

KOKKUVÕTE

AQ Lasertoolis sai tootmisinsenerist autor väljakutseks luua puhastuslaud, mille kasutamine aitaks freesimisoperaatoritel jahutusemulsioonist detailide puhastusaega alla viia. Vestlused peainseneri ning operaatorite endiga sai tulevikuplaan paika pandud ning autor hakkas konseptsiooni looma.

Töö põhieesmärk oli kuluefektiivsus nii valminud lõpptoote puhul, kui ka puhastuslaua loomise puhul, pidi olema tehtud jääkmaterialidest ega tohtinud sisalda liialt komplekseid operatsioone, ega ise olla liiga keerulise disainiga. Töö algas esmase eskiisi loomisel, millest arenes välja esmane SolidEdge CADi mudel. Kuna gabariitmõõtmed olid koheselt teada oli 3D mudel suuruse poolest rahuldav, ent vajab korrekture jäikuse, tõstmise ja ohutuse poole pealt. Teravatel servadele tuli lisada raadiused ning hemmingud, töölaud pidi sisaldama võimekust seda lihtsasti roklaga transportida ning jäikuse jaoks paremad jalgade kontaktpinna lahendust. Parendatud versioon oli nõudmistele vastav ning sellega järgnes tootmiseks juurutamise faas. Iga detail ja koost sai enda abijoonised lihtsustamaks ja kindlustamaks operaatorite töid, kõike detailide töökäigud sisestati Monitor ERPi koos paika määratud tööaegadega. NC operaatorid vastutasid programmifailide ümber kodeerimise eest, et neid oleks võimalik laserpingist välja lõigata ja painutusoperatsioone läbi viia. Kuna suurem enamus detaile sisaldasid ainult kahte töökeskust siis autor alustas samal ajal koostamisega, kui ainukesed keevitamist vajavad detailid olid keevitamise töökeskuses. Koostamisel oli positiivne tähelepanek see, et kõik nurgad ja avad klappisid omavahel suurepäraselt, sest roostevabaterase 3D mudeli Neutraalfaktor ei pruugi alati kokku langeda päriseluga. Kuna jalgade mõningad detailid olid loodud nii, et isegi kui neid painutataks peegelpildis oleks tulemus korrektne ei tekkinud alumise osa kokku ühendamisel ühtegi raskust. Keskmise osa ühendamisel tekkisid kergemad raskused nelja äravoolu osa ühendamisel tänu oma kaalule. Keevisdetailidega läks kauem kui koostamisega, ning lõpptulemusena otsustati, et tasakaaluks loodud jalgu polnud vajagi ning neid ei lisatud. Peale terviklik koostamist viidi töölaud koheselt freesimisosakonda ja tutvustati operaatoritele uut töölauda koos selleks mõeldud puhastusmetoodikaga ning jälgiti selle kasutamist, oli näha, et vajab harjumist. Kuna vaheutsi on palju ja operaatoreid kõiki korraga tööl pole, siis lõpptulemuse saamiseks tuli aega anda.

Peale paari nädalast kasutust võeti pealmine kate pealt ära, kuna blokeeris sissetulevat valgust ning asus kõrgusel, kus võidi pead ära lüüa. Töölaud ise täitis oma eesmärgi, kui seda kasutada nii nagu see oli mõeldud, ent operaatoritel on endil vana harjumus kuivatada detaile nii nagu neile meeldib. Üldkokkuvõttes oli töölaud, kui füüsilise produktina edukas, sest soovitud funktsioone ta täitis ja korrektsel kasutamisel

parendab ajakulu kokkuhoidu, ent tõhusamaks kasutamiseks on vaja operaatorite töötegemise harjumusi paremuse poole muuta, kui on soov võimekust maksimiseerida.

SUMMARY

The author, a production engineer at AQ Lasertool, was assigned to develop a cleaning table for milling operators with a capability to lower cleaning times after milling. Discussions between the engineering team leader and the author laid the foundation for future plans and work began.

The main priority was cost efficiency for both end product and development for the cleaning table, it had to be made from leftover sheet metals and mustn't include too complex operations nor be with a complex design. Work started by creating the first sketch, that was used to create the first 3D CAD model in SolidEdge. Since measurements were given the 3D model was satisfiable at first glance, although it needed corrections surrounding its rigidity, liftability and safety. Sharp corners had to have radiuses and edges had to use a "Hem" function, the cleaning table had to be easily manoverable with a manual pallet truck and all four legs needed a better solution for contacting the surface. Improved version met the requirements and next phase was making it production ready. Blueprints were made for every detail and assembly to ease and improve production for operators, all production related details were inserted into Monitor ERP system with the appropriate work stations and times. NC programmers were responsible for recoding program files so they could be used for laser cutting and sheet metal bending operations. Due to the majority of work on creating the details were done the author started assembling the cleaning table until the last details were being welded together.

During the assembly the author was positively surprised that all of the angles and holes were perfectly aligned, because with stainless steels neutral factor in the 3D model may not always align with the real material. By having some leg details designed in a way that even bending them in mirror image the outcome would still be correct, because of that there were no complications during the assembly of the lower part. There were minor difficulties assembling the middle portion of the cleaning tables four drainages due to their weight. It took longer for the welded details to be produced compared to assembling the entire product, it was decided that the four welded pieces are not needed for balancing, so they were excluded. Thereafter the cleaning table was taken to the milling workstation and introduced to the operators with the right cleaning techniques. Observation was done by the author and engineering team leader. Since there are many shifts and operators both agreed that more practice is needed.

After a few weeks practice the top layer was taken off due to lack of visibility and it was set in at an height where there was a possibility for injuries to the head. The table itself

fulfilled its purpose if it was to be used the way it was designed to be used, but the operators themselves have an old habit of cleaning details the way they are pleased. In summary as a physical product it was a success, because it fulfilled its desired functions and when used correctly improves time management, but for more improved usage operators work habits have to be improved to maximize results.