To enhance the design of a wheel to hub alignment tool through material analysis and the addition of new features to the design.

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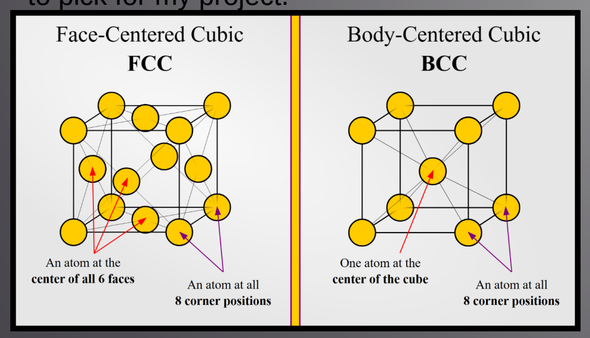
Aim of the Project

The aim of this project is to analyse the materials that were used on the previous design of the wheel alignment tool and enhance the original design by picking alternative materials that are cheaper, stronger and will have a better impact on the wheel alignment tool overall. Carrying out a stress test on solid works using the study motion of FEA analysis is also necessary and the addition of hi vis strips to notify oncoming road users In the event of a puncture. The addition of LED strips on the wheel alignment tool will also be implemented to enhance vision for the event of a puncture at night.

Background

Structures in materials can be broken down into many different categories such as: Nano structures, Microstructures and macro structures. The most common talked about structures in relation to engineering is FCC and BCC. Depending on a product you want to make you want to make sure its material properties are eligible to support this product. Through my research I wanted to develop my knowledge on FCC and BCC structures which will help me decide on materials I want to pick for my project.

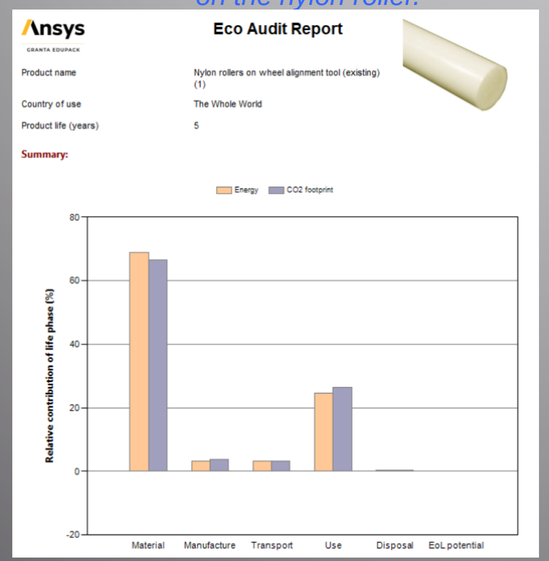


Previous design

Figure 1: Previous design of wheel alignment tool

As seen above in figure 1 is an image of the wheel alignment tool modelled on solid works. The materials that were picked for the wheel alignment tool were Box iron which was used for the base, nylon for the rollers that the wheel will sit on in the wheel changing process and aluminum was used for the rest of the tool such as the arms that will move up and down to lower and raise the wheel in the wheel changing process. Below is an image of the energy usage and carbon footprint emitted over time for the nylon rollers. This chart was gathered in an eco audit through granta edupack

Figure 2: Energy usage and carbon footprint on the nylon roller.



Improved design

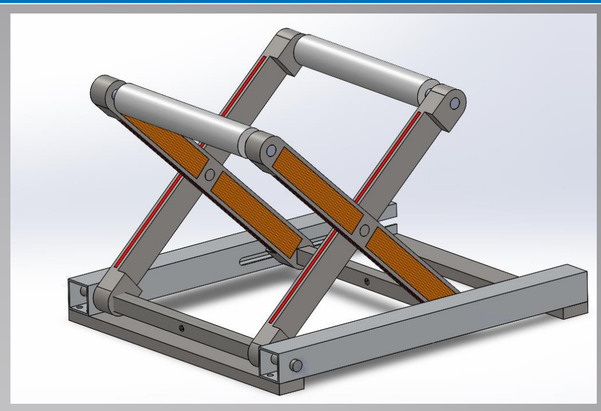
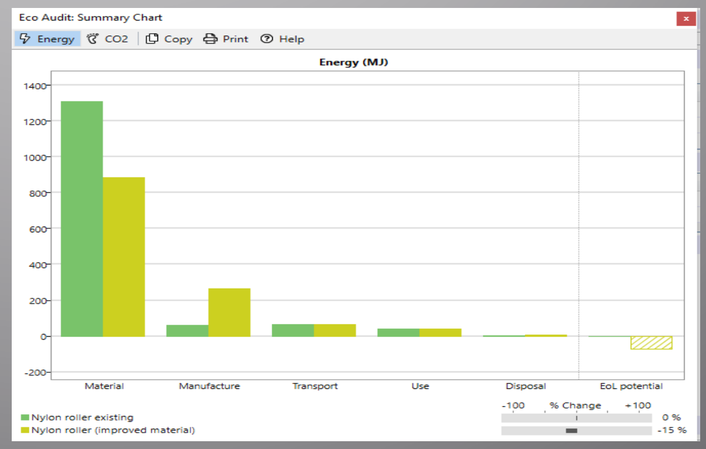


Figure 3: Improved design of wheel alignment tool

As seen above in figure 3 is the improved design of the wheel alignment tool which consists of new materials picked, new rollers and the addition of hi vis trips and led strips as you can see above. The materials I picked were cast alloy steel in replacement for the parts that consisted of aluminum such as the arms and sliding bars that allow the movement along the x and y axis. This material had a better overall tensile strength than aluminum. Aluminum was used instead of the box iron base simply because the box iron added to the weight of the wheel alignment tool and polyester fiberglass was used as the rollers for the wheel alignment tool due to its sustainability .

Figure 4 Energy usage and carbon footprint comparison on the nylon roller and polyester roller.



Material Selection

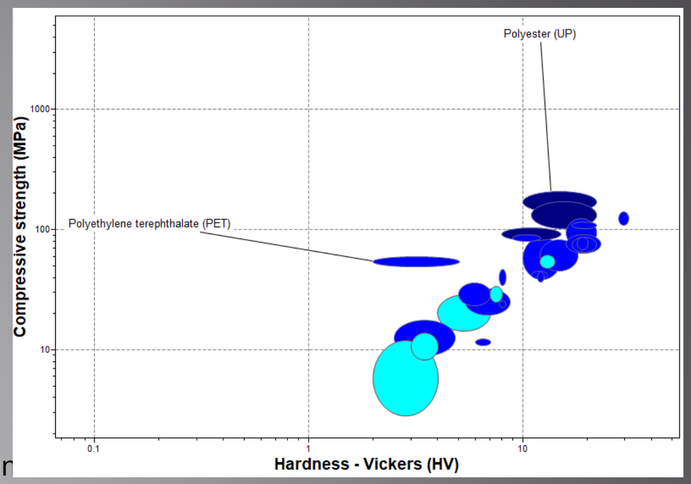


Figure 5: Material selection through granta edupack.

It was important to consider my options of material selection on what material would be most suitable for each part of the improved design. Using granta edupack helped in my decisive choice of material. As seen above in figure 5 is polyester and polyethylene which were two materials that were of choice for the roller. The reason of choice with polyester was due to its mechanical properties and the fact that a polyester fiberglass roller is available to purchase at RS radionics online as seen below on figure 6.

Figure 6: polyester fiberglass roller on RS radionics.