



## TMF-Workshop 2019, BAM, Berlin

### Tentative Schedule / Programme

Chairman: Dr.-Ing. Hellmuth Klingelhöffer  
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Wednesday November 13, 2019

Time Start	Time End	Author(s)/Speaker	Affiliation(s)	Title
09:00	09:05	Klingelhöffer	BAM, chairman	Welcome and Opening
09:05	09:10	Portella	BAM, head of department 5 - Materials Engineering	Welcome to BAM
09:10	09:15	Stekovic	DevTMF	Introduction and aim of the project
<b>Session 1</b>		<b>Chairman:</b>		<b>Industrial TMF applications</b>
09:15	09:40	Meskine, Szmytka, Koster, Forre, Osmond, Remy	ENSTA, Mines, Paristech, PSA Group; France	Crack propagation analysis in automotive turbocharger under high temperature thermo-mechanical fatigue
09:40	10:05	Holdsworth, Hosseini	EMPA, Inspire Centre, Switzerland	The effect of temperature on TMF(HCF) crack initiation endurance
10:05	10:30	Riccus, Kringe, Artzt, Haubrich	DLR - Hardthausen, DLR - Cologne, Germany	Laser-based TMF panel tests: bridging the gap between uni-axial material tests and full-scale liquid rocket engine combustion chamber tests
10:30	10:55	Cammi, Casamassima	Ricerca sul Sistema Energetico, Milan, Italy	Material characterization and numerical simulation concerning flexible operation of thermoelectric power plants
10:55	11:30	Coffee break and poster session		
<b>Session 2</b>		<b>Chairman:</b>		<b>TMF crack growth</b>
11:30	11:55	Kraemer, Mueller, Kontermann, Oechsner, Schweizer	IWK, Darmstadt, Germany, Fraunhofer IWM, Freiburg, Germany	Influences of strain phasing, dwell times, and load ratio on TMF crack behaviour in Nickel cast alloys
11:55	12:20	Azees, Eriksson, Norman, Leidermark, Lindström, Simonsson	Linköping University, Sweden	A stress intensity factor solution for an SE(T) specimen
12:20	12:45	Azees, Eriksson, Norman, Leidermark, Moverare, Simonsson	Linköping University, Sweden	Thermomechanical fatigue crack growth in a steam turbine casing material
12:45	13:10	Schackert, Schweizer	Fraunhofer IWM, Freiburg, Germany	Fatigue life performance of IN100 as blade material for aero engines
13:10	14:00	Lunch break		

Session 2		Chairman:		TMF crack growth
14:00	14:25	Eckmann, Schweizer, Kraemer, Mueller, Kontermann, Oechner	Fraunhofer IWM, Freiburg, Germany IWM Darmstadt, Germany	Local microstructure effects and transferability to components of the TMF crack behaviour in Nickel cast alloys
14:25	14:50	Homs, Gustafsson, Simonsson, Eriksson, Leidermark	Linköping University, Siemens Industrial Turbomachinery, Sweden	Accounting for time-dependent effects on fatigue crack propagation in turbine blading materials under in-phase TMF loading conditions
14:50	15:15	Jones, Whittaker et al	Swansea Univ., UK, Nottingham Univ., UK, Rolls Royce, UK, Linköping Univ., Sweden	The effect of phase angle on crack growth mechanisms under thermo-mechanical fatigue loading
15:15	15:40	Norman, Stekovic, Leidermark, Engel, Rouse, Hyde, Grant	Linköping Univ., Sweden; Nottingham University, UK; Rolls Royce, UK	Crack initiation in notched coarse-grained RR1000 specimens subjected to in-phase thermo-mechanical fatigue
15:40	16:10	Coffee break and poster session		
Session 3		Chairman:		Advanced TMF testing
16:10	16:35	Lopez-Covaleda, Ghodrati, Kestens	Ghent University, Belgium, Delft University, The Netherlands	Semi in-situ observation of thermo-mechanical fatigue of compacted graphite iron
16:35	17:00	Klingelhöffer	BAM, Berlin, Germany	Temperature fluctuation at extensometers and its influence on strain error
17:00	17:25	McGaw, Kersey	McGaw Technology Inc, Ohio, USA, Pratt&Whitney, East Hartford, CT, USA	A Precision Statement for Strain-Controlled Thermo-Mechanical fatigue

Thursday, November 14, 2019				
Time Start	Time End	Author(s)/Speaker	Affiliation(s)	Title
Session 3		Chairman		Advanced TMF testing
09:00	09:25	Palmer, Jones, Dyer, Smith, Lancaster, Whittaker	Swansea University, UK	Experimental methodologies for thermo-mechanical fatigue testing
09:25	09:50	Stekovic, Whittaker, Hyde, Pattison, Norman, Jones, Engel, Grant, Leidermark, Lancaster, Rouse, Williams	Linköping University, Sweden, Swansea University, UK, Nottingham University, UK, Rolls Royce, UK	DevTMF - Code of Practice for thermo-mechanical fatigue crack growth
Panel discussion: TMF crack growth dissemination				
09:50	11:00	Whittaker, Jones, Stekovic, Norman, Hyde, Engel	A panel discussion that focuses on development of Code of Practice for experimental TMF crack growth test method and further activities towards standardisation of TMF CG. Its agenda is to review any previous standardisation activities, sharing of good assessment practice and discuss further activities and processes.	
11:00	11:30	Coffee break and poster show		

Session 4		Chairman		TMF simulation and modelling
11:30	11:55	Okazaki, Yonaguni	Nagaoka University of Technology, Japan	TMF crack growth promoted by superimposed high cycle thermal cycles in a directionally solidified Ni-base superalloy
11:55	12:20	Fischer, Schweizer	Fraunhofer IWM, Freiburg, Germany	Development of a lifetime model for TMF/HCF loading for cast aluminium alloys
12:20	12:45	Lindström, Ewest, Eriksson, Simonsson, Lundgren, Leidermark	Linköping Univ., Siemens Industrial Turbomachinery Finspang, Sweden	Prediction of thermomechanical fatigue crack initiation in an additively manufactured nickel-based superalloy
12:45	13:10	Abraham, Roth, Kuna	Technical University Bergakademie Freiberg, Germany	A cohesive zone model for thermomechanical fatigue
13:10	14:00	Lunch break		
Session 4		Chairman		TMF simulation and modelling
14:00	14:25	Guth, Lang	Karlsruhe Institute of Technology KIT, Karlsruhe, Germany	A thermo-mechanical fatigue lifetime prediction concept using two separate damage parameters for transgranular and intergranular damage
14:25	14:50	Igumnov, Volkov, Livitchuk, Dell'Isola	National Research Lobachevsky State University of Nizhny Novgorod, Russia	A model of damaged media for evaluating fatigue life of materials and structures under combined thermo-mechanical loading
14:50	15:15	Leidermark, Rouse, Engel, Hyde, Stekovic, Pattison	Linköping University, Sweden, Nottingham University, UK	Effect of scatter in material data on the thermomechanical fatigue life of a disc alloy
15:15	15:45	Coffee break and poster show		
Session 4		Chairman		TMF simulation and modelling
15:45	16:10	Rouse, Engel, Hyde, Pattison,	Nottingham University, UK, Rolls Royce, UK,	A visco-elasticity - visco-plasticity material model for superalloy applications
16:10	16:35	Engel, Rouse, Lavie, Leidermark, Stekovic, Hyde, Williams, Pattison, Grant, Whittaker, Jones, Norman	Nottingham University, UK; Linköping University, S; Rolls Royce, UK, Swansea University, UK	The prediction of crack initiation and propagation in coarse grain RR1000 using unified approaches
Buffet dinner				
18:00				
21:00				

Friday, November 15, 2019				
Time Start	Time End	Author(s)/Speaker	Affiliation(s)	Title
<b>Session 5</b>		<b>Chairman</b>	<b>TMF properties</b>	
09:00	09:25	Seisenbacher, Winter, Grün	University Leoben, Austria	Consideration of aging effects during TMF test on the stress-strain behaviour of an aluminium alloy
09:25	09:50	Kihlberg, Norman, Skoglund, Schmidt, Moverare	Linköping Univ., Scania CV AB, Volvo Group Trucks Technology, Sweden	Investigation of microstructure parameters and thermo-mechanical fatigue performance of pearlitic and ferritic compacted iron
09:50	10:15	Li, Zheng, Chen	School of Chemical Engineering and Technology, Tianjin Univ., China	Thermomechanical fatigue behaviour of a Nitrogen alloyed 316LN stainless steel
10:15	10:40	Sun, Yuan	Tsinghua University, Beijing, China	Thermal Gradient Mechanical Multiaxial Fatigue Assessment of a Nickel-based superalloy
10:40	11:10	Coffee break		
<b>Session 5</b>		<b>Chairman</b>	<b>TMF properties</b>	
11:10	11:35	Wagner, Mösenbacher, Eiber, Hoyer, Riva, Christ	IABG Ottobrunn, BMW München, Inst. F. Werkstofftechnik Siegen, Germany	Thermomechanical fatigue of lost foam cast cylinder heads - Experimental and computational studies on crack initiation
11:35	12:00	Zheng, Li, Chen	School of Chemical Engineering and Technology, Tianjin University, China	Thermomechanical ratcheting behaviour of a Nitrogen alloyed 316LN stainless steel
12:00	12:25	Jürgens, Sonntag, Nolze, Agudo Jacome, Roohbakshan, Fedelich, Olbricht, Skrotzki	Bundesanstalt für Materialforschung und -prüfung, Berlin, Germany	Cyclic mechanical performance and microstructure modification of 9-12 % Cr ferritic-martensitic steels under LCF and TMF conditions
12:25	12:35	Closing remarks		
12:40	13:30	Lunch break		
13:30	15:00	optional - to be determined Visit of BAM laboratories		
15:00	End of event			

Poster Session	Author(s)/Speaker	Affiliation(s)	Poster Session at coffee breaks Title
P1	Hartrott, Metzger, Rockehäuser, Skrotzki	Fraunhofer IWM, Freiburg, Germany, BAM Berlin, Germany	Assessment of EN AW-2618A for high temperature applications considering aging effects
P2	Igumnov, Gorokhov, Kapustin, Kazakov	National Research Lobachevsky State University of Nizhny Novgorod, Russia	Experimental and theoretical study of fatigue under high-temperature high cycle loading
P3	S. Stekovic, M. Whittaker, C. Hyde, D. Leidermark, J. Jones, B. Engel, Norman, R. Lancaster, J. Pattison and B. Grant	Linköping University, Sweden, Swansea University, UK, Nottingham University, UK, Rolls Royce, UK	Development of Experimental Techniques and Predictive Tools to Characterise Thermo-Mechanical Fatigue Behaviour and Damage Mechanisms of Nickel-Base Superalloy(s)