Stress-strain analysis of the elastic band of the helicaloid conveyor

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The paper focuses on a new design of the conveyor with a helicoid elastic band. The helicoid band provides not only movement, but also mixing of the loose medium during transportation in the cylindrical casing of the conveyor. The energy method is used to calculate the stress-strain state of the belt. Since the transverse edges located on the band are rigid, and the number of periods is strictly fixed, the shape of the deformed surface of the band is completely determined by only one parameter – the axial deformation. The Cauchy-Green strain tensor was determined by comparing the original and deformed surfaces of the band. The potential energy of the deformed band was calculated by integrating the specific potential energy of the elastic material over the initial surface of the band. The full potential of the system was obtained by adding the potential axial force and torque to the potential energy, the former being determined trivially. Full potential minimization was performed by standard procedures of Wolfram Mathematica mathematical package. As a result of the calculation, we obtained elastic characteristics of the belt, i.e. the dependency graphs of the axial deformation on external loads. In addition, we found stresses that can be used to assess the strength of the band at a given load.

Keywords: *helicoidal conveyor belt, elastic band, Cauchy-Green tensor, full potential, minimization, elastic characteristics*

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