1. Raziskovalna organizacija (*Research organisation)*:

Univerza v Ljubljani, *Fakulteta za strojništvo*

2. Ime in priimek mentorja (*Name and surname of a mentor*):

prof. dr. Jože Duhovnik

3. Področje znanosti iz šifranta ARRS (*Primary research field*):

2.11 Konstruiranje

4. Kontaktni e-naslov mentorja (*Contact of a mentor)*:

joze.duhovnik@lecad.fs.uni-lj.si

5. Kratek opis programa usposabljanja (*Short description of the program)*:

SLO

Usposabljane kandidata za MR bo potekalo v okviru doktorskega študijskega programa na Fakulteti za strojništvo UL na področju Konstruiranja in numerčnih analiz. Cilj raziskovalnega dela bo izvedba celovitih termo-mehanskih numeričnih analiz valjastega zobniškega sistema sestavljenega iz termoplastičnih polimernih materialov.

Polimerni zobniški sitemi ponujajo ekonomsko ugodnejšo alternativo klasičnim kovinskim oz. jeklenim zobnikom zaradi nizke cene polimerov na trgu in hitrih postopkov izdelave pri velikih izdelovalnih serijah ter možnosti izogibnja uporabe maziv. Po drugi strani pa izkazujejo polimerni zobniki precej slabse trdnostne lastnosti in veliko znatnejšo občutljivost na temperaturne spremembe, zaradi česar so uporabni predvsem v gonilih z nižjimi stopnjami obremenitev.

Analize obratovalnih pogojev tovrstnih sistemov so do sedaj v poglavitni meri temeljile na eksperimentalnih pristopih, kjer se navadno raziskuje korelacijo med obremenitvenimi pogoji in življenjsko dobo sistema ter termičnim odzivom sistema (prirastkom temperature). Izdelanih je bilo tudi že nekaj eksperimentalnih matematičnih modelov za napoved napetostnega in termičnega stanja sistema. Medtem ko so mehanski modeli sorazmerno konsistentni, so se modeli za napoved prirastka temperature v sistemu do sedaj izkazali za pomankljive. Iz tega vidika je cilj raziskovalnega dela izvedba celovitejše termo-mehanske analize, ki bi omogočala stabilnejšo napoved prirastka temperature v omenjenih sistemih. Ključna pri delu bo tudi izvedba primerjalne analize klasičnih evolventnih zobnikov s t.i. S-zobniki, kjer je namen ugotoviti katera izmed omenjenih geometrij ponuja ugodnejše obnašanje tako iz vidika napetostnih in deformacijskih materialnih odzivov, kot tudi termičnega odziva.

ANG

The candidate for Young researcher (MR) will perform research work through the PHd programme at the Faculty of Mechanical engineering of UL in the field of construction design and numerical analysis. The key goal of the research work will be the development of an accurate thermo-mechanical numerical analysis scheme for the simulation of a gear system composed of two thermoplastic polymer gears.

Polymer gear systems offer an economically favourable alternative to more classic metal (steel) gears, because of the low price of polymer materials and fast production cycles for high volume production and the possibility to avoid lubricants in their use. On the other hand, polymer gears exhibit fairly lower strength and a high susceptibility to temperature increase, for which they are typically applicable only to drive systems with lower load demands.

Analyses of load conditions for these systems were up until now predominantly carried out using experimental approaches, where typicaly the correlations between load conditions and the life cycle capacity and also the temperature increase were investigated. Several mathematical models derived from experimental tests were also already developed to predict the mechanical and thermal response of polymer gears. While the mechanical models prove to be relatively consistent, the models for temperature increase prediciton mostly prove to be less accurate or applicable in very limited conditions. From this standpoint, the goal of the research work will be to develop a more stable thermo-mechanical computational analysis with which to obtain more realistic results especially for the temperature increase of the system. A key part of the work will be also a comparative analysis between typical involute gears and more recently developed S-gears, with which we wish to find out which of the two geometries exhibits better responses in terms of stresses and strains and also lower temperature increase.