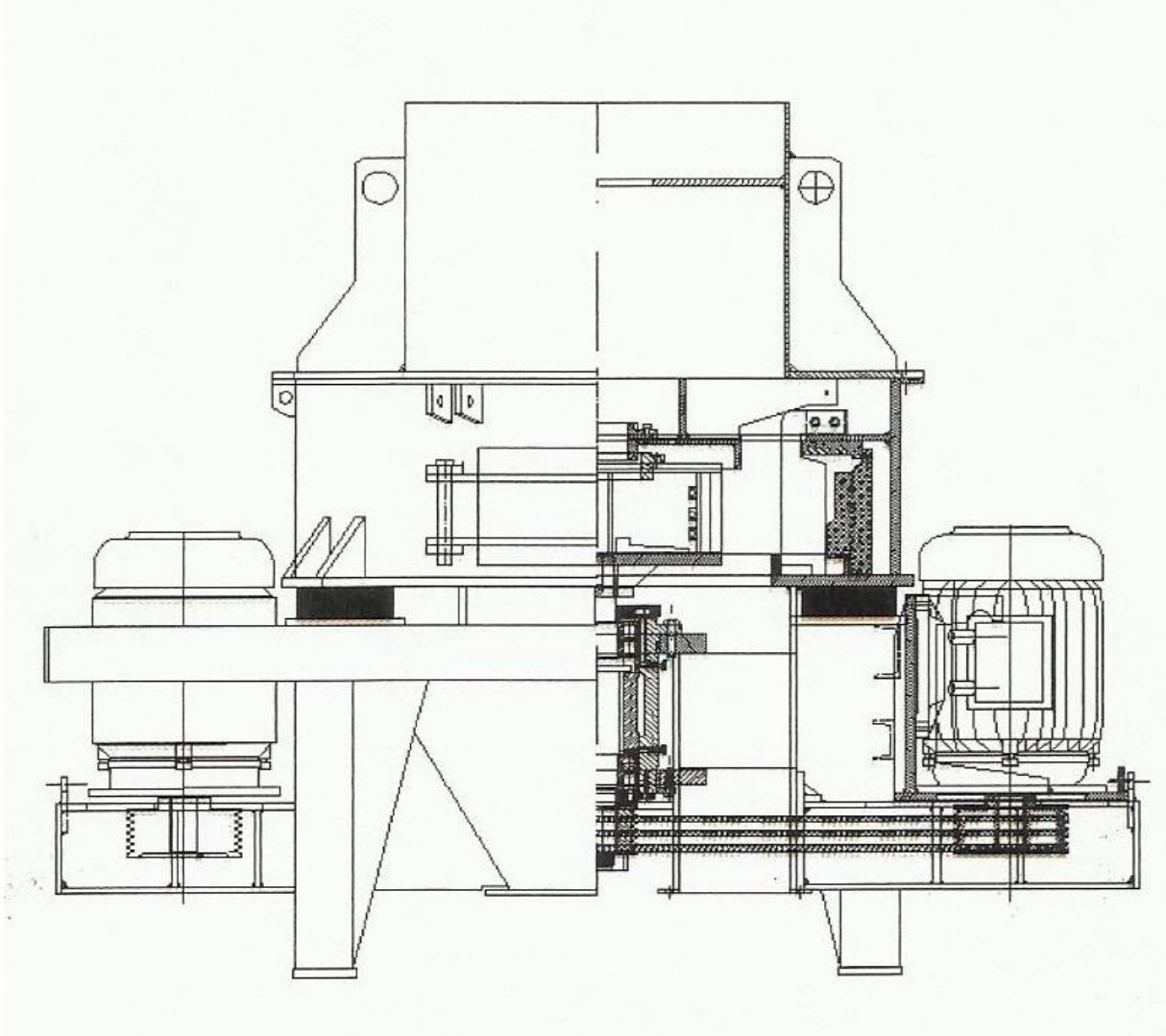


**OPERATING AND MAINTENANCE INSTRUCTIONS  
FOR  
VERTICAL SHAFT IMPACTOR PCL 600**



**VERTICAL SHAFT IMPACTOR PCL 600**

**Summary Introduction and Application**

The Vertical SHAFT IMPACTOR type PCL is a machine researched and developed by our company having a internationally advanced high efficiency and low consumption. The performance of this machine is perfect when compared to all other ore crusher.

This machine is widely used for powdering mineral products including metallic and non-metallic ores, non-combustible materials, bauxite, diamond powder, glass raw materials, architectural materials, artificial sand and all metallic ore minerals. Particularly it is much more advantageous than other machines in processing the hardest materials. Currently, it replaced the hammer crushers and bar crushers and became the principal equipment for sand-construction industry.

**General Characteristics of Vertical Shaft Impactor Type PCL**

Model	Maximum Feeding Size (mm)	Power (kW)	Rotor Speed (rpm)	Output Capacity (ton/h)	External dimensions (LxWxH)
PCL-600	26	45*2=90	2000/2600	8-50	3300 x 1500 x 2050

Note: Output depends on the type of material, feeding size and quantity.

**Principle of Operation of Entire System**

The principle of operation of the system is as follows: The material is conveyed to the crusher via the feeding cone and separated into two parts here. One part enters the high speed rotor through the center of the classifier. The speed of the material gradually increases in this rotor. Then, it leaves the rotor through the tunnels around the rotor at a speed of 60-75 m/sec. The material first strikes on some materials being removed out around the classifier, then they together strike on the side manganese lining in the crushing chamber and rebound changing their direction downwards. A continuous material layer is formed by the material removed from the rotor. In this way, some materials will be exposed to impact twice or more in the crushing chamber, they will be decomposed and ground, and the decomposed materials will then be removed through the discharge hole. This process forms a closed circulation within the circular classifier, forming a stone lining thereby increasing the power efficiency and minimizing wear. The air circulation within the crushing chamber also prevents dust pollution.

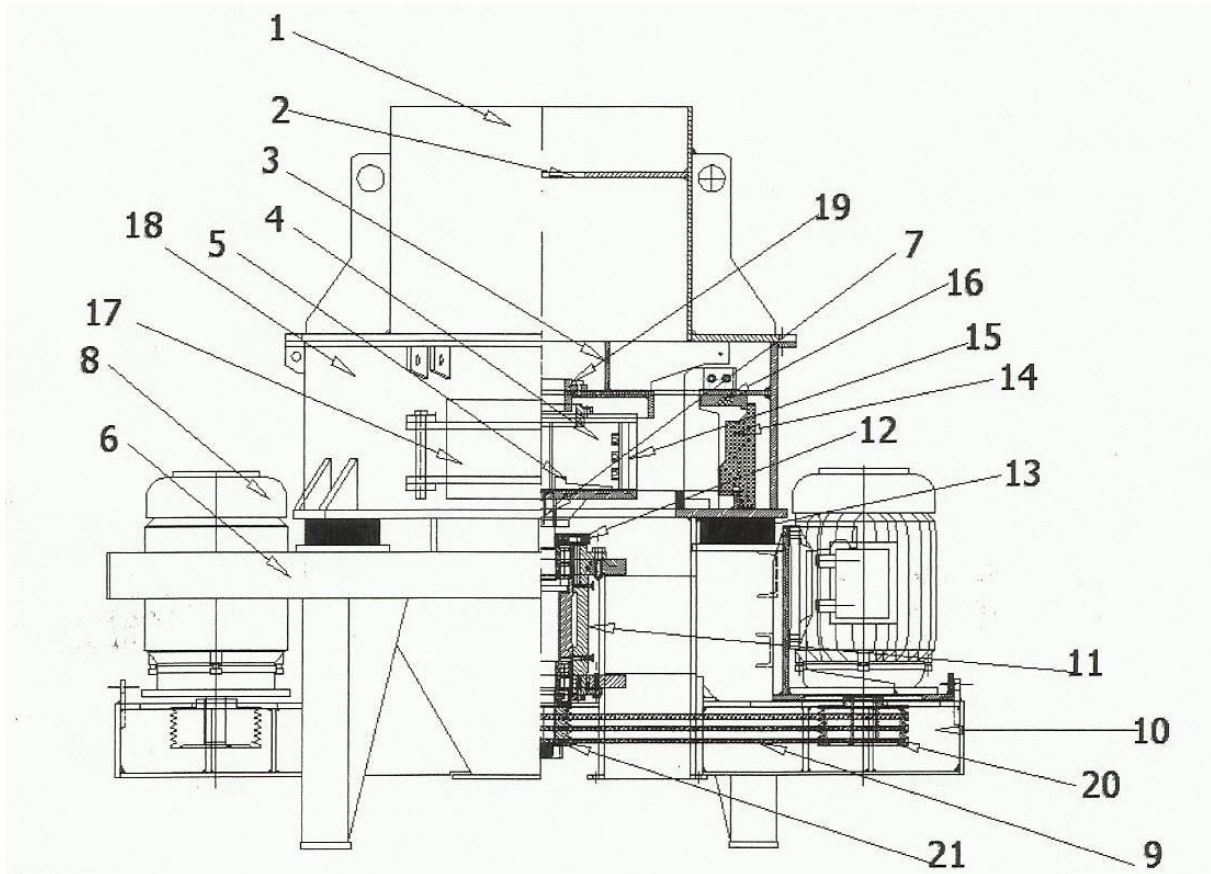
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### Performance Characteristics

- A. Simple structure, low cost
- B. High efficiency, low consumption
- C. Primary and secondary crushing capacity
- D. Capable of crushing the hardest materials
- E. Cubical final product
- F. Low noise and dust pollution
- G. Performance, ease of maintenance and installation

### SECTIONAL STRUCTURAL VIEW OF VERTICAL SHAFT IMPACTOR



- 1- COVER
- 2- MATERIAL INPUT
- 3- LOADER
- 4- ROTOR
- 5- DISTRIBUTION PLATES
- 6- MAIN CHASSIS
- 7- VERTICAL SHAFT
- 8- ELECTRIC MOTOR
- 9- V BELT
- 10- MOTOR CHASSIS
- 11- BALL BEARING HOUSING

- 12- TOP BEARING HOUSING COVER
- 13- RUBBER PADS
- 14- SIDE MANGANESE LINING
- 15- IMPACT JAW
- 16- TOP MANGANESE LINING
- 17- MAINTENANCE COVER
- 18- MAIN BODY
- 19- ROTOR PROTECTION FLANGE
- 20- MOTOR WHEEL
- 21- MAIN SHAFT WHEEL

## **Installation, Control and Commissioning of the Machine**

### **1. Machine Installation**

PCL Vertical SHAFT IMPACTOR may be installed on the concrete structure and steel rack; the base should be minimum four times the total machine weight.

The machine may be installed inside or outside the workshop, depending on the conditions of the worksite. The machine should be leveled during installation in order to ensure that the main axis is vertically straight.

The lifting equipment should be installed on the crusher; the maximum weight of crusher (suspended weight of PCL600 = 3 tons) should be considered when selecting the lifting equipment; a lifting clearance should be left on the upper side of the crusher and some space should be left on the side of the crusher in order to make the necessary controls of the machine.

Magnetic holders should absolutely be available on the belt conveyor, etc. carrying equipment used to feed materials to the machine. In case metal materials enter inside the crusher, the parts inside the machine are severely damaged and the machine becomes inoperable. The operator is responsible to take preventive measures against this.

### **2. Control of the Machine**

- Before the crusher is released from the factory, it is operated in idle position during 8 hours. But the crusher operation should still be controlled after installation at the worksite.
- Make sure to press oil inside the machine ball bearings through the lubrication points.
- Make sure that all parts are safely mounted on the machine.
- Examine the rotor to make sure that there is no foreign matter.
- Check that the electric connection and voltage ( $380\text{ V} \pm 5\%$ ) of the motors are normal.
- The electric motor should be operated before installing the belts. The rotating direction should be the same as the indicator (e.g. counterclockwise from upper view). In case it is in the opposite direction with the indicator, the electric motor network should be adjusted to the direction of the indicator; otherwise is absolutely wrong.
- Since there is double electric motor drive, both sides of the main ball bearing and the electric motor should be connected with V-belts of similar characteristics and the belts of both sides should be adjusted in a balanced manner.
- Start to operate the machine if there is no problem upon completing all controls.

### **3. Commissioning of the machine**

#### **Idle operation**

- a. Make sure that the belt wheel rotates easily. Manually rotate it before testing.
- b. Operate the machine idle during at least four hours.
- c. The crusher should operate stably. Normally, the chassis of the crusher should not cause much vibration and a different noise during operation; otherwise, the machine should be stopped and controlled.
- d. Temperature increase of the ball bearing should be less than  $45^{\circ}\text{C}$  and the maximum temperature cannot exceed  $75^{\circ}\text{C}$ . Otherwise, the ball bearing should be washed and controlled.

### **Loading Test Operation**

- a. The feeding volume should absolutely be adjusted to the machine requirements; use of materials other than those specified is prohibited.
- b. Materials should also be fed regularly; the feeding process continues until the crusher is full.
- c. The testing period should be between 8 – 24 hours.
- d. Temperature increase of the ball bearing should be less than 45°C and the maximum temperature cannot exceed 75°C. Otherwise, the ball bearing should be washed and controlled.

### **Rules of operation**

- a. Check that the observation door of the crushing chamber is firmly closed; otherwise, materials may be scattered out of the observation door and cause damage.
- b. Check the rotating direction of the rotor. Network of the electric motor should be adjusted to ensure that the rotor rotates counterclockwise.
- c. The operation sequence of the crusher and other equipment should be as follows.  
**DISCHARGE → CRUSHER → FEEDING**  
The crusher is started without load and the materials are started to be fed if it operates properly.  
Start and stop sequences are reverse of each other.
- d. The feeding volume should absolutely be adjusted to machine requirements; use of materials other than those specified is prohibited; otherwise, unbalance occurs and the rotor is seriously damaged, even worse, the rotor tunnel and middle section of the feeding tube become inoperable and eventually, the machine does not operate properly.
- e. When the discharge equipment stops, feeding should also be stopped; otherwise, the rotor and motor may be damaged.
- f. Feeding should be orderly and continuous.
- g. No great vibration and abnormal noise should occur during operation. Otherwise, the machine should be stopped and controlled.
- h. Lubrication is made using grease. The lubrication apparatus for lubricating the machine is supplied with the crusher. Most appropriate lubricant is FAG ARCANOL LOAD400 ball bearing grease. Sufficient amount (1/2 – 2/3 the groove volume of the ball bearing) of lubricant should be complemented to the machine every 100 hours.

### **Rules of Repair and Safety**

1. Stop the machine in normal way and open the observation door to monitor the machine wear at middle tube, cone cover, rotor and lower tunnel layer and machine wear at parts including material disposing parts. In case of severe wear, such parts should be replaced or repaired in due time. When replacing the cast hammer, take care that the weights of old and new hammers are equal. The worn out rotor should be replaced or repaired at the manufacturer's factory in due time. It is restricted for the customers to repair the rotor themselves without consent of the manufacturer's factory. It is prohibited to open the observation door during machine operation. In case of occurrence of any danger, the customer is liable.

2. The belt should smoothly rotate after installation. Appropriate lubrication grease is added to the main bearing every 100 hours. The main bearing should be cleaned every 1000 hours. Depending on operating and maintenance conditions, the bearing should be replaced every 1200 hours.

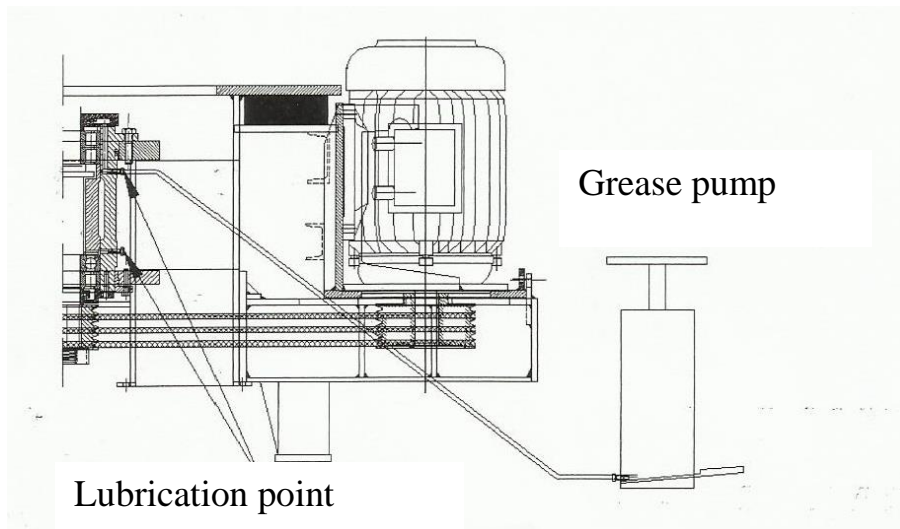
3. The tension of the belt conveyor should be adjusted to ensure equal power. Belt length should be equal on both sides and the difference of electrical current between two motors should be less than 15 A.

4. As the machine operates at high speed, the customers should pay attention to safe operation. In case the machine needs repair, intervention should be made by the relevant person considering all rules of operation.

### **Manner of Lubrication**

The lubrication apparatus for lubricating the machine is supplied with the **crusher**. Most appropriate lubricant is FAG ARCANOL LOAD400 ball bearing grease. Sufficient amount (1/2 – 2/3 the groove volume of the ball bearing) of lubricant should be complemented to the machine every 100 hours.

The points of lubrication are shown in the drawing below. The blind flanges on two lubrication holes are removed, the hose of grease pump is connected to those points and grease is pumped.



**Troubleshooting**

	Common Failure	Cause of Failure	Failure Elimination
1	Severe vibration of the machine chassis	Fast-wear parts of the rotor are severely worn out	Replace the fast-wear parts
		Feeding size is too large	Decrease the feeding size
		There is an obstacle blocking the rotor tunnel	Remove the obstacle
2	Production size is too large	Triple belt is loose	Fasten the triple belt
		Manganese lining is worn out	Replace the lining
3	Excess idle operation resistance	Blockage in ball bearing	Eliminate blockage. Replace the ball bearings.
4	Heating of bearing	Lack of grease or possibility of dust existence	Add grease or clean the bearing
		The bearing is damaged	Replace the bearing
		The grease is degraded	Replace the grease and clean the bearing
		Excess lubrication	Amount of grease should be ½ the volume of bearing groove
5	Metal impact noise	The layer and fast wear parts are split	Replace and fasten
6	Impact noise in machine	There are materials that cannot be broken	Stop and clean the machine
		Connection components are broken or damaged	Replace the connection components and fasten the bolt
7	Rotor not rotating	The belt is loose	Fasten the belt
		The belt is damaged	Replace the belt

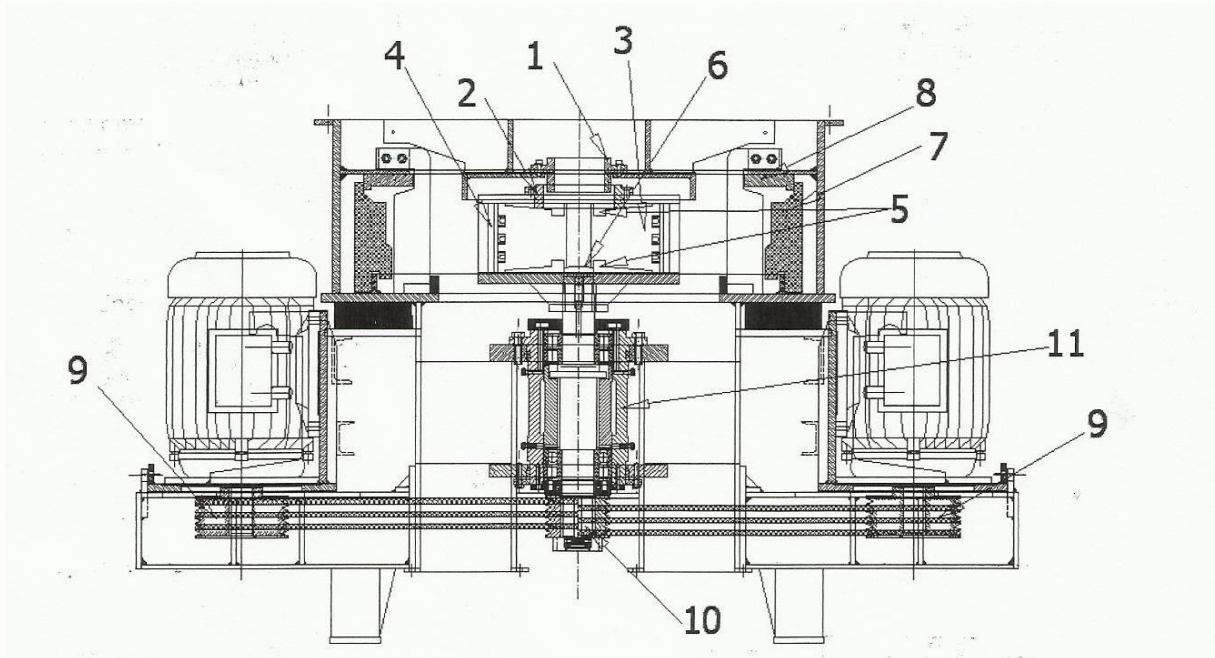
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**List of Spare parts**

NO	PART NAME	CODE NUMBER	QUANTITY
1	MAIN SHAFT BALL BEARING(1)	NU 319 E.M1.C3	3
2	MAIN SHAFT BALL BEARING(2)	6319	1
3	DRIVING BELT	SPB – 2800	6
4	ELECTRIC MOTOR	GAMAK 45KW GM 225-M4	2

**List of Wear Parts**

- 1- Rotor protection belt
- 2- Rotor upper inlet flange
- 3- Rotor
- 4- Pulse claw (diamond tip)
- 5- Rotor lower and upper linings (set)
- 6- Distribution flange
- 7- Side manganese lining
- 8- Upper manganese lining
- 9- Motor drum
- 10- Main shaft drum
- 11- Main shaft and ball bearing housing





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### Base floor installation layout

There are various installation layouts for PCL Vertical SHAFT IMPACTOR regarding the building base layout depending on location data.

External wall measurement

	PCL600
A	2620
B	1550
C	2250
D	920
E	1560
F	1496
G	1285
H	2570
M	1262
N	900
P	1028

