PROJECT ABSTRACT

Jaw Crusher Working Model

A working jaw crusher model: fixed and swing jaw dies, eccentric shaft drive through a toggle plate, flywheel, belt drive and adjustable closed-side setting. Delivered built-to-order with the fabricated crusher, drive, jaw dies, sieve set, feed materials, report, PPT and viva kit.

01. Title

Jaw Crusher Working Model

02. Introduction / Background

Primary crushing — breaking run-of-mine rock down to handleable size — starts with the jaw crusher in almost every mineral-processing flowsheet, yet students usually meet it only as a cross-section diagram with the eccentric, toggle plate and jaw dies labelled. This project fabricates a working bench-scale jaw crusher: a fixed jaw die bolted to the frame, a swing jaw pivoted at the top and driven at the bottom by an eccentric shaft through a toggle plate, a flywheel to smooth the crushing stroke, a V-belt drive from a single-phase motor, a feed hopper and an adjustable closed-side setting. The student feeds chalk lumps, charcoal or soft brick pieces, collects the crushed product, sieves both feed and product, and computes the reduction ratio and the product size distribution from their own weighings. The nip angle, the stroke and the toggle action stop being diagram labels and become things the student has watched work.

03. Problem Statement

Jaw-crusher kinematics — the eccentric-toggle motion, nip angle, the stroke at the discharge — are taught as static diagrams, and reduction ratio is treated as a given number rather than a measured one. This project provides a working model with real machine elements and a sieve-based measurement procedure, so the student computes the reduction ratio F80 ÷ P80 from their own weighings and shows how the product size follows the closed-side setting.

04. Objectives

- Fabricate fixed and swing jaw dies (replaceable, corrugated crushing face) for a ~150 × 100 mm feed opening — design target.
- Machine the eccentric shaft (approx. 10–15 mm stroke at the jaw bottom — design target) with bearing supports.
- Fit the toggle plate transmitting eccentric motion to the swing jaw, doubling as overload release.
- Fit a cast flywheel to smooth the intermittent crushing load on the motor.
- Drive the shaft with a single-phase motor (approx. 1 HP — design target) through a V-belt with a full belt guard.
- Provide wedge/shim closed-side-setting adjustment (approx. 10–25 mm — design target) with a feed hopper and discharge chute.
- Measure reduction ratio by student-run sieve analysis of feed and product.
- Deliver the complete student kit: crusher, drive, jaw dies, sieves, materials, report, PPT and viva Q&A.;

05. Proposed Methodology

The crusher is fabricated: frame, jaw dies, eccentric shaft in bearing housings, toggle plate, flywheel and guarded belt drive. The student sets the closed-side gap with the wedge/shim adjustment and records it, starts the motor, observes the swing jaw's stroke, and feeds chalk, charcoal or brick pieces steadily. Feed and product samples are sieved; each fraction is weighed; the 80%-passing sizes F80 and P80 are determined and the reduction ratio computed as F80 ÷ P80. The trial is repeated at a different closed-side setting to show the product curve following the gap — all from the student's own data.

06. System Architecture / Working

The motor drives the eccentric shaft through the V-belt; the eccentric's throw moves the swing jaw's bottom in an elliptical crushing stroke while the top pivots, and the toggle plate links shaft to jaw, breaking first under a tramp load as a mechanical fuse. Corrugated dies nip each feed piece on the closing stroke and release crushed fragments on the opening stroke; the flywheel evens out the torque pulses. The discharge gap — the closed-side setting — fixes the maximum product size leaving the chute.

07. Hardware / Software Requirements

- Fixed and swing jaw dies, replaceable, corrugated (approx. 150 × 100 mm feed opening — design target)
- Eccentric shaft with bearings (approx. 10–15 mm stroke — design target)
- Toggle plate assembly
- Cast flywheel (sized for the stroke — design target)
- Single-phase motor, approx. 1 HP, with V-belt drive and belt guard — design target
- Feed hopper and discharge chute
- Closed-side-setting wedge adjustment (approx. 10–25 mm — design target)
- Test sieve set and digital weighing scale
- Feed materials: chalk, charcoal, soft brick pieces

08. Expected Outcomes

- A working jaw crusher demonstrating eccentric-toggle crushing action on crushable feeds.
- Student-measured reduction ratios (F80/P80) and product size distributions from sieve weighings.
- A demonstrated relationship between closed-side setting and product size from the student's own trials.
- A complete report, PPT and viva Q&A; on crushing theory, nip angle, reduction ratio and machine design.

09. Applications

- Mineral-processing and mechanical teaching laboratories.
- Demonstrating jaw-crusher kinematics, toggle action and flywheel function.
- Student studies on setting, stroke and feed hardness effects at bench scale.

10. Future Scope

- Power-draw logging across settings to relate energy and reduction ratio.
- Double-toggle variant study for comparison with the single-toggle build.
- Wear-rate study of the jaw dies over extended crushing runs.

- Adjustable-stroke eccentric sleeves for stroke-effect experiments.