



PERGAMON

Journal of Terramechanics 36 (1999) 63–75

Journal
of
Terramechanics

Off-road tyre modelling III: effect of angled lugs on tyre performance[☆]

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Received 4 May 1998; accepted 9 November 1998

Abstract

Satisfactory analysis of the off-road tyre performance parameters of agricultural vehicles depends on the accurate prediction of the forces between off-road tyre and terrain. The normal and shear stresses at the interaction between wheel and soil determine these parameters. This paper presents a prediction method to estimate the forces under angled lugs on a deformable surface. The normal and tangential forces generated at the interface between an off-road tyre with *angled* lugs and terrain was estimated by using the modified multi-spoke tyre model. This model was extended to predict the pull, lift and lateral forces including the effect of *angled* lugs. A comparison between the forces generated between the terrain and the off-road tyre with straight lugs and with *angled* lugs was made. The influence of different parameters such as soil hardness, soil deformation modulus, longitudinal wheel slip, lug height and lug angle on the *angled* lug forces was studied. A computer program using MATLAB software was developed, and the results were presented in the form of distribution of *angled* lug forces along the tyre contact length. The results indicated that the *angled* lug forces decreased as the soil deformation modulus and soil hardness increased. *angled* lugs provided higher lateral force and lower tractive force than straight lugs. The angle of lug has a significant effect on the forces of the *angled* lugged tyre. © 1999 ISTVS. All rights reserved.

Keywords: Off road vehicle performance; Tyre forces; Tyre modelling; Angled lugs; Camber angle

[☆] Part III of a four part series. Parts I and II are published in the *Journal of Terramechanics* 36(1).

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