



Inline Office Chair Caster Wheel

The development of a 65 mm single office caster based on industrial and mass manufacturing guidelines

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Company information

DUPO Enschede BV (Dupo) is an industrial manufacturing company located in the east of the Netherlands. The company is active in two fields of expertise: Dupo wholesale, and Dupo Plastics. Dupo wholesale is an industrial B2B supplier of semi-finished products from plastic, metal and wood that supplies the industrial manufacturers and furniture industry in Europe with its products. Next to Dupo, the company also produces in-house plastic products from scratch via Dupo Plastics. The development steps are followed by the use of CAD models and various in-house production techniques such as injection moulding, CNC milling and 3D printing. All the development and production steps can be facilitated at the company. The factory can run itself fully automatic, 24 hours a day.

Objective

Office wheels cover a large part of Dupo's product range. However, most casters are bought in, or are manufactured at partners. For Dupo, it can be of strategic value to be able to produce caster wheels in-house via Dupo plastics. Thus, the objective of this assignment was focused on the development of an industrial single inline caster via Dupo Plastics, while keeping in mind the available options of manufacturing the caster externally.

Market trends

A new trend is ongoing in the current market. The demand for single casters is growing, especially for the inline wheel category. People prefer to have open, transparent wheels, together with smooth drivability. When combined with an industrial style, they become quite popular on the current market. However, those casters often contain a metal housing. The use of metal is not an option in case the wheel has to be manufactured using injection moulding at Dupo Plastics.

Process

The entire process covered an analysis, ideation, and a concept development phase. The content of the analysis phase was focused on relevant side-information around the wheel to develop. For this, the context of use has been studied, together with an industrial style collage. Based on desktop research and an interview with the marketing and sales department, market research has been carried out to understand the value of Dupo compared to competitors, but also to understand the reliability of existing casters. Additionally, patents, manufacturing considerations and regulations have been studied. At the end of each part of the analysis phase, design guidelines have been defined.

After the information has been gained from the analysis phase, the ideation process was started. First, existing casters have been analysed, to understand how a shape could be changed. Based on the possible options, several ideas are presented, and the most promising ideas have been prototyped. Advantages and disadvantages of all prototypes were evaluated, and reviewed

together with the company. Based on their feedback, the most promising concept was chosen, and underpinned using requirements. In the end, the design questions could be answered.

Final result

During the development phase, the caster was being developed according to injection moulding guidelines, to be made out of glass-fibre-reinforced nylon. Based on feedback from staff members, a final design was made, including the required functions defined beforehand. The concept has been sent to a 3D print company, for making five high quality nylon printed casters. In the end, they were tested under a real office chair frame, and the results were documented. Based on those results, it was concluded that the design was printed according to the right proportions. However, some tolerances had to be adjusted in the final CAD model. Ultimately, a cost price analysis has been made to calculate the sales price of one caster. For this, mould making, engineering, tooling, assembling, and packaging costs were considered, and validated with the corresponding stakeholders. In the end, it turned out that the caster could be manufactured for a reasonable price. Although the initial price of one caster turned out to be slightly higher than expected, it can be lowered by increasing the yearly production, together with lower purchase prices for parts.

Conclusion and recommendations

In the end, the caster is suitable for injection moulding at Dupo, meaning that this caster would be their first self-produced office wheel. Some limitations were that the design could not be tested on stress performances. Therefore, it is highly recommended to injection mould a few samples by means of an aluminium test mould. These samples could then be positioned under the office chairs of the current staff members. By doing so, initial issues can already be solved before applying for any official ISO test standards. When those results are still successful, the product is ready for market introduction.

