Lab Scale Bicomponent Extruder Fed Spinning Machine
Model LBS
Equipment Specification  November 2013
**Machine Description**

This machine is designed for laboratory use to make small amounts of bicomponent fiber from small amounts of polymer. It requires as little as 20 grams of polymer to make 100 meters of fiber. Its simplified design also makes it easy to operate and maintain. The system consists of 2 single screw extruders connected to a spinneret block. Metering pumps are optional to reduce the minimum polymer requirements and maintenance. The extruder speeds are set to deliver the desired flow rates. Mechanical torque limiters are provided to prevent over pressure. It is easily disassembled for cleaning. In addition to the pack, there are only 5 wetted parts to be cleaned with no blind passages. Note that the simplified design means the tolerances of fiber properties (denier & bico ratio) are limited to +/- 10%. Meter pumps can be added as an option to get production fiber tolerances of +/- 0.5%.

The machine is very versatile. With optional parts, the machine is convertible to run monofilaments, high temperature polymers, meltblown and spunbond webs in almost any cross section desired.

**Equipment specifications**

**Model LBS – 100 - Lab Scale Bicomponent Melt Extrusion Unit - Base unit**

- **1 kg/hr/extruder**
  - Complete unit ready to run
  - Extruder unit, with drive mechanisms
    - (Variable speed D.C. electric motor driven)
      - Extruder Barrel Pressure rating of 7,500 psi (500 bar)
      - Screw size 5/8” dia – 24:1 l/d (16mm)
      - Can deliver polymer pressure of 2500 psi (166 bar)
      - Temperature capability of up to 310 °C with temperature control of < ± 3.5 °C.
      - Electrically heated, 5 zones: 2 / extruder; 1 spinneret
      - Pack block - 17-4 ph stainless steel
      - Torque limitation on extruder screw for barrel over pressure protection
      - Throughput range: 0.05 to 1 kg / hour for each extruder.
      - Control of extruder screw speed ± 5% via KBIC dc motor controller (pressure controls optional)
      - Dial gauge type pack pressure indicators
      - Quantity of unused polymer in each system less than 10 cc

- **Spin Pack – qty 1**
  - Spinneret: 19 round holes, 0.5mm dia, shaped holes available
  - Screen sandwich type filters
- Distribution plates for homo, side-by-side, sheath/core, 16 segment pie and 36 islands-in-the-sea. Others available such as: nanofiber islands in the sea, 10 stripes, trilobal core, hollow fiber, etc.
- Screens and seals for 50 pack builds

3. Fiber Winder, lab style
- 50 – 1000 meter / minute, 75 mm id x 150 mm cardboard bobbins

4. Utilities: 240 vac – 1 phase, 90 amp
- 240 vac 3 phase 25 amp (meltblown option)
- 35 cfm 90 psi compressor air (intermittent) for string up aspirator
- 40 cfm 80 psi compressor air for meltblown pack
- 35 cfm 90 psi compressed air for spunbond
- 5 cfh nitrogen for hopper purge
- 1 gpm water @ 30°C for extruder cooling

5. Special tools and expendables
- 10 spare seals
- Antiseize for bolts
- Brass spinneret scraper
- Fiber scissors
- pack installation handle
- Doff stick
- extruder brush
- copper gauze for wiping spinnerets
- fiber cross section microtome

The Base unit as described above includes all the special tools needed to run the machine. Machine operation will also require some standard tools and support equipment that is usually found in industrial shops. These accessories can be purchased from Hills as options.
Floor Plan LBS-100 machine w/ forming table & chiller
Note: Additional space needed for a pack assembly work bench and pack cleaning equipment. These items should be located in a different room.
Model LBS – 300 - Lab Scale Bicomponent Melt Extrusion Unit - Base unit

3 kg/hr/extruder

Complete unit ready to run

1. Extruder unit, with drive mechanisms
   (Variable speed D.C. electric motor driven)
   - Extruder Barrel Pressure rating of 7,500 psi (500 bar)
   - Screw size 3/4” dia – 30:1 l/d (19mm)
   - Can deliver polymer pressure of 2500 psi (166 bar)
   - Temperature capability of up to 310 °C with temperature control of
     < ± 3.5 °C.
   - Electrically heated, 7 zones: 3 / extruder; 1 spinneret
   - Pack block - 17-4 ph stainless steel
   - Torque limitation on extruder screw for barrel over pressure protection
   - Throughput range: 0.1 to 3.0 kg / hour for each extruder.
   - Control of extruder screw speed ± 5% via KBIC dc motor controller
     (pressure controls optional)
   - Dial gauge type pack pressure indicators
   - Quantity of unused polymer in each system less than 50 cc

2. Spin Pack – qty 1
   - Spinneret: 72 round holes, 0.35mm dia, shaped holes available
   - Pack top – 17-4 ph SS
   - Screen support plate – 17-4 ph SS
   - Screen sandwich type filters
   - Distribution plates for homo, side-by-side, sheath/core, 16 segment pie and 36
     islands-in-the-sea. Others available such as: nanofiber islands in the sea, 10
     stripes, trilobal core, hollow fiber, etc.
   - Screens and seals for 50 pack builds

3. Fiber Winder, lab style
   - 100 – 1000 meter / minute, 75 mm id x 150 mm cardboard bobbins

4. Utilities: 240 vac – 1 phase, 90 amp
   - 240 vac 3 phase 25 amp (meltblown option)
   - 50 cfm 90 psi compressor air (intermittent) for string up aspirator
   - 40 cfm 80 psi compressor air for meltblown pack
   - 50 cfm 90 psi compressed air for spunbond
   - 5 cfh nitrogen for hopper purge
   - 1 gpm water @ 30°C for extruder cooling

5. Special tools and expendables
   - 10 spare seals
   - Antiseize for bolts
- Brass spinneret scraper
- Fiber scissors
- pack installation handle
- Doff stick
- extruder brush
- copper gauze for wiping spinnerets
- fiber cross section microtome

The Base unit as described above includes all the special tools needed to run the machine. Machine operation will also require some standard tools and support equipment that is usually found in industrial shops. These accessories can be purchased from Hills as options.

Recommended Minimum Room Layout LBS-300

Floor Plan LBS machine w/ forming table & chiller
Note: Additional space needed for a pack assembly work bench and pack cleaning equipment. These items should be located in a different room.
Required support equipment
- Standard mechanics tool kit
- torque wrench – 10-60 ft-lbs
- Aluminum surface work bench for assembling packs
- Inert atmosphere burn out oven for cleaning polymer from parts
- ultrasonic tank for cleaning spinnerets

Optional support equipment
- preheat oven for preheating packs for quicker pack changes
- microscope for inspecting spinnerets
- microscope for viewing fiber cross sections

Options & Accessories
The machine can run FOY yarn, meltblown webs, spunbond webs and mono filaments with the optional equipment as shown in the sketches below.

a. Air quench cabinet w/ variable speed blower
b. Chiller coil for quench cabinet for customer supplied chilled water
c. Air chiller for quench cabinet, self contained unit
d. Melt pump upgrade, includes: melt pumps, drives and controls
e. Digital pressure read outs
f. Spin finish system, kiss roll type
g. Draw roll stand
h. Production type winder
i. Temperature rating to 450°C
j. Hastaloy wetted parts for running fluropolymers
k. Water quench for monofilament
l. Meltblown upgrade, includes air heater and meltblown dies
m. Web collector drum with winder and leader sheet unwind for meltblown webs
n. Gun type Spunbond aspirator
o. Slot type Spunbond Aspirator
p. Web forming table with compaction roll, calendar, winder and leader sheet unwind for spunbond webs
q. Thread coating attachment
r. Metal core fiber system
s. Special extruder screws
t. Custom packs for any cross section
u. Burn out oven for cleaning polymer from packs and parts
v. Ultra-sonic tank for cleaning spinnerets
w. Small lots of Polymer
FDY fiber arrangement with 3 roll draw stand, spin finish, quench and 2000 m/m winder
Spunbond arrangement with web former, calendar and 2 sheet unwinds to make 60 mm wide multi layer webs
Meltblown arrangement
Industrial Quality Control Cabinets
Metal Core Fiber Attachment – makes monofilaments with low melt temperature metal cores
Thread coating attachment – Coats thread with a sheath of melt processable polymer

Cross section of a Kevlar thread coated with PP