KOKKUVÕTE

Töös sai käsitletud vesiniku elektrolüüsi põhimõtted ning surveelemendi eksisteerivaid lahendusi, sobilikke materjale ja tootmisprotsesse. Seejärel loodi eelneval infol tuginevad disainilahendused ning kasutati neid materjalivariantide analüüsimiseks ja omavaheliseks võrdlemiseks. Töö tulemusena sai valmis ka lihtsustatud disainiga reaalne prototüüp.

Surveelemendi mehaaniline pool sai küllaltki uurimist, elektrijuhtivuse poolest saavutati rahuldav tulemus, kuid täiesti jäeti ära tootmisprotsesside automatiseerimisvõimalus. Seevastu tehti aga disainidega surve all simulatsioon. Loodud tulemusi saab edaspidi ära kasutada sobiva surveelemendi valikul, sealhulgas sobiva materjalivaliku eeltööna või suunitlusena sobiva disainilahenduse valimiseks.

Disainialternatiivide hinda on keeruline hinnata enne töötlemisprotsesside hinna teadmist, kuid materjalikulu oli kindlalt odavam, kui komponendi maksumuseks määrati. Alguses hea variandina tundunud vasknikkel osutus ebasobilikuks, kuid hiljem leitud Monel 400 sulam tundus sobilik. Juba kasutusel olev nikkel on aga endiselt üks parimaid variante. Disainialternatiivide analüüs pani mõtlema metalltraatvõrgust elemendi omaduste üle ning nendele vastu esitama lehtmetalli eeliseid. Ettevõtte seisukohalt on erilise ja sobiva komponendi väljatöötamine oluline, et tekitada hinnaeelis ning luua võimalus jätta ettevõttesse hiljem patenteeritav intellektuaalne omand.

Tulemusena määraks hetkel parimaks alternatiiviks disaini 2, mille puhul tuleks aga erinevate lehtmetalli paksustega ja materjalidega edasist uuringut teha. Saab eeldada, et disain 2 vastab ettevõtte poolt määratud nõuetele. Kõiki nõudeid (näiteks eluiga) aga kontrollida ei saanud.

Käsitsi prototüübi tootmine ja katsetamine tõestas, et seeriaprotsessis või isegi lihtsalt õigete masinate abil toodetud surveelementidel on mitmeid eeliseid, millest peamine on täpsus.

Lõputöö tulemuslikkust võib info poole pealt kindlalt leida, kuna näiteks uuritud materjalide infot saab ka teiste ettevõtte poolt samades tingimustes elementide jaoks ära kasutada. Kindlasti tuleks eelisvarianti disain 2 edasi arendada, prototüüpidega katsetada kui ka tootmise erisusest tingitult lisainfot uurida.

SUMMARY

The paper discussed the principles of hydrogen electrolysis and existing solutions, suitable materials and production processes for the spring element. Then, design solutions were created based on the previous information and used to analyze and compare materials. A real prototype with a simplified design was also made.

The mechanical side of the pressure cell received enough research, a satisfactory result was achieved in terms of electrical conductivity, but the possibility of automating production processes was completely abandoned. On the other hand, simulation was done with the designs under pressure. The generated results can be further used to select a suitable spring element, including preliminary research on suitable materials or as to be used as a guide for selecting a suitable design solution.

It is difficult to estimate the cost of design alternatives before knowing the cost of the machining processes, but the material cost was definitely cheaper than the cost of the component requirement. Cupronickel, which seemed like a good option at first, turned out to be unsuitable, but the Monel 400 alloy found later seemed suitable. However, nickel, which is already in use, was proven to be one of the best options. An analysis of design alternatives brought up the pre-existing topic of the advantages of wire mesh. It is important for the company to develop special and suitable components in order to create a price advantage and an opportunity to retain any intellectual property of the company that can be patented later.

As a result, design 2 would be the best alternative at the moment, but further research should be done with different sheet metal thicknesses and materials. It is assumed, that design 2 meets the requirements set by the company. However, not all requirements (for example lifespan) could be checked.

Prototype production and testing by hand proves that spring elements produced in a serial process or even simply using the right machines have several advantages, the biggest of which is accuracy.

The results of the thesis can be useful, because, for example, the information of the studied materials can also be used by any other elements used by the company that are in the same conditions as the spring element. Design 2 as the preferred variant will definitely be further developed, tested with prototypes, and additional information will be investigated due to the unconventional production methods.