Applied Science and Engineering Progress, Vol. 13, No. 2, pp. 94–95, 2020

Editorial Corner

The Future in Metal Forming Production Goes Digital !

Mathias Liewald*
Institute for Metal Forming Technology, University of Stuttgart, Stuttgart, Germany

* Corresponding author. E-mail: mathias.Liewald@ifu.uni-stuttgart.de DOI: 10.14416/j.asep.2020.02.003

Industry 4.0 promotes the revolutionary use of realtime networking and integration of technical systems into value added chains by digitization of products and processes. The combination of virtually determined with real process data today opens a huge range of opportunities for optimization and self-improvement especially of complex production systems. Permanent analysis of collected data of material to be processed, gathering process data and machine condition monitoring data enable to control running manufacturing processes, to optimize logistics and to forecast future trends in production e.g. regarding expected part quality as a result of varying process conditions.

Until now sheet and bulk metal forming technologies in research and industrial application reveals a great potential for improvements in that spirit of Industry 4.0. In modern production lines to produce forged aviation or automotive components their quality are conventionally assessed at RT after forging and after subsequent heat treatment, i.e. based on measured properties of randomly selected workpieces. In modern sheet metal press shops as well, mainly belonging to international car manufacturers, splits or wrinkles emerging in the sheet metal component unfortunately are observed after the final piercing or restriking operation.

From this point of view, today's state-of-the-art quality assurance of such parts unfortunately is delayed by hours to an instantaneous feed back of workpiece properties into a process control. Hence, the root cause of scatter in the final product properties cannot be directly correlated with the relevant, instantaneous process variables or any parameter fluctuations during production.

Contrary to this, the information based link between digitized material, workpiece and simultaneously gathered process properties in production by the help of workpiece tracking yields a new level of data priority. Such link and data processing reveal previously unknown technological correlations and hence constitutes the base for machine learning strategies and new, efficient adaptive control solutions in metal forming. Recently published papers exhibit new approaches in integrating sensors and data collecting systems into value added chains in metal forming starting from digitizing the properties of raw material, tracking of the workpiece through multiple stages in processing as well as quality assessment prior delivery to the customer.

Following this new paradigm of stringent collection of data at the end allows to understand the capability and performance of final product during lifetime based on previous specification of raw material and features of production.

New approaches in that field disclose the potential of machine learning software to support any corrective impact of process development based on digitized process parameters and sensor signals originating from physics acting in the tool. New solutions were published during the last two years to design a new generation of adaptive control systems based on model or data driven concepts. Meanwhile both concepts can be linked with machine learning algorithms to finally get a highly reliable prediction of quality of produced parts.

The future in that field of digitization of value added chains in metal forming looks promising! New approaches for that reason do include data acquisition and storage with respect to raw material properties,

Please cite this article as: M. Liewald, "The future in metal forming production goes digital !," *Applied Science and Engineering Progress*, vol. 13, no. 2, pp. 94–95, Apr.–Jun. 2020.

logistics, billet or blank preparation, hot or cold metal forming process and subsequent dimensional or microstructural quality assurance. For sure, new exciting and challenging developments in this field will be expected in the near future!

Researchers and companies must therefore work closely together to drive digitization forward. Let's go digital!

Prof. Dr.-Ing. Dr. h. c. Mathias Liewald MBA
Editor