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Jaw crusher kinematics simulation and analysis

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Abstract: Jaw crusher is a kind of the relatively new compound pendulum jaw crusher, it has two crushing chamber and has an inverted crank rocker mechanism. The design is mainly to meet the following requirements: 1, crusher capacity 30-50t / h. 2, the maximum grain size of the material feed 120mm. 3, the largest nesting size should not exceed 30mm. According to the design requirements we design the complex dual-chamber pendulum jaw crusher. Design study of the current status of the development of the jaw crusher and the future trend of development, and the design parameters of the detailed calculations. And the most important is the use of ADAMS software crusher kinematics simulation and analysis .

Keywords: jaw crusher; dual chamber; ADAMS; kinematics simulation

I. Introduction

In the construction industry, the mining industry and the rapid development of the industry today, gravel, crushed stone machinery - Crusher for everyone has been very familiar with different types of broken equipment, broken machinery, broken stone machinery are doing within their field of use outstanding contributions. Resulting in broken machinery and abroad there is a huge gap for many reasons, including market demand is not the same as one of the causes of the gap, due to the excellent crushing equipment manufacturers in the international market is mainly concentrated in Europe and America, where large-scale basic construction phase has been in the past, the demand for sand and gravel is not a lot, it is bound to form a gravel field is highly concentrated in large-scale production to achieve environmental protection. International professional vertical shaft impact crusher manufacturers have adopted most of ceramic production of wear parts, not just the high chromium cast iron and tungsten carbide.

Based on the overall structure of the jaw crusher design, using UG software to build three-dimensional jaw crusher models and their simulation and analysis of kinematics.

II. An overall program design

2.1 research

Something jaw crusher in the design consideration is relatively more important as the machine, a series of indicators of consumption, production capacity and jaw lifetime. Due to harsh working conditions crusher, heavy work, but the force is more complex, in order to ensure the normal operation of the crusher at work, you should make the design process should meet the following requirements: environmental health, energy, security, environmental protection. General jaw crusher mainly consists of eccentric shaft, racks and movable jaw formed. Movable jaw is the core of the design, the size and structure affects the performance of the entire design. The main components of the dual-chamber jaw crusher is moving jaw. Movable jaw structure is basically determines the state of motion of the movable jaw, jaw thus affecting the degree of wear and machine processing capacity.

Dual-chamber jaw crusher can be stable under the operating state of the double working stroke, so there is no single chamber air travel crusher energy consumption, a significant increase in processing power, a significant reduction in power consumption per unit time, in addition, bis jaw crusher cavity but also because it easy maintenance, simple structure, uniform particle size and other characteristics, is an energy efficient, with new models promising far-reaching.

In the analysis of compound pendulum jaw crusher mechanism movement, based on the proposed mechanism has inverted four characteristics of dual-chamber jaw crusher. This way of working dual-chamber jaw crusher is the crushing chamber alternately by two broken material, there is no energy loss of air travel, energy efficiency and high power units significantly decreased, the processing capacity increases, metal consumption is also significantly reduced. The structure has good kinematic properties, can greatly improve the state of motion of the tooth plate, so that the material is more conducive to crushing, and can prolong the life of the tooth plate. And the formula for calculating dual-chamber jaw crusher main parameters, the single, the main performance parameters of dual-chamber jaw crusher is relatively certain that the dual-chamber jaw crusher machine performance, is a far-reaching development a new type of potential.

2.2 The overall design

ADAMS is a collection of visualization techniques, solving, modeling in one of the mechanical system simulation software, this software can quickly and easily build a simulation model of the mechanical system, dynamics and kinematics simulation analysis, the output acceleration, velocity, displacement and force curves can also be applied, such as UG, Pro / E and other powerful modeling software for three-dimensional modeling of mechanical, then ADAMS / Exchange supports STEP, IGES, Parasolid, DXF / DWG, etc. graphics Interchange Format output ADAMS through CAD and interface modules imported into ADAMS, and dynamic simulation and kinematics, but also expanded the scope of its use.

2.3 Motion Simulation Analysis crusher

2.3.1 device simulation model jaw crusher at work

Establishing dual-chamber jaw crusher by using three-dimensional models UG shown in Figure 1, and by paeasolid format output. Open the ADAMS software, just import the output of a three-dimensional map. Three-dimensional map of the various components are named, interference simulation components deletion. Eventually build four components, namely: Building an eccentric shaft for crusher, mobile jaw crusher member 2, member 3 crusher elbow board member 4 rack.

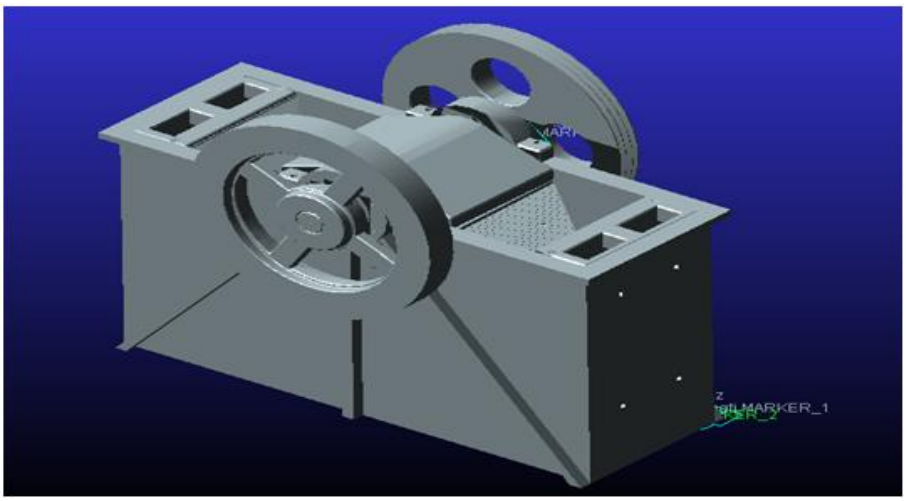

Figure 1 ADAMS The simulation model

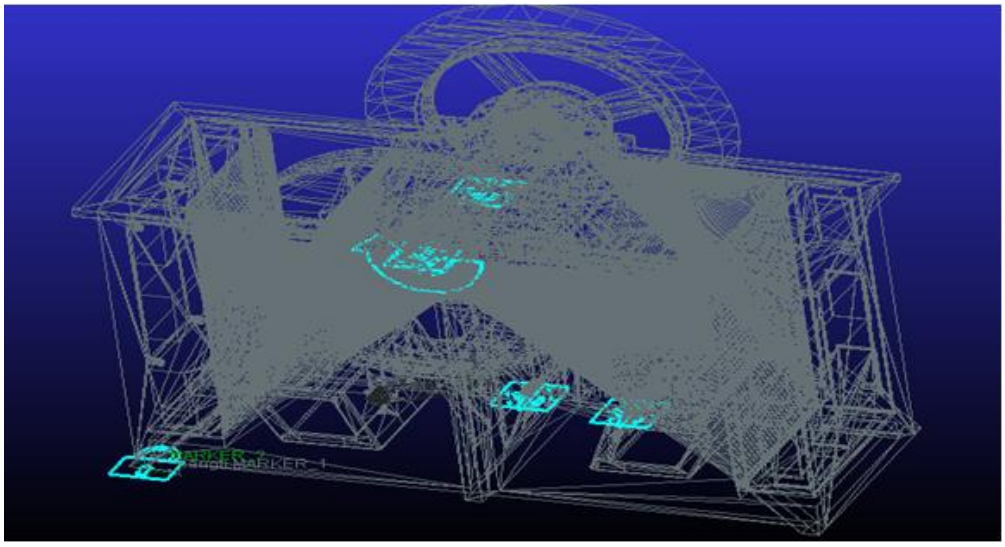

Figure 2 double cavity jaw crusher drive and restraint

2.3.2 impose constraints and drive the simulation model

Before the establishment of a good geometry, motion analysis and calculation, use the movement of each coupling member vice, which is applied to the model constraints, by constraining the coupling together different components, some relative movement between the members to limit, the formation of a mechanical system. First, the rack fixed to the ground. Four members of dual-chamber jaw crusher rotation by three deputy, a deputy joins circumference, namely: the coupling shaft and the rack, the rack between toggle plate and moving parts for rotating and stationary parts deputy connected, moving connection between the jaw and the shaft connected to the movable member is a cylindrical deputy connected with fasteners, which does not participate in the bearing end caps and other moving parts and rack secured to the flywheel and pulley fixedly connected with the eccentric shaft.

After adding constraints, but also applied to the model-driven. Constraints and drive to establish the relationship between the work of the rod on the eccentric shaft and drive pulley joints force is applied, as in Figure 2.

1.3.3 Drawing the characteristic curve of an object

Characteristic curve can draw an object, without having to recreate a measure of the characteristic curve is drawn, and optionally simultaneously displayed more than one characteristic curve. Draw the characteristic curve, you must enter ADAMS / Postprocessor or import models and results after running ADAMS / View. Draw an object characteristic curve data set "Source" on the control panel for the "Objects", the control panel changes to display all plotted graphs available results. Then choose to draw the characteristic curves of the model, select the object you want to draw characteristics from "Object" menu, "Object" menu contains a list of all the components of the model. Select the features you want to draw from the characteristic curve "Characteristic" menu, then select one or more characteristics of the component needs to be drawn from the component "Component" menu. Select "Add Curves" will be added to the current data curve curve. Simulation analysis, from the crusher feed opening point of the horizontal and vertical displacement curve (slightly) the average maximum horizontal stroke can be seen at this point is approximately 3.5 cm, the average maximum vertical travel approximately 0 cm; points from the discharge port C the horizontal and vertical displacement of the point of the curve C can be seen the level of the average maximum stroke of approximately 2.5cm, the average maximum vertical travel of approximately 4 cm.

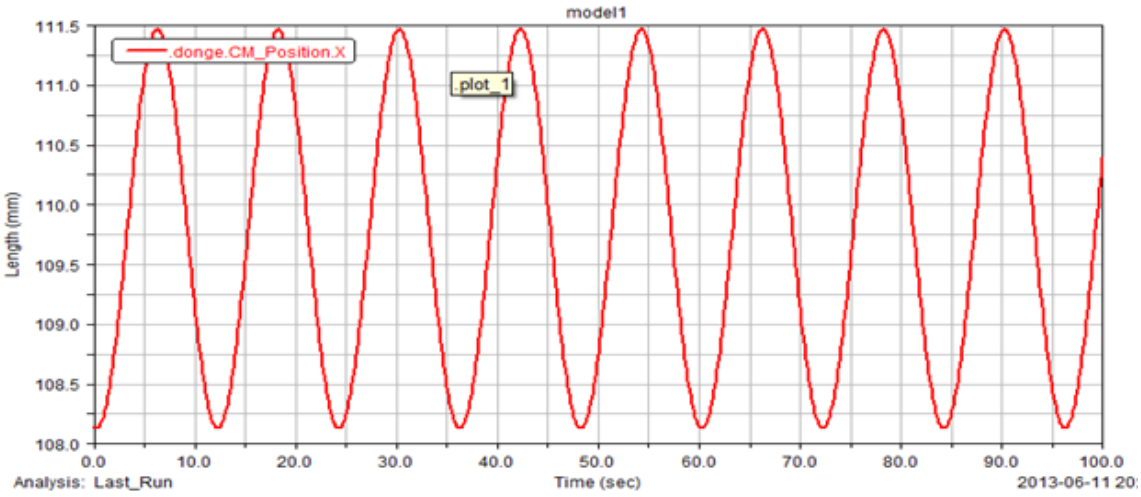

Figure 3 jaw motivated spout horizontal stroke motion curve point

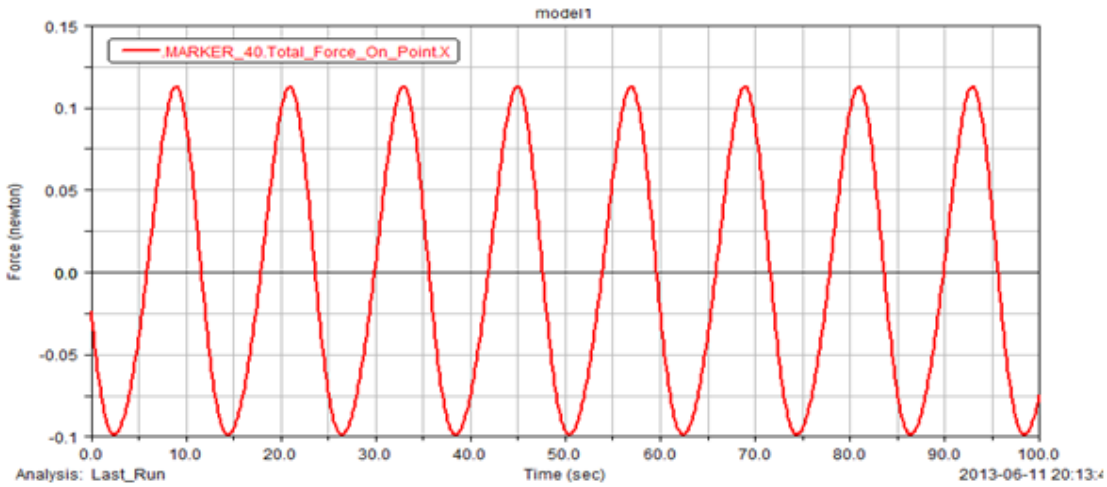

Figure 4 movable jaw horizontal movement on the nesting population curve

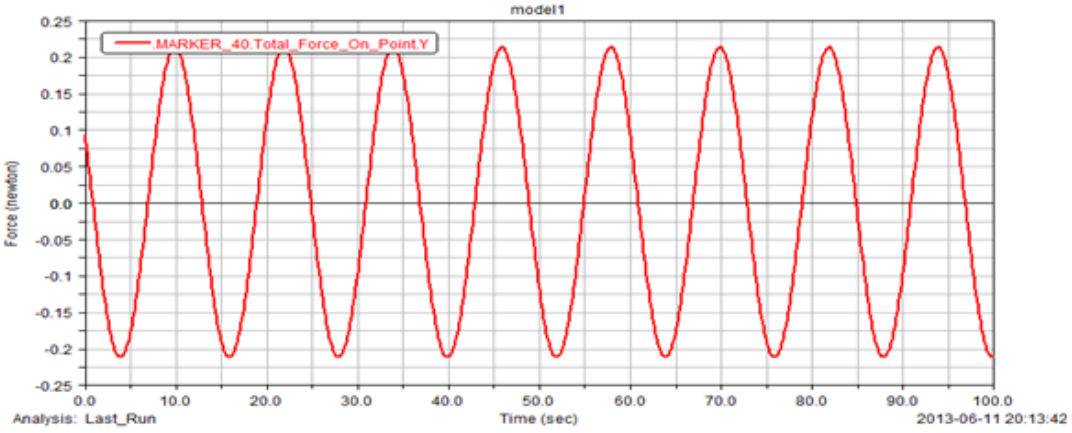

Figure 5 movable jaw movement on the discharge port value curve

Figure 3-5 movable jaw horizontal movement on the nesting population curve .Simulation analysis, from the point of the crusher feed opening levels (Figure 3), the vertical displacement curve (slightly) the average maximum horizontal stroke can be seen at this point is approximately 3.5 cm, the average maximum vertical

travel approximately 0 cm; from the horizontal spout point C (Figure 4), the vertical displacement of the curve (Figure 5) can be seen that the average level of the maximum stroke of the point C is approximately 2.5cm, the average maximum vertical travel of approximately 4 cm.

From the above data shows that the average level of motorized jaw crusher jaw journey, which ensures the movable jaw plate

Squeeze the material exert enough pressure, but the level of the crushing chamber from the top down stroke is decreasing, ensure smooth discharge. As can be seen moving jaw while small vertical stroke, reducing wear and over crushed phenomenon. In favor of the crushing process is also conducive to the discharge process, crushing effect is very good, it is more reasonable.

III. Summary

Our simulation results can be seen from the jaw crusher according to a predetermined trajectory design, each piece does not have a special interference, when the crusher discharge flow, no clogging materials, better sports performance, tooth plate wear and no over crushed. Motion simulation time can be adjusted via a virtual prototype pole position angle θ, thereby improving their efficiency through quick-return characteristics of institutions, and also the drive mechanism and the pressure angle λ simulation and adjust the angle α, the simulation results for later Optimal design of crusher equipment laid a foundation.

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