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POTENTIAL INVOLVEMENT OF INFORMATION TECHNOLOGY TO IMPROVE RELIABILITY OF CONVEYOR SYSTEMS

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Abstract. The authors deal with topics need to bring the latest information technologies in the development of a system for collecting conveyor belts during the emergency failure of the latter. Also, the authors analyze the possible ways and approaches to the implementation of high-accuracy mathematical models of simulation processes capture conveyor belts catchers during emergency rush belt during operation of the conveyor. Also, considerable attention is paid to the analysis of factors affecting the durability of the conveyor belt, as well as the identification of random negative impacts on the conveyor belt.

The authors try to identify areas for further research and develop theoretical component modeling of capture belt during its break, and theoretically define the areas of some practical values that affect the process of collecting conveyor belts when it is broken. Indicated further areas of research give authors an idea of the order of magnitude that will be obtained during field studies, as well as provide an opportunity to focus on the most important factors and trends in the processes of capture. In this paper the authors present their vision of the future theoretical research for the thesis.

Keywords.

Introduction. Computer technologies in the last 50 years have made a huge step forward. Even 60 years mankind has used computers for sending humans into space, and now - using personal computers are able to calculate the complex processes of the medium and tension in different designs. With appropriate skills even one person is able to create a revolution in solving specific problems. Recently, more and more involved in computers and specialized software for designing machines and components. Computer simulation helps save a lot of time in solving any engineering problems.

However, the main obstacle is that relatively small number of specialists has specialized software at the right level. This is due primarily to the fact that our country is in the role of catch-up. In developed countries, almost all development stages are modeling and improvement of technical and geometrical characteristics by the software. That is, every detail, every unit, each unit initially projected collected, tested, improved in the computer environment, artificial environment, which is capable semulate computer program. And only then, when all the characteristics meet the requirements of the project, when all the parts and components are most effective - and start making real collection unit.

In our opinion, it is an advantage and immediate reason for the need of general implementation method of computer simulation units prior to their making and implementation process at work.

In the world for several decades use computer technology for the development of conveyor systems, modeling behavior belts, remote monitoring its status in real time prediction of failure on a given conveyor system in real time, and so on. At present the most relevant precision mathematical computer models are able to provide comprehensive data on the system with the provision of tables, graphs, charts, tables, and enough to make an accurate prediction of future and stability of the system [1-9]. The most progressive elements of the design is the analysis by FEM method (taper elements), and linear or nonlinear analysis [11-12] It allows you to more accurately calculate and consider the behavior of any details.

The introduction of new computer simulation in the process of developing new and improving existing systems capture conveyor belts is one of the priority directions in the design of a continuous transport. This method will work out hypotheses and theories about the appropriateness of different modes capture belts different designs trap. At the same time, will develop mathematical models of the behavior of the end of the belt at the time of the cliff and its behavior at the time of capture.

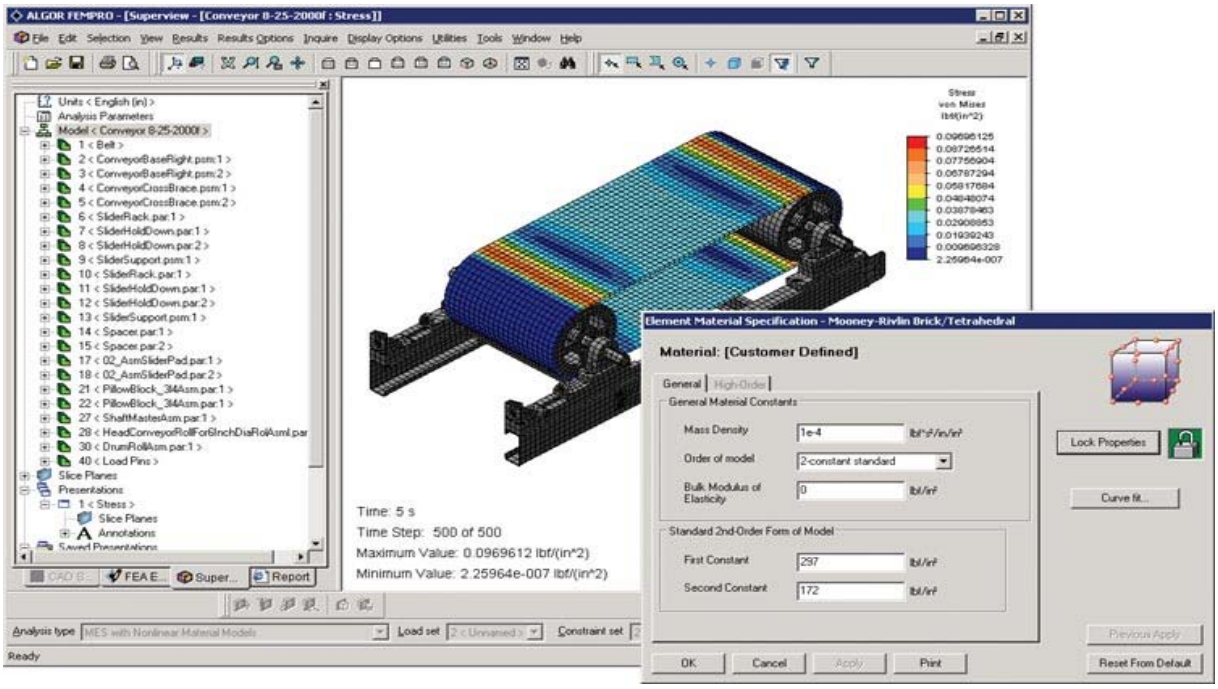

Figure 1. The illustration of of load distribution in the conveyor belt performed in Algor MES software [11]

Materials and methods. During operation of conveyor systems one of the most important elements of the design to ensure trouble-free operation of conveyor belts are traps. Even after emergency impulse conveyor belt traps help to minimize the loss of the goods and the costs of liquidation damages that may cause flow breed. Therefore, the design and operation of the trap is made in accordance with the requirements of the mining industry, namely the ability to trap quickly stop conveyor belt that comes after her emergency impulse.

Simplicity of design helps reduce maintenance costs, and the correct approach to design - simple design has less chance of rejection or failure of its individual elements.

An important and difficult step in modeling systems capture belt when creating emergencies in the pipeline is multifactorial nature of stress, the stress of various types, kinds and sizes, as well as the difference in the material conveyor belt and its pond. Among the most significant is that the trap must work tape as the tape at break, and at its opposite movement together with the load at emergency stop drive belt. Also, the trap should ensure suspension of the belt in such a mode in which the load on the belt did not wear a destructive trap design and components of the tape. In addition, the design of trap should be as simple as possible, in the most effective and the most simple and plain operation.

Results. However, the correct choice of the location of traps on the conveyor pond plays an important role in the efficiency of the assembly line. Installing traps near the old belt tensioning station, performance is reduced to almost zero. This is because the loaded conveyor belt is rarely breaks in the area tensioning drum. In this area there are only belt tensile force of tightening station and a small amount of ore loaded to the feed. In the area around the drum clamp can be torn worn belt or ribbon unlikely influenced by factors such as emergency failure of individual elements of the pipeline, which will create excessive tensile force, and so on.

Set traps in the area near the drum drive belt is the most appropriate. This is due to the fact that in this area on the belt are much harder than in the tension zone near the station. Here repeatedly increasing pulling force from the drive drum creates torque; amount of material transported, which is distributed over the entire length of the tape reaches the maximum value that creates a large longitudinal tensile force in the tape. Also in this case, not least between the belt and sagging supporting rollers under load. Overcoming resistance that creates slack tape multiplied by the length of the conveyor and the

degree of load latter are too large dissipative tensile force, affecting the state of the conveyor belt. The essential point in the selection trap placement is to determine the number of traps. In practice on conveyor lines may have one or more traps. In addition, the types of traps, in which part of the overall design of the device includes previous responses to break the belt, an important factor is the choice of installation location relative to the main structure trap.

This is because the increase in the number of traps increases the overall system to counteract the effects of the possibility gusts belt. But at the same time, increase the number of leads to increased costs for their service and installation immediately.

So, localization zone greatest stress on the conveyor belt during operation, and therefore the most likely places impulse conveyor belt is a major factor in deciding where to install traps or trap system for conveyor pond.

We should not forget that the raw material is transported on conveyors mining complex also wears tape. This is due to abrasive materials, sharp edges pieces of rock, the effect of corrosion factors belts from raw materials and vibrations generated in the film during download this material from the hopper.

The combination of all the aforementioned factors ensures that the belt wears out faster than envisaged performance. If these factors worn and torn tape in the area by far the largest load on it, namely in the area of the drum drive belt.

It should be noted that "zone near the drive drum" is sufficiently vague concept. To date, very little research conducted which would be designed to search for and select the optimal location of traps tapes.

Directly capture process also significantly affect the belt. Depending on the speed of capture, the nature of the efforts that are part of the trap on the belt, the amount of cargo and its physicomechanical properties and load tape may behave differently.

Thus, considering the aggregate belt and load may make concluded that the speed and nature of catching mainly affect the process of catching the condition of belts with load after the final closure of the conveyor belt.

Given the theoretical aspect catching belt speed range can be seen in the following ranges: from almost instantaneous capture from belt by applying maximum effort to capture it with a slow gradual increase efforts admiration. The selection of optimal parameters capture is a key factor proper operation trap. Very sharp capture belt loaded bulk cargo, it can provoke deformation, causing the elastic wave. The kinetic energy of this strain can be transmitted load and sprinkle it on the conveyor gallery.

On the other hand, the relatively slow belt capture trap may not be fast enough that the belt will cause slippage between working bodies trap and its withdrawal from the area of capture. In this case, loaded with belt will move in the direction of tension station, causing the destruction of structures belt.

Among presay examples of emergencies that require development process simulation systems capture conveyor belt fit of the cross is catching bands and stop the conveyor during longitudinal cut belt. The phenomenon of longitudinal cuts belt observed in places loading conveyor by contact with a sharp object, which is obtained from a bootable device is compatible with the main flow of bulk cargo This factor is particularly dangerous because it delayed at stopping the conveyor belt can be cut along its entire length with a forced replacement last .

Empirical optimal selection options in conjunction with the latest methods of computer simulation - the only way to ensure the highest possible efficiency factor and reliability traps conveyor belts.

However, empirical method of selection parameters can give only approximate results. To determine the expected present research results in Table 1 which will determine the most promising areas.

Such a wide margin of tolerance specified time because is unknown how long it takes to capture a conveyor belt on a particular line, and I shall proceed capture process that would not damage the tape. It was mentioned above.

Consider the nature of super-fast capture. At this speed capture clear advantage is that the conveyor belt loaded with what appears to be moving in the opposite side of the main direction of the conveyor stops almost instantly. At first glance belt loaded with bulk materials virtually no time to move in the direction of stretch and break station construction pipeline.

However, with this character trapping may occur in longitudinal elastic wave section of belt as a result of the sudden seizure of the latter. This elastic wave can be so powerful that can throw small- and medium-bulk material space with belt. At the same time, the sharp capture conveyor belt can destroy the surface layer cover belt and can cause excessive load on the trap design.

Quick capture mode can also be damaging to the surface layer of belt and shoe contact surfaces for traps. As in the previous capture mode belt likelihood of unwanted destruction system catcher Feed is very likely. On the other hand, a gradual capture belt is preferred for its surface layer and the contact surfaces trap.

From our point of view, moderate capture mode is the best. This is due to the fact that in this mode the balance of forces between surfaces catching shoe trap and forces that try to pull the tape from the zone of capture is optimal. We believe that in this mode trapping layer is preserved cover belt to continue the whole contact area shoe trap. Also, the likelihood of elastic waves in the film is low enough to not take this probability into account.

In slow motion capture significantly increases the likelihood that performance capture system is lower than required. That increases the likelihood that trap just do not have time to work properly. In this case, it is also possible partial operation systems: boots catcher make it closer to each other and touch the belt, holding it slightly. However, decreasing speed down the tape is already very large and due to inertial forces belt with a load of sliping capture zone.

Very slow capture mode included in the table are more checks for all possible capture. Clearly, in this case, the probability of triggering traps partial or complete refuse is very high. The system can capture tapes just do not have time to squeeze the tape to the desired strength.

Conclusion. As a conclusion we note that we have outlined future directions in the study of modes of capture on tape conveyor systems. Theory is defined most likely value of time and modes of trap mechanism prior actions.

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