European Conference on Heat Treatment 2011 „Quality in Heat Treatment“
organised by: ASMET, A3TS, AIM, ASTT/SVW, ATZK, AWT, VWT

23–25 March 2011, Wels, Austria

&

3rd Int. Conference on “Heat Treatment and Surface Engineering of Tools and Dies”
organised by: ASMET, CSHTSE, SSHT
with support of IFHTSE

www.asmet.at
Organisation & Contact


Contact and Information

Adresse: ASMET - The Austrian Society for Metallurgy and Materials University of Leoben Franz-Josef-Straße 18 A-8700 Leoben
Telephone: 0043 3842 45189
Fax: 0043 3842 402 2202
Homepage: www.asmet.at
E-Mail: yvonne.dworak@asmet.at

Conference Team:

Dr. Heimo Jäger
Assistant Yvonne Dworak

Prof. Reinhold Schneider
European Conference on Heat Treatment 2011
„Quality in Heat Treatment“

International Advisory Committee
S. Hock, Germany
J. Läderach, Switzerland
R. Moulin, France
D. Petta, Italy
P. Stolar, Czech Republic
B. Vanderviele, Belgium

Scientific Program Committee
H. Algera, Austria
D. Brandstätter, Austria
W. Hahn, Austria
H. Klümper-Westkamp, Germany
J. Lüdtke, Liechtenstein
P. Margraf, Switzerland
G. Nemeth, Austria
S. Rufer, Switzerland
R. Schneider, Austria
P. Stolar, Czech Republic
B. Vandewiele, Belgium
H. Veltrop, Netherland
A. Viola, France

3rd International Conference on
„Heat Treatment and Surface Engineering of Tools and Dies“

Conference Chairman
H. Jäger, Austria
V. Leskovsek, Slovenia
B. Smoljan, Croatia

International Advisory Committee
B. Birch, UK
L. Canale, Brasil
D. Doyle, Australia
K. Funatani, Japan
M. Grech, Malta
P. Jacquot, France
Z. Kolozsvary, Romania
P. Stratton, UK
G. Totten, USA
R. Wood, UK
K. Xu, China
Y. Xu, China
H.W. Zoch, Germany

Scientific Program Committee
K. Arimoto, Japan
F. Cajner, Croatia
H. Danning, Austria
T. Filetin, Croatia
M. Jenko, Slovenia
H. Jesperson, Sweden
H. Leitner, Austria
B. Matijevic, Croatia
R. Mesquita, Brasil
Ch. Mitterer, Austria
P. Panjan, Slovenia
M. Pellizzari, Italy
B. Podgornik, Slovenia
R. Schneider, Austria
I. Schruff, Germany
W. Schützenhöfer, Austria
M. Stupniksek, Croatia
B. Sustarsic, Slovenia
W. Theisen, Germany
G. VanderVoort, USA
W. Waldhauser, Austria
R. Zenker, Germany

Upper Austria University of Applied Sciences
The conference will be held at the Upper Austria University of Applied Sciences in Wels, which has a strong focus on engineering and environmental sciences.

Wels
Experience the charm of Wels and its surrounding area. This historic city is situated in the heart of Upper Austria, between Vienna and Salzburg.

Conference Dinner
The Conference Dinner will take place in the nave of the „Minoriten - Abbey“ of Wels which offers a remarkable scope for the conference dinner.
Accompanying Program

The accompanying program will be announced in January 2011.

Excursion

There are two excursions planned on Friday, 13.00 - 15.30.

You can decide between:

Rübig GesmbH & Co KG

&

EBNER Industrieofenbau Ges.m.b.H.

If you are interested in one of those please let me know:

yvonne.dworak@asmet.at

Sponsoring

Gold Sponsor

Silver Sponsor

Bronze Sponsors
This Conference is a combination of the European Conference on Heat Treatment 2011 „Quality in Heat Treatment“ and the 3rd Int. Conference on „Heat Treatment and Surface Engineering of Tools and Dies“. The Conference will bring together managers and engineers from heat treatment shops, tool makers and users, suppliers of heat treatment and surface engineering plant and equipment, as well as materials scientists.

Main Topics:

**European Conference on Heat Treatment**
- Advanced equipment for high quality heat treatment processes
- Measurement techniques, sensors and process control for heat treatment processes
- Quality management and quality control in heat treatment
- Heat treatment and material properties of high quality materials
- Prediction of heat treatment processes by physical and numerical simulation
- Analysis of the influencing factors on heat treatment processes

**3rd Int. Conference on „Heat Treatment and Surface Engineering of Tools and Dies“**
- Heat treatment processes for tools and dies
- Material process selection for tooling
- Physical metallurgy for the heat treatment of tooling materials
- Advanced surface engineering for tooling applications
- Physical and numerical process simulation for the heat treatment of tools and dies
- Heat treatment response in the context of properties and microstructures of new toolin materials
- Advanced equipment for the heat treatment and surface engineering of tools and dies

**Conference Language**
The conference will be held in English

---

**Thursday, March 24**

**Best Paper Award**

In the course of the „Conference Dinner“, the „Best Paper Award“, sponsored by

Böhler Edelstahl GmbH & Co KG, will be awarded.
**Oral Sessions, Keynote Lecture**

**Seminar, 9.00 - 11.45, Room A, 23.3.2011**
George VanderVoort, Consultant Struers Inc., USA
“Metallography of tool steels”

**Opening Ceremony.**
13.00 - 13.30, Room A, 23.3.2011

**Keynote Lecture, 13.35 - 14.25, Room B, 23.3.2011**
Dr. Kiyoshi Funatani, IMST Institute, Japan
„ISO, TQC and real heat treatment to fabricate quality products“

**Closing.**
12.00 - 12.10, Room A, 25.3.2011
### IFHTSE 
**Room A**

#### Cryo - Treatment
13.35 - 15.15

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
</table>
| 13.35 | Cold treatment of tool steel  
P. Stratton  
Matscribe UK, United Kingdom |
| 14.00 | Influence of different deep cryogenic treatment routes on the properties of high speed steel  
M. Pellizzari¹, D. Caliskanoglu², A. Fernández³, J.I. Barbero⁴, B. Pena⁵, T. Uemiti⁶, R. Pizzaro⁷, R. Elvira⁸, L.A. Alava⁹  
¹University of Trento, Italy  
²Böhler Edelstahl GmbH & Co KG, Austria  
³AIMEN, Spain  
⁴Fundacion Labein, Spain  
⁵BFI, Germany  
⁶BSIDENOR, Spain  
⁷CRYOBEST, Spain |
| 14.25 | Influence of deep cryogenic treatment on wear behavior of P/M S390MC high speed steel  
V. Leskovšek, M. Jenko, B. Podgornik  
Institute of Metals and Technology Ljubljana, Slovenia |
| 14.50 | Integration of the “sub zero” treatment in vacuum hardening processes and subsequent advantages  
B. Zieger  
Schmetz GmbH, Germany |

### EURO HT 
**Room B**

#### Fundamental quality aspects in heat treatment
13.35 - 15.15

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
</table>
| 13.35 | Keynote  
ISO, TQC and real heat treatment to fabricate quality products  
K. Funatani  
IMST Institute, Japan |
| 14.25 | Necessary information for a successful heat treatment  
D. Klein, V. Ermert, A. Horsch, R. Kohlmann, R. Mahlig, B. Rentrop  
IWT Bremen, Germany |
| 14.50 | Process audits in heat treatment shops as possibilities of a systematic process improvement  
P. Sommer  
Dr. Sommer Werkstofftechnik GmbH, Germany |
Wednesday, 23 March

**EURO HT**

**Room B**

**Nitriding**

15.45 - 17.25

15.45  Improving quality and cost savings for the TUFFTRIDE® process
J. Boßlet
Durferrit GmbH, Germany

16.10  The world trends in nitriding R&D and new activation control of low temperature salt bath nitriding process
K. Funatani
IMST Institute, Japan

16.35  Effect of surface cleaning on heat treatment results
B. Haase
Hochschule Bremerhaven, Germany

17.00  Ammonia flow and atmosphere control for gaseous nitriding processes
C. Huber1, S. Bockel-Macal1, L. Coudurier1, O. Fontana2
1Air Liquide GmbH, Austria
2MULTIGAS, Austria

18.00  WELCOME RECEPTION

**IFHTSE**

**Room A**

**Simulation and physical metallurgy**

15.45 - 17.25

15.45  Simulation of the deformation and residual stress evaluation during tempering of a hot work tool steel
A. Eser1, A. Bezold1, C. Broeckmann1, K. Bambauer2, W. Theisen1
C. Simsir3
1RWTH Aachen University, Germany
2Ruhr University Bochum, Germany
3Atilim University, Turkey

16.10  Prediction of mechanical properties of quenched and tempered steel die
B. Smoljan, D. Iljičić, N. Tomašić
Faculty of Engineering, University of Rijeka, Croatia

16.35  Analysis of the cooling conditions during heat treatment of die casting dies by use of FEM simulation
S. Zinner, I. Siller, G. Jesner
Böhler Edelstahl GmbH & Co KG, Austria

17.00  Prediction of properties of gas-quenched work pieces based on the modified hardenability test
D. Landek1, T. Filetin1, B. Liščić1, I. Kumić1, T. Lübben2
1Faculty of Mechanical Engineering and Naval Architecture, Croatia
2Collaborative Research Centre “Distortion Engineering”, Germany

18.00  WELCOME RECEPTION
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00</td>
<td><strong>Surface engineering</strong>&lt;br&gt;9.00 - 10.15</td>
<td>I.G. Claus&lt;br&gt;SIRRIS Technologypark, Belgium</td>
</tr>
<tr>
<td>9.25</td>
<td><strong>Duplex and triplex surface treatment of steels used for forming and injection moulding tools</strong>&lt;br&gt;9.25&lt;br&gt;R. Zenker, G. Grumbt, H.-J. Spies, A. Jung&lt;br&gt;1TU Bergakademie Freiberg, Germany, 2Zenker Consult Germany</td>
<td>R. Zenker, G. Grumbt, H.-J. Spies, A. Jung&lt;br&gt;1TU Bergakademie Freiberg, Germany, 2Zenker Consult Germany</td>
</tr>
<tr>
<td>9.50</td>
<td><strong>Laser cladding vs. laser alloying - a comparative study</strong>&lt;br&gt;9.50&lt;br&gt;R. Görgl, E. Brandstätter&lt;br&gt;Joanneum Research Foruschungsgesellschaft mbH, Austria</td>
<td>R. Görgl, E. Brandstätter&lt;br&gt;Joanneum Research Foruschungsgesellschaft mbH, Austria</td>
</tr>
<tr>
<td>9.00</td>
<td><strong>Fundamental quality aspects in heat treatment</strong>&lt;br&gt;9.00 - 10.15</td>
<td>G. Unger, H. Steck-Winter&lt;br&gt;Aichelin Ges.m.b.H., Austria</td>
</tr>
<tr>
<td>9.25</td>
<td><strong>Global database of cooling intensities of liquid quenchants</strong>&lt;br&gt;9.25&lt;br&gt;B. Liščić, T. Filetin&lt;br&gt;University of Zagreb, Croatia</td>
<td>B. Liščić, T. Filetin&lt;br&gt;University of Zagreb, Croatia</td>
</tr>
<tr>
<td>9.50</td>
<td><strong>The influence of aditives in quenching oils on the colling rate</strong>&lt;br&gt;9.50&lt;br&gt;L. Pedišić, B. Matijević&lt;br&gt;1MAZIVA-ZAGREB d.o.o., Croatia, 2University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Croatia</td>
<td>L. Pedišić, B. Matijević&lt;br&gt;1MAZIVA-ZAGREB d.o.o., Croatia, 2University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Croatia</td>
</tr>
<tr>
<td>9.50</td>
<td><strong>Thermal processing systems for automotive suppliers - requirements for CQI-9 compliant automation</strong>&lt;br&gt;9.50&lt;br&gt;G. Unger, H. Steck-Winter&lt;br&gt;Aichelin Ges.m.b.H., Austria</td>
<td>G. Unger, H. Steck-Winter&lt;br&gt;Aichelin Ges.m.b.H., Austria</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
<td>Title</td>
</tr>
<tr>
<td>-------</td>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>10.45</td>
<td>Testing</td>
<td>Reduction of residual stress in cylinder heads - measurement and simulation of residual stress and practical solutions</td>
</tr>
<tr>
<td>10.45</td>
<td>Surface engineering</td>
<td>TiAlN/a-CN coating for protection of metal compaction tools</td>
</tr>
<tr>
<td>11.10</td>
<td>Surface engineering</td>
<td>Improvement of wear and corrosion resistance of nitrided and post-oxidized steels by additional DLC-coating</td>
</tr>
<tr>
<td>11.35</td>
<td>Surface engineering</td>
<td>A comparative study on Ti1-xAlxN coatings reactively sputtered from homogeneous and from mosaic targets</td>
</tr>
<tr>
<td>12.00</td>
<td>Surface engineering</td>
<td>The low temperature aluminizing kinetic of hot work tool steel</td>
</tr>
<tr>
<td>10.45</td>
<td>Testing</td>
<td>Examination of the load-hardness problem in microhardness testing</td>
</tr>
<tr>
<td>11.10</td>
<td>Testing</td>
<td>Sensor application in heat treatment processes for enhancement of the process capability</td>
</tr>
<tr>
<td>12.00</td>
<td>Testing</td>
<td>Automatic vickers case depth measurement</td>
</tr>
</tbody>
</table>
### Surface engineering

**14.00 - 15.15**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.00</td>
<td>Improvement of die life with surface texture control and solid lubricant</td>
<td>O. Furukimi, M. Aramaki, N. Yamada, Kyushu University, Japan</td>
</tr>
<tr>
<td>14.25</td>
<td>Fatigue behaviour of hard coatings in lubricated tribological contacts for forming applications</td>
<td>C. Peuker, A. Tomala, E. Badisch, AC²T research GmbH, Austria</td>
</tr>
<tr>
<td>14.50</td>
<td>Effect of surface topography on galling resistance of tool steel</td>
<td>B. Podgornik, J. Jerina, J. Vižintin, University of Ljubljana, Slovenia</td>
</tr>
</tbody>
</table>

### New materials and manufacturing routes

**14.00 - 15.15**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.00</td>
<td>The creation and technologies of strengthening of new multifunctional economical (nickel free) metastable alloys which self-organizing at exploitation</td>
<td>O. Cheiliakh, Y. Cheiliakh, V. Voloshyn, O. Lyuby, I. Kolodyazhna, Priazovskiy State Technical University, Ukraine</td>
</tr>
<tr>
<td>14.25</td>
<td>Heat and surface treatment of nitinol - the alloy used for medical implants</td>
<td>D. Vojtech, Institute of Chemical Technology Prague, Czech Republic</td>
</tr>
<tr>
<td>14.50</td>
<td>Integration of high deformation by cross rolling into the thermo-mechanical treatment process</td>
<td>A. Borowikow, GMT mbH, Germany</td>
</tr>
</tbody>
</table>
### Thursday, 24 March

#### IFHTSE  
**Room A**

**Surface engineering**  
15.45 - 17.25

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.45</td>
<td>Plasox® extended - economical fabrication of DLC coatings for heavy machine industry</td>
<td>A. Gebeshuber¹, T. Müller¹, C. Lugmair¹, R. Kullmer¹, D. Heim², C. Forsich², ¹Rübig GmbH &amp; Co KG Wels, Austria ²University of Applied Sciences Wels, Austria</td>
</tr>
<tr>
<td>16.10</td>
<td>Hot friction and wear behaviour of plasma nitrided and low pressure carburized hot work tool steel for aluminium extrusion dies</td>
<td>M. Pellizzari¹, I. Siller² ¹University of Trento, Italy ²Böhler Edelstahl GmbH &amp; Co KG, Austria</td>
</tr>
<tr>
<td>16.35</td>
<td>Effect of heat treatment on tribological properties of PM S390 high-speed steel</td>
<td>F. Cajner¹, S. Solić¹, I. Kumić¹, V. Leskovšek² ¹Faculty of Mechanical Engineering and Naval Architecture, Croatia ²Institute of Metals and Technology Ljubljana, Slovenia</td>
</tr>
<tr>
<td>17.00</td>
<td>Nitriding and related processes for tools and dies - applications and quality aspects</td>
<td>G. Walkowiak Bodycote Wärmebehandlung GmbH, Germany</td>
</tr>
</tbody>
</table>

#### EURO HT  
**Room B**

**Hardening technologies**  
15.45 - 17.25

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.45</td>
<td>Process step reduction in induction hardening by online frequency adaption</td>
<td>A. Ulferts, F. Andrä HWG Inductoheat GmbH, Germany</td>
</tr>
<tr>
<td>16.10</td>
<td>Investigating the effect of induction parameters for optimizing the heat treatment of 4620 AISI steel in steering wheel pinion</td>
<td>E. Jajarmi¹, O. Fakhraei², M. Salman Khaksar² ¹Iran University of Science and Technology, School of Materials Engineering and Metallurgy, Iran ²School of Metallurgy and Materials Engineering, University of Tehran, Iran</td>
</tr>
<tr>
<td>16.35</td>
<td>Load-carrying capacity prediction of different plasma nitrided and case hardened specimens under rolling contact loading</td>
<td>A. Trausmuth¹, I. Góðór¹, W. Eichelseder¹, M. Lengauer² ¹FH Joanneum Graz GmbH, Austria</td>
</tr>
<tr>
<td>17.00</td>
<td>Investigation on replacement probability in the heat-treatment cycles used for surface hardening of automotive oil-pump shafts</td>
<td>O. Fakhraei¹, E. Mirtaheri¹, M. Emamy¹, E. Jajarmi² ¹School of Metallurgy and Materials Engineering, University of Tehran, Iran ²University of Science and Technology, Iran</td>
</tr>
<tr>
<td>18.00</td>
<td>Conference Dinner</td>
<td></td>
</tr>
<tr>
<td>19.00</td>
<td>Conference Dinner</td>
<td></td>
</tr>
</tbody>
</table>
### Heat treatment
9.00 - 10.15

**9.00**
**Effect of the heating rate in the tempering of steel grade EN 100 V1**  
F. Cajner, D. Landek, H. Rafel, S. Kovačić  
Faculty of Mechanical Engineering and Naval Architecture, Croatia

**9.25**
**Effects of heat treatment on microstructure and properties of 18st%Cr-6.7wt%Mo cast iron**  
A. Wiengmoon¹, J.T.H. Pearce², T. Chairuangsrí³  
¹Naresuan University, Faculty of Science, Thailand  
²National Metals & Materials Technology Centre, Thailand  
³Chiang Mai University, Faculty of Sciences, Thailand

**9.50**
**Properties of an 80%H13-20%M3:2 PM tool steel by spark plasma sintering**  
A. Fedrizzi, M. Pellizzari  
University of Trento, Dep. of Materials Engineering and Industrial Technologies, Italy

### Hardening technologies
9.00 - 10.15

**9.00**
**Multi-purpose LPC+LPN+HPGQ 25 bar N2/He vacuum furnaces**  
Maciej Korecki, Józef Olejnik  
Seco/Warwick S.A.

**9.25**
**Sinter Hardening - a special heat treatment for powder metallurgy precision parts**  
M. Dlapka¹, H. Danninger¹, C. Gierl¹, B. Lindqvist²  
¹Vienna University of Technology, Austria  
²Höganäs AB, Sweden

**9.50**
**Low pressure carburization of chromium containing sintered steels for gear applications**  
C. Gierl¹, H. Danninger¹, M. Dlapka¹, H. Altena², G. Stetina³, P. Orth¹  
¹Vienna University of Technology, Austria  
²Aichelin Ges.m.b.H., Austria  
³MIBA Sinter, Austria
Heat treatment 10.45 - 11.35

10.45
Light weight in the automotive industry - a challenge for the tool steel industry
I. Schruff, T. Greeb
Kind & Co., Edelstahlwerk, KG, Germany

11.10
Size matters - heat treatment of hot work tool steel
V. Strobl¹, N. Dickinger¹, R. Schneider²
¹Rübig Wärmebehandlung GmbH & Co KG, Austria
²Upper Austrian University of Applied Sciences Wels, Austria

Surface engineering 11.35 - 12.00

11.35
Combination of deep cryogenic treatment with nitriding or oxynitriding of HS6-5-2 high speed steel
A. Ciski, A. Nakonieczny, T. Babul
Institute of Precision Mechanics Warsaw, Poland

Hardening technologies 10.45 - 12.00

10.45
Low distortion case hardening of transmission components and quality control in serial production
V. Heuer, D. Bolton, K. Löser
ALD Vacuum Technologies GmbH, Germany

11.10
Heat Treatment installations for wheels (tyres/rings) in a car bottom pusher-type furnace
E. Tschapowetz
Andritz MAERZ GmbH, Germany

11.35
Steel strip hardening and tempering lines
P. Seemann
Ebner Industriefenbau Ges.m.b.H., Austria
IFHTSE

Fourier analysis of die surface texture for improvement of die life  
N. Yamada, O. Furukimi,  
Kyushu University, Japan

EURO HT

Effect of artificial ageing heat treatment on microstructure and mechanical properties of cast aluminium alloy A319  
A. Wiengmoon¹, P. Apichai¹, J. Kajornchiyakul¹, J.T.H. Pearce²  
¹Faculty of Science, Naresuan University, Thailand  
²National Metals & Materials Technology Centre, Thailand

Non-destructive structure test as heat treatment shop supervision for quality control  
G. Dinold  
NDT - Consult, Austria