

Development of an expert system for electrical upsetting

Prof. Dr.-Ing. Rauschnabel Eberhard - IFUTEC GmbH, Karlsbad, Germany

Dr.-Ing. Alves José - Transvalor S.A. Sophia Antipolis, France

Dipl. Ing. Acevedo Sergio - Hochschule Osnäbruck, Germany
Prof. Dr.-Ing. Bernhard Adams - Hochschule Osnäbruck, Germany

Dr.-Ing. Odening Dirk - IFUTEC GmbH, Karlsbad, Germany

Abstract

Electroforging is an old well-known process for warm forming with conductive heating. It is still in production for valves - especially for big ship engines - and some other applications. This forming method is very useful for big upsettings on shafts with small diameters. The process and the machines are rather simple and allow heating and upsetting at the same time with only very few scale oxides. However, this process saw a decline in the past due to several reasons: the intrinsic physical complexity meant hard controllability and repeatability, the cycle time compared to other forging processes is rather long, there are hardly any (tubular) lightweight applications available. Furthermore, most of the technicians (who did the setup of the machines on a "trial and error basis") are retired and there is only one remaining machine manufacturer in Germany (LASCO).

A new research project has now been established between the Hochschule Osnabrück (development of an expert system), TRANSVALOR (development of the required simulation tool/module), IFUTEC (investigation of potential series applications) and LASCO (development of a sensor-controlled electroforging machine with servoelectric drives) to bring this process into the next generation. With the help of an expert system also tubular applications from various materials shall be possible within very short setup time.

A big challenge was the full understanding of the process. Heating or cooling of the both electrodes, the suitable current as well as the press force and speed play a very important role especially when applied to tubular parts. By variation of the process parameters, it is intended to influence the shape of the parts without modifying existing tools. This ambitious target can only be achieved with a specific simulation tool in combination with modern machine and control technology.