# Diabase Feed Parameters Affecting Crushing Load



*Engineering interpretation of how feed condition changes crusher loading, discharge behavior and screening load.*

## Diabase

A dense, strong igneous rock

- **Volcanic origin** — Dense structure
- **Strong mineral bonding**
- **Typically high strength**

**Natural Diabase Rock**

Dense, durable and widely used as aggregate

## 1 Maximum Feed Size

Determines whether the primary crusher can accept the largest quarry blocks without bridging or repeated feeder interruption.

Oversize blocks → Manageable feed

**Oversize Blocks → Uneven Chamber Filling → Peak Crusher Load**

## 2 Feed Size Distribution

Feed gradation has a major influence on chamber filling and crusher load stability.

| Well-Graded Feed | Highly Variable Feed |
|---|---|
| More stable chamber filling | Intermittent loading |
| More consistent crusher load | Higher load fluctuation |
| Better utilization of crushing chamber | Unstable crusher discharge |

**Crusher performance is influenced by full feed PSD, not maximum lump size alone.**

## 3 Rock Integrity & Natural Fractures

Natural structure strongly affects breakage behavior and required crushing force.

| Massive Fresh Diabase | Jointed / Fractured Diabase |
|---|---|
| Structure is dense with few fractures | Contains natural fractures and joints |
| Higher force required to initiate fracture | Preferential fracture paths → Easier breakage |

## 4 Compressive Strength

Approx. **120–300 MPa**

Higher compressive strength increases resistance to initial fracture and raises the crushing force required during coarse reduction.


- Low fracture resistance → easier breakage
- High fracture resistance → higher crusher load

## 5 Moisture and Fine Material

Moisture does not significantly change the intrinsic hardness of diabase, but wet fines can affect feeder flow, screen efficiency and material movement through the crushing circuit.

| Dry Coarse Feed | Wet Fine-Rich Feed |
|---|---|
| Stable screening | Aperture blinding / reduced screening efficiency |

## 6 Bulk Density and Material Load

Typical density: approx. **2.8–3.1 g/cm³**

Dense feed places a higher mass load on feeders, conveyors and crushing equipment at the same apparent material volume.

Lower density — Higher density (same volume)

**Same material volume → higher mass flow → higher mechanical load**

## OVERALL CONCLUSION

**Feed Condition → Chamber Loading → Crushing Force → Crusher Discharge → Screening Load**

**Crusher capacity should be evaluated from actual feed characteristics rather than maximum feed size alone.**

At the same nominal 300 t/h rating, different diabase feed conditions can produce very different operating behavior.

# Crusher–Screen Capacity and Circulating Load Balance

*Crusher throughput becomes useful finished-product capacity only when crusher discharge, screen capacity, and return load remain balanced within the closed circuit.*


## Crusher Side

### 1 Closed-Side Setting (CSS)

- Coarser discharge → more oversize reaches screen
- Finer discharge → higher reduction duty and potentially more fines

### 2 Reduction Ratio

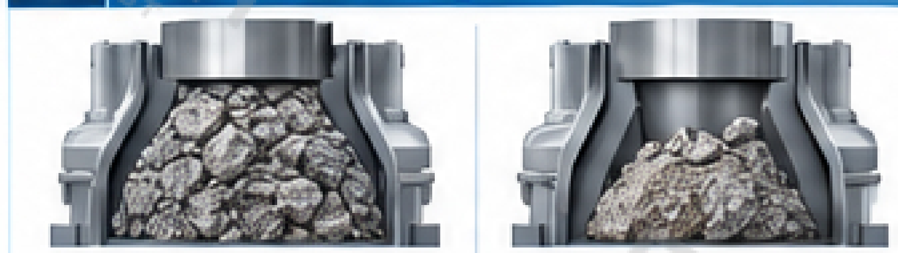
**Too high reduction duty in one stage**

- Higher liner load
- Higher power demand
- Increased wear
- More unstable chamber operation

**Balanced staged reduction**

- More controlled load distribution
- More stable product size

### 3 Chamber Loading



Proper chamber filling | Underfed chamber

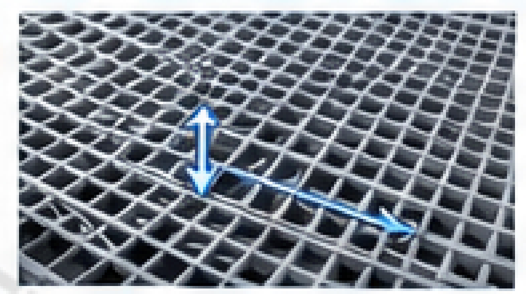
Stable chamber filling helps form a more consistent crushing condition.

### 4 Crusher Discharge Rate

Crusher throughput becomes useful finished-product capacity only when the downstream screen can classify the discharge efficiently.

## Screening Side

### 1 Screen Aperture

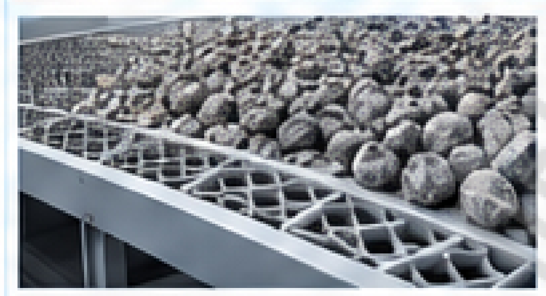


Determines cut size.

### 2 Effective Screening Area

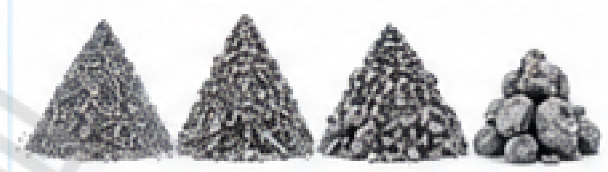
Determines material handling capacity per unit time.

### 3 Deck Loading



Excessive loading reduces classification efficiency.

### 4 Number of Product Fractions



0–5 mm | 5–10 mm | 10–20 mm | 20–31.5 mm

Example product fractions (multiple deck screening)

## Circulating Load

Circulating Load (%) = Returned Oversize ÷ Fresh Feed × 100

**Controlled circulating load**

Indicates the circuit is operating stably.

**Excessive circulating load**

- Crusher discharge too coarse
- Screen overloaded
- Screen aperture unsuitable
- Insufficient screening area
- Excessive feed rate

## Balanced Circuit

- Stable crusher load
- Controlled oversize return
- Screen operates within capacity
- Higher qualified product recovery
- Less unnecessary re-crushing

**Crusher capacity ≠ finished product capacity**

Finished-product output depends on the combined performance of crusher + screen + return load.

## Unbalanced Circuit

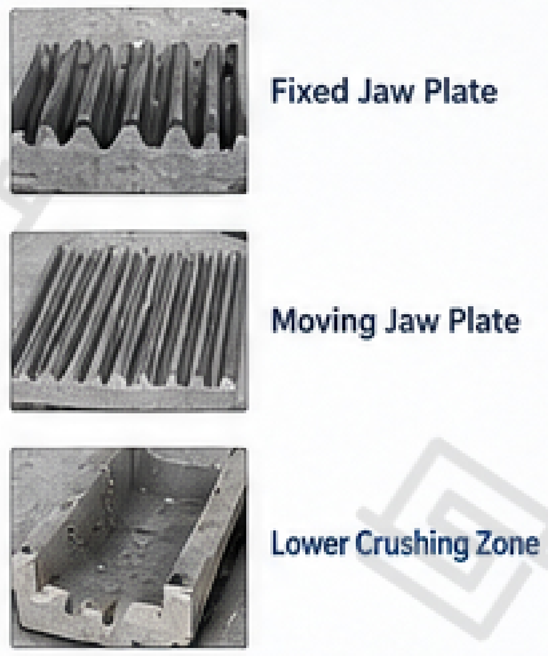
- Oversize accumulation
- Repeated crushing
- Screen overload
- Increased fines
- Accelerated liner wear
- Saleable output does not increase with crusher throughput

# Wear Load Distribution Across Diabase Crushing Stages

Diabase is hard and abrasive. Wear control depends on how the reduction duty is distributed across each crushing stage, not only on individual wear parts.

## Jaw Crusher — Primary Wear Zone

Main wear parts and causes during coarse crushing of diabase.




### Wear mechanism

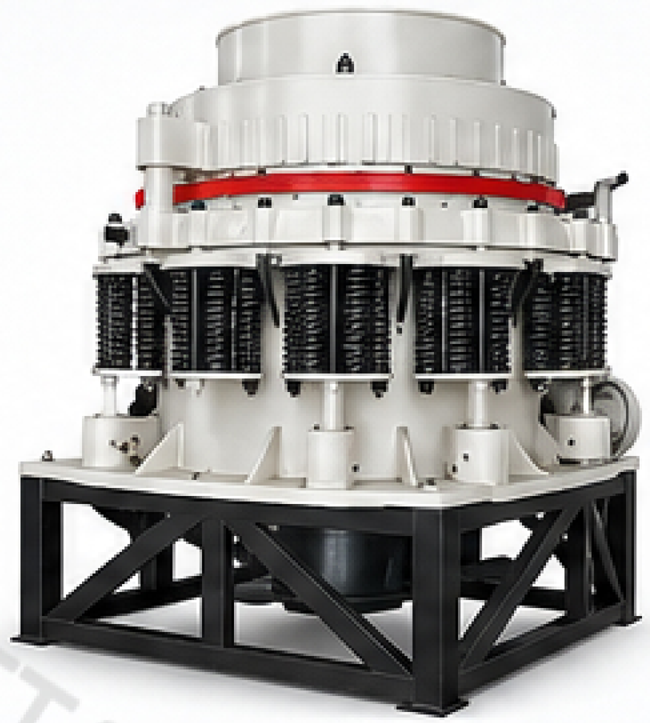
Large diabase blocks generate high contact pressure and sliding abrasion, while hard mineral particles repeatedly scratch and impact the jaw plate surface.

### Main factors accelerating wear

- **Oversize Feed** — Local high load
- **Highly Uneven Feed** — Unstable chamber filling
- **Excessive Primary Reduction** — Higher load and wear on jaw plates

## Cone Crusher — Secondary Wear Zone

Liner wear is affected by reduction duty, chamber filling and circulating load.




### Wear mechanism

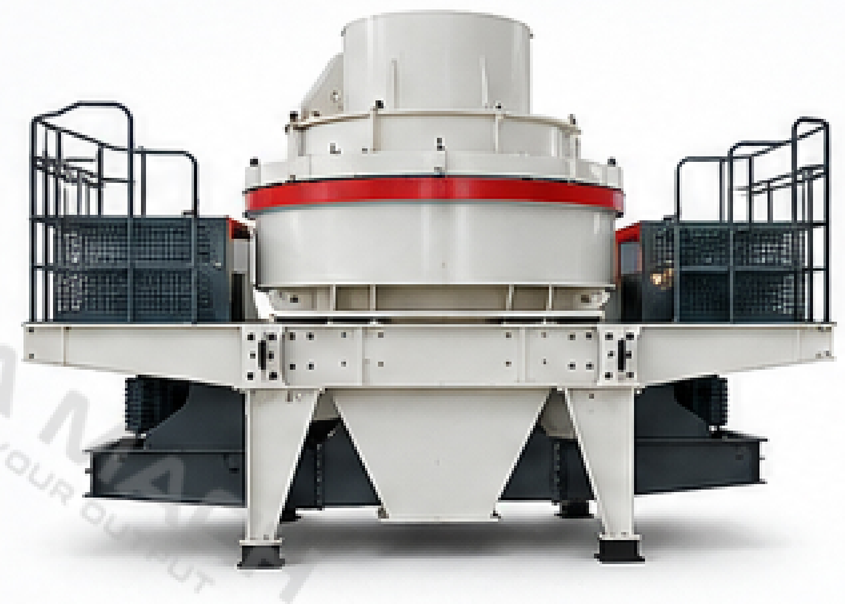
Diabase is compressed and inter-particle friction is high, which increases wear on the mantle and concave, especially when the reduction ratio is too high or circulating load is excessive.

### Main factors accelerating wear

- **Reduction Ratio** — Higher liner duty
- **Chamber Filling** — Uneven wear pattern
- **Feed Gradation** — Changes material layer state
- **Circulating Load** — Repeated contact and higher fines generation

## VSI — Optional Shaping Wear Zone

VSI is used for manufactured sand or particle shape improvement.




### Main application

- Manufactured sand
- Particle shape improvement
- Fine shaping

### Should not be used for

- Primary reduction
- Excessively coarse feed
- Heavy secondary crushing duty

### Improper operation may cause

- Increased rotor wear
- Higher wear-part consumption
- Excessive fines generation

## Reduction Duty Distribution

Distribute the crushing duty properly to reduce wear and improve overall performance.

- **Primary Jaw** — Large block reduction
- **Secondary Cone** — Controlled intermediate reduction
- **Optional VSI** — Shaping / fine reduction

**Wear control begins with distributing reduction duty correctly, not simply replacing wear parts more frequently.**

## Wear Monitoring

Regular monitoring helps identify wear problems early and maintain stable product quality.

- Jaw plate profile
- Cone liner thickness
- Product gradation change
- Crusher power fluctuation
- Increase in circulating load
- Rising fines content

### Wear is often reflected in:

**Product Size Drift**
Products become coarser.

or

**Higher Return Load**
Crusher discharge changes gradually.

# Diabase Crushing Troubleshooting and Adjustment Guide

Identify common problems in diabase crushing, analyze possible causes, check key points and take effective adjustment measures to keep the crushing circuit stable.

## Problem 1 — Circulating Load Keeps Increasing

### Possible Cause

- Cone crusher discharge becoming too coarse
- Screen deck overloaded
- Screen aperture blocked
- Excessive fresh feed rate
- Insufficient screening area

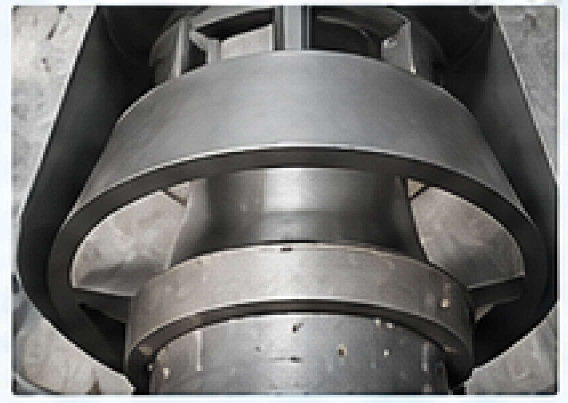
### What to Check

- Crusher CSS
- Screen deck loading
- Oversize return rate
- Screen aperture condition

### Corrective Direction

- Correct crusher setting
- Reduce screen overload
- Restore effective screening area
- Rebalance feed rate

## Problem 2 — Cone Liner Wear Is Too Fast



### Possible Cause

- Excessive reduction in secondary stage
- Unstable chamber loading
- Too much recirculated oversize
- Feed gradation unsuitable for chamber

### What to Check

- Feed PSD
- Reduction ratio
- Chamber filling
- Return load
- Wear pattern across mantle and concave

### Corrective Direction

- Adjust reduction duty
- Stabilize chamber loading
- Control return load
- Optimize feed gradation for chamber

## Problem 3 — Excessive Fine Material

### Possible Cause

- Over-crushing
- Excessive repeated circulation
- VSI duty too high
- Crusher setting unnecessarily tight

### What to Check

- Fine fraction before and after each crushing stage
- Return load
- Crusher settings
- VSI feed size

### Corrective Direction

- Reduce unnecessary reduction duty
- Optimize crusher setting
- Control circulating load
- Ensure appropriate feed size to VSI

## Problem 4 — Throughput Is Unstable

### Possible Cause

- Feed size changes significantly
- Feeder delivery is uneven
- Oversize blocks interrupt chamber loading
- Wet fines affect material flow

### What to Check

- Feed rate trend
- Maximum feed size
- Feed gradation
- Moisture / fines level

### Corrective Direction

- Stabilize feeding
- Remove or control oversize feed
- Improve upstream feed preparation
- Consider screening or scalping

## Problem 5 — Crusher Throughput Is High but Finished Output Is Low

### Possible Cause

**The screen, not the crusher, has become the system bottleneck.**

### What to Check

- Screen throughput
- Deck loading
- Circulating load
- Qualified product discharge
- Oversize return

### Corrective Direction

- Increase screening capacity
- Optimize screen configuration
- Reduce screen overload
- Adjust crusher discharge size
- Ensure balanced circuit operation

## Problem 6 — Product Grading Becomes Unstable

### Possible Cause

- Liner wear changes crusher discharge
- Screen aperture wear
- Excessive screen loading
- Changing feed PSD
- Too much recirculation

### What to Check

- Crusher discharge PSD
- Screen cut size
- Product fraction distribution
- Liner condition

### Corrective Direction

- Replace or adjust worn liners
- Check and renew screen media
- Reduce screen overload
- Stabilize feed gradation
- Control circulating load

## Troubleshooting Sequence

Follow the material flow and check each key point step by step.

1. Product or Throughput Problem →
2. Check Feed Condition →
3. Check Crusher Setting and Wear →
4. Check Screen Loading →
5. Check Circulating Load →
6. Check Final Product Gradation

Adjustment should follow the material flow from feed to final classification rather than changing crusher settings in isolation.