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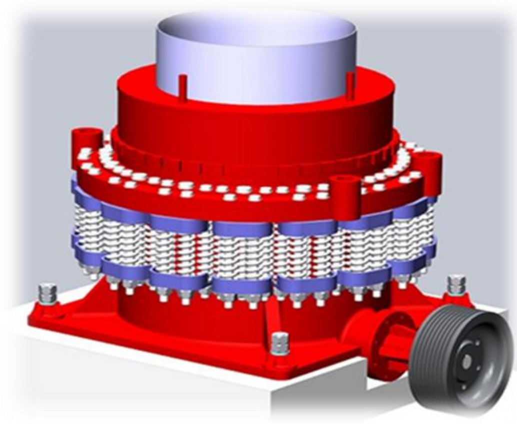
DYNAMIC STUDY AND BALANCES CONE CRUSHER SMALL CRUSHING ENVIRONMENT IN SOLIDWORKS MOTION

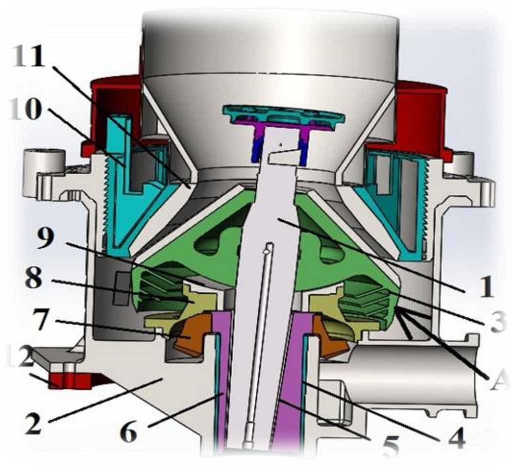
For coarse, medium and small crushing in nonmetallic industry, mainly used cone and jaw crasher. The problem of cone crushers is that unbalanced construction creates a large force, so it is advisable to structurally balance on the construction stage crusher to reduce the impact on the foundation and other equipment.

By definition, the balance is characteristic mechanism, which should not depend on the operating mechanism of external forces. Fully considered a balanced mechanism in which the main vector and main moment of inertia forces are zero. If the external forces are reactive, then the equation will only balance the inertial components as defined by the parameters of inertial mechanism - the masses, moments of inertia and the law of motion. In this case, the inertial components will depend on the size-mass characteristics crushing cone 1 (Figure 1, B), the frequency of rotation and geometrical parameters in building installations crusher 2 (Figure 1, B).

Considering today requirements for shortening the implementation stage design work requirements with simultaneous improvement of their quality, are important issues for effective construction technologies based on the use of CAD / CAE-systems. Therefore, in this paper is relatively dynamic balancing forces and moments cone crusher KMD-1750 model (Figure 1 a) in the module Motion software SolidWorks.



a)



b)

Fig.1. Solid state 3D model cone crusher KMD-1750 (a) and adapted its model to study the dynamic module in Motion (b) 1 - cone movement; 2 - the crusher housing; 3 - the case of movable cone;
4 - intermediate sleeve; 5 - tapered bushing; 6 - eccentric; 7 - bevel gear drive cone; 8 - bearing cup; 9 - thrust bearing; 10 - fixed cone; 11 - real armor cone; 12 - flange for gathering the dynamic loads.

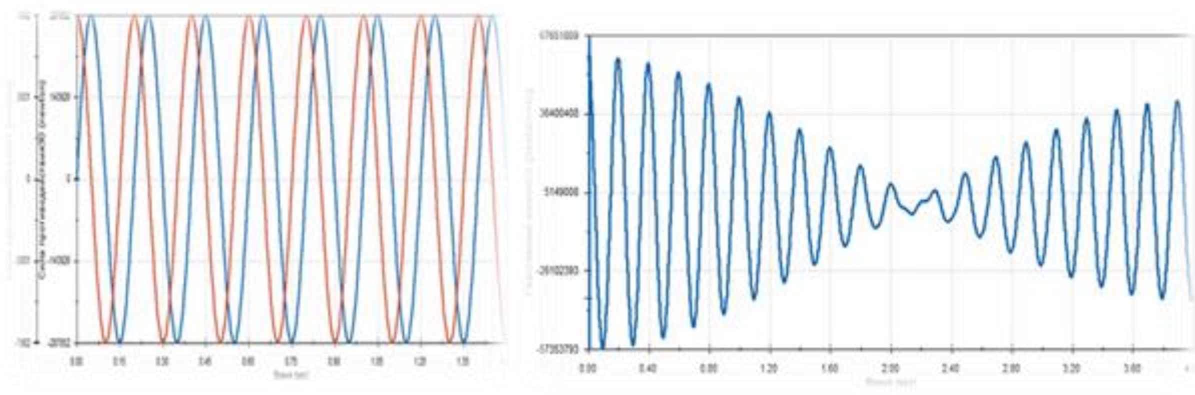
Features of the adapted model.

Due to the fact that the crusher consists of 350 parts 120 configuration for calculating required significant hardware resources and considerable computer time. To improve the efficiency of research crusher model was adapted for dynamic analysis environment Motion. The main difference between the adapted model over the original is still the majority of parts were settled through the appropriate commands to the context menu items of wood construction. Left was only the parts that are connected with moving parts, and some other visualization construction.

To reduce the amount of information the flange 12 brought to a state of **"Recorded"** and all other components / parts brought into the state of **"liberated".** Conjugation between the parts that do not perform movements relative to each other, interface changed to **"Reported".** All other configuration removed or canceled. Left only interface **"concentric"** between the intermediate sleeve 4 and eccentric 5. This is because the fixed coupling parts usually contain redundant connections that can be interpreted incorrectly system, which in turn can reduce the accuracy of the study.

For ease of determination counter reaction housing in accordance with the recommendations that are contained in the literature (Alyamovskyy AA " Engineering calculations in SolidWorks Simulation"), the design was further introduced flange 12 (Fig.1.), Which is connected with the body via two configuration, namely: coincidence between basic vertical planes and alignment. This should ensure that minimal problems «Collect» dynamic forces occurring in the system.

Between the housing and movable cone 3 thrust bearing 9 formed 3D for the following parameters: material parts - Steel (Greasy); friction parameters - ν_k = 10.16 mm / s, μ_k = 0.05; elastic parameters - set to "impact" for which rigidity is 1000000.00 N / mm, maximum damping - 49.91566312 N / (mm / s); maximum penetration - 0.1 mm.



(((a) (b)

Fig.2. The results of the study of dynamic balancing power crushers in (a) and in points (b).

Setting research analysis module movement in Motion: the study - 1.5 seconds; the number of frames per second - 100; type integrator - GSTIFF; maximum integrator step size - 0.01.

After analyzing the team through «Results and Plots» dependency diagrams of the forces of reaction time (Figure 2, a). After receiving value unbalanced force 287,852 N dependence on $m = P / (\omega ^ 2 R)$ defined the approximate mass to constitutes 316 kg (compared cone the hull mass 5850.87 kg). After fixing a balancing mass (from structural considerations Balancing mass was slightly reduced) on the housing cone and after a study received reaction force constitutes 7862 N. But at the same time there is a significant imbalance in moments. To investigate the optimum placement distance balancing mass relative to the moments of intersection of the main central axis of inertia moment and the axis of rotation of movable cone was provided mobility balancing mass along the axis of the cone shell moving without changing radial distance from the axis of the cone. Additionally was created linear motor, which has moving balancing mass during rotation of the cone. The engine was moving at a constant speed, and movement performed by 400 mm by 4 seconds. Results of the study depends reactive moment of time relative to the flange shown in Figure 2, b.