Application Note: The RIECO POWTRAN® (Powder Transfer System)

The RIECO POWTRAN® Powder Transfer System (PTS) is a fully automated pneumatic conveying solution designed for the safe, contained, and efficient transfer of powders and granules in pharmaceutical, food, and chemical plants. Engineered to meet cGMP standards, it eliminates the limitations of manual scooping, bag dumping, and mechanical conveyors that cause dust exposure, contamination, and inconsistent transfer rates.

A Powder Transfer System (PTS) is a pneumatic conveying setup that moves powders and granules from one process stage to another under vacuum. Unlike open manual handling or mechanical conveyors, it ensures total containment of the product, maintaining both operator safety and product purity. The RIECO POWTRAN® operates on a lean-phase vacuum principle, transferring material in controlled slugs that minimize degradation and dust generation.

1.0 Design and Working Principle

The POWTRAN® system functions through a three-step automatic cycle that ensures continuous, repeatable, and dust-free transfer.

- **Step 1 – FILL (Conveying Phase):** Vacuum is applied to the sealed receiver vessel, pulling material from a source container or hopper through a flexible hose. High-efficiency MERV 16 filters retain powder and separate clean air.
- **Step 2 – DISCHARGE (Venting Phase):** Once filled, the vessel's discharge valve opens, and the powder is released by gravity into the receiving equipment (reactor, blender, or mixer). The bleed valve manages smooth venting for continuous operation.
- **Step 3 – FILTER CLEAN & RESET:** Reverse-pulse compressed air cleans the filters automatically, knocking fines back into the batch to ensure zero product loss and readiness for the next cycle.

The entire operation takes 30–90 seconds, fully automated through a PLC-based control panel with HMI interface.

2.0 Key Components

Component	Function	Construction	Key Feature
Receiver Vessel	Collects powder during vacuum phase	SS304 / SS316L	Crevice-free, cGMP compliant
Filter Element	Separates air and powder	PTFE / SS	MERV 16 efficiency, pulse-jet cleaning
Valves	Controls flow and sequencing	SS304, FG Silicon Gasket	Electro-pneumatic operation
Vacuum Source	Generates conveying vacuum	Side channel blower	High reliability, low noise
Control Panel	Automates complete cycle	PLC + HMI	Local & remote operation modes

3.0 POWTRAN® Model Characteristics (Ready Reckoner)

POWTRAN® Model	Charge Volume (litres/cycle)	Total Loader Height (mm)	Weight of Loader (Kg) (Without valves)	Conveying Pipe Size (NB)	Discharge Size (NB)	Filter Area (m^2)	Air Consumption (Nm3/hr) at 6-7 bar
T-150	2.6	~750	~40	25NB	150	0.5	2-10
T-200	6.5	~800	~45	40NB	200	1.152	2-10
T-250	12.5	~850	~55	50NB	250	2.56	2-10
T-300	21.0	~1100	~70	65NB	300	3.6	2-10
T-350	33.5	~1250	~85	80NB	350	6.336	2-10

4.0 Key Features & Benefits

User Challenges	POWTRAN® Feature	Tangible Benefit
Operator Exposure & Dust	Fully Enclosed, Dust-Free Operation	Protect operators and maintain compliances.
Cross-Contamination	cGMP & Hygienic Design	Quick cleaning and zero carryover between batches.
Manual Handling & Delays	Automated, Repeatable Cycles	Reduces manpower and increases batch throughput by up to 70%.
Space Constraints	Compact, Hose-Based Layout	Easily routed around existing machinery with minimal footprint.
Product Loss	Pulse-Jet Filter Cleaning	Maximizes powder recovery, improving yield and efficiency.

5.0 Applications

Industry	Material / Process	Purpose of Use	Integrated Equipment	Key Benefit
Pharmaceutical	API, excipients, granules	Transfer from drum to blender or reactor	RMG, Blender, FBD	OEL & cGMP compliance
Food & Beverages	Flour, sugar, spices, milk powder	Ingredient feeding & dosing	Mixer, Hopper, Silo	Hygienic, FSSAI-ready operation
Spice Manufacturing	Chili, turmeric, coriander powder	Transfer to grinding & blending systems	Pulverizers, Blender	Dust-free, odor containment
Specialty Chemicals	Pigments, resins, catalysts	Safe transfer to reactors	Reactors, Mixers	Explosion-safe, contamination-free
Battery Manufacturing	Cathode/anode powders	Charging to slurry mixer	Ball Mill, Mixer	Static-free inert transfer (optional)

Applications above are indicative. Material-specific trials recommended for optimal design selection.

6.0 Performance Parameters

Characteristic	Specification
Capacity Range	500 to 3000 Kg/hr
Bulk Density Range	350 – 900 Kg/m³
Particle Size Range	D50(passing through %) 100 microns to 10 mm (subject to particle shape)
Max Conveying Distance	25m (including horizontal (15m) & vertical (10m)) with a maximum of 3 bends
Moisture Content Limit	<2%
Temperature	Atmospheric
Gaskets & Seals	Food Grade (FG Silicon)
Required Clearance above the PTS	Xx m

7.0 Automation & Integration

POWTRAN® systems are modular and can be retrofitted into existing process lines. Typical setup includes a suction lance or bag dump station, flexible conveying line, receiver vessel, and discharge connection to downstream equipment. The PLC panel interfaces seamlessly with plant SCADA systems via Modbus or Ethernet protocols. Installation is quick and requires minimal civil work.

8.0 Frequently Asked Questions (FAQs)

Q: What about cleaning between batches?

A: Quick-release clamps allow full disassembly in minutes; optional CIP/SIP for pharma units.

Q: Can this system really guarantee zero dust? We handle an active pharmaceutical ingredient (API)?

A: Yes, it's a total containment solution. It works in a sealed loop, pulling powder from a sealed source to a sealed destination under vacuum. This eliminates dust from the environment, making it compliant with strict Operator Exposure Limit and other safety requirements.

Q: My powder is very light (low bulk density). Will it just blow around or clog the filters?

A: The POWTRAN® is suitable for a wide range of materials, specifically those with a Bulk Density between 350 – 900 Kg/m³. Its advanced filtration (MERV 16) and reverse-jet pulse cleaning prevent filter clogging by knocking fine powder back into the batch after every cycle, ensuring continuous operation.

Q: What are the limits on particle size? We have a mix of coarse and fine material.

A: The system is designed for the contained transfer of coarse powders and granules, with the acceptable range being D50 100 microns up to 10 mm. We can test your specific material, but this range covers most common food and general bulk chemicals.

Q: Cleaning our current equipment is an absolute nightmare. How long does the POWTRAN® take to clean?

A: Cleaning is streamlined. The cGMP design features stainless steel with a high-polish finish, crevice-free interiors, and quick-release clamps. It is built for CIP/SIP capability (Clean/Sterilize-In-Place), which means you can dismantle, clean, and reassemble in minutes, not hours, to guarantee product purity.

Q: What parts will wear out? Do I need to keep a large spare parts inventory?

A: Minimal wear. The POWTRAN® is a pneumatic system, meaning it has no moving parts in contact with the powder. The main wear parts are the filter element (PTFE/Stainless steel) and the gaskets (Food Grade Silicon) on the valves, which are readily available

9.0 Possible Layouts/ Combination