



LCI TESTING SERVICES

Extrusion and Spheronization

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.



LCI's Laboratory

➤ **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.



LCI's Pilot Plant



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.

Requirements

- Completed Product Questionnaire
- 1-2 kg of material (dry blend). Additives or wetting agents (other than water) should also be sent. The minimum material quantity for a PES is 200 grams.
- Material safety data sheets for all ingredients shipped to LCI

Ship to:

LCI Corporation
Attn: Bryan Allen
4404-C Chesapeake Drive
Charlotte, NC 28216

Test Charges

PES (Unattended by client): \$500

PES (Attended by client): \$1,000 and is limited to 8 hours

To schedule a test, please fax a PO to 704-392-8507. A test is not confirmed unless a PO in the correct amount is received.



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:

1. **Wet Mixing:** Dry ingredients 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.
2. **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.
3. **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.
4. **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.

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.
- Material safety data sheets for all ingredients shipped to LCI

Ship to:

LCI Corporation
Attn: Bryan Allen
4404-C Chesapeake Drive
Charlotte, NC 28216



Test Charges

PPT (Attended by client): \$2,000/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.

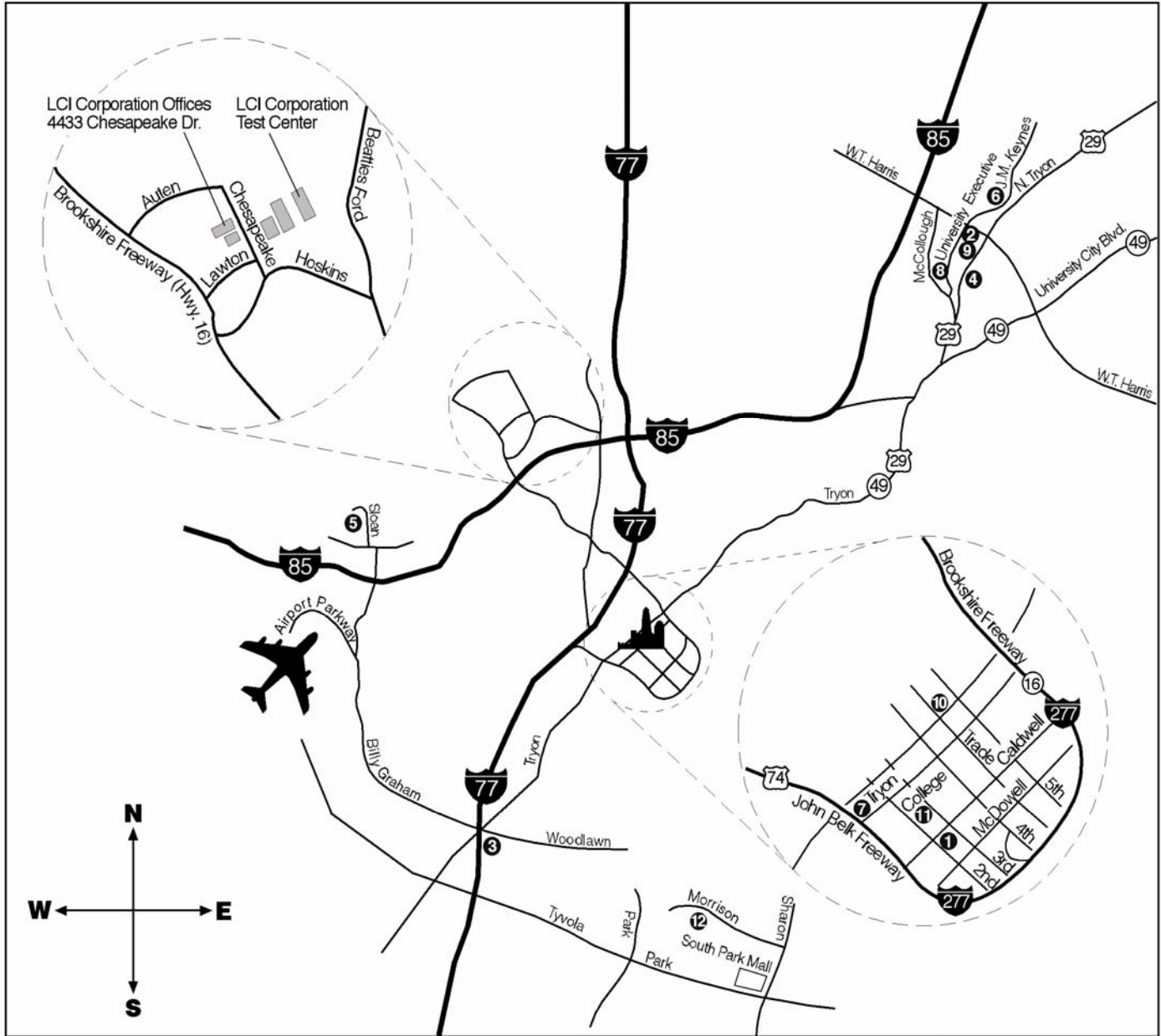
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4433 Chesapeake Drive • Charlotte, NC 28297
 704 394 8341 • Fax 704 392 8507
 www.lcicorp.com

Directions from airport to LCI Corporation Offices:

Follow airport parkway to Billy Graham Parkway (85 north). Take Billy Graham to 85 north. Head north on 85 to Brookshire Freeway (Hwy. 16) exit. Turn left at the top of the exit ramp and continue to first stop light at Hoskins Road. Take a right at the Burger King and continue about 1 mile. Take a left onto Chesapeake. After the second set of railroad tracks, LCI Corporation will be on your immediate left. Enter the 2-story building with blue windows and call from the lobby.



Listed below are some of the more popular hotels and motels in Charlotte located no more than twenty minutes from LCI Corporation.

	<u>Miles</u>	<u>Rating</u>		<u>Miles</u>	<u>Rating</u>		<u>Miles</u>	<u>Rating</u>
1 Hilton Garden Inn 508 E 2nd Street 704 347 5972	4.4	★★★★	5 La Quinta Inn 3127 Sloan Drive 704 392 1600	3.6	★★★	9 Homewood Suites 8340 North Tryon Street 704 549 8800	7.1	★★★★
2 Courtyard by Marriott 333 W.T. Harris Blvd. 704 549 4888	7.2	★★★★	6 Hilton-University Place 8629 J.M. Keynes Drive 704 547 7444	7.3	★★★★	10 Marriott City Center 100 W. Trade Street 704-333-9000	4.0	★★★★
3 Embassy Suites Hotels 4800 South Tryon Street 704 527 8400	6.9	★★★★	7 Holiday Inn-Center City 230 North College Street 704 335 5400	4.1	★★★★	11 The Westin Charlotte 601 S. College Street 704 375 2600	4.2	★★★★
4 Hampton Inn 8419 North Tryon Street 704 548 0905	7.1	★★★	8 Holiday Inn-Executive Park 8520 University Executive Park Drive 704 547 0999	7.1	★★★	12 Doubletree Guest Suites 6300 Morrison Blvd. 704 364 2400	8.8	★★★