THE UNFOLDING OF THE PIPES OF PNEUMATIC TRANSPORT USED IN MILLING INDUSTRY

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Abstract:
The purpose of this paper is to establish the intersection curves between cylinders, using Mathematica program . The equations curves which are inferred by mathematical methods are introduced in this program. This paper take into discussion the case of two cylinders, because the intersection curve is identical for all.

Key words: intersection curve, Mathematica program, dust catcher

1.INTRODUCTION

The ventilation pipes from the silo linking the technological transport equipment with the ventilators and the separation dust catchers. They are made, mostly, of sheets whose thickness is taken according to the diameter pipes. These pipes are made, usually, with a circular section.
To achieve a network of aspiration is necessary, that the first, the main pipe, connected only in a certain way with the secondary pipes of ramification, because any change of direction of the air is causing losses of supplementary pressure. These losses are even greater with the change direction are more sudden. For these reasons, the connections make changes in direction as extended. With both the angle formed by the pipe axis with the axis of shunt bus is lower, with both losses pressure ramifications are lower.
In practical use, angles of 15 - 30^o are used. These pieces are made of several segments, which have the name of slices, and they assemble by welding. To obtain a smooth curve, it is necessary that we use a large number of slices, which assures the reduction of the resistance of the air current in this point of direction changing. In practice, for these pieces having an angle of 90^o, we use 5-7 slices.

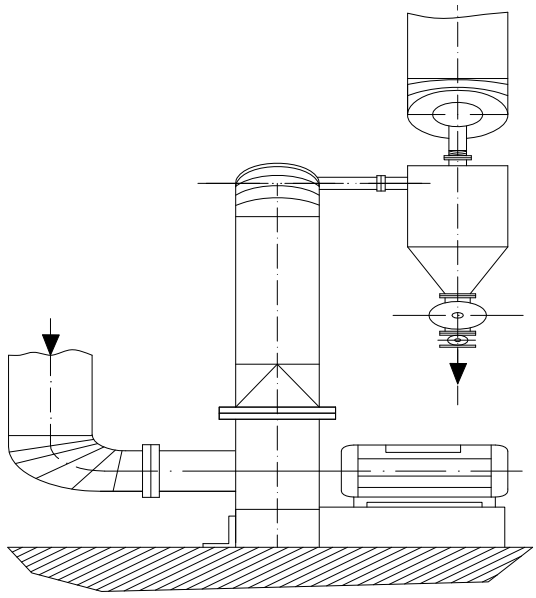

Figure 1. The schema of the dust catcher

2. THE CALCULUS OF THE CYLINDER UNFOLDING

In the figure 2 is presented the setting way of the cylinders. The transition element presented in the figure 2 is met in this pneumatic equipments..
For the first cylinder presented in the figure 3, the equation of the transformation curve, is obtain by applying the transformation (2), (3) to the equation (1).

$$\sin 9° = \frac{AB}{OA} \rightarrow AB = 900 \cdot \sin 9° = 140{,}791$$

$$z = (x+R)\ tg\ \beta,\ x \in [-R,R] \quad (1)$$

$$x = R \sin \alpha \quad (2)$$

$$z = z_d \qquad \alpha \in [0, 2\pi] \quad (3)$$

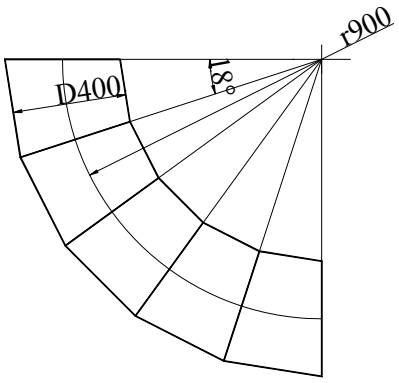

Figure 2. The setting way of the cylinders

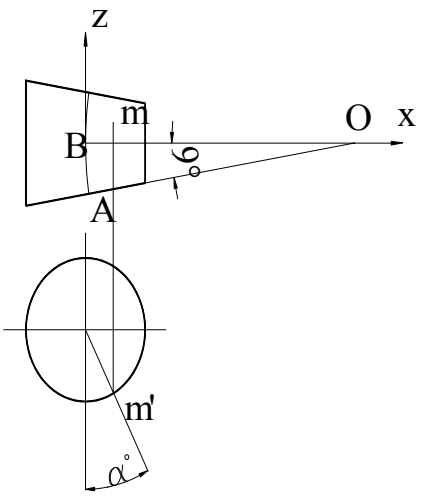

Figure 3. The geometric elements of a cylinder

$x_d = R\,\alpha$

$x = R \sin (x_d/R)$

$z = z_d$

Those we obtain:

$$z_d = \mathrm{tg}\,\beta\ (R \sin \frac{x_d}{R} + R), x_d \in [0, 2\pi R] \qquad (4)$$

For an angle $\beta = 9^o$ and a cylinder radius R = 200, we obtain the figure 4, by introducing the relation (4) into Mathematica program.

Plot[{Tan[9Degree]*(200*Sin[xd/200]+200)}, {xd,0,Pi*400}]

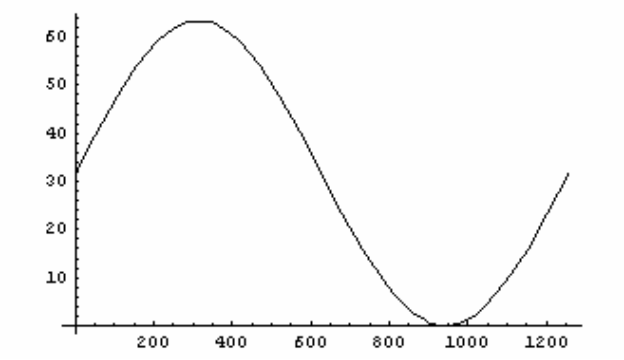

Figure 4. The unfolding of the cilynder

3. CONCLUSIONS

The presented method is very speedy and exactly and using the program we can obtain the cylinders unfoldings for any other dimensions.

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