Abstract: - During the manufacturing process of small cylindrical rollers that equip radial bearings some significant defects can occur. The present paper shows a numerical comparison using dynamic modeling techniques, of physical phenomena occurring at collisions between two rollers in a lot of distinct situations: impact on the edge at different angles, from 0° to 90° and impact on generator.

Key-Words: - Bearing rolls, collision, dynamic modeling, impact, kinetic energy

1 Introduction
In the manufacturing process of small cylindrical rollers that equip radial bearings collisions between two rollers frequently occur leading to significant defects. It is of high importance modeling physical phenomenon of roller impact on the edge at different angles and impact on generator [3].

Radial bearings have rollers which fit tolerances of the order of hundreds and after processing are sorted into groups with restricted tolerance.

In figure 1 is shown the circuit of a roller bearing until it reaches the collector bunker where it falls from a given height, with a known speed. It is of importance the angle of impact at collision of rollers that fall and the ones that are already inside the collector [5]. Rollers materials must have mechanical characteristics [2] that match both operation stress and loads arising in the manufacturing process.

Besides dimensional tolerance sorting, shape tolerances are required (straightness, circularity) in order to achieve the identical shape of rolling bodies with cinematically correct geometrical shape following the operation in the best possible conditions. Roll surface roughness is also very important and should be done within certain limits.

2 Collision Phenomenon
Generally collisions are short-term phenomena (interaction takes a finite time) during which two or more bodies exchange momentum and energy between them. Interaction length is small enough so that external forces do not produce a change in system momentum.
In the collision process there are two phases [4]:
- Compression stage in which kinetic energy of relative motion is converted in deformation potential energy and other non mechanical forms of energy (thermal).
- Separation phase in which the bodies depart one from another, breaking the contact, and the relative velocity increases, the deformation is reduced, the bodies have the tendency to return at original shape.

In this paper the collision of two rollers in different conditions is considered. Parameter that changes is the angle between rollers elements of cylinder, with values between $0^\circ$ and $90^\circ$ with a $10^\circ$ step. Time taken into account is $t = 0.0001$ s. Different situations of rollers impact that can occur inside the collector bunker are presented in figures 2 to 19. The analyzed impact is under various angles.
Fig. 9. 30° angle - Dissipated kinetic energy graph of moving object time depending

Fig. 10. Rollers impact at 40° angles

Fig. 11. 40° angle - Dissipated kinetic energy graph of moving object time depending

Fig. 12. Rollers impact at 50° angle

Fig. 13. 50° angle - Dissipated kinetic energy graph of moving object in relation with time

Fig. 14. Rollers impact at 60° angle

Fig. 15. 60° angle - Dissipated kinetic energy graph of moving object in relation with time

Fig. 16. Rollers impact at 70° angles
The rollers velocity after collision depends on the dissipated kinetic energy [6], while the plastic strains depend on impact forces [1].

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