ANALYSE AND VERIFICATION OF IN-PIPE BRISTLED MINIMACHINE PROTOTYPE

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This paper describes experimental work done on a prototype of in-pipe bristled minimachine, which locomotes in pipe with inner diameter under 40 mm. The principle of minimachine locomotion is based on difference friction force between bristle tip and pipe wall. The new bristle design and its mathematical and graphical model will be presented.

Key words: *thin pipe, minimachine, smart bristle, difference friction*

1. Introduction

The mobile machines for motion in the thin pipes (less than 40 mm) represent today suitable area of research. Their utilization is oriented on detection of defects on inner pipe surface, repair of localized defects, monitoring and maintenance of pipes and last but not least their utilization is oriented on ability drawing new cables into old and already unused pipe systems.

Utilization of motion principles by means of classic wheel and crawling traction for design of in-pipe minimachine is dimensionally limited. In the view of this reason for positioning and motion are used bristles in form of flexible beams which are orientated under precise angle towards pipe surface and they use difference friction. At the minimachines realization are used actuators that are designed and manufactured with different approach because efficiency of energic fields which generating forces that are need for initiation of minimachine in motion decreases with dimensions [1], [2], [3].

In-pipe minimachine, that will be analysed in next, is designed to motion in straight pipe with 40mm inner diameter in view of possibility its another extension by the monitoring system in form of CCD cameras or surface defects sensor.

2. Mechanical concept of minimachine

Minimachine (Fig. 1) is consists of the basic parts namely the DC-micromotor (1), the worm gearing (2), crank mechanism (3) and the smart bristles (4, 5).

Front row of the smart bristles (4) is mounted on body of the minimachine (6). Rear row of the smart bristles (5) is mounted on the rams (8) which are located on the linear slides (7). Rams are connected with the worm gears (2) by the crank mechanisms (3).

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