



Czech Technical University in Prague

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From PragTicA to FADO

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Workshop on Computational Fatigue Analysis 2008 & 2nd PragTic Users' Meeting

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4. PragTicA Project

(PragTic in Application)

- Applied to European Commission within FP7 scheme
- Consortium of companies and universities
 - Evektor, CZ (PragTic)
 - Brno University of Technology, CZ (MSC.Fatigue)
 - CDM IT ASCR, CZ
 - Centro Ricerche Fiat, IT
 - CTU in Prague, CZ (Fe-Safe)
 - Delft University of Technology, NL
 - Fatec Engineering, NL (fFatigue)
 - IPM ASCR, CZ
 - Materials Engineering Research Laboratory, GB
 - SKODA VYZKUM, CZ (FemFat)
 - Trinity College Dublin, IRL
 - University of Parma, IT
 - Vision Consulting Automotive, CZ (expected WinLife)

PragTicA Project

- Work areas
 - fatigue research accompanied by extensive experimental program
 - comparison of different fatigue post-processors of FE-solution
 - Joint PragTic development with focus on
 - notch effect
 - multiaxial loading
 - seam and spot welds
 - riveted joints
 - composites
- It seems that we are close to rejection at this moment

Why PragTicA?

Use of Commercial Systems

- Not including implemented standards, the software producers
 - do not present any more extensive verification of implemented methods
 - if they implement some method or standard, the potential deviation from it are not verified
- It is common, that the **producers disclaim any warranty** with losses caused by the use of their software
- How the end-users know **what they computed?**
- There is **no independent authority** that would **check** quality of different software solutions

Room for Verification Authority

I - Goals

- Bridging of the gap between research and commercial application should be verified
- Need for verification of
 - methods implemented in SW
 - the implementation ways themselves
 - new calculation methods where a great potential of commercial implementation exists

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II – Is there a gap? Researcher on the cliff

■ Researchers

- often test their method on a small group of experiments
- the support of the research group is usually focused on the design of the new criterion and proof of its usability
- the extent of the proof depends on the researcher and money invested
- once the method is said to be proved, the only impulse to continue in the verification is an attack started by some other researcher

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III – Is there a gap? SW producer on the cliff

- SW producers
 - are confronted with demand on implementation of certain calculation procedures.
 - either use some older method, where is a greater probability that it is known (~recognized !) by the end users.
 - or implement (design) some new method; if they do some further testing of the method's credibility, its results are scarcely public
 - the decision what to implement is made by a small group of people

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IV – The choice and what matters in it

- **Evolution Rule in Implementations:** Why to select older methods for implementations?
 - The originators are either dead (i.e. without doubts) or highly distinguished man, who taught a great number of engineers
 - Even some engineers could hear about such a method at the university
 - More researchers referred to such a method within all the years
 - The scope of the validation is often better
- **Example:** See the results of the Dang Van method in FatLim and compare it with its spread in solvers and research papers
- **Conclusion:** What matters in this process is publicity level and not the performance

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V - Warranty acquittance

Quiz

Who will be blamed if anything happens?

■ **Researcher:**

- Proposes a new criterion
- Proves its validity on data he has in hands
- His **only (vague) responsibility** is for these research results

■ **Solver developer:**

- Selects and implements the method
- I do not know about any case, where further testing was sponsored by such a company with publicly available results
- Decides to what extent to release publicly details of the implementation (so that the competitors would not steal his ideas)
- **Disclaims any responsibility** for the use of the software

■ **End user - engineer:**

- Gets a very expensive tool in his hands
- Due to high price is forced to use it to maximum
- Does not have time enough to get through all the theoretical basis or validation studies (if there are any available)
- **Would like to believe** that the previous two persons were responsible

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VI - Conclusion

- The fatigue solvers are very simple to use – it is not hard to generate a nice map of fatigue damage on some particular structural element
- Fatigue problems and solutions are still empiric
- Fatigue is a weak link mechanism
- There is often present
 - quite a big scatter of experimental results
 - important uncertainty as regards load levels and courses, materials, ...
- The Help sections and the documentation of quality of used methods are poor

Users can get quickly to complete results without adequate knowledge what they mean

- The end users of the commercial fatigue solvers are the only persons responsible for results they get from it

Are they aware of it?

Lets Start to Change It

FADO – Fatigue Analysis Documentation Office

- Even if **PragTicA** fails, why not to organize the development in another way?
- Consortium of companies and universities
 - Joint work can still produce adequate results for acceptable money, only the consortium has to get bigger.
- What can I offer:
 - Understanding to problems both in programming and fatigue analysis
 - PragTic with an access to its complete source code can be provided to any interested company
 - Conditions:
 - The code stays in the company and no its part is further distributed
 - Any derived application can be used only within the company or within the consortium
 - The company gets involved in the FADO project by any of the following ways

FADO - Fatigue Analysis Documentation Office

- Your potential involvement:
 - Experimental facility available
 - Material provision, specimens manufacturing
 - Collecting other experimental data
 - Financial support
 - Research work
 - Programming work
 - FEA models preparation
 - Fatigue analyses
- The output for your money
 - Direct influence on the next development of PragTic
 - Understanding its limits and the limits of other solvers
 - Possibility to use the core structure of PragTic for your own goals
 - Access to all the results gathered within the consortium
 - A consortium generates adequate financial sum from smaller partial deposits
- A dedicated website is currently being prepared (will be placed on www.pragtic.com/q_org.php)
- Still needs to get the right momentum and enough participants involved to start FADO