

Motion control by servo motor in the ring rolling sector

A servo motor (from Latin "servus" meaning "slave") is a motor capable of reaching predetermined positions and then maintain them. Every position is checked continuously and adjusted to the measurement. There are several types of servo motors: the synchronous motors, the asynchronous motors, the torque motors and the linear motors. In this presentation we only talk about rotary motors, the linear motors are not by their power and design adapted for a forging environment. Presently the power of a servo motor can reach more than 1.000 kW and a torque of more than 10.000 Nm.

For the two types of motions most frequently used in the ring rolling sector, namely in the linear and rotary motions, historically hydraulics were used. With the new generation of servo motors, it is now possible to use this technology instead of hydraulics. The main benefits of servo motors compared to hydraulic systems are:

- Avoidance of oil related issues (fire, pollution, quality of oil...),
- Over 35% reduction of energy costs
- Possibility of temporary overload
- Elimination of all maintenance issues with regard to the hydraulic system
- With a servo motor the diagnostics of all components can be regulated via internet connection (remote maintenance).

In the industrial applications in the ring rolling sector, the servo motor is never used alone. For the rotary motions, the servo motor is generally used coupled with a planetary gearbox to get a low rotary speed with a high torque. For the linear motions, the servo motor is also coupled with a planetary gearbox in association with a ball screw or a gear / rack system.

We will present the servo motor using examples like the multi mandrel ring rolling mill (BANNING KFRWt) and the radial axial ring rolling mill (Banning ERWW).

The first multi mandrel table ring mills were designed in the 1950ies as an electromechanical machine without hydraulics. These machines were extremely robust and very popular with more than 200 units built. The limit of the old design table ring mills is:

- The important time of change in production
- The bad precision of settings (all the settings were changed manually with tools)

With the motion control by servo motors it's now possible to have this type of machines with

- A short time for changing the production with the possibility to save and restore the production parameters
- The possibility to adapt the settings during the production without tools
- A high precision for the setting (0.05mm for the thickness of the ring)

For the radial axial ring rolling mill, the vast majority of machines currently use the hydraulic technology. In the 90's some machines were designed with a motion control by servo motors for the axial and radial forces; screws and nuts were used to create linear motion. In the following time the result was not so good, there was too much damage on the screws and nuts. In 2007 a new generation of radial axial ring mills was developed, designed with a motion control by servo motors for the radial and axial forces, rack and gear were used to create linear motion.

We would like to present the future possibilities as well as the limits for the motion control by servo motor technology in the ring mill industry.