APSTP 2017 THE FIRST ASIA PACIFIC SYMPOSIUM ON TECHNOLOGY OF PLASTICITY

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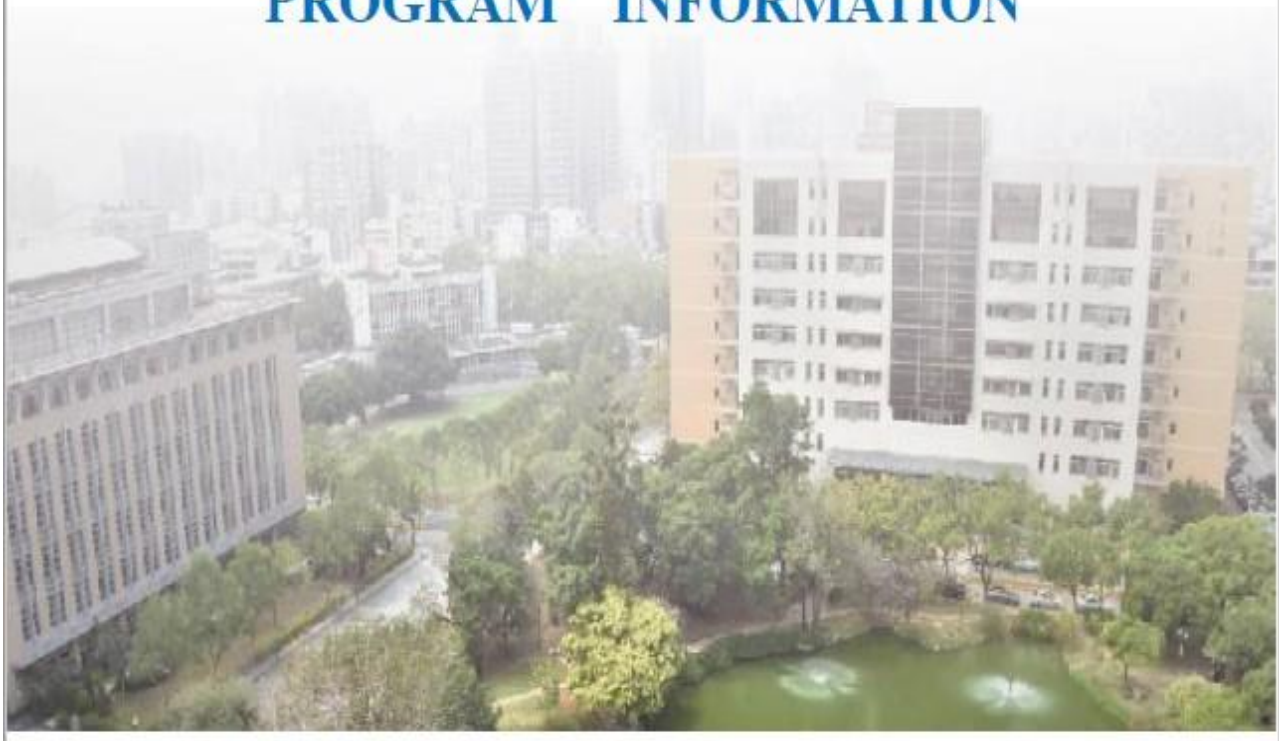
THE FIRST ASIA PACIFIC SYMPOSIUM ON TECHNOLOGY OF PLASTICITY

PROGRAM INFORMATION



國立中興大學 National Chung Hsing University

科技部 Ministry of Science and Technology

CHINA STEEL

TTP

한국소성가공학회 The Korean Society For Technology of Plasticity

塑性工程学会 CHINA SOCIETY FOR TECHNOLOGY OF PLASTICITY

一般社団法人日本塑性加工学会 The Japan Society for Technology of Plasticity

Friday, 24th November Keynote Speech II

"Scientific Work in the Field of Reducer Rolling"

Mr. Hermann Eratz ERATZ Engineering, Germany

Reducer Rolling often is used as preform operation in hot forging of large production volumes. The process provides a mass distribution of the material prior to the main forging operation. Thereby material and energy can be saved, press forces and diewear are reduced. The process is fast and works from small to very large forging parts, like front axle beams or crankshafts. Because it is a rough process of limited precision, it is normally not used for near net shape forging. The session will explain the general procedure of Reducer Rolling, how the process works, the benefits of the process, its limitations, rules and introduce some rolling defects.

Although the process is very old, the amount of scientific papers in the literature, in machine manuals and in commonly available guidelines is limited and fragmentary. Some of the algorithms and guidelines have been developed by machine manufacturers, but furthermore some publications are very old and based on randomly tested real projects. That is, the experimental results could only be upgraded, as a side effect of industrial service projects. At this time no Computer Aided Design tools or Metal flow Simulation Software (FEM) was in the world. Today we have advanced design tools for Reducer Rolling (VeraCAD) and highly developed Simulation Software for verifying the process stability.

This gives us the option to restart the scientific work of analysing the reducer roll process and to find rules for calibration sequences, reduction rates, spreading of cross-section or filling rates. Only if this knowledge is available, it will be possible to avoid rolling defects during the design stage. If the tool design is improper, the tools must be modified during try-out of the rolling dies. This mostly is though, time-killing and costly. Surely the tool design can be tested by Finite Element Simulation, but running a simulation requires plenty of time and interpreting the results needs some expert knowledge and good experience. The visions is, not only to abbreviate the loop of Tool Design, Simulation, Optimisation until a stable process and faultless roller product is reached, but rather to completely avoid this loop.

The basic idea is, to do the FEM-Simulation work in advance before the user will do. That is a number of 10.000 or more simulation jobs, have been performed in advance. Within these jobs the major parameters that have an effect to the reducer roll process are identified and analysed. The results of this huge number of simulations will form the "Reducer Roll Database". Later during interactive tool construction, the software will check the database for similarity of the current case with any pre-calculated case. It will identify a pre-calculated case by a set of normalised parameters or perform an interpolation between cases. By incorporating the pre-simulated design parameters into the current project, a high accurate rolling process can be expected. Furthermore the access to a database needs zero time, instead of FEM-Simulation time. Therefore the design process becomes interactive.

Parts of the new database already exists and are integrated in VeraCAD Software. This work was done with diploma workers in Germany and also from Taiwan. This paper will introduce some of the results and outline the basic strategy. The project is supported by German Industry, machine manufactures and a specialist for FEM-Simulation software.

Experience

- 1994-present: Owner, ERATZ Engineering, Germany
- 1989-1994: CEO, DGN GmbH, Germany
- 1979-1989: Project engineer, MEC GmbH, Germany