Accepted Manuscript

A study and comparison of frictional losses in free-piston engine and crankshaft engines

Boru Jia, Rikard Mikalsen, Andrew Smallbone, Anthony Paul Roskilly

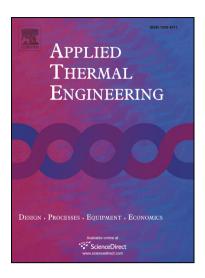
PII: S1359-4311(18)31078-0

DOI: https://doi.org/10.1016/j.applthermaleng.2018.05.018

Reference: ATE 12157

To appear in: Applied Thermal Engineering

Received Date: 16 February 2018
Revised Date: 14 April 2018
Accepted Date: 7 May 2018



Please cite this article as: B. Jia, R. Mikalsen, A. Smallbone, A. Paul Roskilly, A study and comparison of frictional losses in free-piston engine and crankshaft engines, *Applied Thermal Engineering* (2018), doi: https://doi.org/10.1016/j.applthermaleng.2018.05.018

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

CCEPTED MANUSCRIPT

A study and comparison of frictional losses in free-piston engine and

crankshaft engines

Boru Jia*, Rikard Mikalsen, Andrew Smallbone, Anthony Paul Roskilly

Sir Joseph Swan Centre for Energy Research, Newcastle University, Newcastle upon Tyne, NE1 7RU, UK

Abstract

Friction work in free-piston engines is expected to be lower than in crankshaft engines due to the

elimination of the crank mechanism. In this paper, friction mechanisms were reviewed and compared

between a free-piston and crankshaft engine of similar size. The main friction mechanisms were

identified to be the piston assembly including piston rings and piston skirt, valve train system, the

crank and bearing system for the CSE, and the linear electric generator for the FPE. The frictional

loss of each friction mechanism was estimated and discussed. A Stribeck diagram was used to

simulate the piston ring friction during hydrodynamic lubrication, mixed lubrication, and boundary

condition. It is found that the FPE doesn't show advantage on piston ring friction force over the CSE,

and the frictional loss from the piston ring is even higher. While the elimination of the crankshaft

system reduces the frictional loss of the FPE, and the total friction loss of the FPE is nearly half of

the CSE.

Keywords: Free-piston engine; piston assembly friction; friction force; skirt friction.

* Corresponding author: Boru Jia

Email: jiaboru@sina.com

boru.jia@newcastle.ac.uk

Tel: +44 07547839154

1

Download English Version:

https://daneshyari.com/en/article/7045041

Download Persian Version:

https://daneshyari.com/article/7045041

<u>Daneshyari.com</u>