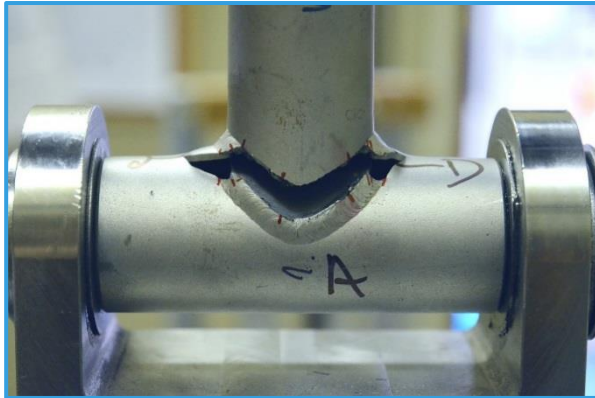**CZECH SOCIETY FOR MECHANICS**

UNDER AUSPICES OF

THE FME CTU IN PRAGUE

HOLDS

NOVEMBER 26 - 28, 2018

WORKSHOP ON COMPUTATIONAL FATIGUE ANALYSIS 2018
FKM GUIDELINE TRAINING

KARLOVO NÁMĚSTÍ 13
PRAGUE 2
CZECH REPUBLIC

WEBPAGE
www.pragtic.com/FKM.php
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(Jan Papuga)

During last two volumes of the WCFA workshop, we announced the plan to organize some of the next volumes on the topic of the FKM-Guideline "Analytical Strength Assessment". This guideline of the German provenience is designed with the aim to serve as a safe and sufficient approach to static and fatigue analyses of common engineering structures.

The guideline is built on a long tradition of German research and standardization. Its 6th edition was released in 2012 (the English version in 2013).

The name of Dr Roland Rennert from IMA Dresden can be found in the list of the FKM-Guideline authors (6th edition) on the first position. We are glad that he accepted our proposal to be the main lecturer during our workshop.

As usually in the case of WCFA workshops, we decided to start with a series of introductory lectures for the first day covered by Prof Milan Růžička, Dr Jan Papuga and Dr Josef Jurenka. This part serves as a quick start for those attendants, who have no or only very limited experience with fatigue prediction.

LOCATION
The meeting will be held at the building of the Czech Technical University in Prague on Karlovo náměstí (the same as in 2016 and 2017). It can be conveniently accessed by a subway, and one of its exits on Karlovo náměstí station is directly on the edge of this building. The lecture room No. 215 will host the workshop.

COURSE OPTIONS
No prior knowledge on fatigue analysis is needed. The basic principles of the common fatigue damage estimation are described in the first day, to help the complete freshmen to get on board. The content related to the FKM-Guideline is extensively discussed in next two days. To better suit needs of participants and to fit the course better to the level of their knowledge, several variants of the course are provided:

Mon Nov 26, 2018	**Introduction to Fatigue** (Růžička, Papuga, Jurenka)	V1			
Tue Nov 27, 2018	**Non-welded structures** (Rennert)		V3	V4	V5
Wen Nov 28, 2018	**Welded structures** (Rennert)	V2			

ROLAND RENNERT
Employed:
IMA Dresden, Germany (1995-...)
Academia: He studied technical mechanics and made his grade at the TU Dresden.
Focus: Analytical strength assessment, measurement data analysis, fatigue strength assessment based on measured strains, load assumptions and generation of test loads.
Other:
- **Long-term experience by ca. 160 industrial projects.**
- **Co-author of FKM-Guideline "Analytical strength assessment"**
- **Expert for German and European standardisation of railway vehicles.**
- **Leader or contributor of several national and European research projects, e.g.**
  o TRISYD (2004-2007),
  o SPEEDFAT (2006-2009),
  o Mat4Rail (since 2017, https://www.mat4rail.eu).

MILAN RŮŽIČKA

Employed: FME CTU in Prague (1983-.) Head of Dept. of Mechanics, Biomechanics and Mechatronics (2015-..)

Academia: He finished his Ph.D. thesis in 1984 at the FME CTU in Prague, habilitation 1999 (Doc.), 2005 (Prof.).

Prof. Růžička focuses on fatigue in notches, fatigue of welded structures, composite structures, fatigue in composites, use of optical fibres, structural health monitoring.

Other: Secretary of the Czech Society for Mechanics, program director of WCFA&PUM meetings.

JOSEF JURENKA

Employed: FME CTU in Prague (2008-), TechSim (2015-..)

Academia: Ph.D. thesis (2012) at the FME CTU in Prague.

Focus: Low- and High-cycle fatigue, Fatigue of welded structures, Fatigue crack propagation, Fracture mechanics.

LECTURES CONTENT

The complete program of the workshop is presented on the workshop website www.pragtic.com/FKM.php.

Nov 26: Introduction to Fatigue:

History of Fatigue; Materials and Loading Considerations; Stress-Life Based Fatigue; Strain-Life Based Fatigue; Factors Affecting Fatigue Life; Processing of Load Records; Fracture Mechanics and Crack Propagation; Brief Introduction to Fatigue Prediction in Welds; Multiaxial Fatigue; FE-Based Fatigue Analysis; Commercial Applications; Data Sources.

Nov 27: FKM-Guideline on Non-Welded Components:

- General introduction (Basics to stress formulations and strength assessment, basic philosophy, application range, formal structure of FKM-Guideline.)
- Static strength assessment (Assessment stresses: combined stresses; Material strength: static strength values from standards or from drawing, technological size factor, temperature factor; Component strength: section factor, Neuber's hyperbola and critical strain, plastic notch factor; Safety factors; Degree of utilisation; Example: Centre pin of a tram (static strength)
- Fatigue strength assessment for non-welded components (Assessment stresses: stress spectrum, proportional and non-proportional stresses; Material strength: fatigue strength factor; Component strength: design factor (Kt-Kf-ratio, surface roughness, …), mean stress factor and Haigh diagram; Cumulative damage approach: generalised S-N curves, Miner' rule with modifications and effective damage sum, inverse calculation of Miner's rule and derivation of variable amplitude factor, equivalent stress amplitude; Safety factors; Result of fatigue strength assessment: degree of utilisation; Example: Centre pin of a tram (fatigue strength)

Nov 28: FKM-Guideline on Welded Components:

- Assessment stresses for welded components (Coordinate system on weld line; Nominal stresses, structural stresses, effective notch stresses; Consideration of misalignment)
- Static strength assessment for welded components (Base material, heat affected zone and welding; Material strength: softening factor for aluminium; Component strength: weld factor for steel and aluminium; Safety factors and utilisation)

- Fatigue strength assessment for welded components (Component strength: FAT-class, FAT-factor, thickness factor; Residual stress factor + mean stress sensitivity; S-N curves for welded joints in different standards; Safety factors and utilisation; Academic example: butt weld with bore hole under variable amplitude load; Application example: T-Joint with countersink.
- Fatigue strength assessment based on measured stresses (Preparations: measurement values, sample rate, duration; Correction of measurement data; Combination of partial measurements; Rain-flow counting; Mean stress transformation; Application of equivalent stress amplitude)
- Fatigue strength assessment based on measured stresses (Hints to database and synthetic S-N-curves; Hints to experimental estimation of fatigue strength values: pearl line method, horizon method, stair case method)

ATTENDANCE FEE

The conference fee includes access to the lectures, printouts of the presentations, attendance certificate, meals during lunches plus drinks and meals during coffee breaks. The price of the accommodation is not included.

Members of the Czech Society for Mechanics pay 10% less from any of the prices mentioned hereafter.

The fee is set in several versions, which can be paid either in EUR or in CZK.

Var.	Days	Date	Regular rate	
			EUR	CZK
V1	1	Nov 26	105	2600
V2	2	Nov 27-28	440	11000
V3	1	Nov 27	285	7200
V4	2	Nov 26-27	330	8200
V5	3	Nov 26-28	500	12500

More details about the payment conditions can be found on the workshop website.

USED LANGUAGE

English language is the official language of the lectures.

JAN PAPUGA

Employed: FME CTU in Prague (2007-..); Evektor, spol. s r.o. (2006-..); Fatigue Analysis RI s.r.o. (2016-2017)

Academia: He finished his Ph.D. thesis in 2006 at the FME CTU in Prague.

Focus: Multiaxial fatigue, fatigue in notches, fatigue computation methods, validation of fatigue prediction methods, experimental fatigue data aggregation and manipulation

Other: Developer of PragTic fatigue freeware (www.pragtic.com), chairman of WCFA&PUM meetings, secretary of DTMA 2011 workshop, leader of the FADOFF project (Fatigue Analysis Documentation Office in 2011-2014, www.fadoff.cz).

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