

## Reformation Design of the Feeding System of the Semi-Mobile Crushing Station

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**Abstract.** The crusher station of the Qi Dashan mine is the semi-mobile crushing station. The crusher station has three parts. They are a heavy plate type material feeder having a receptacle trough, a crusher having a tower for controlling and a blowdown equipment. The hazard rate of the heavy plate type material feeder having a receptacle trough is high and its operating cost is costly. So the heavy plate type material feeder having a receptacle trough will be thrown off. A new feeding system will take the place of it. And new steel structure beams will be designed. The weight of the new feeding system will be borne by the steel structure beams. The ore or rock will be piled into the crusher directly.

### Current architecture of the semi-mobile crushing station in the Qi Dashan mine

Two semi-mobile crushing stations are introduced from the Krupp Works of Germany in 1995. The two semi-mobile crushing stations are all under the jurisdiction of the Qi Dashan mine. One smashes the rock. And the other smashes the ore. They costed 3 hundred million RMB at that time. One semi-mobile crushing station includes three parts. As illustrated in Fig. 1. They are a heavy plate type material feeder having a receptacle trough (as illustrated in Fig. 2), a crusher having a tower for controlling and a blowdown equipment. The core of the semi-mobile crushing station is a 60"-89" cratic cycle model crusher. The driving power of the crusher is 597kw. The production capacity of the ore is 4100t/h. The production capacity of the rock is 6100t/h. The maximal feeding materials size is 1500mm. The maximal discharging-material size is 50mm. The two semi-mobile crushing stations start to use in the beginning of the year 1997. The adaptive stage high of the heavy plate type material feeder having a receptacle trough is 12m. The useful volume of the receptacle trough is 615t. The length of the material feeder is 31m. The length of the material feeder is 2.512m. The obliquity of the material feeder is 24.95°. The running speed is 0~0.5m/s. The main generator is driven by fluid power. The main generator's power is 2×400kw. The installation power of the material feeder is 856kw. Its gross weight is 795t. From 1997 to now the operating cost of the heavy plate type material feeder having a receptacle trough is very high and the failure rate is also high. These cause resource-wasting largely. The semi-mobile crushing station will be transformed. The material feeder having a receptacle trough will be thrown off. The load of feeding equipment will be absorbed by the steel structure beams. The ore and the rock will be drawn into the receptacle trough directly. This will bring more economic effect.

Where 1 is the heavy plate type material feeder having a receptacle trough. 2 is the crusher having a tower for controlling. 3 is the blowdown equipment.

**Direct expense cost.** The power consumption of the heavy plate type material feeder having a receptacle trough is 451.2 ten-thousand-yuan every year. And it wears the cost of the scraping belt and attachment 150 ten-thousand-yuan every year. Its operating cost reaches up to 601.2 ten-thousand-yuan every year.

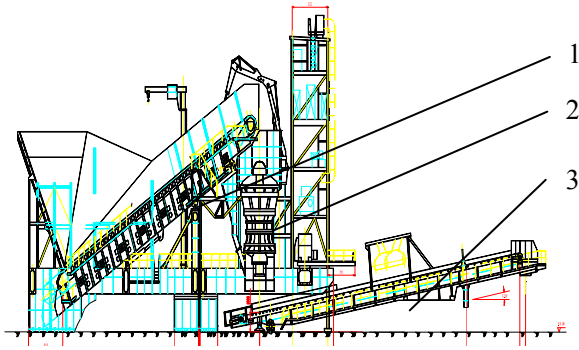


Fig. 1. The Model of Qi Dashan Semi-mobile Crushing station

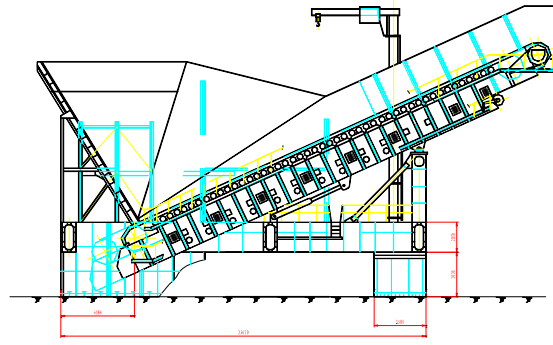


Fig. 2. The Model of Heavy Plate Type Material Feeder

**Indirect expense cost.** The crusher can not be filled with ore or rock using the heavy plate type material feeder having a receptacle trough. This reduces the productivity effect. This is also uneconomical operation. If the crusher can be filled with ore or rock the productivity effect will be increased. And this will reduce using scaleboard. This will save operating expense. The failure rate of the heavy plate type material feeder having a receptacle trough is very high. The replacement time of the scraping belt and the attachment is  $100 \times 2$  hours. These reduce the operating rate of the system.

#### Structure design of the steel structure beams

The semi-mobile crushing station will be transformed. The heavy plate type material feeder having a receptacle trough will be thrown off. The steel structure beams will be designed. The weight of the new feeding system will be born by the steel structure beams. The steel structure beams are welded steel plates. They are space steel structure. The steel structure beams have two parts. One part is the main beam. The other part is the auxiliary beam. The main beam have two beams and the auxiliary beam have four beams. The structure is enormous. As illustrated in Fig. 3. The four tips of the main beam are set on the concrete shoulder. And they are welded partly. The eight tips of the auxiliary beam are fixed using bolts.

**Structure of the steel structure beams.** The new crushing station have two parts. They are a crusher having a tower for controlling and a blowdown equipment. The heavy plate type material feeder having a receptacle trough will be thrown off. The crusher having a tower for controlling and a blowdown equipment will parallelly move 23.82m to the dumping terrace. The socket of the dumping terrace will be widen. The headroom will be 17m. A new receptacle trough will be set up on the top of the crusher. The steel structure beams will be around the new receptacle trough. There will be two EH3500 EV with in-wheel motor drives on the steel structure beams. The two EH3500 EV with in-wheel motor drives will take off ore or rock to the new receptacle trough. The new receptacle trough will be syndeton in block. Finishing the installation and the backout will take 3~5 days. And the moving of the crusher having a tower for controlling and a blowdown equipment will not be influenced. The weight of the new receptacle trough is 650t. And the gross weight of the new feeding system will be born by the steel structure beams.

The plan view of the semi-mobile crushing station after reformation is as illustrated in Fig.3, where 1 are the main beams. 2 are the auxiliary beams. 3 is the receptacle trough.

The throat of new receptacle trough for ore after reformation is 140mm. And the throat of new receptacle trough for rock after reformation is 180mm. The crusher can be filled with ore or rock using the new feeding system. The output will be stable. The output of the ore will be 4000t/h. The output of the rock will be 6000t/h. The maximal discharging-material size of ore is 300mm before reformation. The maximal discharging-material size is 230mm when the throat is 140mm. The maximal discharging-material size of rock is 350mm before reformation. The maximal discharging-material size is 300mm when the throat is 180mm. These will raise the beneficiation

capacity. These will reduce using scaleboard. This will save more operating expense. The full-scale mock-up model of one girder and the inner structure of one girder are as illustrated in Fig.4 and in Fig.5.

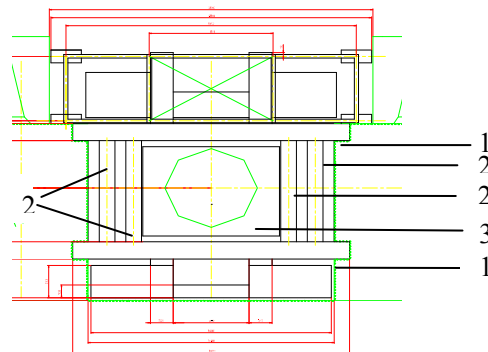


Fig. 3. The Plan View of Semi-mobile Crushing Plant after Reformation

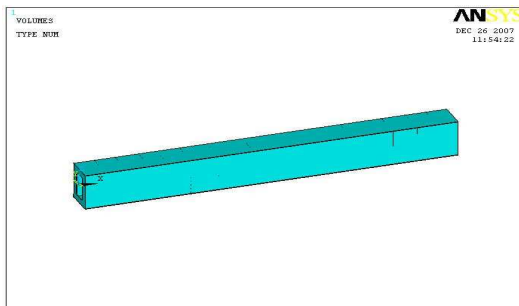


Fig. 4 .The Full-scale Mock-up Model of One Beam

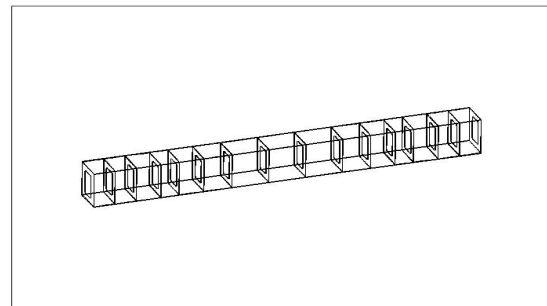


Fig. 5. The Inner Structure of One Beam

**Load for the steel structure beams.** There are two part loads.

(1) The autologous weight of the steel structure beams

Because  $G=mg$  and  $m=\rho v$  the weight of the steel structure beams can be obtained. Where  $m$  is the gross mass of the 16Mn steel plates. The  $\rho$  is the density of the 16Mn steel plate and  $\rho=7430\text{kg/m}^3$ . The  $v$  is the volume of the beams. Through calculating the volume of the main beams is  $2.3068\text{ m}^3$ . If  $g=9.8\text{N/kg}$  we can have  $m=17139.5\text{ kg}$  and  $G=167967.3\text{N}$ .

Through calculating the volume of the auxiliary beams is  $0.98314\text{m}^3$ . If  $g=9.8\text{N/kg}$  we can have  $m=7304.7\text{kg}$  and  $G=167967.3\text{N}$ .

(2) The weigh of the carrying capacity

Two EH3500 EV with in-wheel motor drives are on the steel structure beams. The autologous weight of the two EH3500 EV with in-wheel motor drives is 140t. The maximal carrying capacity is 190t. So the gross weight is 330t.

## Summary

Using the transformed semi-mobile crushing station will reduce the cost of production immensely. And this will enhance the economic performance. The reformationed feeding syste has been tested. And it can meet the need of practice manufacture.

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