

KOKKUVÕTE

Käesoleva töö eesmärk oli töötada välja vastupidavam klapptooli detail. Töö käigus uuriti kolme levinumat tootearenduse meetodit ning lähtuvalt saadud infost valiti töö põhifookuseks timmitud tootearenduse meetod. Töö raames tutvustati lähemalt timmitud lähenemisviisi, selle päritolu ning edukuse põhjuseid. Kirjeldati timmitud protsesside toimimist ning üldist mõtteviisi. Olles selgitanud timmitud lähenemisviisi põhimõtteid, liiguti edasi töö fookuses oleva klapptooli detaili arendamise juurde. Arendamise eel tehti detaili purunemisele põhjalik analüüs. Olles kindlaks teinud toote purunemise põhjused, liiguti potentsiaalsete lahenduste otsimise juurde. Lahenduste leidmisel olid lähtepunktiks kliendi nõuded tootele ja nende optimaalne, see tähendab mitte-väärtustloovaid tegevusi vältiv täitmine.

Tootearenduse protsess hõlmas olemasoleva detaili skanneerimist ATOS II 400 masinaga. Skanneeritud punktipilve põhjal loodi parameetiline CAD mudel. CAD mudeli geomeetria täpsust hinnati punktipilve ja mudeli võrdlemisega. Loodud originaal detaili mudel võeti aluseks nii uute kontseptsioonide loomisel kui ka tugevusarvutustele. Lähtuvalt kliendi nõudmistest analüüsiti kahte erinevat lahendust. Potentsiaalsetele lahendustele tehti eraldi tugevusanalüüs, mille eesmärgiks oli aru saada, kas lahendused on kliendi vajadusi rahuldavad. Kahe analüüsi tulemusel valiti välja üks lahendus, millega liiguti töös edasi. Välja valitud lahendusele tehti täpsemad tugevusanalüüsid nii Solidworks simulatsiooniga kui ka käsitsi ning saadud tulemusi võrreldi omavahel. Töö lõpptulemusena valmis arendatud detail, mis täitis kliendi nõudmisi ning pidas avalduvatele koormustele paremini vastu. Lõputöö raames arendati klapptooli detail, mis arvutuste kohaselt vastas kliendi nõudmistele.

Töö raames tehtud tootearendusprotsess oli põhjalik ning vastas timmitud lähenemisviisi põhimõtetele. Kogu arendusprotsessi käigus oli esikohal klient ja tema ootused, millest lähtuvalt arendati klapptooli detaili.

SUMMARY

The aim of this work was to develop a more durable folding chair component. Three most common product development methods were investigated and based on the information obtained a lean product development method was chosen as the main focus of the work. The work presented in more detail the lean approach, its origins and the reasons for its success. The functioning of the lean processes and the general way of thinking were described. Having explained the principles of the lean approach the focus of the work moved on to the development of the folding chair detail. Prior to the development a thorough analysis of the detail breakage was carried out. Having identified the causes of the product breakage the search for potential solutions moved on. The starting point for finding solutions was the customer's requirements for the product and their optimal fulfilment i.e. avoiding non-value-creating activities.

The product development process involved scanning an existing part with an ATOS II 400 machine. A parametric CAD model was created from the scanned point cloud. The accuracy of the CAD model geometry was assessed by comparing the point cloud and the model. The generated original detail model was used as a basis for new concepts as well as for strength calculations. Two different solutions were analysed depending on the customer requirements. A separate robustness analysis was performed on the potential solutions to understand whether the solutions meet the customer's needs. The two analyses resulted in the selection of one solution which was taken forward. The selected solution was subjected to more detailed strength analyses both in Solidworks simulation and manually and the results were compared. The final result of the work was a developed part that met the customer's requirements and was better able to withstand the loads. The thesis included the development of a folding chair detail that was calculated to meet the customer's requirements.

The product development process carried out as part of the work was thorough and in line with the principles of the lean approach. Throughout the development process the customer and their expectations were the primary focus and the folding chair detail was developed accordingly. According to the calculations the developed detail meets the customer's requirements.