LOADING COMPUTATION OF SLIDING CONTACTS BETWEEN VANE AND HOUSING OF THE VANE PUMP

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Abstract: *In this paper, the vane pump with constant capacity is considered, because vast usage in industry. This is double-flow vane pump. The paper is focused on contact place between vane pick and housing, so called "sliding contact", as most stressed point. For that purpose, loading computation and analysis of sliding contacts are carried out using mathematics models of geometric dimensions and forces.*

Key words: *Pump geometric, forces on vane, sliding contact.*

1. INTRODUCTION

Vane pump has vast usage in industry. This is volumetric pump and it can be made with changeable and constant capacity. It will be explained later, that it is composed of stator, rotor and vanes, which are put into grooves made in rotor.
When we talk about pumps with changeable capacity it has stator with circular inner surface, while at types with constant capacity, we have elliptic shape. During rotor rotating, chambers are creating in pump, and they are filling on absorbing side, and empting on pressing side. Chambers are bounded with surfaces of rotor, stator and lateral surfaces of two adjacently vanes, which are overlapping on surface of stator with their picks and sliding over it.
Goal of this work is expressing resultant radial force on vane in function of time, in the contact point between vane and stator (sliding contact), as most stressed point.
In order to introduce sliding contact of pump we used earlier mathematics models of its geometry and forces on vane in function of mentioned geometry [1].
In this research we considered vane pump with constant capacity, i.e. double-flow vane pump.

2. DESIGN AND FUNCTIONING OF DOUBLE-FLOW VANE PUMP

At first, it is very important to emphasize difference between single-flow and double-flow vane pump. Single-flow pump has one period of absorbing and pressing of fluid, and double-flow pump has two periods.
Design of double-flow pump is based on elliptic shape of stator's inner surface, which enables two absorbing and two pressing intervals, as we can see in figure 1.

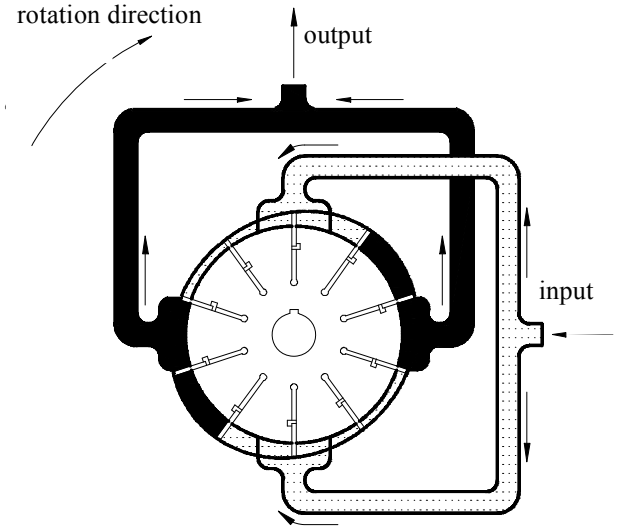

Figure 1. Double-flow vane pump

On input sides, fluid is filling space between rotor and stator in following way: with volumen increasing of that chamber, vacuum is being made in it and chamber is being filled with fluid.
With further rotating, chamber i.e. fluid is reaching minimal volume, and that is influencing rise of hydrostatical pressure, and it is flowing out under the pressure at output side.
Although, we can see that vanes are put into grooves and radially movable. Front edge of vane is in contact with housing (stator).
Pressure in front p_1 and pressure behind vane p_2 are reacting on each vane. Motion pressure p_B is pushing vane and inner vane through hole, so stator is pressed on whole interval of rotation angle φ. Design of this pumps provides relieving of bearings, because all radial loading are distributed symmetrically [1].

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