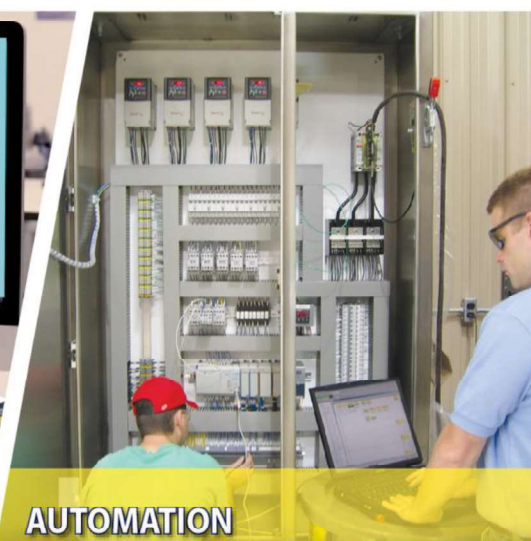
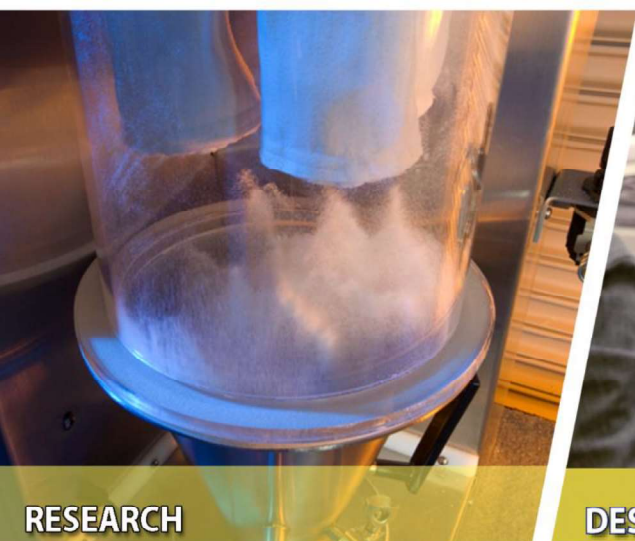


Develop



***Research and
Development***

*Leading the Way in Process
Engineering and Product
Development*



Visit us online appliedchemical.com



Skid Mounted
Demonstration Plant

"My company has had a long relationship with ACT. From time to time, ACT has declined additional development opportunities to ensure they do not risk IP of any of the other clients. Any company can have the proper legal agreements in the file. The actions of the personnel at ACT demonstrate a commitment to integrity that keeps us coming back."

**Senior Manager,
Premium Products**

Development Specialty Areas

Coatings

Common Coating

Materials:

- Waxes
- Epoxy
- Sulfur
- Urethanes
- Latex
- Resins
- PVA's
- Polymers

Types of Coatings:

- Hydrophilic
- Moisture Barriers
- Hydrophobic
- De-dusting agents
- Anti-caking agents
- Taste Masking
- Coloring

Prilling

- 40-Foot Tower
- Capable of Producing from 5 Pounds to Several Tons
- Batch or Continuous
- Conditioned Air Available
- Prill sizes from 0.25 mm to 1.0 mm
- May be Used as a Spray Chamber for Seed Material
- Downstream Processing Equipment

Chemical Reactions

Reaction Types:

- Solids to Liquids
- Liquids to Solids
- Solid to Gas
- Gas to Liquid
- Neutralization Reactions
- Reactions Driven by Catalysts
- Specialty Coating Reactions (Epoxies/Resins)

Possible Test Conditions May

Include:

- Atmospheric, Pressure, or Vacuum
- Inert Atmospheres
- Heated or Cooled
- Conditioned Air

Granulation & Agglomeration

- Drum Agglomeration
- Pan Agglomeration
- Melt Spray Granulation
- Prilling
- De-dusting
- Wet Acid Granulation
- Pugmill Granulation/Agglomeration
- PinMill Granulation/Agglomeration
- Fluid Bed Granulation/Agglomeration
- High Intensity Mixers

Product Testing

We provide analytical testing for products developed in our laboratories or pilot plants. By having trained technicians and equipment available, we provide quick turnaround on results often in less than 24 hours. This quick turnaround allows adjustment of processes while they are being developed which translates into savings for our clients in both time and money.

Thermal Processing

- Fluid Bed Drying, Heating, or Cooling
- Rotary Drying or Heating
- Spray Drying
- Custom Drying Processes

We Can...

- Recommend the Process for Your Specific Need
- Test Your Process in Our Laboratory & Pilot Plant
- Collect Relevant Data Required for Scale-Up



Bench Scale Fluid Bed



Pan Granulation

Bench-Scale Development Services

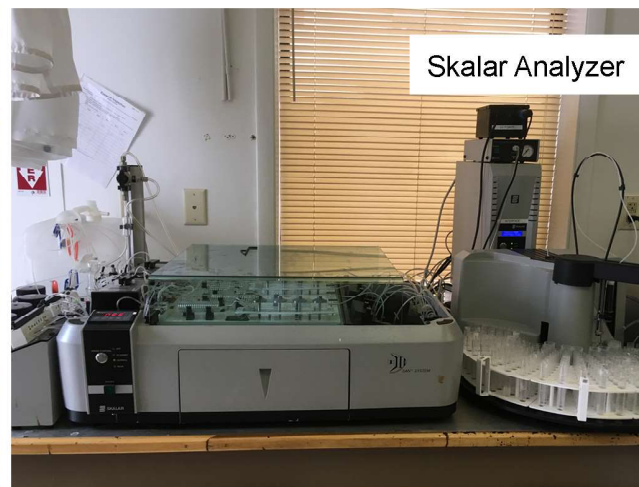
Applied Chemical Technology's (ACT) research and development services provide you with quick assessments of process and product viability, as well as custom analytical procedures and product quality testing. Our laboratory and pilot plant teams support our process engineers allowing us to start at the bench-scale, work our way to the pilot plant, and finally to a commercial scale process. This approach allows us to help our clients develop their project from an idea or concept to completion. Since 1981, our research and development team have been named as co-inventors on numerous patents.

With five laboratory spaces totaling 4,000 square feet we are able to provide secure and low cost testing and assessments of process and products. Small samples of product can be produced for chemical and physical evaluation or provided for early market testing. Our bench scale services support pilot plant operations with scale-up data, chemical analysis and product quality testing.

ACT maintains a team of engineers, designers, and craftsmen with the ability to build specialty equipment for testing new processes. We also provide assistance and training for use of specially developed lab equipment designed and constructed at ACT.

- **Process Development**
- **Product Development**
- **Analytical Testing**
- **Quality Control**





Fertilizer Testing

Fertilizer Physical Properties Testing:

- Ammonia Volatilization
- Hardness Testing
- Abrasion Resistance
 - Attrition
 - Dust Testing
- Critical Relative Humidity
- Moisture Penetration
- Caking Test
- Reid Vapor Pressure
- Particle Size Analysis
- Sphericity
- Density
- Angle of Repose
- Fluidization Velocity
- Flash Point
- Electrical Conductivity
- Viscosity
- Crystallography
- Microphotographs

Fertilizer Controlled Release Testing:

- Accelerated Nutrient Release
- 7 Day Dissolution
- Ultrasonic Dissolution
- Method FM-701
- Soil Incubation
- Ammonia Volatilization

Agronomic Screening:

- Greenhouse Studies
- Test Plot Trials



Confidentiality and Patents

At Applied Chemical Technology, we offer every client the security of signed non-disclosure agreements. With ACT, your project is kept completely confidential, both during the project and afterwards. Assurance that confidential information will be kept private is key to confidently sharing information and ideas relative to the project. Since ACT's founding in 1981, there has never been a breach of confidentiality, proving our track record.

In addition to keeping our client's information confidential, ACT assigns any patentable developments based on your information to you and assists in applying for patents, both in the U.S. and abroad.

Pilot Plant / Scale-Up Services

Benefits of Pilot Testing at ACT

- Built for Your Specific Project
- Customizable to Either Batch or Continuous
- Develop and Test New Products and Processes
- Incorporate New Ideas into Current Processes
- Provide Test Data for Scale-Up
- Identify Bottlenecks
- Process Adjustments in Low-Cost Environment
- Small Scale Training Facility
- Produce Small Production Batches for...
 - Product Analysis
 - Test Markets
 - Field Tests
 - Specialty Market

Why Choose ACT?

- Pilot Plant Services Offered Since 1981
- Pilot-Scale Plants up to 2 Ton/hr.
- 30,000 Square Feet of Pilot Plant Space
- Wet and Dry Processing
- Skid Design, Fabrication, and Testing
- Emphasis on Continual Process Improvement
- Commercialization of New Products and Processes
- Innovative Approach
- Inventory of Equipment for Rapid Assembly and Start-Up
- Low-cost Specialty Equipment Easily Designed and Fabricated at ACT
- Tailored to Client Schedule and Budget
- Client Involvement Welcomed and Encouraged
- Pilot Plant Equipment may be Leased or Purchased
- ACT Ships and Oversees Plant Erections at Any Location Domestically or Internationally
- On-site Laboratory Support
- Supervised by Experienced ACT Process Engineers
- Supported by Our Team of Technicians, Laboratory Staff, Designers and Craftsmen



Fluid Drying Pilot Plant



1.5 Ton/hr. Pilot Plant



Coating Pilot Plant



Falling Curtain Granulation



1/4 Ton/hr. Pilot Plant



5 Sq. Ft. Fluid Bed



Granulation Pilot Plant



Falling Curtain Coating



Falling Curtain Drum



Pilot Scale Fluid Bed Test

Facilities & Equipment

Bench-Scale Development Equipment

- Fluid Beds
 - High Temperature
 - Explosion Proof
 - Dryer/Cooler
 - Granulation
 - Coater
- Rotary Drums
 - 24 Inch
 - 20 Inch
 - 12 Inch Heated
- Pan Granulation/Coater
- High Intensity Mixers
- Pin Mill Mixer/Granulation
- Pug Mill Mixer/Granulation
- Pressure Vessels
- Muffle Furnaces
- Hammer Mill
- Ball Mill
- Ring and Puck Mill
- Speed Mixer
- Prilling Equipment
- Melt Spray Systems
- Chillers
- Calcining Ovens

On-Site Utilities

- High Pressure and Low Pressure Steam
- High Pressure and Low Pressure Natural Gas
- Electric Heat
- Compressed Air

Major Pilot Plant Equipment

- | | |
|-----------------|--------------------------|
| • Bag Houses | • Pellet Mill |
| • Rotary Drums | • Pin Mill |
| • Chain Mill | • Pipe Reactor |
| • Coating Drums | • Prill Tower |
| • Conveyors | • Pug Mill |
| • Elevators | • Pumps |
| • Evaporator | • Reactors |
| • Feeders | • Rotary Dryers |
| • Fluid Beds | • Scrubber |
| • Hammer Mill | • Tanks |
| • Mixers | • Vibratory Screeners |
| • Melters | • Custom Built Equipment |
| • Pans | |



Expertise and Experience

Applied Chemical Technology has offered unparalleled engineering and development services to the **fertilizer, chemical, bio/renewables, pharmaceutical, mining, polymer, food, and specialty chemicals** industries since 1981. Our development experience includes a wide range of process applications and chemical products.

Typical Process Applications

- Agglomerating
- Biomass Processing
- Classifying
- Coating
- Concentrating
- Cooling
- De-dusting
- De-watering
- Densifying
- Drying
- Encapsulation
- Gasification
- Granulating
- Heating
- Impregnating
- Incinerating
- Mixing
- Material Handling
- Pelletizing
- Prilling
- Reacting
- Separating
- Solvent Extraction & Recovery
- Tableting

Products & Materials

- Algae
- Animal Feed
- BioChemicals
- BioFuels
- BioSolids
- Catalysts
- Chemicals
- Clean energy
- Coated Seed
- Cosmetics
- Industrial Chemicals
- Fertilizers - Solid & Liquid
- Foods
- Paper
- Pharmaceuticals
- Polymers
- Proppants
- Solvent-Based Products
- Specialty Chemicals
- Waste Streams
- Waxes



Prilling Tower

ACT's integrated approach reduces project costs



Drum Coating Pilot Plant



Falling Curtain Granulation Pilot Plant