



Part of Nederman Group

LCI TESTING SERVICES

Extrusion and Spheronization

Overview:

LCI's testing program allows clients to evaluate an array of Extrusion and Spheronization (ES) technologies in meeting their agglomeration objectives. LCI's fully equipped and staffed Test Center is located in Charlotte, NC, where we offer the following test services:

Preliminary Evaluation Study (PES):

The objective of a PES is to determine general application feasibility using LCI's ES technologies. A PES is performed on LCI's laboratory scale equipment, which has the same forming techniques as production scale equipment. In most cases, product samples generated at the PES level closely resemble those generated on large-scale equipment in performance and appearance. PES product samples are not necessarily optimized. No scale-up data is collected at this stage.



Lab Scale Spheronizer

Pilot Plant Test (PPT):

The objective of a PPT is to confirm the results from the PES on pilot scale equipment, generate a larger quantity of product, and generate scale-up data.



Lab Scale Fluid Bed Dryer



Pilot Scale Extruder

Preliminary Evaluation Study (PES)

Description:

The first step of the PES is to mix the dry ingredients. A wetting agent is then added to the dry blend and mixed, manually or in a kitchen aid, to produce a homogeneous mix suitable for extrusion. The wet mass is extruded using any of LCI's laboratory extruders, optionally followed by spheronization with a laboratory Marumerizer. The extrudates or spheres are sometimes dried utilizing a laboratory fluid bed dryer.

Upon test completion, test samples, unused material, and any waste generated during the test, will be returned to the client. A brief report will be sent within two weeks outlining testing parameters, observations, and recommendations.



Lab Extruder

Test Charges:

PES (Unattended by client): \$750

PES (Attended by client): \$1,000 limited to 8 hrs.

Material Requirements:

- 1-2 kg of material (dry blend).
- Additives or wetting agents (other than water) required for the test. The minimum material quantity for a PES is 200 grams.
- All solid ingredients should be milled to 50 micron or below
- Material safety data sheets for all ingredients should be included with the material shipment to LCI

Pilot Plant Test (PPT)

Description:

After positive results are achieved in the PES, a PPT is scheduled to demonstrate production feasibility. We invite our clients to attend this stage of testing. A PPT can be completed in 1 day, however, it can last up to 3 days, depending on product quantities and client objectives. Additional testing may be required to optimize production parameters and total plant design.

A PPT generally involves the following steps:

Wet Mixing: Dry ingredient are measured and transferred to the mixer. After dry blending, the wetting agent is added. Consistency of the mix is closely observed to determine when adequate mixing has been achieved. Power draw and mixing time are recorded along with any relevant observations.

Extrusion: The wet mass is manually transferred to the extruder and loaded on its feed tray. The extrusion device is started and the wet mix extruded. The quality of the extrudates is observed and the extrusion rate measured. Power draw, extrusion rate, shaft speed, die configuration, extrusion gap and other relevant parameters are investigated and recorded.

Spheronization: This optional step is required if the desired product shape is spherical. This step involves charging a measured amount of wet extrudates to the MARUMERIZER™. The material is observed to see when the desired shape is obtained. Variables studied and recorded in this operation are charge volume, residence time, power draw, plate pattern, and rotational speed.

Drying: Wet pellets or spheres are placed in a batch fluid bed dryer and air velocity and temperature adjusted to proper conditions. When the exit air temperature approaches the inlet air temperature or temperature limit, the batch is discharged and packaged for return to the client. Air flow rate, temperature, charge size and drying time are recorded along with any other observations. Samples can be collected and analyzed for moisture if a drying curve is needed.

Test Charges:

PPT (Attended by Client): \$3,000/day and is limited to 8 hours.

Test charges do not include freight charges for shipping materials and samples to and from LCI's test facility

Material Requirements:

- 100 kg of material (dry blend). Additives or wetting agents (other than water) should also be sent. The minimum material quantity for a PPT is 20 kg.
- Additives or wetting agents (other than water) required for the test.
- All solid ingredients should be milled to 50 micron or below
- Material safety data sheets for all ingredients should be included with the material shipment to LCI

Required Information for All Test Services

Paperwork:

- **Purchase Order:** Email PO to Samer Habash at shabash@lccorp.com. A test is not confirmed unless a PO in the correct amount is received.
- **Completed Product Questionnaire**
- **Certificate of Insurance** from the customer's insurance company or agent evidencing the required coverage is mandatory if the customer is attending the testing. This certificate has to be in place before entering the Test Center.

Materials Shipment Address:

LCI Corporation
Attn: George Pauley
4404-C Chesapeake Drive
Charlotte, NC 28216

Phone: (704)398-7928
Email: gpauley@lccorp.com

Hazardous Material Protocol:

LCI will return all non-hazardous test materials back to the customer. **HAZARDOUS** Materials, as defined in 40CFR261, can only be returned to the customer if the materials will be integrated back into the customer's process or be used without further processing.

If the Hazardous Materials cannot be re-used, the material must be disposed of by LCI & the cost charged back to the customer. Note that samples generated during the test may be returned to the customer.

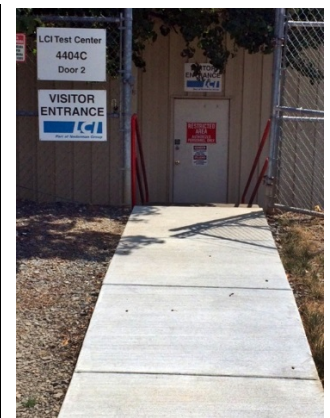
Directions to Test Center from I-85:

From Airport take Billy Graham Pkwy N towards I-85. Travel I-85 N approx. 3 miles, take exit 36 (Hwy 16) turn left off exit. Turn right on N Hoskins Rd., travel 1mile. Turn left onto Chesapeake Dr.

Immediately after passing the 2nd railroad tracks, turn **Right** onto **Nederman** driveway (see pic below):



Drive all the way to the end (4404-C) and park in the designated parking slots on the left. Our test center will be on your right. Proceed through the gate, down the steps and through the front door.



Once you enter the building, the **Customer Office** is the **1st door on your right.**