



TOMORROW'S PROCESSES, **TODAY.**

FEECO.com

SINCE 1951



SMALL-SCALE TESTING FOR

LARGE-SCALE PROBLEMS

SCALABLE TESTING

The FEECO Innovation Center provides a unique testing environment for producers to address the problems our world is facing through innovative process and product development.

The facility is fully staffed with process experts and equipped with a range of batch- and pilot-scale agglomeration and thermal processing equipment for scalable testing of hundreds of processes.

An advanced data collection system gathers critical process data for trending and analysis. These capabilities offer an unmatched opportunity to:

CONFIRM FEASIBILITY (PROOF OF CONCEPT)

Answer the most basic questions around an intended process by establishing that it is physically and economically feasible.

ILLUSTRATE PROOF OF PRODUCT & PROOF OF PROCESS

Show that a product can be made to desired specifications. Identify the necessary equipment configuration and process parameters for continuous production based on a representative sample.

OPTIMIZE

Refine process conditions and feedstock parameters to optimize the production line for product quality, efficiency, resource utilization, and more.

No matter what you're looking to do, testing in the Innovation Center brings decades of expertise around hundreds of materials and processes to the table—from assessing the initial feasibility of an idea, to engineering a continuous, pilot-scale production line, our process engineers can work with you to develop a customized testing program around the answers you need.

DEVELOP A NEW PROCESS OR
OPTIMIZE AN EXISTING ONE

Recover valuable components from wastes. Establish beneficial reuse applications for process by-products. Convert challenging materials into something more manageable. It all starts with scalable testing in the [FEECO Innovation Center](#). Capable of accepting a wide range of materials, our experience spans across industries, giving our customers a competitive advantage in bringing their idea to commercial-scale production. We regularly work with:

POWER GENERATION

- Coal
- Coke
- Fly Ash
- Synthetic Gypsum

INDUSTRIAL WASTES

- Process By-products
- Pulp & Paper Products
- Metals & E-Waste
- Recovered Dust
- Tailings

MINERALS & ORES

- Alumina
- Aluminum
- Bauxite
- Clay
- Copper Ore
- Glass
- Gypsum
- Iron Ore
- Limestone
- Lithium
- Nickel
- Phosphate
- Potash
- Zinc

CHEMICALS

- Activated Carbon
- Additives & Fillers
- Adsorbents
- Carbons
- Catalysts
- Fertilizers
- Animal Feeds
- Pigments
- Detergent
- Zinc Oxide

ORGANICS

- Biochar
- Biomass
- Biosolids
- Compost
- Manure
- Wood Chips

AGGREGATES

- Abrasives
- Roofing Granules
- Sand
- Silica

The capabilities found in the Innovation Center go beyond developing a new process—we can also simulate commercial-scale conditions to help you improve your existing process, troubleshoot issues, improve product quality, and reveal inefficiencies.



On-farm granulation plant
designed and built by
FEECO after testing in the
Innovation Center

RECOVER
REUSE
CONVERT

BRING NEW PROCESSES & IDEAS TO LIFE

TESTING EQUIPMENT

Whether you need to test a single piece of equipment, or you're looking to try various configurations of multiple pieces, the FEECO Innovation Center is well equipped to suit small batch tests, as well as continuous process loops. Available testing equipment includes:

THERMAL

BATCH EQUIPMENT

- Rotary Kiln
- Indirect Kiln
- Flight Simulator

CONTINUOUS EQUIPMENT

- Rotary Kiln
- Indirect Kiln
- Rotary Dryer
- Fluid Bed Dryer (with batch capabilities)

MATERIAL HANDLING

(ALL CONTINUOUS)

- Steep Incline Conveyor
- Bucket Elevator
- Belt Conveyor
- Various Feeders

AUTOMATION & DATA COLLECTION

FEECO is a Rockwell Automation partner, providing integrated process control solutions, both as a service in the Innovation Center, and as part of a system purchase. FEECO and Rockwell Automation process control solutions are provided with current technology, motor control centers, programmable logic controllers, and data collection systems with advanced technologies for reporting. The FEECO Innovation Center features a Rockwell Automation PLC/MCC system, which utilizes current technologies for optimizing testing operations. Our system allows you to monitor, trend, and adjust various data points in real time, all from a single interface or mobile device. This includes:

- Current (Amps)
 - Feed Rate
 - Flow Rates/Product Flow
 - Fuel Usage
 - Horsepower
 - System Pressure
 - Temperature
 - Torque
- Gas Sampling & Analysis (Oxygen, Carbon Monoxide, Nitric Oxide, Nitrogen Dioxide, Sulfur Dioxide, and combustibles discharged from various thermal processes)



AGGLOMERATION

BATCH EQUIPMENT

- Disc Pelletizer
- Pin Mixers (2)

CONTINUOUS EQUIPMENT

- Disc Pelletizers (2)
- Rotary Granulator
- Paddle Mixer/Pug Mill
- Pin Mixer
- Hammer Mill
- Rod Mill
- Prater Mill
- Rotex Screen – 2 deck
- Circular Screen
- Coating Drum
- Curing Drum

SUPPORT

BATCH EQUIPMENT

- Muffle Furnace
- Tray Oven

CONTINUOUS EQUIPMENT

- Steam Generator with steam tanks

ADVANCED PARTICLE ANALYSIS

FEECO utilizes a 3D Dynamic Image Analysis tool to provide advanced particle analysis during testing. A number of characteristics, including size, shape, thickness, surface roughness, density, transparency, and more, can all be measured without disrupting the testing process. Results are recorded with precision accuracy in real time, with data comparison and trending available through the integrated software program. Advanced particle analysis systems are also available as part of a system purchase.

ON-SITE SUPPORT

In addition to the equipment listed here, we are capable of making on-site, large-scale modifications to our facility in order to accommodate your testing needs, without the hassle of bringing in external contractors.

TESTING OBJECTIVES

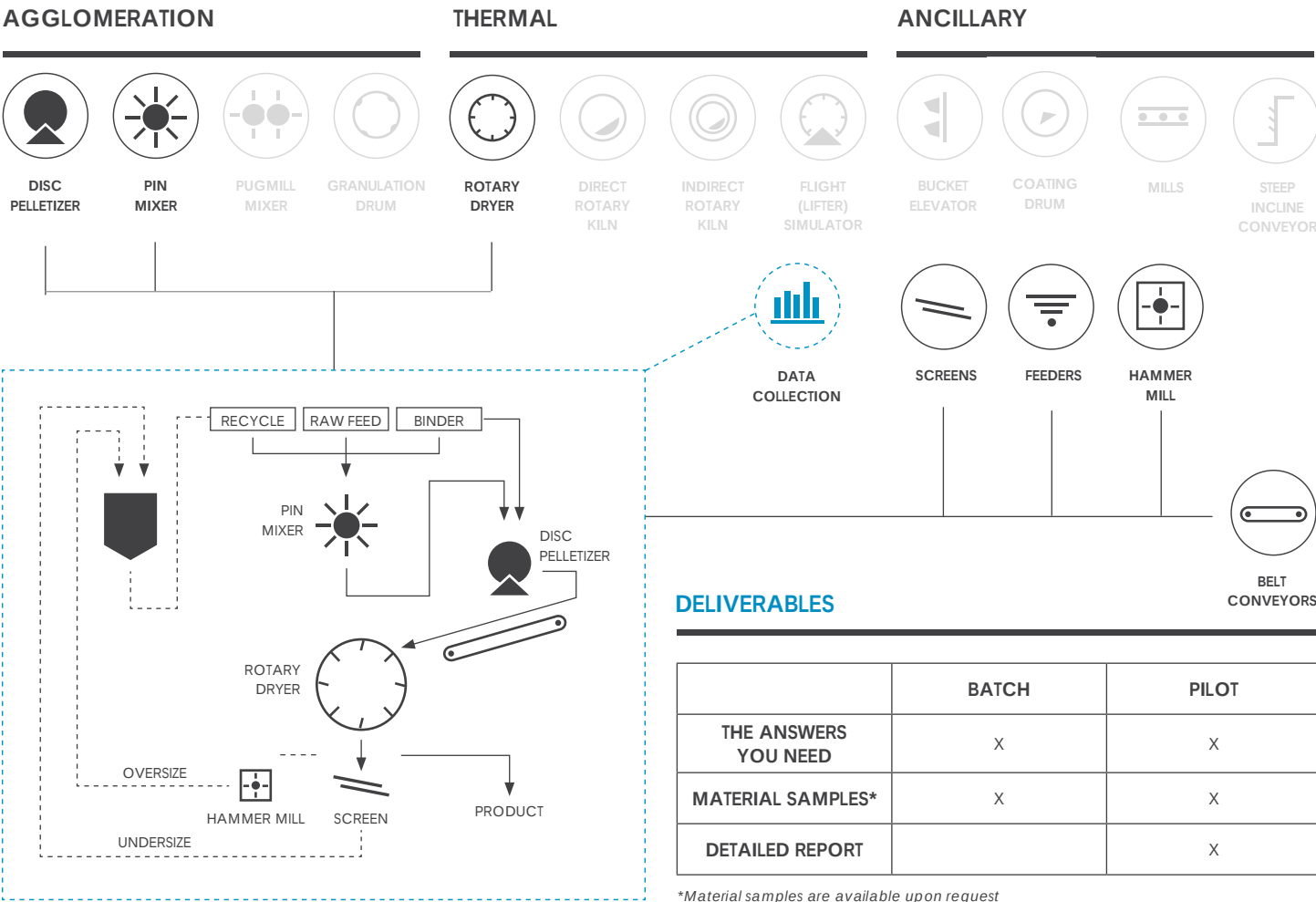
- Evaluate feasibility of an intended process
- Improve efficiency of an existing process
- Reduce resource consumption
- Establish best equipment configuration
- Gather initial process data points
- Gain a working familiarity with material and its response to the intended treatment
- Solve a material problem (flowability, etc.)
- Improve product characteristics
- Compare different approaches and equipment for an intended process

REQUIREMENTS

	BATCH	PILOT
SDS	X	X
NDA	X	X
MATERIAL QUANTITY	5 GAL. MIN.	VARIES

TEST ON A SINGLE PIECE OF EQUIPMENT, OR A CONTINUOUS PROCESS LOOP

EXAMPLE PROCESS CONFIGURATION



*Material samples are available upon request

AGGLOMERATION

Agglomeration testing in the Innovation Center will tell you if your material is capable of agglomerating, as well as what equipment will be required to achieve the results you're looking for. We can convert dusts, bulk powders, and sludges into free-flowing pellets for dust-free handling, or to improve product characteristics. We can also test a complete, continuous process with agglomeration, drying, particle sizing, and product recycle capabilities to create a highly efficient process. We can record operating data to assist in process scale-up and design a full-scale production plant.

QUESTIONS THAT CAN BE ANSWERED THROUGH AGGLOMERATION TESTING:

- Will my material agglomerate?
- Can agglomeration solve my material problem?
- Which method of agglomeration will best suit my material?
- What equipment configuration will be required to produce the results I'm looking for?
- What binder, if any, will work best for my material?
- Can my product be improved?
- How can I optimize my existing process?
- How much can dust/product loss be reduced?

DE-DUST | CONDITION | PELLETIZE

A form of particle size enlargement, agglomeration is a powerful tool in managing particle characteristics, whether for performance, handling, storage, or transportation. Through agglomeration, producers have the opportunity to control a variety of particle characteristics.

The Innovation Center is equipped to measure these characteristics and modify process variables to achieve a product with ideal characteristics. The following properties can be measured and fine-tuned:

- | | |
|----------------------|----------------------------|
| - Attrition | - Moisture Content |
| - Bulk Density | - Physical Characteristics |
| - Compression | - Particle Size Analysis |
| - Crush Strength | - Solubility |
| - Flowability | - Temperature |
| - Green/Wet Strength | |



TEST THE FOLLOWING:

- Pelletizing (Disc, Rotar Drum)
- Conditioning (Pugmill Mixer, Pin Mixer, Rotary Drum)
- Mixing (Pug Mill, Pin Mixer, Rotary Drum)
- Coating (Rotary Drum)
- Micro Pelletizing (Pin Mixer, Disc Pelletizer)

IMPROVE FLOWABILITY.
INCREASE BULK DENSITY.
MITIGATE DUST.

CONTROL PARTICLE CHARACTERISTICS

DRY CALCINE RECOVER REACT

TEST THE FOLLOWING:

- Drying
- Calcination
- Carbon Activation
- Catalyst Production
- Incineration
- Metal Recovery
- Organic Combustion
- Reduction
- Thermal Desorption
- Upgrading of Ores

EXTENSIVE ANALYTICAL TESTING

- Measure physical parameters
- Evaluate dust levels & attrition
- Establish volume flows
- Analyze exhaust gases
- Measure gas concentrations
- Identify thermal losses
- Reveal inefficiencies

THERMAL TESTING

The Innovation Center offers testing for both high-temperature applications, as well as drying processes; whether you're looking to enhance product characteristics, test the feasibility of a new process, or improve upon an existing process, the Innovation Center is well equipped to serve your thermal testing needs.

Thermal testing in the Innovation Center allows you to test small samples of material, while simulating process conditions of a continuous, commercial-size rotary unit (kiln or dryer). Testing can be conducted at both batch and pilot scale, and can also be carried out as part of a larger agglomeration or granulation process.

FEECO gathers a multitude of data during testing, including both process data points and material characteristics to ensure the process is meeting expectations.

FLIGHT/LIFTER DESIGN & PATTERN

When it comes to drying bulk solids, flight (lifter) design and pattern are commonly customized in order to maximize drying efficiency. For this reason, it is common to test a variety of flight designs and patterns when designing a rotary dryer. The Innovation Center offers a flight simulator that can be utilized to test various configurations, confirming the most ideal design and pattern combination for the material to be processed.

OPTIONAL TESTING CONDITIONS & EQUIPMENT

- Baghouse
- Combustion Chamber
- Direct- or Indirect-Fired
- Parallel (Co-Current) or Counter-Current Flow
- Reducing Atmosphere
- Removable Flights, Dams, and Bed Disturbers
- Thermal Oxidizer
- Water Quench Tower
- Wet Scrubber

DATA GATHERED

- Air Volume
- Feed & Product Physical Analyses
- Burner Fuel Usage
- Drum Slope
- Emissions
- Feed Rate
- Gas Sampling & Analysis
- Residence Time
- Rotational Speed
- Screen Analysis of Feed & Product
- Temperature Profiles



INTERESTED IN TESTING? It's easy!

1

Fill out some **paperwork**

2

Send us a **sample**

3

We'll run some **tests**

4

We'll mail you the **results**

Get started today by going to:
[FEECO.com/contact-us/](https://www.feeeco.com/contact-us/)



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/