

## ECCC2014 3rd International ECCS Conference: 5-7th May 2014

Creep & Fracture in High Temperature Components

Design & Life Assessment

HOTEL BARCELO' Aran Mantegna Via Andrea Mantegna, 130 - 00147 Rome, Italy

### Sunday 4 May 2014

**17.00-20.00** Registration

### Monday 5 May

**8.00-12.00** Registration

**ECCC2014 Conference Opening: introduction and scope: P. Auerkari (conference and plenary session chairman)**

**8.40-8.50 Welcome by Centro Sviluppo Materiali: CEO Dr. Mauro Pontremoli**

**8.50-9.20 #14 The European Creep Collaborative Committee (ECCC) Revival – The Joint Industrial Programme (JIP); D. J. Allen, G. Merckling, M.W. Spindler, A. Di Gianfrancesco, J. Hald, M. Spiegel, W. Gamble, E. Zanin: ECCC**

**9.20-9.40 World Energy Council key notes: D'Ermo, Callera**

	AUDITORIUM	SPACE 4A
	<b>A1: Low &amp; High Chromium steels 1</b>	<b>B1: Superalloys for gas turbine 1</b>
	<b>Chairman: Merckling, Brett</b>	<b>Chairman: Gamble, Latourte</b>

9.40-10.00	#3 P91 microstructure atlas of ASME Grade 91 and life assessment tools	#13 ECCS Test Programme and Data Assessment on GTD111 Creep Rupture, Strain and Ductility
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10.00-10.20	#1 Effect of tungsten on creep behavior of 9%Cr martensitic steels with cobalt additives	#90 Compression creep properties of a single crystal nickel-based superalloy CMSX-4 at 1323K
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10.20-10.40	#116 Microstructural modelling of 11-12Cr steel under creep conditions	#22 Creep-Fatigue Interaction of an Equiaxed Ni based Superalloy: Cyclic-Hold Characterisation and Verification by TMF Benchmark Tests
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#### Coffee break 10.40-11.10

	AUDITORIUM	SPACE 4 A
	<b>A2: Low &amp; High Chromium steels 2</b>	<b>B2: Superalloys for gas turbine 2</b>
	<b>Chairman: Sawada, Allen</b>	<b>Chairman: Imano, Kuhn</b>

11.10-11.30	#111 The effect of high temperature processing on microstructural evolution during creep in high chromium creep resisting steels	#17 Damage evaluation based on EBSD method for a notched specimen made of Nickel-base directionally solidified superalloy under creep conditions
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11.30-11.50	#92 Microstructural Evolution Investigation of P92 Steel During Creep Test by TEM and EBSD	#31 Crack Growth Behavior and Micro Damage Accumulation Related to the Load Frequency Characteristic of Fracture Life for Directionally Solidified Ni-Base Superalloy CM247LC under Creep Fatigue Condition
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11.50-12.10	#96 Creep-fatigue behaviour assessment of P92 parent metal and welds	#114 Origin of microstructural evolution in nickel-based single crystal turbine blades after using in aircraft engines
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12.10-12.30	#75 Changes in Precipitate and Electrochemical Property of 12%Cr Ferritic Steels Due to Creep	#23 Small Punch Testing Technique for Creep Residual Life Evaluation on two Cast Ni based Superalloys
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#### Lunch 12.30-13.30

	AUDITORIUM	SPACE 4 A
	<b>A3: Low &amp; High Chromium steels 3</b>	<b>B3: Superalloys for steam power generation 1</b>
	<b>Chairman: Di Gianfrancesco, Abe</b>	<b>Chairman: Takeyama, Klenk</b>

13.30-13.50	#50 Creep life prediction of P91 steel from stress relaxation tests	#9 Development of age-hardenable superalloy INCONEL alloy 740H for advanced ultra supercritical service
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13.50-14.10	#49 Change of 0.2% proof stress during creep exposure and its effect on creep strength evaluation in high Cr ferritic steels	#10 Creep deformation by dislocation movement in Waspaloy
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14.30-14.50	#44 Evaluation of Long-term Creep Life of Creep Strength Enhanced Ferritic Steels by Multi-region Analysis of their Rupture Data	#79 Influence of Service Exposure on Mechanical Properties and Microstructure of HR6W
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14.50-15.10	#66 Microstructural evolution of a 10%Cr martensitic steel during creep at 650°C	#125 Creep Rupture Properties of Ni-base Superalloy USC141TM as Solution Treated for 700°C Class A-USC boiler
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15.10-15.30	#73 An assessment of creep rupture strength in 9 Cr steels based on the quantification of the effects of microstructural degradation	#77 Verification of practical applicability of 45Ni-23Cr-7W alloy to thick-walled component for A-USC boilers
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#### Coffee break 15.30-15.50

	AUDITORIUM	SPACE 4 A
	<b>A4: Low &amp; High Chromium steels 4</b>	<b>B4: Superalloys for steam power generation 2</b>
	<b>Chairman: Maruyama, Kaibyshev</b>	<b>Chairman: Dowson, Vacchieri</b>

15.50-16.10	#26 Modeling of creep deformation and creep life of Gr.91 and some ferritic steels	#69 ECCS assessment of creep rupture strength for the new nickel alloy Alloy 617B
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16.10-16.30	#16 Analysis of ECCS Creep Rupture Data on Grade 91 Steel – The Influence of Nickel	#38 Hardening of the Ni-base Alloy 617B during primary creep – Numerical simulation and experiments on a component test bench
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16.30-16.50	#81 The Effect of Hot Bending on Creep in Thick-Walled P92 Steel Pipes	#94 IN718: higher temperature application range for an old superalloy
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16.50-17.10	#88 : Microstructural factors related to creep-strength in modified 9Cr-1Mo steel	#129 Characterization of Creep-Fatigue Crack Growth Behavior of Transversely Isotropic Materials Using Ct-parameter
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17.10-17.30	#2 Structural integrity assessment of pipes for high temperature applications	
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#### SPACE 4C

**18.00-20.00 Poster session and cocktail**

	#32 A Study of Grain Boundary Design to Enhance Creep Properties of Ni-Based Superalloys	
	#62 The effect of phase stability on creep rupture life at 625°C and 150MPa for P92	#29 Experimental creep degradation curve from P92 grade steel by on site X-ray diffraction
	#101 Evaluation of the creep behaviour of a super duplex stainless steel for oil and gas applications	#35 Microstructure Evolution in a Low Carbon 9 pct Cr Martensitic Steel during Creep at 650°C under 100 Mpa
	#110 Effect of prior aging on the creep properties of 2XXX age-hardenable Al alloys	#67 The Characterisation of Creep Properties of Advanced Manufactured Components Through Small Punch Testing
	#124 Strain-induced precipitation behavior of TP347H	#91 Assessment of remaining lifetime of the boiler tube and correlation of the results
	#113 High temperature behaviour of a new nickel base superalloy for aeronautical single crystal blade applications	#30 Sensitivity of on site X-ray diffraction technology to detect creep phenomenon
	#21 Effect of Temperature and Cyclic Behaviour on Elasto-Plastic Behaviour of a Single Crystal Ni based Superalloy	#58: Microstructure investigation of post weld heat treatment for the high-temperature steel T24
	#144 Development of 9% chromium creep-resistant steels and their manufacturing for Russian projects of advanced thermal power plants' equipment	# 83 Reserach on the materials property of superheater for USC boiler
	#64 Computational design of martensitic creep resistant steels with stable precipitation strengthening and high solid solution strengthening	#98 Prediction of Thermal Cyclic Creep Behavior of Automotive Bumper Polymer components
<b>Tuesday 6 May</b>		
<b>8.00-12.00</b>	<b>Registration</b>	
	<b>AUDITORIUM</b>	<b>SPACE 4 A</b>
	<b>A5: High Chromium steels 5</b>	<b>B5: Austenitic &amp; Superalloys &amp; their welding</b>
	<b>Chairman: Kimura, Vodarek</b>	<b>Chairman: Uehara , Spindler</b>
8.30-9.00	<b>Introductory keynote 130 Investigations on the Behavior of Materials and Components under High Temperature Conditions Loading - Achievements and Needs</b> Andreas Klenk, Materialpruefungsanstalt Universität Stuttgart (MPA) Alfred Scholz, Institut für Werkstoffkunde, Technische Universität Darmstadt	<b>Introductory keynote #127 Creep of the Novel Austenitic Heat Resistant Steels Strengthened by Fe2Nb Laves Phase under Steam Condition;</b> M. Takeyama, T. Kimuraa, I.Tarigana, Y. Misosakua, N. Takata, M. Ueda, Tokyo Institute of Technology, Japan
9.00-9.20	#52 Modeling Creep Crack Growth In High Chromium Steels	#33 Weldability of HR6W for Advanced High Efficient Power Plant
9.20-9.40	#15 Analysis of ECCS Creep Rupture Strength and Ductility Data on Grade 92 and 91 Steels	#48 Effect of Stress-Relief Treatment on Microstructure and Mechanical Properties in Weld joints of Fe-23Cr-45Ni-7W alloy
9.40-10.00	#7 Uncertainty in Damage Assessment and Remaining Life Prediction of Engineering materials used in Power Plant and Petrochemical Industry:	#117 Application of stress relaxation testing and constant displacement rate testing to develop creep testing data for weldments and superalloys compared to conventional creep testing data
10.00-10.20	#119 Creep testing of Grade 92 notch samples	#107 Damage mechanism and failure behaviour of Ni-base welded joints at 700°C
10.20-10.40		#126 Spatially resolved creep deformation of a thick section stainless steel welded joint
<b>Coffee break 10.40-11.10</b>		
	<b>AUDITORIUM</b>	<b>SPACE 4 A</b>
	<b>A6: Rotor steels</b>	<b>B6: Austenitic steels 1</b>
	<b>Chairman: Masuyama, Auerkari</b>	<b>Chairman: Holmstrom, Hirata</b>
11.10-11.30	#63 Effect of geometry on the microstructural ageing of a 1CrMoNiV turbine rotor steel	<b>Key note # 142 Creep strength in austenitic stainless steels: Rolf Sandström</b> Royal Institute of Technology (KTH), Stockholm, Sweden
11.30-11.50	#57 Life assessment of Grade 91 components based on hardness and creep void density (HaVoC)	#47 Creep strength and microstructural evolution of Type 316L(N) stainless steel
11.50-12.10	#8 Creep Strength and Microstructural Change after Creep Exposure in Martensitic High Cr Steel Large Forgings for Steam Turbine Rotors	#51 Creep damage and metallurgical characterization of high alloyed reformer tubes after long service time
12.10-12.30	#95 Experience in manufacture and behaviours of high Chromium forged steels	#24 Nitrogen effect on creep properties of austenitic stainless steel
<b>Lunch 12.30-13.30</b>		
	<b>AUDITORIUM</b>	<b>SPACE 4 A</b>
	<b>A7: Welded joints 1</b>	<b>B7: Austenitic steels 2</b>
	<b>Chairman: Nonaka, Sorrentino</b>	<b>Chairman: Schwienheer, Whittaker</b>
13.30-13.50	#131 Evaluation of the state of damage of a Grade 91 header after long-term high temperature service	#103 Effect of elastic follow-up on the creep deformation of 316H austenitic stainless steel at 550°C
13.50-14.10	#11 Creep and damage investigation of advanced martensitic chromium steel weldments for high temperature application in thermal power plants	#122 The Degradation of Long-term Creep Strength and Microstructure Evolution in Super304H
		<b>B8: Modeling 1</b>
		<b>Chairman: Rantala; Servetto</b>
14.10-14.30	#25 Creep/Creep Dominant C-F Failure Initiation in Martensitic Steels Welds	<b>#145 ECCC Guidance for Creep Rupture Data Assessment - M W Spindler et al (ECCC)</b>
14.30-14.50	#112 Creep Damage Assessment System for Longitudinal Welded Joints of High Chromium Steels	#59 A comprehensive creep model based on the internal stress
14.50-15.10	#104 Microstructural Stability of P23/P91 Dissimilar Welds during Creep at 550°C	#89 The Capability of Traditional and Modern Creep Lifting Methods to Predict Long-Term Creep Properties
15.10-15.30	#137 Experience with the inspection/ quality check and management of aberrant P91 and its welds in power plants	#106 Creep rupture determination based on creep deformation

15.30-15.50		#4 Evaluation of Extrapolation Methods for Creep and Creep Rupture Data
16.30-19.00	<b>Guided Visit to Roman Sites: Colosseum, Palatino, Roman Forum and Campidoglio Hill. Departure is scheduled by buses at 16.30 from HOTEL BARCELO' Aran Mantegna Via Andrea Mantegna, 130 - 00147 Rome, Italy</b>	
19.00-20.00	<b>Tour by bus in the Old Appian Way: the most romantic street of the world</b> <a href="http://en.wikipedia.org/wiki/Appian_Way">http://en.wikipedia.org/wiki/Appian_Way</a> ; <a href="http://www.aviewoncities.com/rome/viaappia.htm">http://www.aviewoncities.com/rome/viaappia.htm</a> <a href="http://www.frommers.com/destinations/rome/705644">http://www.frommers.com/destinations/rome/705644</a>	
20.00-24.00	<b>Social dinner at Restaurant l'Archeologia, <a href="http://www.larcheologia.it">www.larcheologia.it</a> - After dinner, buses will return the participants to the Hotel Barcelò</b>	

**Wednesday 7 May**

8.00-12.00	<b>Registration</b>	
	AUDITORIUM	SPACE 4A
	<b>A8: Welded joints 2</b>	<b>B9: Modeling 2</b>
	<b>Chairman: Sandstrom, Mayr</b>	<b>Chairman: Bonora, Zuzek</b>
8.30-9.00	<b>Introductory keynote #118 EPRI research in support of the construction and successful operation of advanced plant . Jonathan Parker EPRI USA</b>	<b>Introductory keynote #133 A Review of the LICON Methodology for Predicting; E. Hosseini, S.R. Holdsworth: EMPA, E. Mazza Swiss Federal Institute for Materials Science and Technology,</b>
9.00-9.20	#128 X10CrWMoVNb9-2 (Grade 92) Martensitic Steel: Welded joints between piping and fittings for high pressure and temperature service.	#123 Electron backscatter diffraction (EBSD) measurement of accumulated strain
9.20-9.40	#46 Effect of the Stress Multi-Axiality on the Creep Damage in Fine Grained HAZ of Mod. 9Cr-1Mo Steels	#102 Preventing failures in high temperature pressure components: the role of technical standards.
9.40-10.00	#39 The Effect of Welding Procedural Variables on the Cross-Weld Performance of Grade 92 Pipe Steel	#97 Influence of size and distribution of carbide particles on activation energy for creep deformation
10.00-10.20	#71 Negligible creep of P91 steel	#60 Modeling creep response of high temperature steels under multiaxial state of stress
	<b>Coffee break 10.20-10.50</b>	
	AUDITORIUM	SPACE 4 A
	<b>A9: Welded joints 3</b>	<b>B10: Modeling 3</b>
	<b>Chairman: Parker, Rothwell</b>	<b>Chairman: Tonti; Huysman</b>
10.50-11.10	#78 Microstructure and property assesment of creep aged 12Cr steel after welding	#61 Creep performance of steels for challenging applications
11.10-11.30	#108 Numerical Simulation of Deformation and Damage in Martensitic Welds	#99 Methods to Assess and Compare Low Cycle Fatigue Model Performances
11.30-11.50	#132 Creep failure of a P91 simulated heat affected zone material under multiaxial states of stress	#87 Safe structural design for fatigue and creep using cyclic yield strength
11.50-12.10	#36 Proposal of Creep Residual life Prediction Procedure for Mod.9Cr-1Mo Steel based on Omega Method	#72 Long term stress relaxation modelling
12.10-12.30	#40 Creep strength behavior of Boron added P91 steel and its weld in the temperature range of 600-650°	#80 The FEM analysis of creep damage development considering the anisotropy of crystal grain
	<b>Lunch 12.30-13.30</b>	
	AUDITORIUM	SPACE 4A
	<b>A10: Special testing &amp; modeling 1</b>	<b>B11: Nonferrous alloys 1</b>
	<b>Chairman: Naumenko , Gonzalez</b>	<b>Chairman: Hurst, Gorash</b>
13.30-13.50	#70 The Application of Small Scale Sampling and Impression Creep Testing to Power Plant	#82 A 'cold creep' model for time dependent deformation and damage at low temperatures in Ti-6Al-4V
13.50-14.10	#76 Evaluation of miniature creep testing technique for remaining life assessment of power generation components	#120 Oxidation effect on the creep behavior of thin samples of titanium alloy at 600°C
14.10-14.30	#100 Small Ring Testing of High Temperature Materials	#27 Creep curve behaviour of TiAl-8Ta intermetallic alloy
14.30-14.50	#43 Size effects in miniature specimen creep testing of P91	#42 Creep performance of OFP copper for the final repository canister
14.50-15.10	#54 Creep assessment on a 14Cr ODS steel	#45 Modelling the anisotropic creep behaviour of an Al-Cu-Mg-Si alloy
15.10-15.30	#68 Small Punch Creep Testing of Next Generation TiAl alloys	#53 E-AlMgSi Wire and Full-Scale Conductor Testing for Improving Electricity Transmission
	<b>Coffee break 15.30-15.50</b>	
	AUDITORIUM	SPACE 4 A
	<b>A11: Special testing &amp; modeling 2</b>	<b>B12: Nonferrous alloys 2</b>
	<b>Chairman: Yoon, Shibli</b>	<b>Chairman: Viguier, Smith</b>
15.50-16.10	#37 Robust approaches for the assessment of stress concentration in the creep range	#56 Requirements and application of notched bar creep testing for assessing multi-axial creep behaviour of OFP copper
16.10-16.30	#55 Microstructure evolution and creep properties of High Performance Ferritic (HiPerFer) steels at 600, and 650 °C	
16.30-16.50	#28 The lattice anisotropic model of creep phenomenon	

17.00-17.30 End of conference by Pertti Auerkari