

KOKKUVÕTE

Käesoleva bakalaureuse töö peamiseks eesmärgiks oli uurida, mil määral aitavad eelnevad masinaehituse kogemused kaasa tehniliste lahenduste projekteerimisele, ehitamisele ning dimensioneerimisele, kui kõrvale jätta tehnilised arvutused ning analüüsid. Samuti oli üheks eesmärgiks viia läbi optimeerimine töös käsitlemist leidvale niidukile. Töös lähtuti koduses majapidamises toodetud vasarniidukist.

Töö esimeses osas anti ülevaade niitmise ning sellega seotust üldiselt ning võeti vaatluse alla erinevad traktori haakesse kinnitatavad heina niidukid, kirjeldades nende töö põhimõtet ning eeliseid ja puuduseid võrreldes teiste lahendustega. Kajastamist leidis nii latt- , rootor- , trummel- , ketas- kui ka töös kasutatav vasarniiduk. Lisaks toodi üldiselt välja kõigi eelpool nimetatud niidukite niitmiskiirused ning efektiivsus tavatingimustes.

Teise peatüki eesmärgiks oli läbi viia tehnilised arvutused ning analüüs niiduki konstruktsioonile, määramaks erinevate osade dimensioneerimisel jäetud varuteguri väärtus, millest lähtuvalt tehakse järeldus töö eesmärgiks seatud küsimusele. Esmalt tehti tugevusarvutused reduktori ja rihmaratta vahelisele veovõllile, leidmaks arvulised väärtused väände ja painde koosmõjule. Teiseks leiti rihmülekanne jaoks vajalike rihmade arv. Samuti tehti analüüs niiduki korpusele, et leida selle maksimaalne läbipaindumine, kui kogu niiduki raskus peaks asetuma niitmise käigus ühele niiduki küljele.

Töö kolmandas peatükis optimeeriti juba valmisolevat niidukit ning selle osi, eesmärgiga vähendada nii rahalist kulu kui töötlemisaega. Sihiks seati tootmismahd 50 niidukit ning eeldus, et tootmine toimub metallitööstusettevõttes, mis omab erinevaid töötlemismeetodeid. Suurimaks muudatuseks oli nii niiduki korpuse geomeetria kui tootmise meetodi muutmine. Samuti muudeti maapinda kopeeriva rulli ja paigaldusraami kinnitusi. Analüüsi all oli ka laagri-pukkide lahenduse asendamine, kuid see ei osutunud majanduslikult otstarbekaks.

Lähtudes töö teises peatükis saadud tulemustest, võib öelda, et peamiseks uurimisaluseks teemaks olnud küsimus sai kinnitatud ning varasemate kogemuste olulisus masinehituslike lahenduste projekteerimisel on suur. Samas ei tohi alahinnata tehniliste arvutuste olulisust kuna niiduki ehitamisel testiti korduvalt erinevaid ülekandearve, et niitmisevõlli pöörlemiskiirus paika saada.

SUMMARY

The main goal of this bachelor's thesis was to study the extent to which previous mechanical engineering experience contributes to the design, construction and dimensioning of technical solutions, aside from technical calculations and analyzes. One of the goals was also to carry out optimization for the mower. The work was based on a flail mower produced in a household.

In the first part of the work, an overview of mowing and related issues were given, and various hay mowers attached to the tractor hitch were examined, describing the principle of their work and the advantages and disadvantages compared to other solutions. The sickle bar, rotor, drum, disc and flail mowers used in the work were covered. In addition, the mowing speeds and efficiency under normal conditions of all the above-mentioned mowers were generally indicated.

The aim of the second chapter was to perform technical calculations and analysis of the mower's construction to determine the value of the reserve factor left during the dimensioning of different parts, based on which a conclusion is made to the question set for the work. First, strength calculations were performed on the drive shaft between the gearbox and the pulley to find numerical values for the combined effect of torsion and deflection. Second, the number of belts required for the belt transmission were found. An analysis was also made of the mower's body to find its maximum deflection if the entire weight of the mower should be on one side of the mower during mowing.

In the third chapter, the existing mower and its parts were optimized in order to reduce both the financial cost and the processing time. The production volume was set at 50 mowers and the assumption was that production would take place in a metal industry company with different processing methods. The biggest change was the change in both the geometry of the mower body and the production method. The mounts of the ground copy roller and mounting frame were also changed. The replacement of the bearing bracket solution was also under analysis, but it did not prove to be economically reasonable.

Based on the results obtained in the second chapter of the work, it can be said that the main topic of research was confirmed and the importance of previous experience in the design of mechanical engineering solutions is high. At the same time, the importance of technical calculations should certainly not be underestimated, as different gear ratios

were repeatedly tested during the construction of the mower in order to determine the speed of the mowing shaft.