

Application Note: High-Performance Di-Calcium Phosphate (DCP) Grinding Plant

1.0 INTRODUCTION

Di-Calcium Phosphate (DCP) is widely used in **animal feed, food additives, and mineral supplements**. These applications require controlled fine grinding with **uniform particle size distribution (PSD)** to ensure proper mixing, improved bioavailability, and consistent product performance.

Due to its **moderate abrasiveness and relatively higher bulk density**, conventional grinding systems may face challenges such as **wear, inconsistent fineness, and higher energy consumption**.

The **Air Classifying Mill (ACM)** system offers a high-efficiency solution for producing uniform fine powder. Its integrated grinding and dynamic classification design ensures **precise fineness control, high product recovery, minimal heat generation, and dust-free operation**.

This application note outlines the process flow, system design, technical performance, and advantages of an ACM plant optimized for **Di-Calcium Phosphate grinding**.

2.0 Design & Working Principle

The grinding system operates on a continuous, automated principle comprising the following stages:

Step 1: Material Feeding

Raw material is fed into the system through a **feed hopper (SS304)**.

A **Rotary Airlock Valve (RAL – AL-150)** ensures:

- Uniform and controlled feeding
 - Air sealing to maintain system pressure balance
 - Prevention of backflow
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Step 2: Impact Grinding in ACM Rotor

Material enters the grinding chamber where it is subjected to high-speed rotor action.

Grinding occurs due to:

- Impact of hammers/pins
- Shearing forces
- Particle-to-particle collision
- Air turbulence

The rotor creates strong airflow, keeping particles suspended and ensuring efficient size reduction.

Step 3: Air Classification

The ground material enters the dynamic classifier zone.

- Classifier wheel rotates at controlled speed (VFD driven)
- Fine particles pass through and exit with airflow
- Coarse particles are rejected and returned for regrinding

This ensures:

- Narrow particle size distribution
 - Minimal oversize
 - Consistent product quality
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Step 4: Pneumatic Conveying & Cooling

The centrifugal fan generates airflow that:

- Conveys material to downstream system
- Maintains system temperature near ambient
- Enhances classification efficiency

For DCP, this helps:

- Maintain flowability
 - Avoid excessive heat build-up
 - Ensure stable grinding performance
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Step 5: Bag Filter & Product Collection

The air-material mixture enters the bag filter where:

- Powder is separated from air
- Fine particles are collected efficiently (>99%)
- Clean air is exhausted or recirculated

Pulse-jet cleaning ensures continuous operation without choking.

Step 6: Product Discharge

Collected powder is discharged via **Rotary Airlock Valve (AL-200)** into:

- Storage bins

- Packing systems
- Downstream processing

3.0 Key Components

Component	Function	Key Technical Feature
ACM Mill (ACM 10)	Grinding and classification	Integrated rotor + classifier, adjustable fineness (~150 micron)
Feed Hopper + RAL (AL-150)	Controlled material feeding	Uniform feed, airlock sealing
Bag Filter System	Powder separation & dust control	>99% recovery, pulse-jet cleaning
Centrifugal Fan (C-Fan)	Airflow generation	Maintains system pressure, conveying & cooling
Control Panel (MCC/PLC)	System control & monitoring	VFD control, interlocks, automation ready
Ducting System	Equipment interconnection	Optimized airflow, low pressure drop

4.0 Model Variants

Variant	Model	Capacity (Approx.)	Fineness
DCP-10-SS	ACM 10 SS304 CP	150 – 180 kg/hr	99% < 44 microns
DCP-30-SS	ACM 30 SS304 CP	375-400 kg/hr	99% < 44 microns
DCP-60-SS	ACM 60 SS304 CP	750-900 kg/hr	99% < 44 microns

⚠ Capacity may vary depending on material characteristics and fineness requirement.

5.0 Key Features & Benefits

Precise Fineness Control

Dynamic classifier with VFD enables accurate control of particle size (~150 microns).

Consistent Product Quality

Closed-loop grinding and classification ensure stable PSD.

High Product Recovery (>99%)

Efficient bag filter minimizes material loss.

Dust-Free Operation

Fully enclosed system ensures clean and safe working environment.

Energy Efficient System

Optimized airflow and mill design reduce power consumption.

Reliable Continuous Operation

Designed for 24/7 industrial usage.

Automation & Easy Control

PLC/MCC system enables real-time monitoring and control.

Low Maintenance Requirements

Wear-resistant internals suitable for moderately abrasive material.

Hygienic Design

SS304 contact parts suitable for feed/food-grade applications.

6.0 Applications

- Animal Feed Additives
 - Poultry & Cattle Feed
 - Food-Grade Phosphate Blending
 - Mineral Supplements
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7.0 Performance Parameters

- Feed Size: < 1 mm
 - Final Fineness: 99(-) 44 microns
 - Bulk Density: 450 – 700 kg/m³
 - Moisture: < 1%
 - Product Recovery: > 99%
 - Operating Temperature: Ambient
 - Noise Level: ~95 dB (without acoustic enclosure)
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8.0 Automation & Integration

The system supports:

- Closed-loop control of airflow, pressure & classifier speed for stable PSD
 - Load-based feed control to avoid mill overloading
 - Differential pressure monitoring across bag filter
 - VFD control for classifier and feeder
 - Safety interlocks for safe operation
 - Integration with DCS/SCADA systems
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9.0 Frequently Asked Questions (FAQ)

Q1: Can fineness be adjusted for different feed applications?

A: Yes, fineness can be controlled through classifier speed and airflow adjustment.

Q2: How does abrasiveness of DCP affect the system?

A: Proper material selection and wear-resistant components ensure long equipment life.

Q3: Is the system suitable for hygienic applications?

A: Yes, SS304 contact parts make it suitable for feed and food-grade processing.

Q4: How is dust controlled?

A: Through a high-efficiency bag filter and fully enclosed system.

Q5: Can the system operate continuously?

A: Yes, it is designed for 24/7 industrial operation.

Q6: What ensures consistent product quality?

A: Closed-loop control of airflow and classifier speed ensures stable PSD.