KOKKUVÕTE

Antud lõputöö eesmärgiks oli projekteerida kergliikuri elektriveomootori dünopink, mis vastaks kõikidele ettevõtte poolt määratud eesmärkidele. Sellega kaasnes põhjalik turu- ning taustauuring, millest selgus kiirelt, et häid lahendusi ükski tootja kergliikurite elektrimootori dünopinkidena ei paku. Seetõttu oli vajalik teha põhjalik taustauuring erinevate võimaluste, koormusagregaatide ja andurite kohta.

Töö käigus peale taustauuringu sai tehtud erinevad tehnilised otsused ja valikud, mis oleks kõige mõistlikumad ning lihtsasti teostatavad. Kontseptsioon sai paika kiiresti. Koormusagregaadina kasutatakse alalisvoolumootorit selle lihtsuse ja kõige madalama hinna tõttu. Pöördemomendi mõõtmiseks ei olnud palju variante – kõige paremini sobib pöördemomendi andur, kuna see suudab pöördemomenti mõõta dünaamiliselt, mida teised variandid ei paku.

Antud otsuste põhjal sai teha põhjendatud tehnilised valikud. Pöördemomendi anduri valimisel pidi jälgima, et mõõtevahemik oleks piisavalt suur ning sobiva varuteguriga. Koormusagregaadiga tuli jälgida, et sobiv alalisvoolumootor oleks piisavalt võimsam testitavast mootorist. Samuti tuli juurde valida ka sobivad sidurid pöördemomendi anduri ning testitava mootori ja koormusagregaadi vahele. Otsutama pidi kogu kontseptsiooni kohta, kuhu suunas edasi minna. Valitud sai alumiiniumprofiilidest ehitatav raam, kuhu järgmises peatükis projekteeriti kõik vajalikud osad.

Projekteerimise käigus tuli ette mitmeid keerulisi kohti – tähtis oli saavutada piisav tugevus ning jäikus. Samuti erinevad kinnitused, ostutoodete valiku muutmine ning nende kokkusobivused. Kõik keerulised kohad said lõpuks ületatud ning disaini ilme tundub hea. Projekteerimisel oli oluline, et komponentide omavaheline radiaalhälve oleks minimaalne, ideaalis nulliligidane. Projekteeritud vajalikele komponentidele teostati tugevusanalüüs. Tugevusanalüüsiga sai aimu, kas radiaalhälve jääb siduri tootja poolt ette antud piiridesse. Tulemused tõestasid, et deformatsioonid olid minimaalsed ning loodetavasti ei tekita pöörlemisel tugevat vibratsiooni ning ohtlike olukordi.

Kõik lõputöö püstitatud ülesanded said edukalt täidetud. Vajalikud mehaanilised probleemid ja keerulised kohad said mõistliku lahenduse, pöördemomenti mõõdab sobiv andur ning testitavat mootorit koormab töötsüklitega sobiv mootor. Järgmiseks oleks vaja disainida juurde sobiv elektroonika ning keskenduda turvalisusele. Kui need asjad saavad samuti lahendatud, siis saab dünopingi valmis ehitada ning mootoreid testima hakata.

SUMMARY

The objective of this thesis was to design a dyno stand for light electrical vehicle traction motor, which meets all the requirements set by Optigon OÜ. This involved a comprehensive market and background research, which quickly showed that no manufacturers offers a good solution for dyno stand for light electrical vehicles. Because of that a thorugh background research had to be done for all the options for the load aggregates and sensors.

Following the background research, all the options had to be compared, which are the most suitable and practical. Different technical decisions had to be made – for load aggregate a direct current motor was chosen for it's simplicity and low cost. For torque measurement, there were not many options – a torque sensor was chosen, because it is the most suitable as it could measure torque dynamically, which the other options could not offer.

Based on these decisions, all the technical selections could be made. When selecting torque sensor, it was important to ensure that the measurement range is large enough considering the factor of safety. For the load aggregate, it was important to choose sufficient direct current motor that is powerful enough for the light electrical vehicle traction motor. Also the appropriate couplings between the torque sensor and motors had to be chosen. After that the whole conception needed to be decided, in which course to go. For the frame, an aluminium profiles were chosen for it's simplicity and modularity, where all the necessary parts were designed on in the next chapter.

The design process faced several difficulties – it was important to make sure that the strength and stiffness is sufficient. All the different mountings, choice of vendor products and their compatibility had to be carefully analyzed. All the difficult tasks were eventually overcame and the concept of the design looks good. While designing, it was important to make sure that the radial clearance between components is minimal, ideally zero. Strength analysis was also done for designed components. The analysis indicated that the deformation was minimum. Because of that it can be expected that there would be not too much vibration and potential hazardous situations.

All the tasks set for this thesis were successfully accomplished. All the necessary mechanical tasks and difficult parts were solved with reasonable solutions. A suitable torque sensor was chosen and the motor is loaded with real world test cycles. The next step would be to design all the electronics needed and to concentrate on the safety. Once these are taken care of, the dyno stand can be assembled and all the motors can be tested.