Bachelor's Thesis Engineering Technology

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Automation of repair of steel rolls

Femke Schreurs and Myrthe Van Tichelen

Specialization Electromechanical Engineering Technology

The automation of the repair of steel rolls is realized in cooperation with '*Werkhuizen Hengelhoef*', situated in Genk. This company is active in seven sectors including steel. The project consists of the supply from the rolls, the processing, and the outlet. The rolls that arrive have a broken outer layer. Therefore the processing consists of the removal from this layer by turning, reinstatement of a new layer by submerged arc welding of steel, and lastly resizing of the roll by turning.

The bottleneck in the system used by '*Werkhuizen Hengelhoef*' is the duration and relocation of the steel roll between the processes. The machines are too far apart from each other.

Goals
- budget of €300 000
- the duration of the repair can take a maximum of 4.5 hours
- safety conform CE
- adjustable parameters

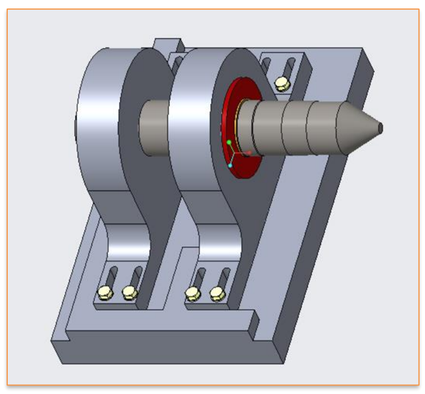


Figure 1: Lathe tailstock

Function: components of the lathe to clamp and spin the steel roll

Figure 1 illustrates the lathe tailstock.

Important components of the lathe tailstock with their function is:
- Linear system: slide in and out the roll
- Conical head: self-adjusting system to guide the turning of the steel roll

Figure 2 illustrates the lathe headstock.

Important components of the lathe headstock are:
- Motor: spins the steel roll for the lathe to work
- Chuck:
  - clamps the steel roll from the inside out
  - self-adjusting

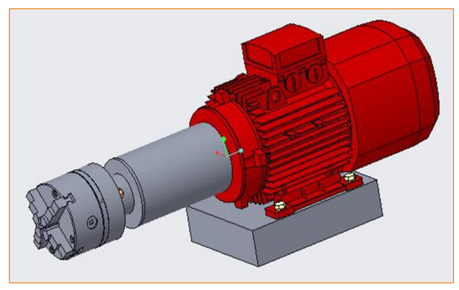


Figure 2: Lathe headstock

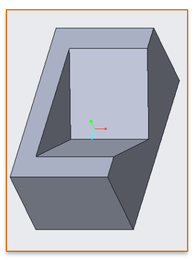
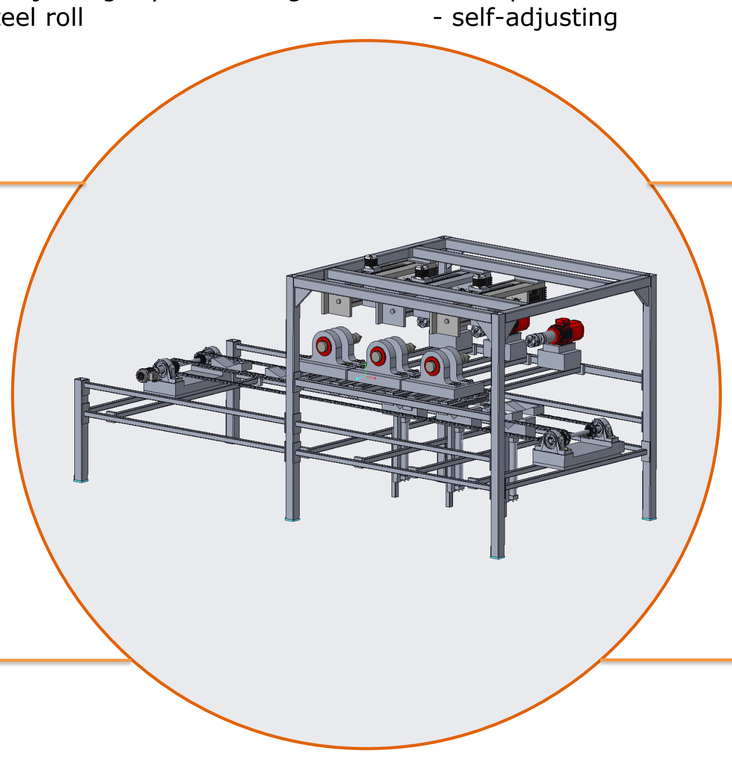


Figure 3: Transport piece

The functions of the transport piece in figure 3 are:
- transport of the roll
- supports roll
- buffer: three pieces are used as a buffer to store three roll

With a mechanical stop on the side of the lathe headstock, the roll can't collide with it.



Functions of the lift system, in figure 4, are:
- to raise the roll

⇒ roll is easy to clamp because the tailstock and the headstock are same height

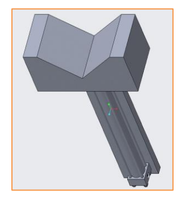


Figure 4: Lift system

Functions of the chain drive, seen in figure 5, are:
- transport of the transport pieces

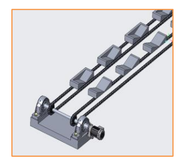


Figure 5: Chain drive

Figure 6: Tool post chisel

Function: tool post chisel and tool post welding machine

Tool post chisel in figure 6:
- Lathing along the top
- Moving both horizontally and vertically

Tool post welding machine in figure 7:
- Submerged Arc Welding (SAW)

Figure 7: Tool post welding machine

Based on the morphological overview different methods for each step in the process of the automation of repair of steel roll were listed. With one chosen method, the concept drawing could be created. This is important because therefore not a single component or dimension is forgotten. The concept drawing helps to be efficient during the 3D-drawing phase. That way for every component the best alternative is selected. Then the 3D- and 2D-drawing could be made.

In conclusion, the machine in this project reduces the time losses during the transportation of the rolls and makes the whole process more efficient. The machine consists of one frame with all the processes gathered. But there always has to be a supervisor that gives the machine the commands it needs. One disadvantage of the design is that it only can repair 3 rolls a day. A solution for this problem can be to copy the machine.

Supervisors / cosupervisors: John Bijnens, Michael Daenen, Karel Kellens en Jeroen Lievens

WERKHUIZEN HENGELHOEF

UHASSELT

KU LEUVEN