

Redesign manual clamp control

Bachelor Thesis Industrial Design Engineering

In the automotive industry, a lot of tooling is designed for the production of modern day cars. Due to tight deadlines for designing the tooling, not all parts can be optimized within the given time. This mainly counts for one specific aspect: the ergonomics. There are manual components on the tooling that require an action performed by operators, who have intensive workdays of eight hours a day of performing several tasks, to make sure lead times can be reached. Therefore having an ergonomically responsible working area is very important, as an unhealthy situation could quickly lead to injuries.

The aim for this thesis is to improve the ergonomics, by redesigning a specific manual component on the tooling. Currently the main reason why the ergonomics are not optimized, is due to a combination of tight deadlines and overall functionality of the system. First it is made sure the overall system is working properly and afterwards the ergonomics are optimized as much as possible. Making the system work properly often takes away much time, as the manual components often conflict with other parts of the tooling. Therefore custom solutions to work around the other parts need to be designed. By making the new design flexible in placement, the manual component can be placed in such a way it is not conflicting with its surroundings anymore, while also addressing the ergonomics properly. This would also reduce the time it takes for the engineers to design the tooling, as no custom solutions for the manual component are required anymore.

With the idea of making the system flexible in mind, the design process was started. First preliminary research was conducted, to find out which ergonomic requirements needed to be met. Also an insight in the mechanical working of the tooling was obtained, combined with possibilities for improving the mechanism in terms of ergonomics. After the research a list of requirements for the new design could be drawn up.

Next, several concept directions were generated and compared with each other. In the end the concepts were reduced to two concepts, i.e. a mechanical and an electronical concept. Currently the manual component has always been a mechanical mechanism. Therefore the use of electronics for this purpose was completely new. Even though this concept consists of interesting aspects to be a potential solution, it was decided the concept for now contains too many uncertainties.

Therefore it was decided to use the mechanical concept for working out a final design. This design features two Bowden cables, which are flexible wires that are able to transmit a mechanical force by the movement of an inner cable relative to a hollow outer cable housing. In this way the force put on the manual component can be transmitted to the component that needs to be moved. The flexibility of the wires also allows to place the manual component completely regardless of the part that needs to be moved.

Concluding the thesis, it was determined the aim of the thesis had been reached. The flexible placement of the new design allows to place the manual component in a spot where it is ergonomically responsible.