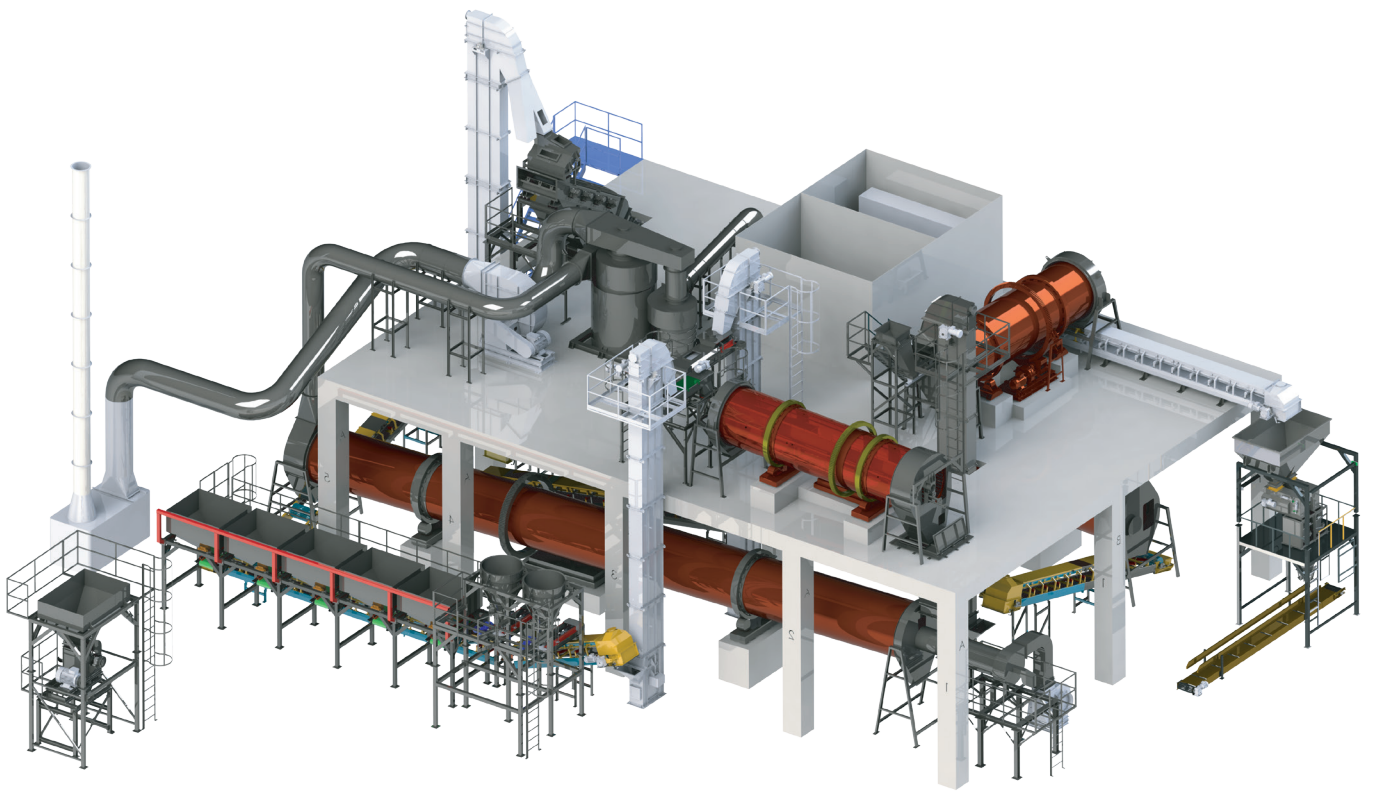


NPK AGGLOMERATION/GRANULATION PROCESS





CEYLAN Machinery designs and manufactures custom fertilizer production equipment and complete NPK production lines for your process needs. Whether it's a granulation process or a simple bulk blending line, every solution is engineered according to your end product and target capacity, with a focus on durability, safety, and continuity.

COMPREHENSIVE SUPPORT

Our support spans the entire production cycle — from the initial concept phase to the point where your facility reaches stable, continuous operation:

- Feasibility studies and process design (mass/energy balances, 3D drawing of your desired facility)
- Manufacturing schedule, and project administration
- On-site installation, commissioning, and operator training
- Inspection, spare parts supply, performance optimization

AUTOMATION & CONTROL

We integrate recipe management, data logging systems (historian), and remote diagnostics into Siemens or Rockwell-based PLC/SCADA systems. From single-machine panels to control rooms managing the entire plant, we deliver scalable solutions tailored to your needs.

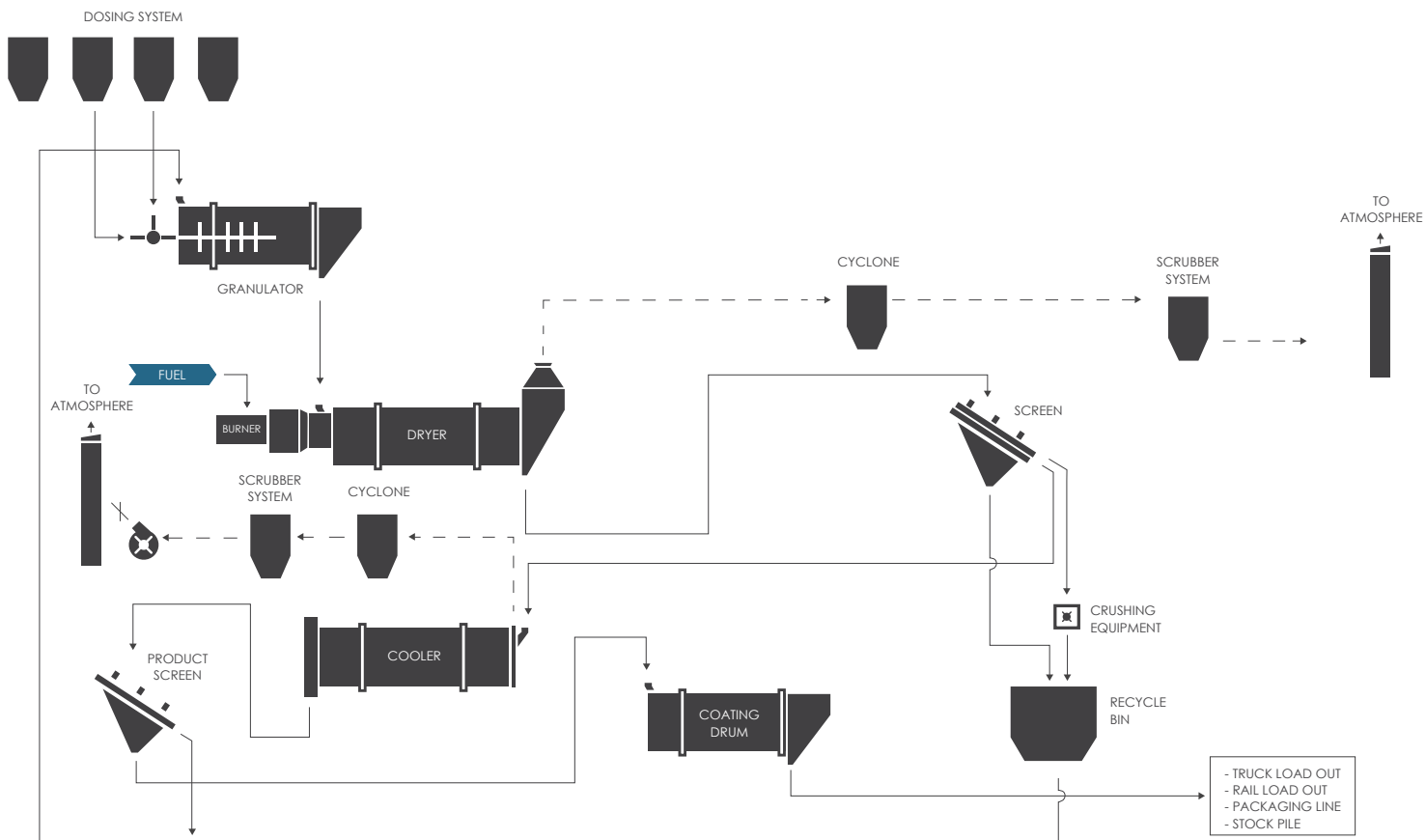
OUR RANGE of EQUIPMENT

Granulators, rotary dryers and coolers, coating drums, gas cleaning systems (scrubber, cyclone, bag filter), screens, crushers&mills, conveyors, elevators, dosing & mixing systems, and semi/fully automatic packaging and palletizing lines.

All custom-designed to match your capacity and product specifications. From a single machine to a turnkey NPK production line: tell us your product, capacity, and constraints, and we will design the fastest route to stable and efficient production.



GRANULATION PROCESS GENERAL ARRANGEMENT



MAIN STEPS

1- DOSING of the RAW MATERIALS

- Raw materials are stored in separate silos or feeding hoppers.
- The material is fed to the granulator in a controlled manner, via dosing belts.

2- GRANULATION

- Powder or fine materials are agglomerated here to form granules.
- The required binders and moisture are added at this stage to aid granule formation.

3- DRYING

- The granulated product enters the dryer to remove excess moisture.
- Inside the drum, lifting flights continuously shower the granules through a stream of hot air, ensuring maximum heat transfer.
- The gas and dust mixture exiting the dryer is directed to cyclone and scrubber systems.

4- SCREENING

- Product-sized granules → Sent to the Cooling Stage
- Oversized granules → Sent to the Double Hammer Mill
- Undersized granules/fines → Sent to the Recycle Bin.
- The stainless mesh provides long service life, reduces clogging and ensures consistent material flow.

5- COOLING

- Semi finished products enter the rotary cooling drum, where ambient or conditioned air reduces the product temperature to safe storage and handling levels.
- Dust-laden air produced during cooling is routed to cyclone and scrubber systems for cleaning before discharge.

6- COATING

- Product-sized granules enter the coating drum.
- A thin layer of anti-caking agent (e.g., kaolin, talc, bentonite, mineral oil, etc.) is sprayed onto the product surface to inhibit moisture back into the granules.

EQUIPMENT

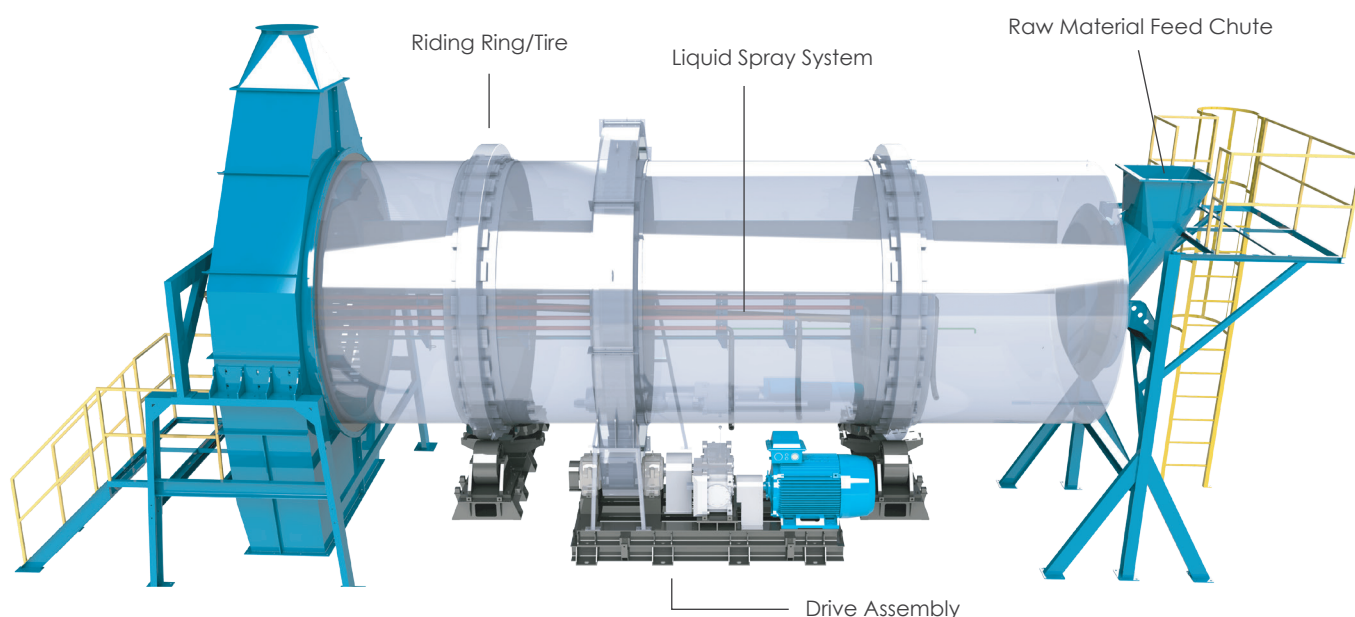
EQUIPMENT OVERVIEW | GRANULATION EQUIPMENT



AGGLOMERATION, GRANULATION DRUMS

Rotary drums form the basis of various types of rotary equipment. These versatile machines provide uniform results and a reliable solution for high-capacity processing across different applications. Thanks to their robust construction, they are ideal for demanding operating conditions. They are also preferred in processes that require a long retention time or where the agglomeration process involves a chemical reaction — such as in the production of granular fertilizers.

The **granulation drum** is typically fitted with a wear-resistant lining to protect against abrasion and extend service life. It can be equipped with integrated liquid spray systems for binder addition and other process-specific enhancements. The design allows for precise control over retention time, moisture distribution, and granule size growth, ensuring consistent, high-quality production. Below, you can see a 3D figure illustrating the design and key features of a granulation drum.



FEATURES

- Robust design and construction
- Rubber lining for protection
- Laser aligned ring/gear

CAPACITY

5 TPH - 250+ TPH

SIZE

Drum diameters from 1m - 4.6m

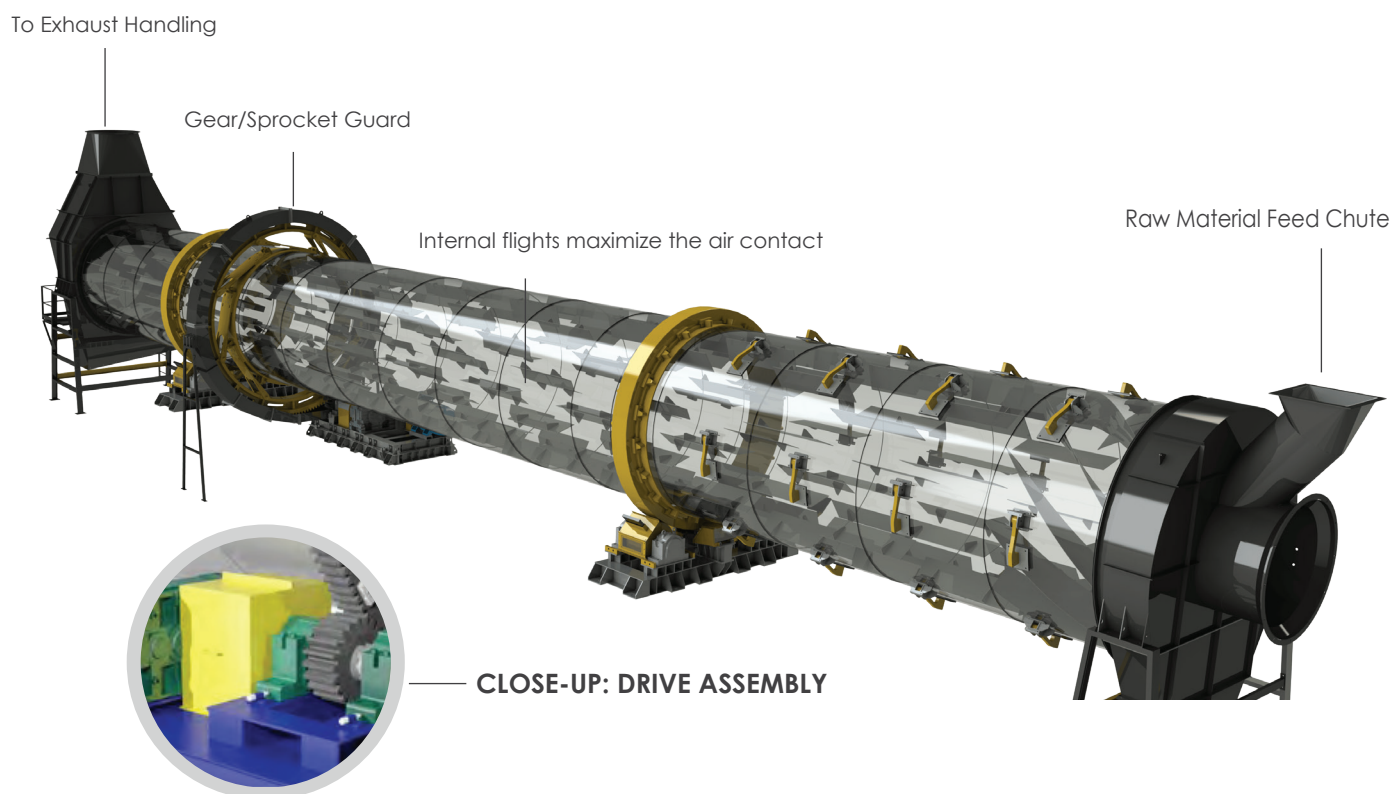
OPTIONAL COMPONENTS

- Spray Systems
- Various Liner Options
- Machined Bases
- Screw Conveyor Feeder
- Automatic Gear Lubrication System
- Variable Speed
- Variable Slope
- Variable Frequency Drive (VFD)

DIRECT ROTARY DRYERS

Direct rotary dryers are the most commonly used equipment for drying fertilizers. These durable industrial dryers stand out with their heavy-duty construction, high process efficiency, and continuous operation. When used in conjunction with a granulator, rotary dryers provide an additional “rounding” effect — further smoothing and refining the edges of the granules.

Direct-type dryers operate on the principle of direct contact between the material and the drying air. This contact, combined with the lifting flights inside the drum, maximizes heat transfer between the material and the air, offering an extremely efficient process solution.



CAPACITY 5 TPH - 250+ TPH

DIAMETER 1 - 4.6m

FEATURES

- Custom-designed lifting flights
- Heavy-duty design and construction
- Custom air flow configurations
- Sealed end plates and dust-tight design

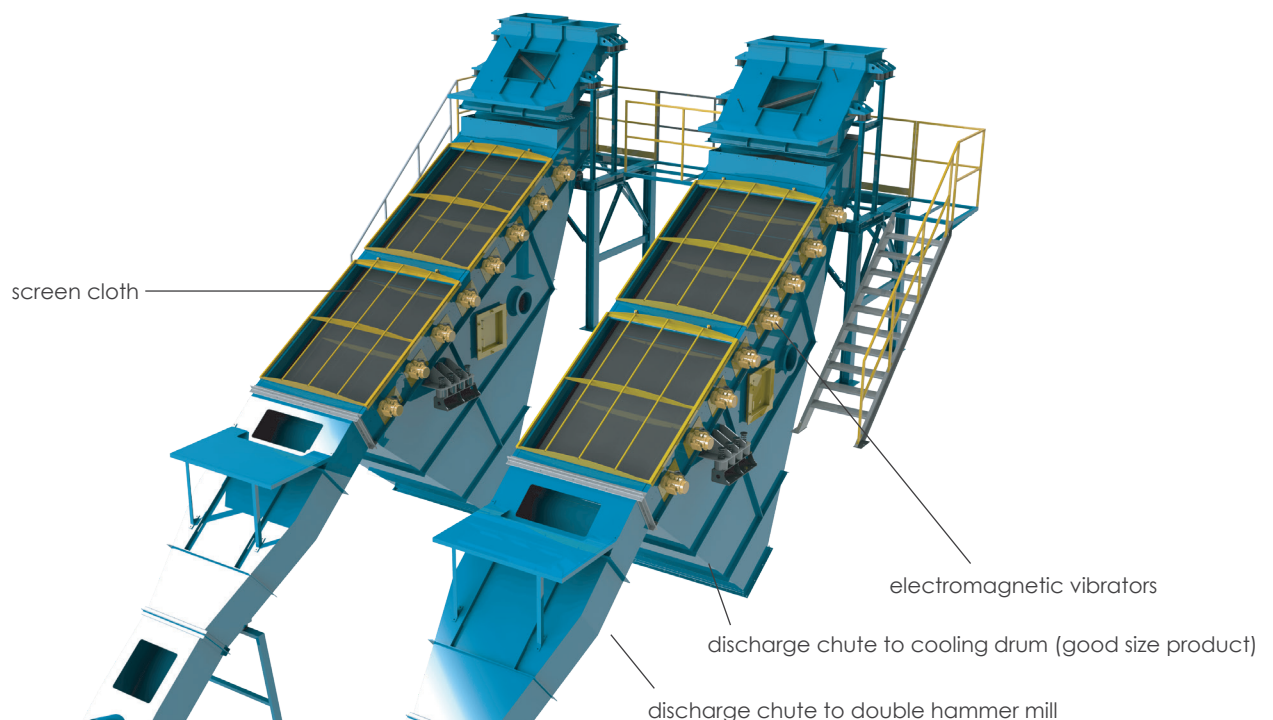
OPTIONAL COMPONENTS

- Machined bases
- Automatic gear lubrication system
- Variable Speed
- Variable Frequency Drive (VFD)

SIFTING the GRANULES: SCREENING

The screening unit is a key piece of equipment that precisely determines the particle size distribution of the product in the granulation process. Rotary drum screens (trommels) or inclined vibrating screens, with their heavy-duty construction suitable for high capacity and continuous operation, provide reliable classification in fertilizer production lines. Wear-resistant screening surfaces, modular panel design, dust-tight body, and easy maintenance access offer a long-lasting and stable solution.

The product enters the screen and is separated into three fractions: the desired granule size (on-size) flows downward; oversized particles are sent in a closed loop to a double chain mills for re-crushing; and fines/undersize fractions are returned to the granulator. This closed-circuit classification ensures a narrow and repeatable particle size distribution, low dust generation, and uniform product quality, while also reducing raw material loss and energy consumption to improve overall process efficiency.



FEATURES

- Configuration: 2 deck inclined vibrating screen (or trommel)
- Feed management: Distribution box, deflector plates, and bypass cover option
- Drive and adjustment: VFD-controlled vibration motor/eccentric exciter
- Anti-blinding system: Brush/Sweeper cleaners.
- Dust-tight covers: Inspection windows and aspiration connection nozzles.
- Safety & maintenance: Interlock access covers, platform-ladders

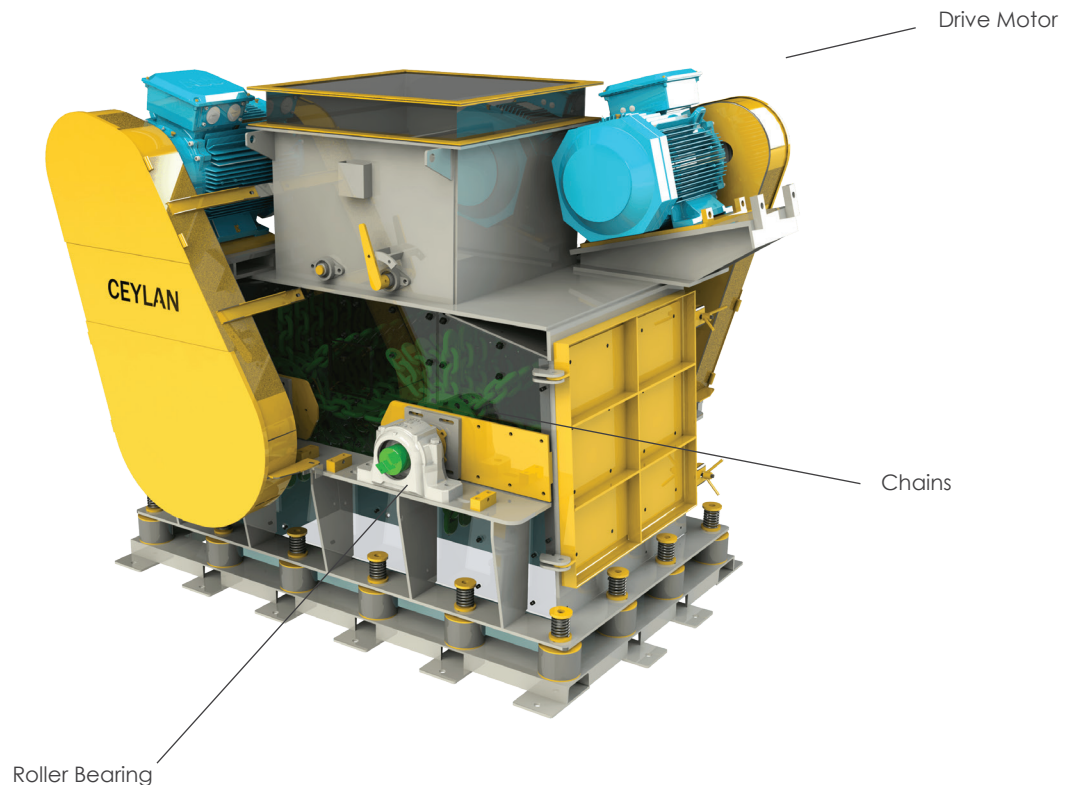
ADVANTAGES

- Precise particle size control: Multi-deck classification with accurate screen apertures ensures narrow granule size distribution.
- Anti-clog design: Flow deflectors minimize screen blockage.
- Low dust – clean operation: Enclosed body and aspiration nozzles limit dust emissions.
- Easy maintenance: Modular panels and large maintenance covers minimize downtime.
- Durable and quiet: Heavy-duty frame, large bearings, and isolator pads ensure long service life with low dynamic loads.

SIZE REDUCTION: DOUBLE CHAIN MILLS

The Double Rotor Chain Mill is a high-impact energy machine used in the granulation process to crush oversized materials and return them to the granulation cycle. These robust industrial crushers, with their heavy-duty construction, high crushing capacity, and wear-resistant design, provide a long-lasting and reliable solution for granulation lines.

During the granulation process, oversized particles remaining after screening are directed to the double chain mill. Here, cast chains attached to the rotor spin at high speed, repeatedly striking the material until the particles are reduced to the desired granule size. This operation ensures the process runs in a closed loop and prevents raw material loss.



FEATURES

- Heavy-duty design and construction by material selection
- Internal lining for abrasion
- Cr-Mo (Chromium-Molybdenum) alloy steel and solid steel bar connection—for wear resistance
- Lined interior walls for anti-clogging and smooth pass through
- Drive assembly: electric motor, sliding motor base, mounting bolts, bushings, pulleys, and V-belts

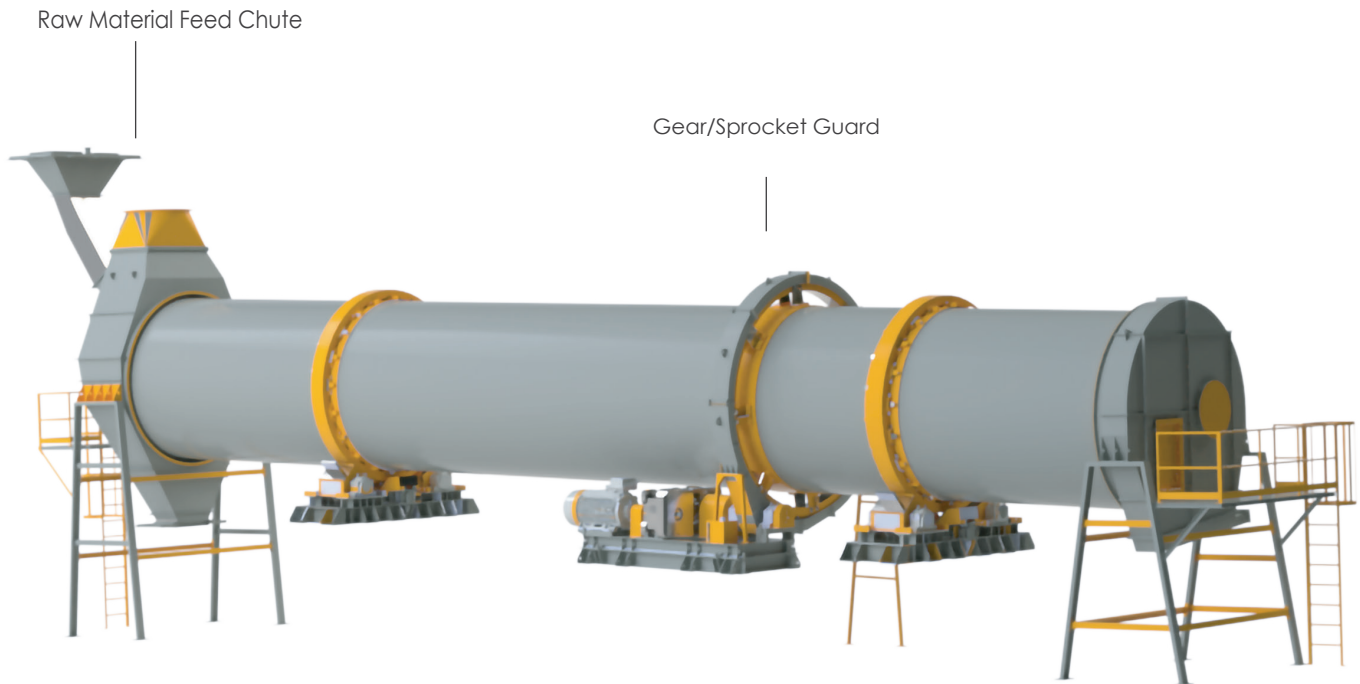
ADVANTAGES

- Two sets of chain/rod arms, made from wear-resistant Cr-Mo (Chromium-Molybdenum) alloy steel, effectively reduce dry and semi-moist material size with minimal clumping, coating/sticking, and fine dust generation.
- Anti-Clog Design: Wide openings along the entire flow path ease material passage and help prevent build-up and production stoppages.
- Easy Access: Side bodies can be removed with just eight bolts for quick access.
- Simplified Maintenance: All parts and wear components can be easily removed and replaced.
- Durable Construction: Heavy-duty steel body, large bearings, and specially hardened Cr-Mo chain hammers ensure high reliability and long service life.

DIRECT ROTARY COOLER

Similar to rotary dryers, direct-type rotary coolers are the most commonly preferred equipment for cooling bulk solids. Their heavy-duty construction, efficient processing, and uniform results are the main advantages of these coolers. Direct coolers rely on direct contact between the material and the cooling air. This contact, combined with the use of lifting flights inside the drum, maximizes heat transfer between the material and the environment, providing highly efficient cooling.

While all coolers are custom-engineered according to the material to be processed and the targeted process goals, the basic design of a direct-type unit is largely standardized (the basic structure of a typical rotary cooler can be seen in a 3D drawing).



CAPACITY 1 TPH - 250+ TPH

DIAMETER 1 - 4.6m

FEATURES

- Custom-designed lifting flights
- Heavy-duty design and construction
- Custom air flow configurations
- Sealed end plates and dust-tight design

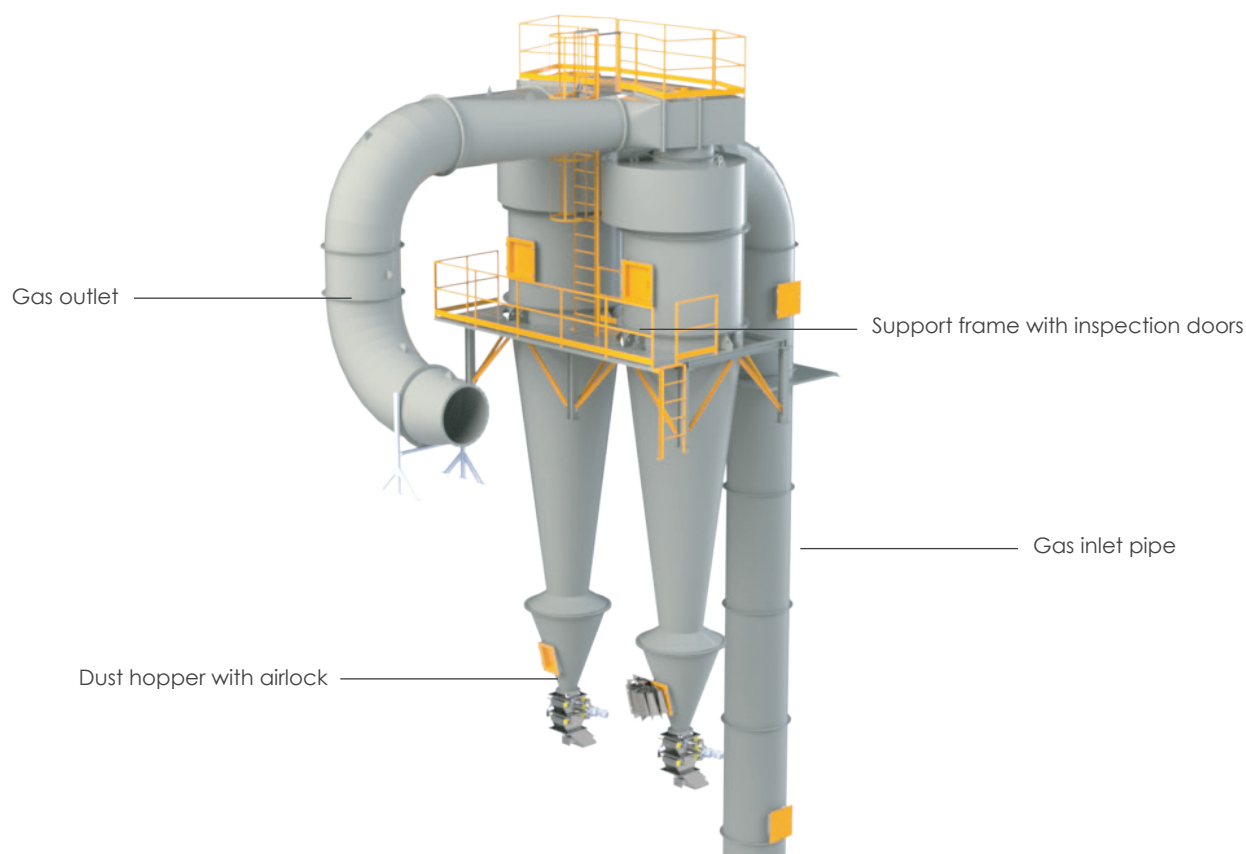
OPTIONAL COMPONENTS

- Machined bases
- Automatic gear lubrication system
- Variable Speed
- Variable Frequency Drive (VFD)

CYCLONES

Cyclones (also known as cyclone separators or inertial dust collectors) are primary units used throughout fertilizer and chemical plants to remove coarse and mid-sized particulates from process air—prior to cleaning of the gas. They work on the principle of centrifugal separation: process gas saturated with dust enters tangentially and spins into a tight vortex; inertia drives particles to the wall, where they slide down the cone into a hopper for discharge or recycle, while cleaned gas exits from the top. With no moving parts, cyclones offer high reliability and low maintenance.

The basic structure of a typical cyclone—comprising tangential gas inlet, cylindrical barrel, conical section, vortex finder/clean-gas outlet, dust hopper with rotary airlock or screw, and support frame with inspection ports—can be shown clearly in a 3D drawing.



APPLICATIONS

Primary dust removal in fertilizer, chemical, and mineral lines (dryers, coolers, crushers, screens)
Product-fines recovery from granulation/drying exhausts

FEATURES

- No moving parts → very high reliability and low maintenance
- Handles heavy, abrasive dust loads; optimized geometry for coarse/mid-size particles
- Robust construction in CS/SS with optional AR wear protection at inlet and cone
- Gas-tight hoppers with airlock discharge; inspection doors for easy checks

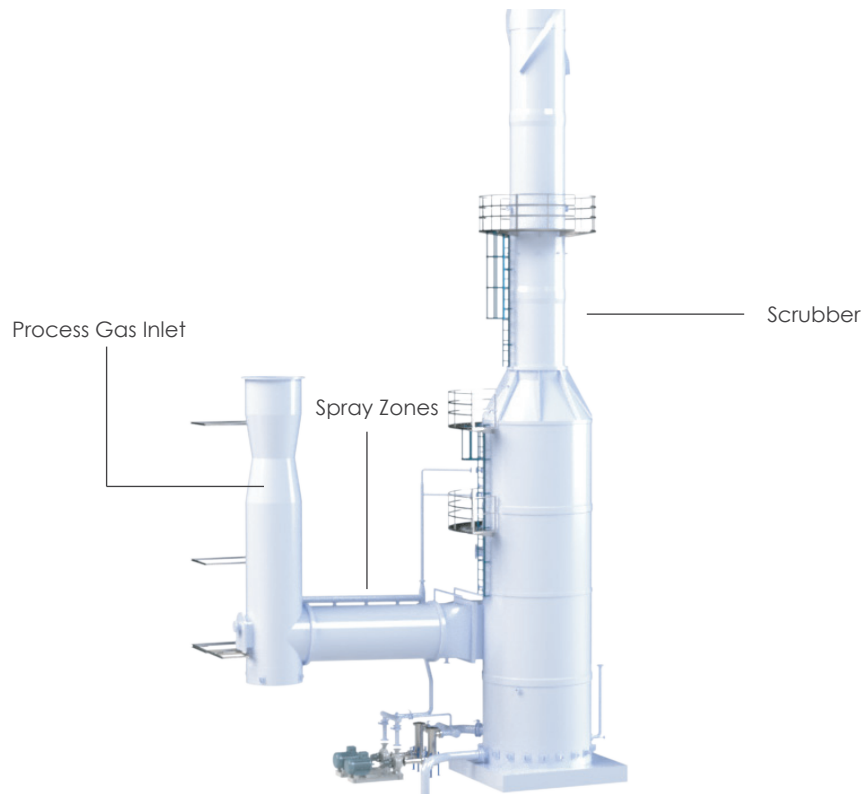
OPTIONAL COMPONENTS

- Rotary airlock, double-flap valves, or screw conveyor with hopper level sensor

WASHING TOWER

Washing towers (also known as scrubbing towers) are essential units in fertilizer and chemical production plants for cleaning process gases and removing fine particulates or acidic vapors. Their design is based on the principle of intensive contact between gas and liquid phases, allowing contaminants to be efficiently absorbed or neutralized. Inside the tower, process gases rise counter-currently to a downward flow of washing liquid, sprayed through nozzles for maximum surface contact.

Constructed in carbon steel, stainless steel, or FRP-lined materials, washing towers are built to withstand corrosive environments and ensure long operational life. They can be integrated with granulation, neutralization, or scrubbing systems, depending on process requirements. The basic structure of a typical washing tower—comprising gas inlet, spray zones —can be seen in a 3D drawing.



APPLICATIONS

Gas scrubbing in fertilizer, chemical, and acid plants
Removal of dust, ammonia, or acid vapors
Integration with granulation or neutralization units

FEATURES

- High scrubbing efficiency with low pressure drop
- Corrosion-resistant materials (CS, SS, or FRP-lined)
- Large manholes and access doors for inspection
- Custom-engineered internals for specific process conditions

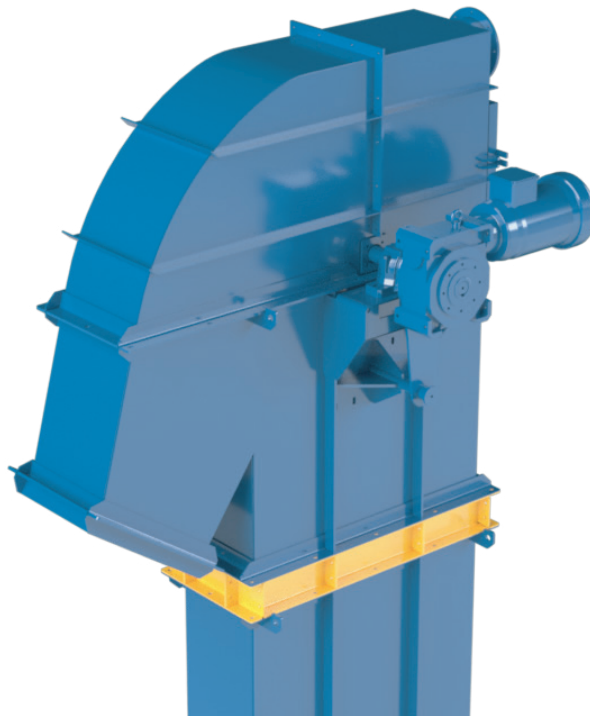
OPTIONAL COMPONENTS

- Speed monitoring and belt alignment sensors
- Variable Frequency Drive (VFD) control system
- Lined boot and head sections for abrasive materials

BUCKET ELEVATORS

Bucket elevators are the most reliable and efficient solution for vertically conveying bulk materials such as fertilizers, minerals, and chemicals. Their robust construction, dust-tight design, and steady material flow make them indispensable in modern process plants. The system consists of a continuous line of buckets mounted on a belt or chain that transports the material from the inlet boot section to the discharge head section with minimal spillage or degradation.

Depending on the application, elevators are designed in centrifugal or continuous discharge types and are custom-engineered for the required capacity, lift height, and handled material. The basic structure of a typical bucket elevator—can be seen in a 3D drawing.



CAPACITY 1 TPH - 500+ TPH

HEIGHT 3 - 60 m

FEATURES

- Continuous or centrifugal discharge types
- Rugged, heavy-duty construction for industrial use
- Dust-tight casings with inspection doors and sealed bearings
- Low-maintenance, long-life drive and tensioning systems

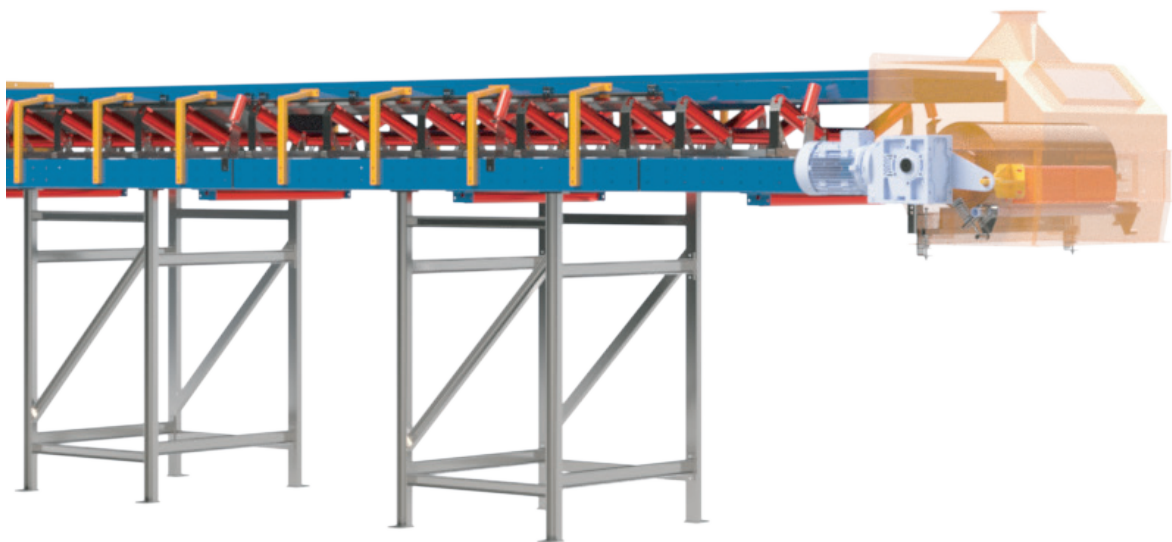
OPTIONAL COMPONENTS

- Speed monitoring and belt alignment sensors
- Variable Frequency Drive (VFD) control system
- Lined boot and head sections for abrasive materials

BELT CONVEYOR

Conveyor belts are the backbone of bulk-handling lines, moving material reliably between every unit operation—dosing, granulation, screening, cooling, storage, and load-out. Because any belt failure stops the whole plant, their design focuses on continuous, clean, and centered conveying. Performance depends on correct chute geometry for controlled loading, effective sealing to prevent spillage, proper belt tracking, and efficient cleaning to avoid carry-back that can foul rollers and cause misalignment. Critical elements such as impact beds at the loading zone, wear-lined skirt boards, primary/secondary belt scrapers, V-plows, and belt tracking devices work together to minimize dust, reduce idler wear, and protect the belt.

Condition monitoring—speed and alignment sensors, rip/tear detection, bearing temperature checks—and high-quality hot-vulcanized splices further cut downtime. Emergency pull-cords, interlocked guards, and maintenance walkways enhance safety and serviceability. The basic arrangement of a typical belt conveyor—can be seen in a 3D drawing.



APPLICATIONS

Interconnecting unit operations in fertilizer, chemical, and mineral plants
Long-run plant conveyors with low dust/spillage requirements
Handling hot, abrasive, or corrosive products with suitable belt compounds

OPTIONAL COMPONENTS

- Belt scale (weightometer) and metal detector
- Weather covers, galleries, and dust-suppression systems
- Variable Frequency Drive (VFD) or soft-starter for the drive

FEATURES

- Primary & secondary belt cleaners to minimize carry-back
- Self-aligning idlers and crowned/lagged pulleys for reliable tracking
- Safety: emergency pull-cords, interlocked guards, walkways for maintenance



photo of a dryer drum



photo of a screen and double hammer mill



ABOUT CEYLAN

CEYLAN Machine & Process was founded with a commitment to excellence in the design and manufacturing of high-quality machinery for the fertilizer production industry. As an expert in providing customized equipment solutions, we are recognized for our advanced process design, engineering expertise, and equipment innovation. Our capabilities extend from process development and feasibility studies to detailed plant engineering and full system integration.