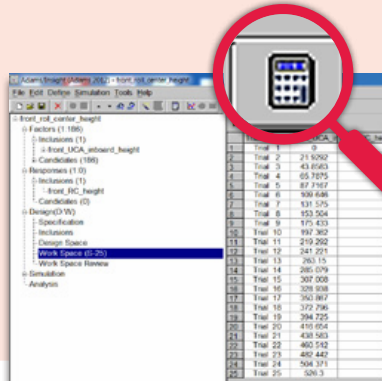
- 7 Promote the design objective, front_RC_height that we created earlier as an included response shown as below. Promote all of the inboard upper control arm z hardpoints to factor inclusions from candidates by selecting each one and pressing the promote button.



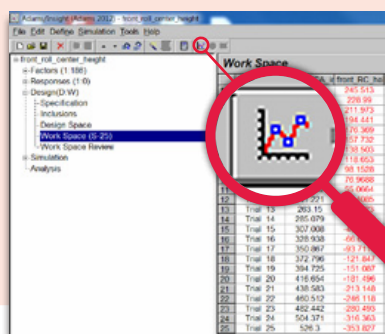
- 8 Set up the experiment by clicking the "Set Design Specification" button and filling out the page as shown below.



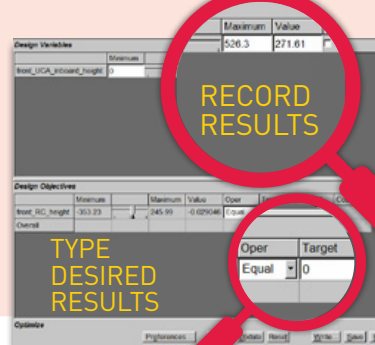
- 9 Run Adams/Insight as shown below.



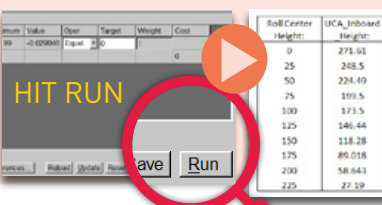
- 10 Fit results as shown below: Set up the experiment by clicking the "Set Design Specification" button and filling out the page as shown below



- 11 Use Adams/Insight to interpolate the UCA inboard height to give us each desired roll center through running Adams/Insight optimization



- 11 Hit Run for your optimised results



Recommendation

It is always good to go back and validate that the points the optimize tool puts out will yield the results you expect.

For more information, please contact us at info@compumod.com.au

