New Developments in Forging Technology

Neuere Entwicklungen in der Massivumformung (NEMU)

2019

Published by
Mathias Liewald

INSTITUTE FOR METAL FORMING TECHNOLOGY
OF THE UNIVERSITY OF STUTTGART
IMPRINT

Publisher:
Institute for Metal Forming Technology
Univ.-Prof. Dr.-Ing. Dr. h. c. Mathias Liewald MBA
Holzgartenstr. 17
70174 Stuttgart
Deutschland

Editing:
Institute for Metal Forming Technology
Laura Schomer, M.Eng.
laura.schomer@ifu.uni-stuttgart.de
Holzgartenstr. 17
70174 Stuttgart
Deutschland

Conference Proceedings of the
International Conference on “New Developments in Forging Technology”
in Stuttgart – Germany, held on May, 14th and 15th, 2019.
Conference Chairman: Univ.-Prof. Dr.-Ing. Dr. h. c. Mathias Liewald MBA
Director of the Institute for Metal Forming Technology (IFU) of the University of
Stuttgart, in cooperation with:
Forschungsgesellschaft Umformtechnik mbH (FGU, Stuttgart / Germany)

All contributions included in this conference proceeding are published as written by
indicated authors. Contents and orthography of contribution belong into scope of responsi-
bility of respective author / authors.

ISBN 978-3-947085-02-6
Preface

The International Conference “New Developments in Forging Technology” in Stuttgart / Germany is organized every second year alternating with the International Conference “New Developments in Sheet Metal Forming Technology”. Main goal of both conferences is to join engineers and specialists in metal forming technologies from industry and scientists from universities on a common communication platform. Debates and discussions revealing diverging opinions and perspectives on newest trends in metal forming technology, analyses of current state of the art as well as targets to be reached in research and development in the field of bulk metal forming technologies are highly appreciated during both days of this year’s conference.

The Institute for Metal Forming Technology (IFU / Stuttgart / Germany) annually organizes this venue in collaboration with Forschungsgesellschaft Umformtechnik mbH (FGU / Stuttgart / Germany). For many years, the concept of conference has focused on an effective transfer of scientific results into value added chains of producing companies, which are quite active in forging and such dedicated market segments. The presented topics of selected papers of the conference therefore have to be evaluated in the context of current research activities in cold, semi hot and hot forging technologies in Europe and Asia. Finally, contributions during the conference also intend to present strategic issues of more general topics in production of forged components to external specialists and to figure out the recent state of the art on an international level.

Within the scope of this two-day conference, experts from both universities and industrial companies will present their papers. The topics presented include running investigations and projects being launched in several European and Asian metal forming companies, suppliers of semi-finished products, press machine manufacturers and software vendors addressing their newest achievements. Thus, participants can expect an adequate mix of practical-oriented and theoretical contributions and papers. Stimulated by several contributions supplied by partners of the hosting institute, this year special attention is paid to present and to publish modern practical solutions in warm and cold forging as well as new approaches to integrate sensors into forging tool structures in order to control process development during series production. Therefore, one session of the conference is dedicated to the topic “Industry 4.0”, which deals with the ongoing digitization of production on the shop floor of forging processes.
The conference also provides space and opportunity for partner companies to offer their service and products to conference attendees personally at their booth being located on the conference site. Detailed information and personal consulting provided by booth staff are offered to every interested individual.

The conference programme also includes exciting accompanying events, with two company visits and a quick tour to Stuttgart’s largest civil engineering construction site. Hopefully the whole three days venue may meet expectations of our guests to take as much as possible back home into their own day-to-day work.

I would like to thank all authors in advance for contributing and feeling inspired on this conference! I am sure that this book comprising papers presented on May 14th - 15th, 2019 in the Liederhalle in Stuttgart / Germany will be dispatched widely and will be available to all international experts involved.

Sincerely yours

Univ.-Prof. Dr.-Ing. Dr. h. c. Mathias Liewald MBA
Table of Contents

Preface
M. Liewald V

International Conference “New Developments in Forging Technology”
May, 14th and 15th, 2019

Strategic Opening Lectures

ANDRITZ and Schuler – A Perfect Match
D. Iacovelli, S. Scherrenbacher 1

Transformation of the Medium-Sized Automotive Supplier Bharat Forge
into a Global and Digital World
D. Seckler 11

Latest Trends in the European Forging Industry
A. Kanca, T. Hain 17

The Future and Scopes of Action of Solid Forming Using the Example
of MUSASHI-Bockenau GmbH & Co. KG
E. Körner, D. Beckers, T. Liesen 27

Cast Components for Lightweight Constructions
Made of Cast Iron and Aluminium Materials
W. Knothe 39

Additive Manufacturing in Context with Forging and Casting Processes
M. Bednarz 47

Forging of Aluminium Alloys and Steel

Potentials in Aluminum Forging for Passenger Car Chassis Parts by Using
Alternative Pre-Material or: Forging Without Scrap
R. Wiel, M. Muckelbauer 55

Extended Value Chain of Forged Heat Sinks for Electronic Control Units
J. Engel 65

Requirements on Forging Dies for Aluminium
I. Schruff 73

Specific Air-Blowing Cooling Pattern Enhancing Mechanical Properties
of Bainitic Steels in the As-Forged State – Application on SOLAM® B1100
V. Bordereau 83
# Simulation of Microstructure and Material Phases During and After Forging

Optimizing Cooling Rates of Microalloy Steels

*J. Miller, J. Walters, C. Van Tyne, M. Fiderer*

DIGIMU®: 2D and 3D Full Field Recrystallization Simulations with Coupled Micro-Macro Approaches

*P. De Micheli, L. Maire, C. Moussa, N. Bozolo, M. Bernacki*

Development of an Expert System for Electrical Forging

*E. Rauschnabel, D. Odening, J. Alves, S. Acevedo, B. Adams*

New Material Property Classes by Integrating Intensive Forming into the Thermomechanical Treatment

*K. Helas, M. D. Bambach, D. Seifert, L. Oberli, A. Alimov*

Effect of Sulphur Content on Formability of a Low Alloysed Steel

*U. Prahl, F. Qayyum, S. Guk, R. Kawalla*

Recent Advances in Metal Forming Simulation:
Microstructure, Phase Transformation and Ductile Fracture

*N. Biba, A. Alimov, A. Shitikov, S. Stebunov*

## Advanced Concepts for New Press Lines and Industry 4.0 in Forging Technology

Lightweight Forging – A Success Story in Four Chapters

*H.-W. Raedt, T. Wurm, A. Busse*

Performance Increase in Forging Through Workpiece Tracking, Adaptive Control and Machine Learning

*M. Liewald, C. Karadogan, B. Lindemann, N. Jazdi, M. Weyrich*

Industry 4.0 in Hot and Cold Forming: The Three Main Obstacles to Implementation with Best Practice Examples to Overcome

*W. Faulhaber, R. Renz*

Artificial Intelligence in the Press Shop – Hype vs. Real Chances?

*J. Stahlmann, M. Brenneis*
Strengths and Advantages of Horizontal Press Machines
Multidirectional Presses in Massive Forming
*S. Lorz*
Servo-Technology in Horizontal Multi Die Cold Forming Machines
*J. Van Rompaey, E. Justus*
Hot Shearing on Horizontal Multi-Stage Presses
*M. Vulcan, K. Schreiner*

New Developments of Environmental Lubricants in Cold and Hot Forging
Environmentally Friendly Tribosystems for Cold Forging of High-Alloyed Aluminium Materials
*H. Venzlaff*
Recent Trends and Developments in Lubrication Systems for Metal Forming
*G. Odink, C. Rosenkranz*
Innovative Cold Forging Methods for Manufacturing Various Types of Gearing by Means of Preforming
*T. Deliktas, A. Weiß, M. Liewald*

Special Session: Generation Y & Z
Recruiting and Retaining Young Talents:
New Leadership for Generation Y & Z
*S. Schnetzer*