FEECO INTERNATIONAL

ROTARY KILNS

TOMORROW'S PROCESSES, **TODAY.**

FEECO.com

SINCE 1951

ABOUT

FEECO has developed a reputation as a leader in custom thermal processing solutions through helping companies around the world to develop advanced systems for a variety of applications. From process development, to sizing and design, and even manufacturing a custom rotary kiln, we can guide you through every step of the way.

What sets FEECO systems apart from our competitors is the customized solutions we offer. Our process experts work with our Innovation Center to develop a process around your material's unique characteristics and the goals of your intended process. We then use the data gathered through testing to scale up the process and design and manufacture a custom rotary kiln for full-scale production.

COMPLETE SYSTEM CAPABILITIES

In addition to the kiln itself, FEECO can provide a complete system with all necessary support equipment, including:

- Material Handling
- Agglomeration
- Drying
- Afterburner/SCC
- Baghouse/Scrubber
- Acid Gas Removal
- Product Cooling
- Gas Cooling/Quench Tower

WHO WE WORK WITH

Many of the world's most notable companies, across nearly all industries, rely on FEECO for innovative solutions in process design, engineering, and manufacturing, including:

xstrata nickel

SGI

The Ohio State University

amec

RioTinto

Honeywell

INDUSTRIES WE SERVE

- Chemical
- Fertilizer & Granulation
- Mining & Minerals
- Power Generation
- Forest Products
- Waste Transformation

COMMONLY PROCESSED MATERIALS

- Activated Carbon
- Alumina
- Biochar
- Catalysts
- Contaminated Soil
- Electronic Waste
- Petroleum Coke
- Phosphate Ore
- Pigments
- Precious Metals
- Proppants
- Specialty Ceramics
- Specialty Chemicals
- Waste Lime Sludge
- Waste Materials

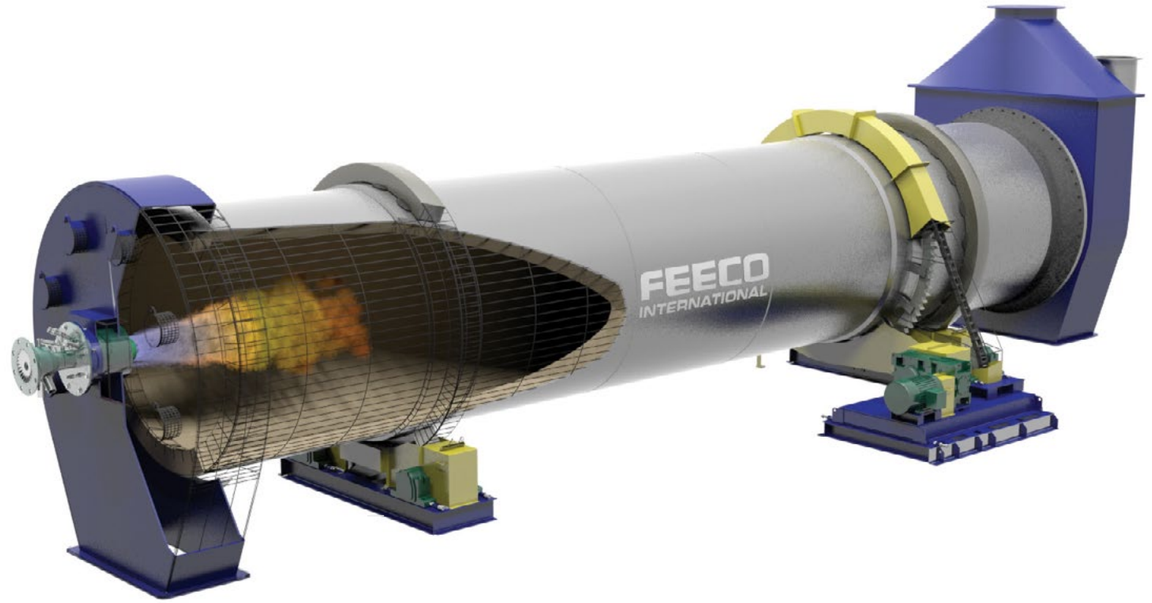
ROTARY KILNS

FEECO rotary kilns offer a tailored solution to specialized high-temperature bulk solids processing. FEECO engineers all rotary kilns according to the specific process and material goals of each project. All rotary kilns are then manufactured according to stringent quality standards for a safe and reliable system.

FEECO rotary kilns can carry out **calcination, incineration, organic combustion, and reduction roasting** for accomplishing a range of objectives, including:

- Activated Carbon Production
- Carbon Reactivation
- Biochar Production
- Catalyst Preparation
- Catalyst Reactivation
- Waste Incineration
- Metal Recovery
- Upgrading of Ores
- Organic Combustion

For a labeled diagram of components, visit
FEECO.com/rotary-kilns/



Rotary Kiln
internals

DIRECT ROTARY KILNS

Direct rotary kilns use direct contact between the material and combustion gases to treat material based on predetermined temperature profiles. Various internals can be employed to further increase heat transfer efficiency. Rotary kilns can be designed for co-current or counter-current air flow.

CAPACITY | 1 TPH - 50 TPH+
(1 MTPH - 45 MTPH+)

Maximum capacity is dependent on process variables unique to each application

SIZE | Up to 15' (4.6m) diameter x 100'+ (30.5m+)

FEATURES

- Optimized refractory linings
- Engineered shell to eliminate distortion and misalignment due to high operating temperatures

OPTIONAL COMPONENTS

- Various Seal Options
- Machined Bases
- Screw Conveyor Feeder
- Automatic Gear Lubrication System
- Exhaust Gas Handling Equipment
- Ductwork
- Various Burner Configurations
- Components for increasing efficiency (flights, dams, bed disturbers, etc.)

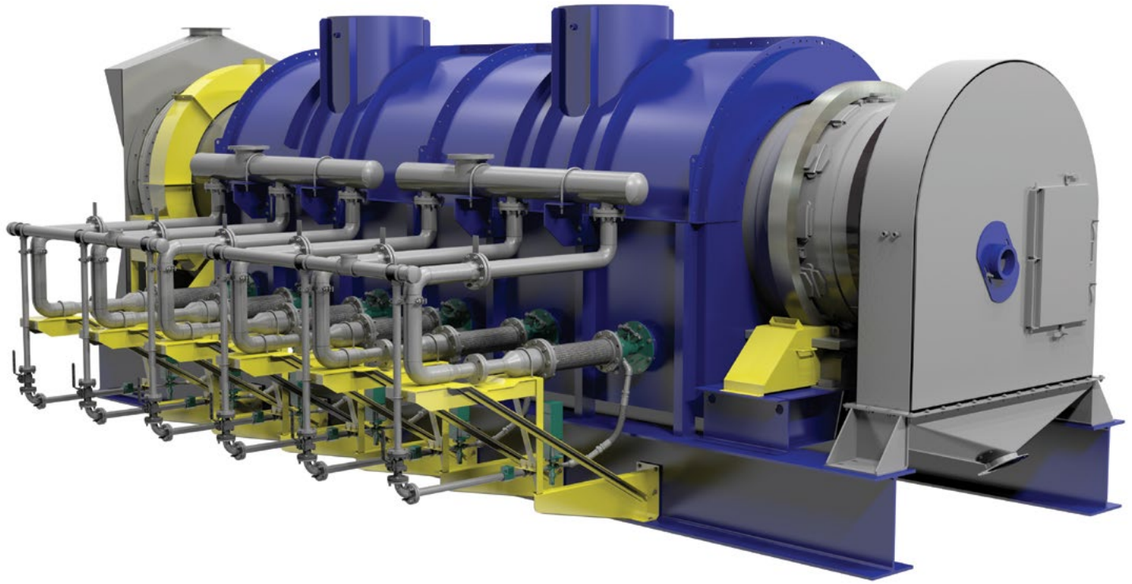
FUEL TYPES

- Fuel Oil
- Natural Gas/Propane
- Waste Heat
- Biogas

DRIVE OPTIONS

- Chain & Sprocket
- Girth & Pinion Gear
- Friction Drive

For a labeled diagram of components, visit
FEECO.com/rotary-kilns/



Indirect
Rotary Kiln

INDIRECT ROTARY KILNS

CAPACITY | 1 TPH - 20 TPH
(1 MTPH - 18 MTPH)

Maximum capacity is dependent on process variables unique to each application

SIZE
| Up to 15' (4.6m) Diameter x 75'+ (23m+) Heated Length

FEATURES

- Heat resistant alloy shell
- Engineered shell to eliminate distortion and misalignment due to high operating temperatures
- Separate zones for temperature control
- Integrated cooling zone can be added

OPTIONAL COMPONENTS

- Various Seal Options
- Machined Bases
- Screw Conveyor Feeder
- Automatic Gear Lubrication System
- Ductwork
- Components for increasing efficiency (flights, dams, bed disturbers, etc.)
- Internal Bed Temperature Measurement

MATERIAL OPTIONS

- Carbon Steel
- Stainless Steel
- Specialty Alloys
- Explosion Bonded
- AR Steel

FUEL TYPES

- Fuel Oil
- Natural Gas/Propane
- Electricity
- Waste Heat
- Biogas

When specific atmospheric conditions are required for processing, FEECO offers state-of-the-art indirect kilns for specialized thermal treatment.

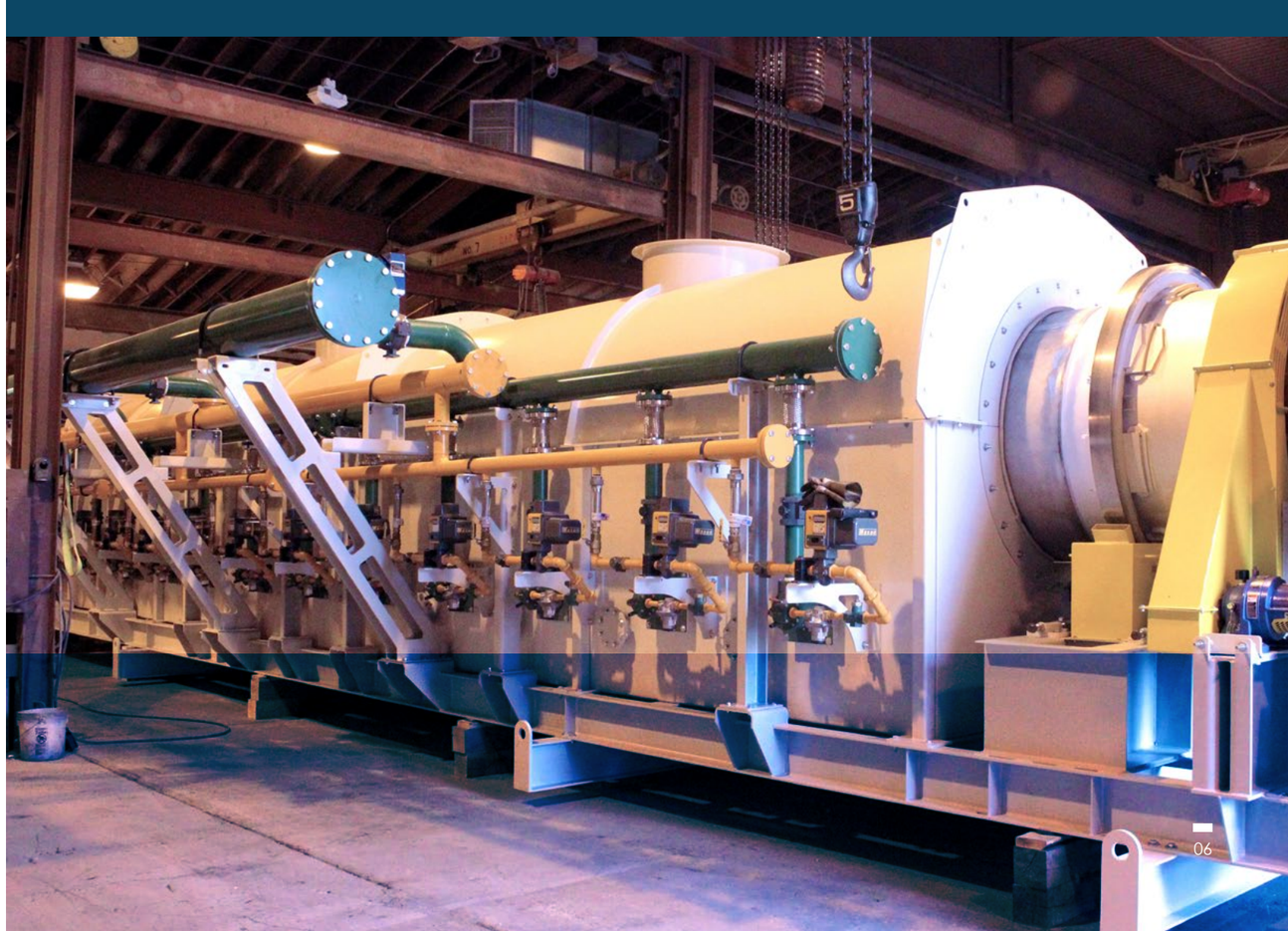
In an indirect kiln setup, the rotating drum is sealed off and externally heated inside a heat shroud to prevent contact between the material and heating medium. Material is heated through contact with the drum shell.

Indirect kilns offer three major distinctions compared to direct rotary kilns:

1. When processing fine materials, an indirect kiln avoids the risk of entrainment. When processing in a direct kiln, fine materials can become entrained in the process gas and carried out to the baghouse. An indirect kiln avoids this issue because there is minimal gas moving through the drum.

2. Less exhaust air treatment is required. Because no process gas is moving through the drum, and the furnace exhaust is kept separate, significantly less exhaust air treatment is required.

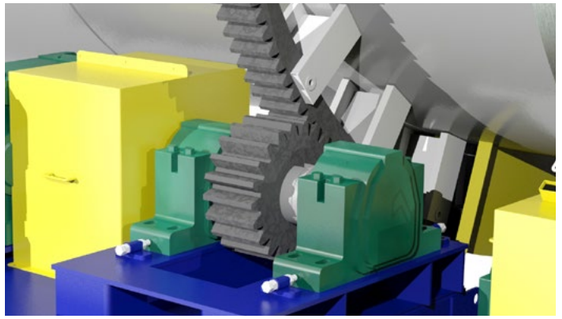
3. Processing in an indirect kiln allows temperatures to be adjusted along the length of the drum, providing precise process control. Additionally, because there is no contact with the combustion gases, the internal processing environment can be kept inert.



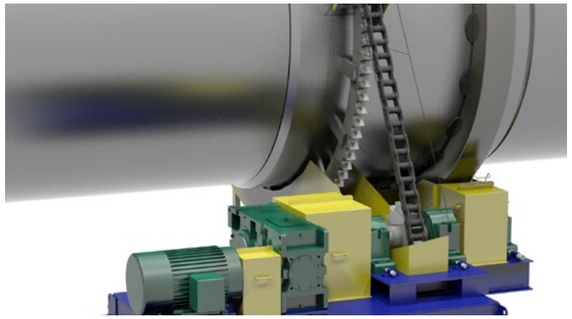
OPTIONAL COMPONENTS & SUPPORT EQUIPMENT

DRIVE ASSEMBLY OPTIONS

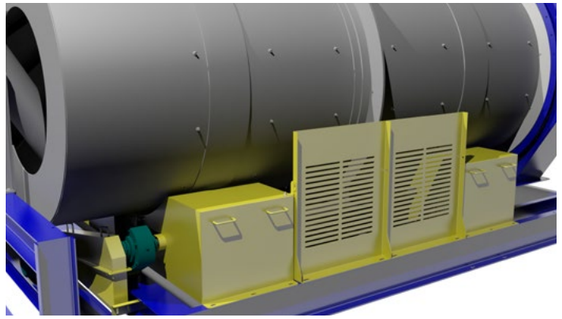
A variety of drive assembly options exist for dryers and coolers, with the choice between them depending on the amount of horsepower, and the overall size of the drum. Direct drive assemblies are also available.



GEAR & PINION DRIVE
The gear and pinion drive assembly is best for heavy-duty applications running above 75 horsepower (55kw). While this type is more costly, it operates and wears better in demanding applications.



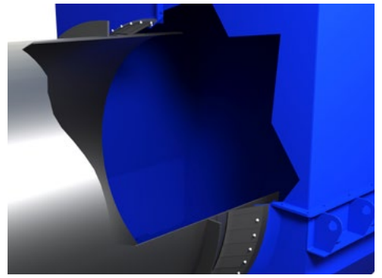
CHAIN & SPROCKET DRIVE
Chain and sprocket drive assemblies are reserved for smaller drums, running up to 75 horsepower (55kW). This type of arrangement is not suitable for larger drums running above 75 horsepower, but is ideal for smaller jobs, as it is cost-effective, and easy to run.



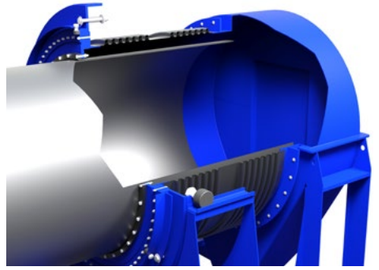
FRICTION DRIVE
Trunnion wheels are driven utilizing friction with the tires to cause drum rotation.

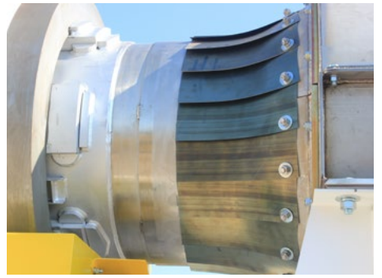
DIRECT DRIVE
Trunnion wheels are driven utilizing friction with the tires to cause drum rotation.

SEALS

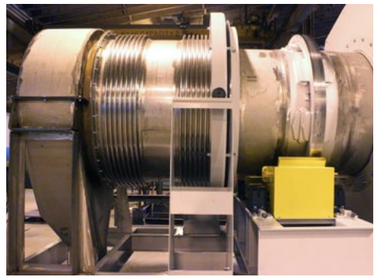


LEAF SEAL
Leaf seals employ overlapping spring steel plates mounted on the housing and riding on the wear ring to create an effective seal. Both single- and double-leaf seals are available, with a relative leakage of around 1.0% - 5.0% depending on the type chosen.





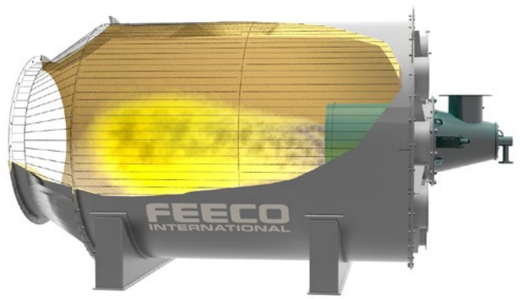
BELLOWS SEAL
The bellows seal offers a relative leakage of <<1.0%, utilizing a wear material (such as graphite) to act as a face material when compressed against a flat, rotating surface. The corrugated bellows this seal uses allow for significant longitudinal expansion, making it ideal for use with kilns.



COMBUSTION CHAMBERS

Combustion Chambers are frequently incorporated into rotary kilns for the many benefits they can offer. Used to house the combustion reaction, the combustion chamber prevents direct contact between the material and the flame. This maintains product integrity and promotes more uniform heating.

The FEECO combustion chamber design includes the option for the burner system to be mounted on the front wall or inlet breaching of the kiln, which provides the advantage of using radiant heat from the burner flame, as well as convective heat transfer (in a co-current unit) so material can quickly be brought up to temperature.



INTERNALS

Rotary kilns can be fitted with a variety of custom internals to improve agitation, efficiency, and performance.

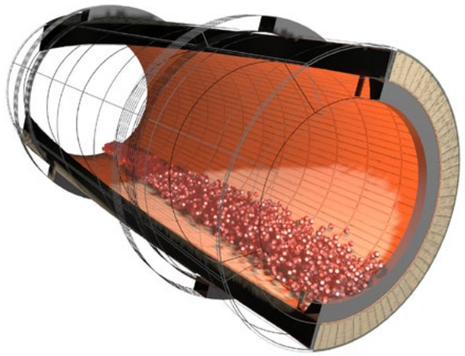
REFRACTORY

Direct-fired rotary kilns are typically provided with refractory to protect the drum shell from the high temperatures within.

Refractory can be provided in either castable or brick form, with multiple layers possible.

BED DISTURBERS

FEECO can configure custom bed disturbers to promote agitation of the material bed for more uniform heat distribution. This is especially common in indirect-fired kilns, since the material is heated through contact with the shell.



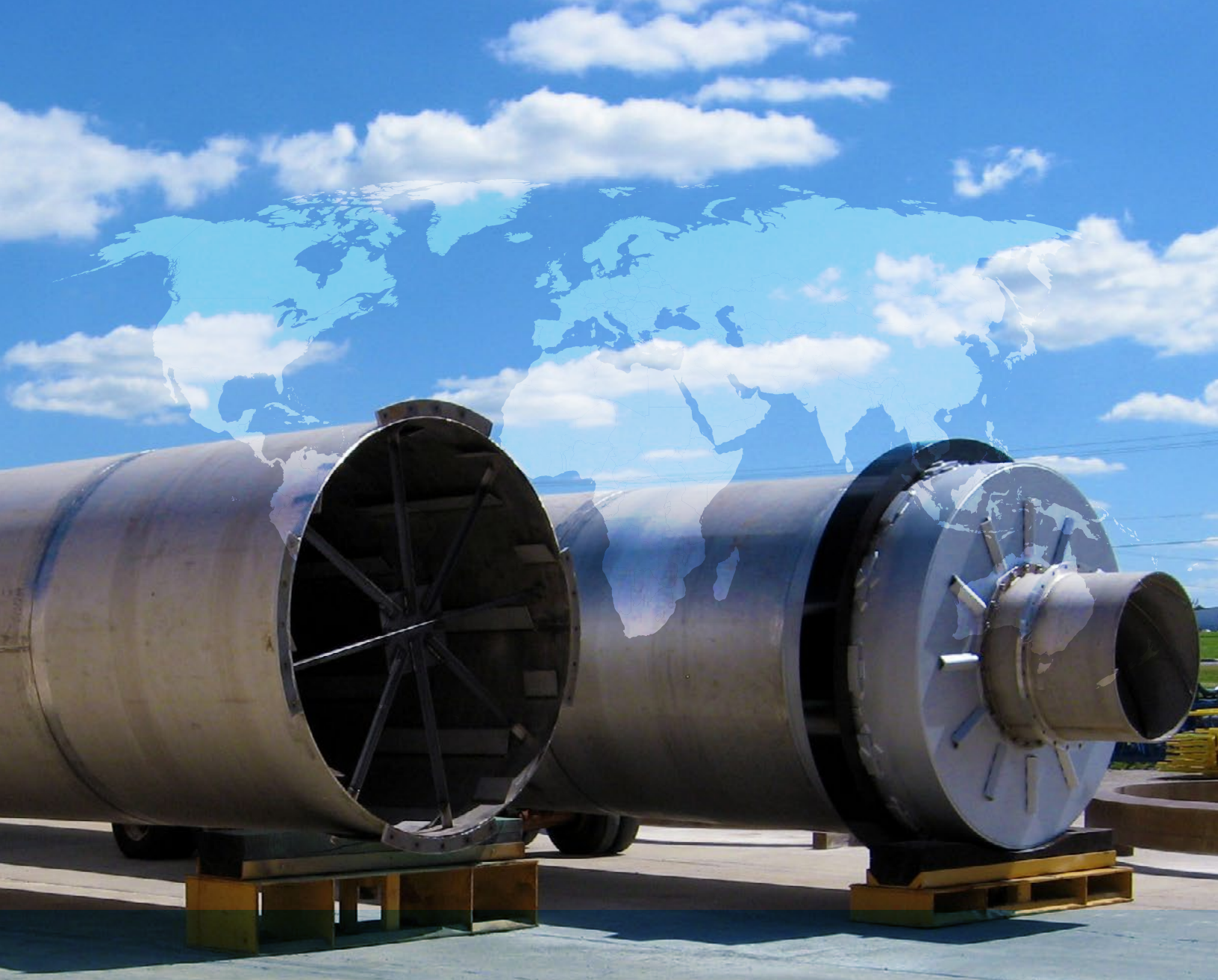
This 3D Rendering illustrates an end dam in direct-fired counter-current rotary kiln

DAMS

Dams, like the one shown in the 3D rendering here, are used to increase retention time and bed depth. Shown here is an end dam, the most commonly used type, as it holds material where the air is hottest (at the discharge end of a counter-current kiln).

Delacquering Rotary Kiln

Rotary Kiln



ABOUT FEECO

FEECO International, Inc. was founded in 1951 as an engineering and equipment manufacturer. We are recognized globally as an expert in industry-leading process design, engineering capabilities (including everything from process development and sample generation, to feasibility studies and detailed plant engineering), custom equipment manufacturing, and parts and service. We serve a range of industries, including fertilizer and agriculture, mining and minerals, power/utility, paper, chemical processing, forest products, and more. As the leading manufacturer of processing and handling equipment in North America, no company in the world can move or enhance a concept from process development to production like FEECO International, Inc.

The choice to work with FEECO means a well-rounded commitment to quality. From initial feasibility testing, to engineering, manufacturing, and parts and service, we bring our passion for quality into everything we do.

FOR DETAILED PRODUCT INFORMATION & CAPABILITIES, **DOWNLOAD THE FEECO HANDBOOK** AT: **FEECO.com/FEECO-handbook/**

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