EN500 application on stone crushing machine

1. Crusher introduce

Crushing machine is a kind of equipment used to crush the big stone into small pieces, it is divided into jaw crusher, impact cone crusher, hammer crusher, compound crusher, rotary crusher, mobile crusher etc.

Fig.1- jaw crusher

Fig.2- cone crusher

Fig.3- hammer crusher

2. Jaw crusher process

Crusher divided into different specification and usage range, jaw crusher main used to rough crushing, standard cone crusher main used to second crushing, short cone crusher used to fine crushing. This article aim to clear reader to get to know the usage for EN500 application on jaw crusher.

Jaw crusher contains two working board, one is static, the other is movable by up & down repeatedly. This two boards open & close constantly, when pouring stone material into crushing chamber, rough material will fall into pieces through the crushing, bending and splitting.

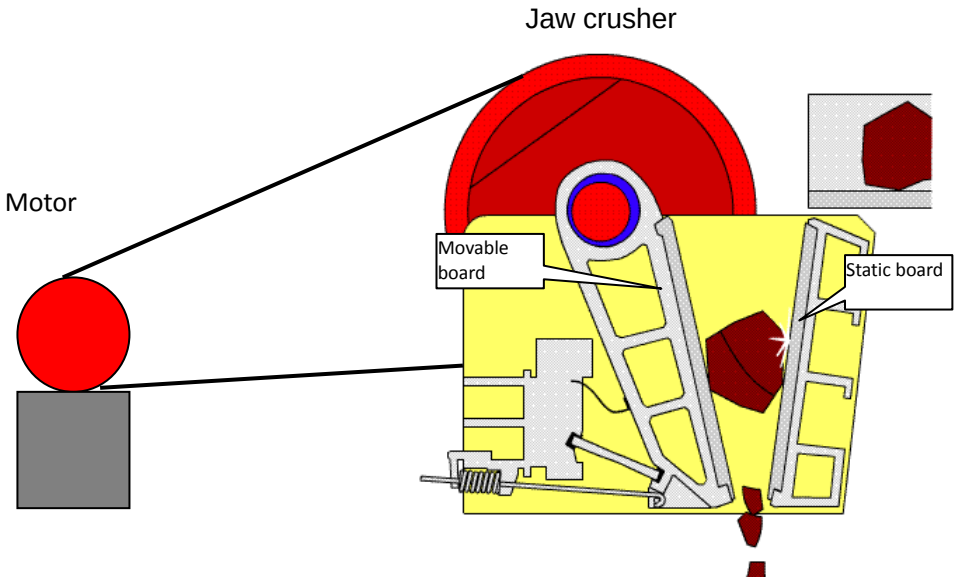


Fig.4- Jaw crusher theory diagram

3. EN500 application on Jaw crusher

1) Motor parameter

power：400KW	poles：8	Rated frequency：50HZ
Rated voltage：380V	Rated stator current：738A	Rated speed：779r/min

2) on site working condition：

- Motor adopting auto voltage regulator starting, starting current is very big to decrease the whole voltage in plant.
- Working normal full operate at 50HZ
- Working output current：600A～800A
- Motor current without load：200A
- Circle period of engineering car deliver stone material is 2.5～4 minutes

3) working flowchart：

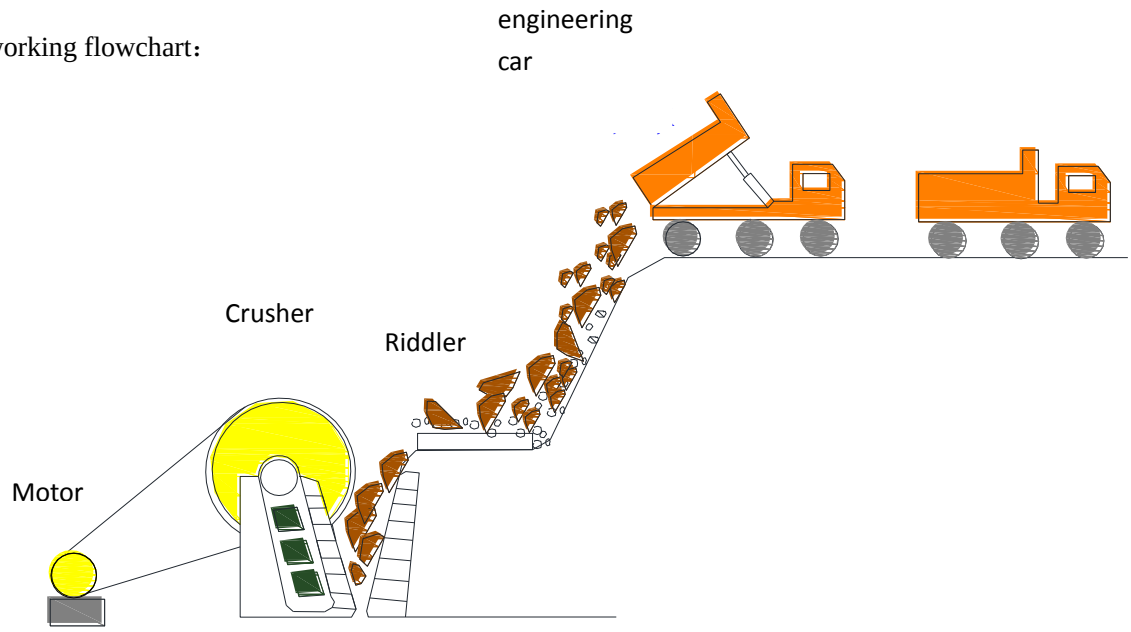


Fig. 5- crushing & feeding

4. Application analysis & achieve method

4.1. Feasibility analysis：

The interval period of stone material delivery is 2.5-4 minutes/circle and the stone material loaded in each vehicle can be crushed within 1.5 minutes, the minimum time of operation without load for each circle is 1～2.5 minutes. The equipment has two working status for each complete circle: crushing and without load. The current under crushing is 600A～800A, 200A is under without load. When equipment operate

under without load, it can lower the operate speed.

4.2. Inverter model selection: inverter power should be 1～2 grade bigger than motor.

4.3. Application achieving method:

To use EN500-4T4500G/P，operate at 50HZ when stone material crushing, operate at 30HZ without load. The engineering car unloading the stone material to where it need to install position detecting switch and output signal to inverter to make it operate at 50HZ when engineering car arrived. After engineering car leave about for 1.5 minutes later, the crushing process will finish. Then inverte will decelerate to operate at 30HZ, this overall process will be repeated constantly. Setting two steps acceleration & deceleration time: first acceleration from 0HZ to 30HZ, acceleration value setting 30S; second 30HZ to 50HZ acceleration value setting 20S, from 50HZ to 30HZ deceleration value setting 40S.

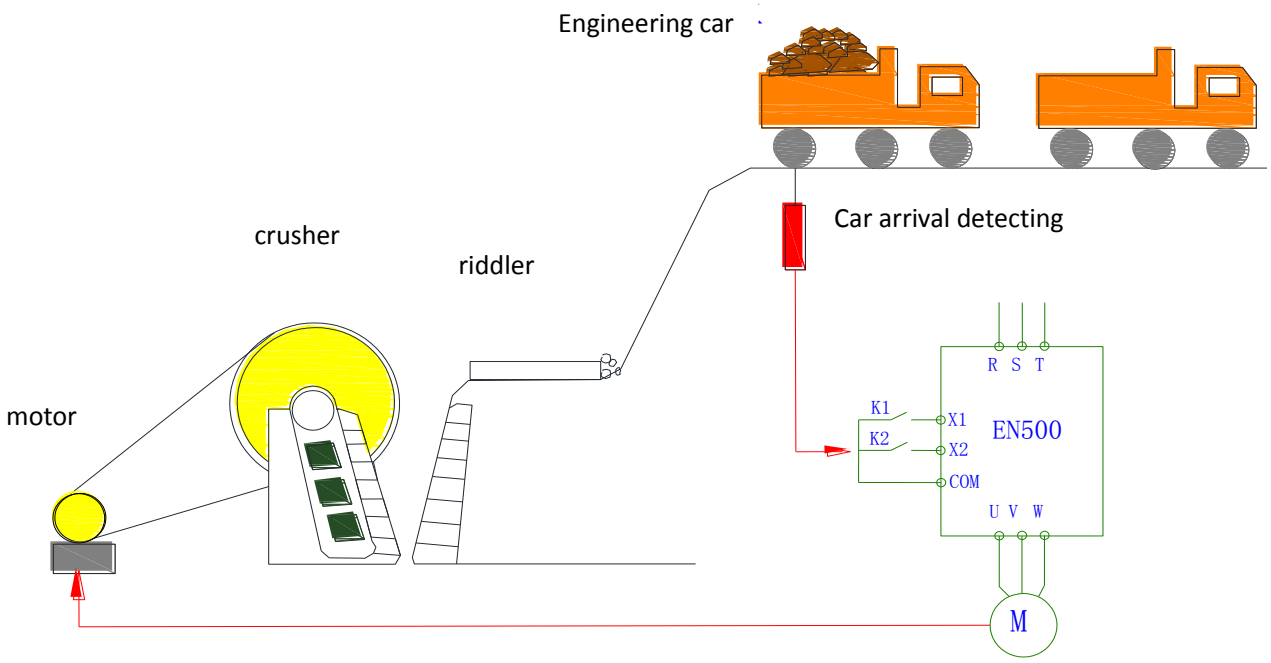
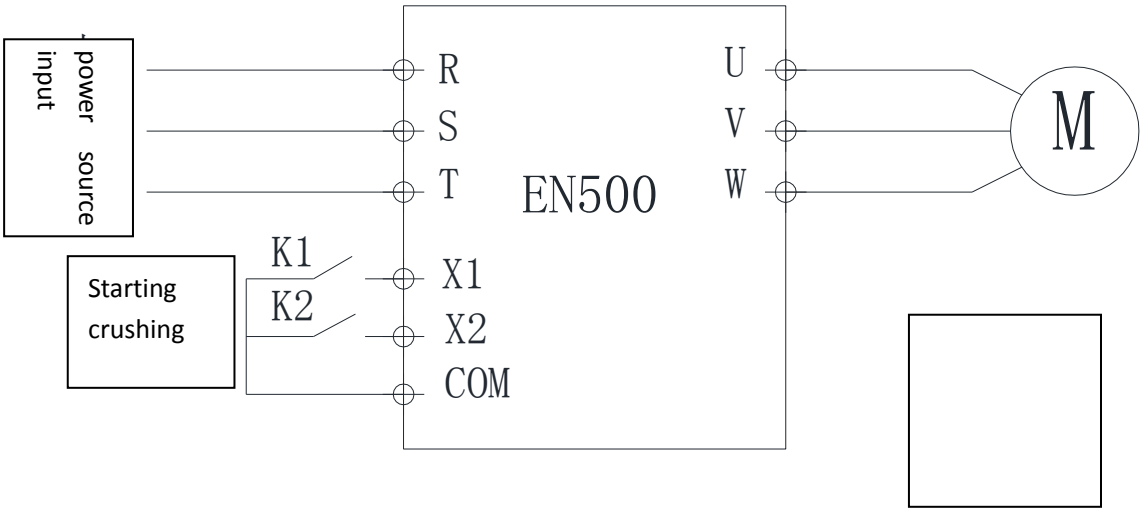


Fig6- Crusher frequency vary modification

4.4. Control wiring

inverter control wiring diagram：



- Power source inlet: connecting R,S,T;
- Output to motor wiring: connecting U, V, W
- Starting VFD: K1 open, inverter accelerate from 0HZ to 30HZ
- Crushing working status: K2 open, inverter accelerate from 30HZ to 50HZ
- No load status: K2 close, inverter operate for 1 minutes, decelerate from 50HZ to 30HZ, it takes for 40S.

1) inverter parameter setting

Function parameter	Value setting	explain
F00.00	2	Select the advanced menu mode
F00.24	3	Slip vector control
F01.01	30	Low speed frequency
F01.15	1	External terminal control
F01.17	600	First section acceleration 60 seconds
F01.18	600	First section deceleration 60 seconds
F04.16	400	Second section acceleration 40 seconds
F04.17	800	Second section deceleration 80 seconds
F08.05	60	X2 open time delaying 60 seconds
F08.18	1	Starting forwarder
F08.19	5	Multiple step 1 valid
F10.01	100	Multiple step 2 binding step 2 acceleration & deceleration
F10.31	50	Step 2 50HZ
F15.O1	Selected model as requirement	Motor rated power
F15.02	Selected model as requirement	Motor rated voltage
F15.03	Selected model as requirement	Motor rated current
F15.04	Selected model as requirement	Motor rated frequency
F15.05	Selected model as requirement	Motor rated RMP
F15.06	Selected model as requirement	Couples No. of poles
F15.19	1	Motor self tuned

5. EN500 Crusher application site

6.EN500 inverter introduction

6.1. Product brief

■ Advanced performance: EN500 series multi-function magnetic vector inverter use 32 bits DSP hardware platform, adopting advanced magnetic vector control technology, contain speed sensorless vector control, closed loop vector control, optimum V/F control mode, include speed and torque control modes with high precision, fast response and low frequency characteristic.

■ Abundant function: with unique self learning and rotation speed tracking function, compact structure, high density power range, easy installation, high performance with good price, smart detection and perfection protection.

■ Convenient application: this type inverter can be used to make network widely and good usage habit. It's designed multiple operation & display interface according to different customer requirement, with abundant peripheral BUS extension, terminal extension, relay extension and analog extension etc.

6.2. EN500 advantage on Crusher application

■ Small starting current, decrease electrical shock to power grid greatly

- No need add capacity, decrease transformer investment and save the fee from power grid extra capacity
- Perfection protection to achieve voltage, current and motor overload protection etc
- Achieve non polarity speed adjustment to motor
- Alarm to stop when blocked so that it will avoid big current to burn equipment
- Good overvoltage inhibition function
- Control mode easy, no need add complicated external circuit
- Effective energy saving according to actual site application, energy save up from 8～25% based each actual working status