Component Energy Efficiencies in a Novel Linear to Rotary Motion Inter-Conversion Hydro-Mechanism Running a Solar Tracker

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Abstract

A new mechanism interconverting linear and rotary motion was investigated for energy transfers among its components. It employed a gear-rack set, a Hooke coupling and a specially designed bladder-valve system that regulated the motion. The purpose was to estimate individual component mechanical efficiencies as they existed in the prototype so that future reengineering of the mechanism could be properly targeted. Theoretical modelling of the mechanism was first done to obtain equations for efficiencies of the key components. Two-stage experimentation followed when running a solar tracker. The first stage produced data for inputting into the model to determine the efficiencies' theoretical variation with the Hooke coupling shaft angle. The second one verified results of the Engineering Equation Solver (EES) software solutions of the model. It was found that the energy transfer to focus on was that between the Hooke coupling and the output shaft because its efficiency was below 4%.

Keywords: bladder, efficiency, gear-rack, hooke coupling

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