Bachelor's Thesis Engineering Technology

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Automated Welding Installation and Crane Bridge for the welding process of rollers.

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SITUATION

Werkhuizen Hengeloef is an engineering company based in Genk. Specializing in the design and construction of machinery, they cater to clients across various industries. Notably, they serve the steel industry by providing the **production and maintenance of steel rollers,** some up to **6 meters** and **10 tons**.

PROBLEM DEFENITION

In the later stages of the production process for these rollers, they undergo assembly and spot welding. As a final step, a **continuous weld** is applied. However, this process is time-consuming and challenging due to the irregular angles at which the weld must be applied.

OBJECTIVE

The aim of our bachelor thesis is twofold: designing a machine for automating this process, and providing a bridge crane for placing the rollers into the machine.

METHOD

The development method of the project is the **Van Den Kroonenberg method**, comprising three phases:

1. **Problem definition phase**: During this phase, the project's purpose is translated into a functional block diagram, as depicted in Figure 1.
2. **Procedure determining phase**: In this stage, a conceptual framework is devised for each function outlined in the initial phase.
3. **Design phase**: Here, each conceptual framework is transformed into both 3D and 2D models of the machine. Strength calculations were done for the critical components.

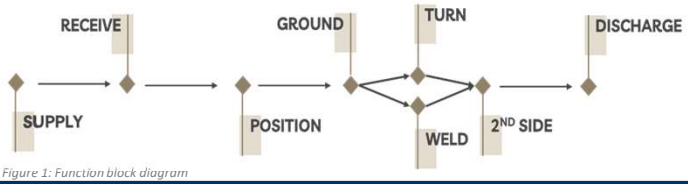

Figure 1: Function block diagram

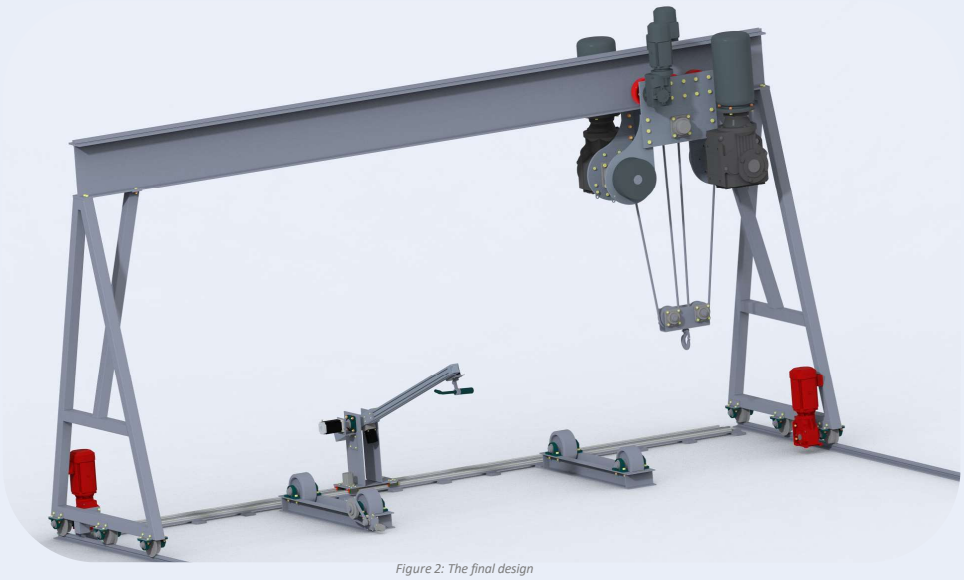

Figure 2: The final design

UNDERCARRIAGE

The undercarriage serves two functions:

1. Supporting the roller: The system supports the roller **by four wheels**, two of which can be adjusted to accommodate various dimensions of the roller.
2. Rotating the roller: To ensure smooth operation of the welding process, the roller must rotate at a precise speed. This is done using a **driving mechanism,** driving one of the wheels.

Figure 3: The adjustable wheels and the driving mechanism

WELDING INSTALLATION

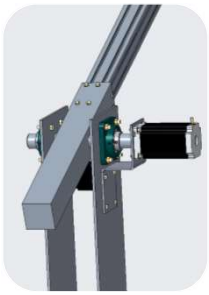

Figure 4: Guide arm rotation

The system is compatible with two welding torches, one for **MIG** welding and one for **TIG** welding. Each torch is mounted on a system that enables **various welding positions and angles**. There are 4 mechanisms that realize this:

1. The welding torch can rotate.
2. The torch can move along a guide.
3. The guide can rotate to facilitate different heights.
4. Movement parallel to the roller is achieved using a linear guide, driven by a rack and pinion mechanism.

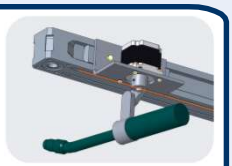

Figure 5: Welding torch rotation

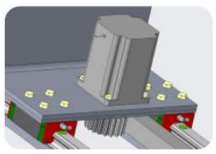

Figure 6: Rack and pinion

CRANE BRIDGE

The crane bridge facilitates the placement of rollers into the welding machine, enabling automated movement in three directions.

1. The first system enables movement perpendicular to the roller, achieved through a **rail mechanism**.
2. The second motion is accomplished using a system that rolls along the lower half of an I-beam.
3. The vertical motion is facilitated by a **chain** mechanism that moves up and down.

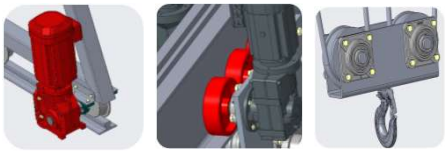

Figure 7: 3 Movement methods of the bridge crane

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