LIST OF PILOT PLANT EQUIPMENT AVAILABLE AT PURDUE

THERMAL PROCESSING AND HEAT TRANSFER
1. Steam Injection Unit with Flash Cooler
2. Plate Heat Exchanger (De-Laval); capacity 1000-2000 lbs./hr.; 8" x 24" plates (1.5 ft.2 surface area/plate); 2 sections for heating and cooling.
3. Plate Heat Exchanger (De-Laval); capacity 1000 lbs./hr.; 8" x 24" plates (1.5 ft2 surface area/plate); 3 sections (includes regenerator section).
4. Plate heat Exchanger-Vicarb
5. Scraped Surface Heat Exchanger (2)- Contherms 6X72 scrapes
6. Tubular Heat Exchanger (Stork)-Double 10 pass. 1.5 in. ID
7. Tubular Heat Exchanger (Stork); 8 individual heat exchanger modules with triple tube design of varying lengths; capacity = 500 gal./hour (for UHT milk) with thermal regeneration efficiency of 75%.
8. Tubular Heat Exchanger (Stork); 2 individual heat exchanger modules with double tube design. 1.25" inside diameter for particulates.
9. Tubular Heat Exchanger (Stork) - 2 individual heat exchanger modules with double tube design 1 3/8" inside diameter for particles.
10. Water Heater (Bell & Gossett) for heating city water up to 270øF.
11. Water heater (Pick) for heating water to 270øF. Direct Steam injector
12. Pick Steam Injection system for heating product.
13. 1- 40-gallon open steam kettle
14. 1 30-gallon Hamilton scraped surface kettle with dual media hook-ups: steam or city water.
15. 8-gallon Groen (also under evaporation/Dehydration) scraped surface steam kettle. Vacuum concentrator.
16. 2-3 gallon jacketed kettles non-aggitated on table
17. 125 Gallon Lee jacketed kettle. Double action, 110ø inclined mixer.
18. 50 Gallon Jacketed tank on wheels
19. 50 gallon jacketed cheese vat.
20. 2- 2 Gallon Lee variable speed agitated kettles.
21. 15 gallon variable speed scraped surface agitated kettle.
22. Pressure Retort (FMC Sterilmatic Universal Laboratory Model); this unit is capable of simulating the FMC Still Retort, Sterilmatic, Orbitort, and Hydroflex processing methods. 5' diameter x 2-½' length x 5' height. Equipped with 18 thermocouple hub. Also equipped with 5 small retorts for inoculated pack/thermal death time studies. With can heat penetration tools and equipment.
23. Still Retort for canning. Set up with automated controls on Field bus system.
24. 2-5 gallon groen electric jacketed kettles
25. Vegetable/Pasta Blancher
26. Readco 2” jacketed, shear pump
27. Readco 5” jacketed shear pump
28. Steam Blancher-Direct Steam heating
29. Armfield Model FT-74-UHT/HTST Heat exchanger system
30. Double tube Heat Exchanger (Cherry Burrell):1 ½ in product inlet-15 pass with hot water set
31. (2) 150 gallon Double jacketed kettles with agitation
32. (3) 60 gallon Double jacketed kettle w/o agitation
33. Double tube heat exchanger 1.5” ID FMC Dimple tube-10 Pass
34. Jacketed 100 gallon paddle mixing tank-Horizontal
35. Jacketed 300 Gallon Cherry Burrell mixing tank-Horizontal
36. Scraped surface heat exchanger-FMC-9ft² and 6ft² units

EVAPORATION AND DEHYDRATION
1. Vacuum Kettle (Groen); 8 gallon batch capacity; 28" vacuum by vacuum pump; condenser leg cooled with 35°F cooling water.
2. Spray Drier (Niro Atomizer Laboratory Unit); capacity ¬ gallon (milk)/hour; with centrifugal nozzle.
3. Drum Dryer (Blaw-Knox, Buffalo Division); Laboratory model. Steam-heated, 6" x 8" double drums; speed control - 4 options.
4. Drum Dryer BuffaloVac - Vacuum capable steam heated 6"x8”. Variable speed
5. Freeze-dryer (Virtis) Laboratory model; 4 heated 10" x 24" trays.
6. Drying Oven-Blue M
7. Drying oven-
8. Ceramic Ultrafiltration cartridge-Tetra Pak-.05 micron, 5-8 GPM

FREEZING EQUIPMENT
1. Soft-serve Freezer (Taylor); 2 separate freezing section.
2. Still-air Chest Freezer. -25°F

MEMBRANE SEPARATION
1. NanoFiltration Unit
2. Ceramic Ultrafiltration cartridge-Tetra
3. Ultrafiltration Reverse Osmosis Unit (DDS) with homogenizing pump and several membranes available.

FERMENTATION EQUIPMENT

EXTRUDERS
1. Twin-screw extruder with changeable dies-pilot plant scale
2. Single-screw Extruder (Brabender Co.) for mixing, cooling and extrusion processing of a wide variety of food products; 3/4 inch and 1-inch barrel-ribbon dye and cylindrical die.
3. Single screw extruder (Brabender Co.)

DAIRY EQUIPMENT
1. One steam-jacketed 50-gallon vat.
2. Milk Cans-10 Gallon (33), 5 Gallon (10)
3. Various cheese-making tools and
5. Cold Milk Cream Separator-Tetra-5 GPM

HOMOGENIZER AND PUMPS
1. Homogenizer (Cherry-Burrell); 3 piston model; 2-stage, 3000 psig maximum operating pressure; capacity 233 gal./hr.
2. 2-Homogenizer-APV- 3 piston, 2 stage, 5000 PSI max. operating pressure capacity, 500 ml. Min capacity
3. Centrifugal pumps
   a. Triclover-10 HP
   b. 2-Triclover 2 HP, Variable speed control
4. Vacuum pump
5. Parastaltic Pump
   a. Waukesha aseptic – 1”
   b. Waukesha-1 ½”
   c. Waukesha-3”
   d. Seepex - to 1” particulates
   e. Seepex- to 2” particulates
   f. Moyno -1” particulates
   g. Sine-3”
7. Marlen Piston Pump for doing large particulate or viscous products
8. Colloid Mill
9. Colloid Mill

PACKAGING EQUIPMENT
1. Scholle Bag Filler (see Aseptic)
2. Dixie can sealer-Vacuum,atmospheric or gas flush capable set up for 300 or 303 can sizes.
3. Vacuum Bag sealer (Swissvac) for closing flexible bags; adjustable vacuum and sealing temperature and pressure.
4. Dixie Can Sealer set for 211,303,300 diameter size cans.
5. Can closer set for TDT can size

RAW MATERIAL HANDLING AND PROCESSING
1. Washer, with water sprays and conveyor belt for washing fruits and vegetables.
2. Slicer/Dicer (Urschel); slices, strip-cuts, and dices fruits and vegetables.
3. Emulsion System -American Lewa
5. Finisher/Pulper (Langsenkamp); laboratory model for chopping and juicing or pureeing tomatoes and other fruits and vegetables; variable speed drive).
6. Fitzmill Pulper/Grinder (Fitzpatrick Co.) for size reduction.
7. Scale Metler
8. Scale 12000 g capacity
9. Lightning Mixer-Air
10. Lightning Mixer-Electric
11. Small electric mixer
12. Orange Juice Squeezer (FMC) single head
13. Hobart Mixer
14. Hobart Mixer
15. Hobart Vertical Chopper
16. 1 Gallon Waring Blender (2 Bases, 3 cannisters)
17. Liquifier-Bredo-30 Gallon
18. Quadro Pro high shear mixer- Stand alone

OVENS AND FRYERS
1. Pressure Fryer (Henny Penny)
2. Open Deep Fat Fryer.
3. Oven (Blue M).
4. Proctor and Schwartz Radio Frequency Oven
5. Microwave Oven.
6. Table top fryer

DATA ACQUISITION/MANAGEMENT
1. Emerson Delta V System fully integrated in the pilot plant
2. Control-logix in a mobile NEMA-4 cabinet
4. 2-Calplex Analog/Digital converter
5. Rocky II computer, Water resistant

SENSORS
1. Near Infrared - (Katrina) Measure in-line moisture, fat, protein, pH, sugars
2. Oxygen (Ingold) - measures ppm O2 in line.
3. In Line Refractometer(Maselli)-Measures soluble solids in line
4. In Line Refractometer(Fischer Rosemont)-Measures soluble solids in line
5. In line Density (Calibron) - Measures product density
6. In line Viscosity(Nametre)- Measures product viscosity
7. In Line Viscosty (Brookfield)
3. In Line pH (Leeds and Northrup)
7. Mass Flow Meter (Micromotion)- Measures mass flow
8. Mass flow meter (Endress and Hauser)
9. Volumetric flow (Endress and Hauser)- Magnetic resonance flow measurement
10. RTD’s (8)- Stork
11. Pressure transducers-2- Anderson 0-300 PSIG

TANKS
1. Stainless, aseptic (Spartenburg Steel)
   a. 250 Gallon
   b. 80 Gallon
   c. 55 Gallon
2. Lined, aseptic (Enerfab) - 100-250 gallon (vertical & horizontal)
3. Lined aseptic (Enerfab)- 3-100 gallon, on stand
4. 50 gallon open, jacketed
5. COP (cleaning) tank- 50 Gallon

CUTAWAY
1. Fristam aseptic pump
2. Seepex progressive pump
3. Stork Double/Triple tube Heat Exchangers
4. Cherry Burrell Double/Triple tube/Multi tube Heat exchangers
5. See thru Scraped surface Heat exchanger

MOVING
1. Clark Riding Lift Truck- 6500 Lb Capacity, Electric
2. Big Joe Hydraulic Lift- 1000 Lb. Capacity, walk behind
4. 2-Barrel Mover- Manual
5. 5-4 wheel Heavy Duty Carts
6. 1-4 wheel Light Duty carts

ASEPTIC
1. Custom Engineered Scholle Aseptic bag filler
   (.5 liter to 300 gal capabilities)
2. Aseptic divert valve Cherry Burrell- 2"
3. Aseptic Waukesha Pump, 3” Inlet

MACHINE SHOP
1. Drill press
2. Grinder
3. Circular saw- Poter Cable
4. Reciprical Saw- Milwaukee
5. Cordless Drill
6. Drill-Milwaukee
7. Various Manual Tools

MISCELLANEOUS
Aseptic valves, sampling devices, several aseptic holding tanks (can also be used as bulk storage tanks); aseptic air and liquid filter membranes (Pall Cartridge Filters).