Elektronische Prüfungsarbeiten

Typ: Semesterarbeit
Autor: Lukas Geß
Titel: Design of a low-tech water wheel for the electric power supply in Nepal
Übersetzter Titel: Design of a low-tech water wheel for the electrical power supply in Nepal

Abstract:
Nepal still faces a great lack of electrical energy. That also leads to many hours of load shedding during the day. Rural areas are affected in particular, because some of them do not even have a proper connection to the electrical grid. With respect to the large hydro potential of Nepal the idea is powering rural households or small neighbourhoods independently using overshot water wheels. The costs and the feasibility of the production are the challenges that have to be taken care of. In the present work, a simple but at the same time effective design concept is created. Therefore, the basic demand, the general usage of overshot water wheels for electricity supply and the limitations due to material and machinery are addressed. Based on that, a modular water wheel concept that allows constructing water wheels with varying diameters and width is developed. Sheet metal is identified as the perfect material for the water wheel rim construction in Nepal. In addition, a dimensioning-tool is developed in Matlab which allows an optimization of the concept for different operating sites and computes the expected behaviour of the power output. Finally, the generated design concept and the Matlab-tool are adapted to design a prototype. Afterwards, this prototype is constructed to check the manufacturability with respect to the circumstances in Nepal. The results demonstrate that the designed concept is convertible and that a production in Nepal should be easily possible. Furthermore, the provided cost and time estimations show that the modular design is a cheap possibility to
construct overshot water wheels in little time. To finally verify the developed concept, the prototype should be operated in test mode to examine, if the prediction on the behaviour of the power output is reliable. Key words: overshot water wheel, modular water wheel concept, dimensioning, rural electrification, small scale power supply

Übersetzter Abstract:
Nepal still faces a great lack of electrical energy. That also leads to many hours of load shedding during the day. Rural areas are affected in particular, because some of them do not even have a proper connection to the electrical grid. With respect to the large hydro potential of Nepal the idea is powering rural households or small neighbourhoods independently using overshot water wheels. The costs and the feasibility of the production are the challenges that have to be taken care of. In the present work, a simple but at the same time effective design concept is created. Therefore, the basic demand, the general usage of overshot water wheels for electricity supply and the limitations due to material and machinery are addressed. Based on that, a modular water wheel concept that allows constructing water wheels with varying diameters and width is developed. Sheet metal is identified as the perfect material for the water wheel rim construction in Nepal. In addition, a dimensioning-tool is developed in Matlab which allows an optimization of the concept for different operating sites and computes the expected behaviour of the power output. Finally, the generated design concept and the Matlab-tool are adapted to design a prototype. Afterwards, this prototype is constructed to check the manufacturability with respect to the circumstances in Nepal. The results demonstrate that the designed concept is convertible and that a production in Nepal should be easily possible. Furthermore, the provided cost and time estimations show that the modular design is a cheap possibility to construct overshot water wheels in little time. To finally verify the developed concept, the prototype should be operated in test mode to examine, if the prediction on the behaviour of the power output is reliable. Key words: overshot water wheel, modular water wheel concept, dimensioning, rural electrification, small scale power supply

Fachgebiet:
ERG Energietechnik, Energiewirtschaft

DDC:
620 Ingenieurwissenschaften

Gutachter:
Sattelmayer, Thomas (Prof. Dr.); Spinnler, Markus (Dr.); Baur, Stephan

Jahr:
2017

Seiten:
85

Sprache:
en

Sprache:
en

Hochschule / Universität:
Technische Universität München

Fakultät:
Fakultät für Maschinenwesen

Occurences:
· Elektronische Prüfungsarbeiten > Fakultät > Fakultät für Maschinenwesen

Entries: