AMERICAN JOURNALS
Open Access, Peer Reviewed Journals

American Journal of Technology and Applied Sciences
ISSN (E): 2832-1766 Volume 31, December - 2024

ABOUT LIMITS OF THE FORCE SHOULDER FROM THE GENERATOR TO ROLLING ELEMENT OF BEARING

Urinov N. F.
Saidova M. Kh.
Associate Professors of the Department of TM and MT

Aminov M. Kh.
Master of Group M7-23 MICHADK
Bukhara Engineering and Technological Institute

A B S T R A C T

The article presents calculations for determining the force arm from the generator to the rolling element in order to determine the value of the generator force from the magnitude of the arm on the desired rolling elements

K E Y W O R D S

Pressure angle, wheel profile, generator pressure angle, rolling body, force arm, gear ratio, radius of rolling bodies, reaction, generator, wheel.

Introduction

Rolling elements are an integral part of modern technologies. These mechanisms must have high productivity, operate under high loads and high wear. To calculate these loads and design highly efficient mechanisms, it is necessary to know the reactive forces, stresses, force arms and pressure angles of these elements.

In addition to the force from the generator, the rolling element in the mechanism under consideration is affected by reactions from the separator and the profile wheel. In Figure 1, the transmission section with the rolling element and sections of the conjugate elements is taken separately to construct the calculation scheme of the forces.

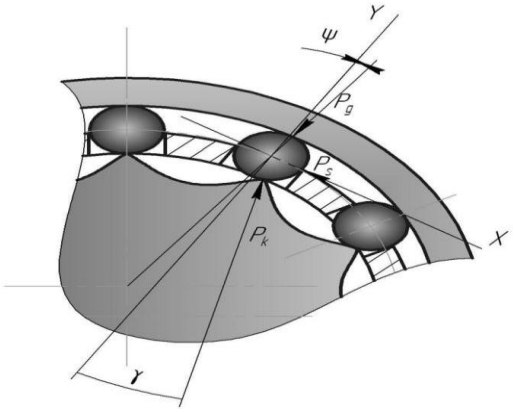

Figure 1 - Reactions of the rolling element from the side of the generator, separator, and profile wheel.

P_g -rreaction from the generator,k– reaction from the profile wheel,Ps -preaction from the separator,ψ-atgenerator pressure point on the rolling element,γ– angle of pressure of the profile wheel on the rolling element

To determine the numerical values of anglesψAndγOlet's fraternize withrwork [1].
Thus, to determine the angleψOlet's turn to formula (1):

$$\psi = \arcsin\left(\left(\frac{e}{r_2}\right)\sin(\beta)\right) \quad (1)$$

Where r– radius of the centers of the rolling elements.
2
To determineγwe enter the values of radial and tangent components of speed$V$ and V.
1 2

$$V1 = -etg(\psi)\cos(\beta) - esin(\beta) \quad (2)$$

$$V2 = \frac{S}{i_o} \quad (3)$$

Where$i0$– gear ratio;
S- the distance from the center of the generator to the circle of the centers of the rolling elements;
e– transmission eccentricity;
ψ- atgenerator pressure point on the rolling element;
β– angle of rotation of the input link.
Ratio for(4):

$$\gamma = \left|arctg\frac{V_1}{V_2}\right| \quad (4)$$

ABOUTReferring to (Fig. 3) we compose a system of equations of static equilibrium (5,6):

$$P\text{g}\cos(\psi) - \text{Pk}\cos(\gamma) = 0 \quad (5)$$

$$-P\text{s} - P\text{k}\sin(\gamma) + P\text{g}\sin(\psi) = 0 \quad (6)$$

Pabout the relation (5) we express(7):

$$P\text{k} = -\frac{P\cos(\psi)}{\cos(\gamma)} \quad (7)$$

Underputting (7) into (6) we express$P$s(8):

$$P_s = P_g = \left(\frac{-\cos(\psi)\sin\gamma + \cos\gamma\sin\psi}{\cos\gamma}\right) \quad (8)$$

Next, to determine the shoulders, let's refer to Figure 2:a_i^r

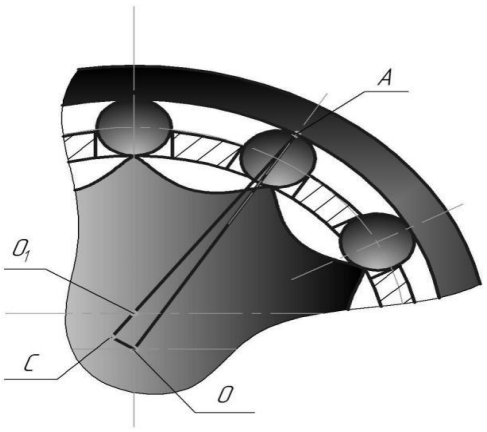

Figure 2 - Geometric diagram for determining the lever arm hg from the generator to the rolling element

Let us consider triangle OO1A in Figure 4. Let us determine the height of this triangle hg, which corresponds to segment CO. To determine this height, let us use formula (9):

$$CO = \frac{2}{O_1A}\sqrt{P(P-OO_1)(P-OA)}(9)$$

where P is the semiperimeter of triangle OO1A.

This formula is obtained by determining the height throughthe value of the semi-perimeter [2].

We determine the value of the semiperimeter using formula (10):

$$P = \frac{AO_1 + OA + OO1}{2}(10)$$

Let's determine the values of the segments:

$$AO_1 = r_t + r_{tk}(11)$$

$$\text{O}(12A = S_t + r_{tk})$$

$$OO_1 = e(13)$$

Where e– transmission eccentricity;

S-distance from the center of the generator to the circle of the centers of the rolling elements;

$r2$– radius of the circle of the centers of the rolling elements.

Distance$S$will be determined by the following formula:

$$S = \text{ecsc}\,\beta + \sqrt{r^2 - e^2\sin(\beta)^2}(14)$$

Thus, formula (9), taking into account the above values,

we rewrite the segments as:

$$P = \frac{r_2 + \text{S} + 2r_{tk} + \text{e}}{2} \quad (15)$$

Underputting (15) into (9) we obtain the following formula:

$$CO = \frac{2}{r_2 + r_{tk}}\sqrt{P(P-e)(P-r_2-r_{tk})(P-S-r_{tk}} \quad (16)$$

The length of CO corresponds to the desired value of hg, respectively.

Conclusion

Using Microsoft Excel software, it is possible to determine each value of the hg arm and, by substituting it into the formula for finding the force from the generator on any rolling element, determine the values of the generator forces from the value of the arm on the desired rolling elements.

References

1.ShiBinsky K.G., Efremenkov E.A., An I-Kan Calculation of geometry and kinematics analysis flat To OuchrAdial ptransmissions with prOintermediate rolling elements //Theory and practice of gear transmissions and gearbox engineering: Collection of reports onatinternal technical conference with international participation - Izhevsk, Izhevsk State Technical University. - 3-5 Dec. 2008. - Izhevsk: Publishing house IzhSTU. - 2008. - pp. 193-196 (58410462)

2.Minyuk S. A. Mathematics for engineers: textbook in 2 volumes // Minsk: Elaida. - 2006. - V. 2.