

4.1 AGGREGATE PRODUCTION, DIFFERENT CRUSHERS

Manufactured coarse and fine aggregates are produced by crushing sound parent rocks by stone crushing machines. Manufactured aggregates differ from gravel and sand in their grading, shape, and texture. The following are the process involved in the production of Aggregate.

1. quarrying
2. Hauling
3. Crushing
- 4. Screening**
5. Washing

QUARRYING

This is an essential stage in the production process, because the quality of the aggregates produced depends on it. This is our consideration when we applied for our concession. The choice and selection of the source on the basis of its physical properties are decisions of strategic importance.

HAULING

The raw materials are hauled from quarry site through dump trucks and stockpiled at designated areas.

CRUSHING

The said materials are crushed and ground by the primary jaw crusher, secondary and tertiary cone crushers. The quality of the finished material used, the setting of the cone, turnover speed, flow rate control, etc. All these operations can be repeated until the required product quality has been achieved.

SCREENING

The Screening phase allows us to purify and to homogenize the blends in accordance with the requirements set by sieve analysis. The quality of the finished product and its uses depend directly on the effectiveness of this phase.

WASHING

The sand and gravel, undergo further complementary processing such as washing. The main purpose of this is to make the products clean. It is the only plant in the region that uses a Double Sand Classifier System for a cleaner and better-quality sand.

STOCKPILING

Finally, the aggregates are stored in separate areas to avoid mixing and product pollution. Similarly, at each stage in the shipping of the products, every precaution is taken to preserve the quality of the material.

DELIVERY

The finished products are delivered where the construction site is located from the aggregates crushing plant. The dump trucks ship the sand and gravel to different destinations in CALABARZON area.

4.1.2DIFFERENT CRUSHERS

Crushers are mainly used for crushing stones or mineral ores, recycling construction waste, and producing aggregate. This equipment aims to reduce large solid raw material masses into smaller sizes. They also help to change waste material form so that they can be simply disposed of or recycled. They can also be used for secondary and tertiary crushing to produce the finished product and crushing materials between two parallel solid surfaces.

Different types of crushers

There are three types of crushers. Types of crushers depend on the feeding method. These are- Primary crusher, Secondary crusher and Tertiary crusher.

The primary crusher is only for the breaking of large stones into pieces (this means primary crusher is not for the aggregate size material.). Examples of primary crushers are jaw crusher; hammer mill crusher and gyratory crusher.

A secondary crusher comes into action and further reduces the size. In secondary

crushers some sizes of stones may pass directly from sieve number.

At the end tertiary crusher reduces the size of crushed pieces very much to the required size and it also brings the fineness to the crushed material. Tertiary crushers are at the job site and these are small in size.

Types of Primary Crushers

There are several types of primary crushers, including:

- Gyratory Crushers
- Jaw Crushers
- Hammermills
- Horizontal Shaft Impact Crushers
- Sizers
- Roll Crushers
- Cone Crushers
- Feeder-Breakers

GYRATORY CRUSHERS: Gyratory Crushers are an excellent choice for a primary crusher, as they can handle very hard and abrasive material. They are ideal for dry to slightly wet material but not sticky material. The main features of a Gyratory Crusher include a tall crushing chamber lined with replaceable manganese wear plates, a main shaft with head and mantle, and a spider to anchor the top of the main shaft bearing.

They have an adjustable main shaft positioning system and drive assembly, and they are available in a single cylinder or multiple cylinder design. Material to be crushed is fed into the top of the crushing chamber and compressed between the wobbling mantle in the centre and the stationary concave liners covering the inner walls of the chamber. When the material is crushed to the desired product size, it is discharged out the bottom of the crusher.

JAW CRUSHERS: Jaw Crushers are another excellent choice for primary

crushing applications because they can accept the toughest, hardest, most abrasive materials. They can handle dry to slightly wet material that is not sticky. Jaw Crushers feature a moving piece of steel (called the pitman) and a stationary piece of steel that form a V-shaped chamber.

Material that enters the chamber is crushed to size between the moving piece of steel and the stationary piece of steel. Most of the crushing action occurs in the bottom third of the chamber. In a cycle of the rotating pitman, first the material in the chamber is squeezed to crush the material, then the chamber opens, which allows the material to fall farther down the chamber before the next squeezing cycle comes around.

HAMMERMILLS

Hammermills can be used as a primary crusher in many types of aggregate and industrial applications, including limestone, marble, shale, gypsum, phosphate, bauxite, aluminium dross, uranium, cryolite, clinkers, quicklime, petroleum coke, coal and more. Hammermills tend to generate finer material in addition to size reduction, which may not be desirable for every application.

The material enters the crusher and shatters upon impact with swinging hammers that are secured to a spinning rotor. The particles rebound off the breaker plates into the hammer circle and are carried into the grate assembly and across the grate surface, grinding down larger particles. Once the material reaches the appropriate size, it exits through the openings in the grate assembly. Output gradation changes are made through speed changes as well as different combinations of grates with various sizes of openings. They are a good tool to use in lower abrasive applications.

HORIZONTAL SHAFT IMPACT CRUSHERS

Horizontal Shaft Impact Crushers, such as the New Holland, Andreas and MaxCap (which is a hybrid of the two) styles, are typically used for the primary size reduction of soft to medium hard materials. Horizontal Shaft Impactors

feature a large expansion chamber inside of which is a spinning rotor shaft covered with blow bars or hammers. Material that enters the crushing chamber connects with the spinning rotor, which flings the material at the breaker plates lining walls of the chamber.

Much of the breaking of the material occurs upon the initial contact of the material with the rotor and its subsequent impact with the breaker plates. Some additional breakage occurs by the inter-particle collisions as the material is tossed around in the chamber.

SIZERS

Direct-Drive Crushing Sizers are used for the primary crushing of soft to medium hard material that can be slightly abrasive, dry, or wet and sticky. They are best suited for heavy mining applications and provide a typical reduction ratio of 4:1. Primary sizers feature two inward rotating rolls that crush the material between the teeth and roll bodies.

Already sized material passes between or flows around the rolls, minimizing the generation of fines. These types of crushers offer a low profile and high throughput capacities with low roll speeds. Also, like gyratories, they can accept fines in the feed where other compression machines, like jaws, require some pre-screening.

ROLL CRUSHERS

Similar to Sizers, Roll Crushers can be used for the primary crushing of soft to medium hard material that can be slightly abrasive, dry, or wet and sticky. They are typically used in heavy mining applications and have a typical ratio of reduction of 4:1.

CONE CRUSHERS

Cone Crushers are compression-type crushers that are typically found in secondary crushing stages but can be used as the primary crusher in certain applications. They handle medium hard to very hard, abrasive materials that can

be dry or wet but not sticky. Cone Crushers are typically found in quarried materials and sand and gravel applications.

They provide a reduction ratio of 3:1 to 5:1. Material that enters a Cone Crusher is compressed between a wobbling mantle and the concaves inside the crushing chamber. The gradation is controlled by adjusting the spacing between the mantle and the concave at their closest point. This is accomplished by raising and lowering the top or bowl of the crusher. A finer setting will create a finer product but at a lower throughput.

FEEDER-BREAKERS

Feeder-Breakers, which combine both feeding and crushing into one machine, are used for the primary crushing of friable materials that can be slightly abrasive, dry or wet, but not sticky. They are typically used in heavy mining applications to provide the primary crushing and to make a beltable product to be conveyed for further downstream processing.

Primary Crushers Used in Aggregate Applications

The types of primary crushers typically found in aggregate applications include:

- Jaws
- Gyratories
- Impactors
- Cones

Primary Crushers Used in Mining Applications

The types of primary crushers typically found in mining applications include:

- Roll Crushers
- Sizers
- Feeder-Breakers
- Jaws
- Cones
- Impactors

The right primary crusher for an application depends on several factors:

- Material to be crushed
- Feed size
- Desired product size
- Capacity required
- Compressive strength of the feed
- Moisture content

The material and its characteristics, e.g., its hardness, density, shape and condition, will affect the type of crusher that needs to be used. Knowing the material characteristics as well as the advantages and limitations of the different crusher types will help to determine the best primary crusher for a given application.