Application Note: RIECO Besan (Gram Flour) Grinding System

The RIECO Besan Grinding System is a fully automated, hygienic, and high-efficiency turnkey solution designed for producing premium-quality gram flour from Bengal gram (chickpeas). Leveraging RIECO's 50+ years of grinding expertise, the system integrates milling, sieving, dust control, and packing into one seamless workflow. With precise particle size control and low heat generation, it preserves natural color, aroma, and protein content required for both traditional food markets and modern FMCG clients.

1. Design and Working Principle

The Besan Grinding System follows a staged, controlled size-reduction sequence to ensure consistent fineness 100-500 microns (Gargara, Fine & super fine), hygienic operation, and minimal product loss:

Stage 1: Feed Hopper + Feed RAL (Rotary Air Lock)

- Chana Dal / pre-crushed material is loaded into the **Feed Hopper**.
- A **Feed Rotary Air Lock** ensures controlled, uniform material dosing into the system.
- It also maintains **air sealing**, preventing false air entry into the mill and ensuring stable airflow.

Stage 2: ACM Mill (Grinding + Classification)

The ACM Mill is the heart of the Besan system and carries out both **fine grinding** and **particle classification** in a single pass.

Grinding Action

- Material enters the grinding chamber where a **high-speed rotor** impacts and pulverizes the product.
- The high velocity of air through the chamber maintains **cool grinding (<10°C rise)**, preserving besan colour and aroma.

Integrated Classification

- A **dynamic classifier wheel** rotates at controlled speed to determine the cut-point.
- **Fine particles** pass through the classifier.
- **Coarse particles** are rejected and re-circulated for further grinding, giving uniform mesh output.

Output Mesh Range

- Suitable for **Gargara**, **Fine**, and **Super-Fine Besan** (100 - 500 Microns).

Stage 3: Interconnecting Ducting

- Carries the air-material mixture from ACM to Bag Filter.
- Designed for **smooth airflow**, minimum pressure drop, and hygienic transfer.
- Fabricated in **SS/MS** as required for food safety.

Stage 4: Bag Filter (Dust Collection + Fine Product Recovery)

- The air-material stream enters the **Pulse Jet Bag Filter** where the fine besan powder is separated.
- Filter bags ensure **>99% collection efficiency** with negligible dust emission.
- **Pulse Jet cleaning** maintains stable differential pressure and consistent airflow.

Stage 5: Discharge RAL

- The collected besan is discharged through a **Rotary Air Lock** into the product bin/packing system.
- Prevents air leakage from the Bag Filter and maintains proper suction in the system.

Stage 6: Centrifugal Fan (C-Fan)

- The C-Fan provides the **required airflow** through the mill, ducts, and bag filter.
- Ensures:
    - Efficient transportation of fines
    - Stable classification performance

Stage 7: Control Panel (MCC/PLC Based)

- Houses starters, drives, automation logic, and safety interlocks.
- Functions include:
    - Feed RAL speed control
    - Classifier RPM control (VFD)
    - Fan airflow control
    - Bag filter pulse sequencing

- Temperature and motor load monitoring
- Safety interlocks for doors, airflow, and overloads

- Optional **HMI/PLC** enables recipe-based operation and real-time monitoring.

2. Key Components

Sr. No.	Component	Function	Key Technical Features
1	**Feed Hopper + Feed RAL (Rotary Air Lock)**	Hold material and ensures controlled, uniform feeding into the mill	Maintains air sealing, prevents false air entry, supports consistent feed rate
2	**ACM Mill (Air Classifying Mill)**	Performs fine grinding and internal air-classification in a single pass	Cool grinding (<10°C rise), screen-less design, adjustable classifier RPM for mesh control
3	**Bag Filter (Pulse Jet Type)**	Separates fine besan powder from conveying air and ensures dust-free operation	>99% collection efficiency, food-grade filter bags, automatic pulse cleaning
4	**Discharge Hopper + RAL**	Collects finished besan and discharges it to packing or downstream equipment	Provides airlock, ensures dust-free discharge and maintains suction in system
5	**Centrifugal Fan (C-Fan)**	Generates required airflow through ACM, ducting, and bag filter	Ensures cooling during grinding, stable classification.
6	**Control Panel (MCC/PLC Based)**	Controls and synchronizes all equipment for smooth and safe operation	Classifier speed control, feed control, bag filter pulse logic, safety interlocks, overload protection

3. Model Variants

Variant	Mill Model	Total Power in HP	Capacity
BS-15-MS	ACM 15 MS	25	100-150 Kg/hr
BS-15-SS	ACM 15 SS 304CP	25	100-150 Kg/hr
BS-30-MS	ACM 30 MS	59	300-500 Kg/hr
BS-30-SS	ACM 30 SS 304CP	59	300-500 Kg/hr
BS-60-MS	ACM 60 MS	127	660-1000 Kg/hr
BS-60-SS	ACM 60 SS 304CP	127	660-1000 Kg/hr

4. Key Features & Benefits

a) Process Benefits

i. Uniform particle size with exact mesh control
ii. Low heat generation → preserves aroma, color & nutritional value
iii. Screen-less operation → no choking or frequent stoppages
iv. Higher yield & low wastage

b) Hygiene & Safety Benefits

i. SS304/316 contact parts available
ii. Dust-free environment with >99% collection efficiency

c) Operational Benefits

i. Fast changeover between grades (Gargara / Fine / Super Fine)
ii. Lower power consumption vs. traditional pulverizer
iii. Stable performance with automated controls

5. Applications

• Besan (Gram Flour)
• Sattu
• Ladu Besan
• Premium Fine Besan for FMCG

6. Technical Parameters

Moisture Limit: <8%

Temperature Rise: <10°C

Fineness Range: 80–300 mesh

Power Consumption: Range of 20 – 365 HP Depends on Capacity required.

Colour Index: Natural yellow retained

7. Frequently Asked Questions (FAQs)

Q: How do you maintain the natural color and aroma of besan?
A: ACM air-cooled chamber prevents heat rise and maintains product quality.

Q: Can the system achieve multiple fineness grades?
A: Yes, meshes from 80–300 can be produced by adjusting classifier speed.

Q: Is the system suitable for FMCG-level hygiene?
A: Yes, food-grade stainless steel and dust-free operation ensure compliance.

Q: What about cleaning between batches?
A: Quick-release construction allows rapid cleaning; CIP optional.

Additional Frequently Asked Questions (FAQs)

Q: How do you ensure consistent mesh size across batches?
A: The ACM/RACAM system uses a variable-speed dynamic classifier that automatically recirculates coarse particles while passing only the fine particles, ensuring repeatable mesh sizes from 80–300 mesh.

Q: Will the system overheat the material during grinding?
A: No. RACAM's air-cooled grinding chamber maintains the temperature rise below 8–10°C, preserving aroma, color, and protein quality.

Q: Can one machine produce fine besan, ladu besan, and sattu?
A: Yes. By adjusting classifier RPM, feed rate, and sieve configurations, you can switch between different grades with minimal downtime.

Q: What is the recommended moisture content for chana dal?
A: Ideally ≤12%. Higher moisture can cause smearing, clogging, and reduced efficiency during fine grinding.

Q: Is the plant suitable for export-grade or FMCG-standard besan?
A: Yes. RIECO systems comply with FSSAI, HACCP, and food-safe material guidelines, with SS304/316L options for all contact surfaces.

Q: What are typical power requirements for besan grinding systems?
A: Depending on the capacity (200–5000 kg/hr), power ranges from 40 HP to 365 HP, with optimized consumption in ACM systems.

Q: How long does cleaning and changeover take?
A: With quick-release clamps, smooth liners, and tool-free access, cleaning typically takes 15–30 minutes. CIP options are available.

Q: Can the system minimize dust and maintain hygiene?
A: Yes. Cyclone + Pulse Jet Bag Filter ensures >99% dust collection efficiency, enabling a clean, compliant environment.

Q: How do you maintain product uniformity in continuous operation?
A: Automated controls maintain consistent feed rate, classifier speed, and airflow, ensuring batch-to-batch uniformity.

Q: Can the plant be integrated into an existing production line?
A: Yes. RIECO systems support modular integration with existing conveyors, silos, cleaning lines, or packing machines through PLC-based automation.