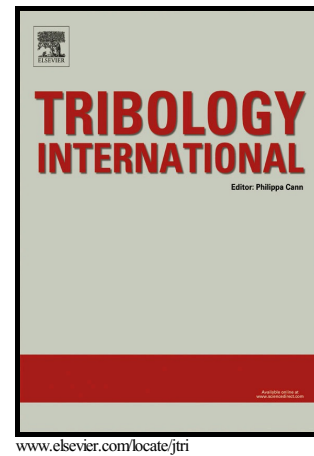


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A calculation method on the performance analysis of the thrust aerostatic bearing with vacuum pre-load

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Abstract

Thrust aerostatic bearing with vacuum pre-load (VPL pads) is a kind of effective supporting structure with simple mechanism and well stiffness. In this paper, a calculation method is presented to calculate the static characteristics of the VPL pads. Based on finite difference method (FDM), an efficient iterative algorithm is developed to decrease the iterative times. Compared to the experiment results, it shows that the calculation method can predict the static characteristics exactly.

Keywords

static characteristic; stiffness; vacuum pre-load; aerostatic bearing

Nomenclature

p	pressure
p_s	supply pressure
p_d	orifice outlet pressure
p_a	atmosphere pressure
p_1, p_2	boundary pressure
f	pressure, $f=p^2$
r_a, r_b, r_c, r_d	supporting area radius
r_{ab}, r_{cd}, r_0	orifice distribution radius
r, θ	polar coordinates
h	air film thickness
d_0	orifice diameter
$\Delta r, \Delta \theta$	grid length in r, θ - direction
A	orifice area
C_D	orifice coefficient
a, c	coefficient of m_{out}
$m_{in}, \Delta m_{in}$	mass inflow rate

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