Process Equipment List

The detailed lists of process equipment for the facilities used in production at ScinoPharm are attached.
These facilities include the:
* 1: Kilo Lab. (2 lines)
* 2: Mini Plant. (3 lines)
* 3: Pilot Plant.
* 4: Small Manufacturing Unit(SMU).
* 5: Large Production Facility (Bay 1).
* 6: Large Production Facility (Bay 2).
* 7: Large Production Facility (Bay 3).
* 8: Large Production Facility (Bay 4).
* 9: Large Production Facility (Bay 5).
* 10: Mini Bay
* 11: Kilo Lab 2
* 12: Early Stage plant 2
* 13: Peptide plant (2 lines)
* 14: Solid phase peptide synthesis plant (SPPS)

Each of these provides separate rooms for reactors, material charging, and drying /finishing equipment.
All plant areas are designed to be highly configurable to allow multi-purpose batch operations.
G/L steel equipment is either Buchior Tycon. Centrifuges are all Heinkel inverting basket. Dryers are Krauss Maffe, conical with agitation.

More specific information on plant operations is contained in Specialized Facility Capabilities in General.

1: Kilo Lab

Volume Material Comments

Reactors (Operating Range of -50^{o}C to +120^{o}C)

* 50L Glass and G/L Steel With Distillation Column
* 50L Glass and G/L Steel
* 25L Glass and G/L Steel With Distillation Column
* 25L Glass and G/L Steel
* 30 L Hastelloy C
* 16 L Glass and G/L Steel
* 16 L Glass and G/L Steel
* 20 L SS 316L

Material Charging Equipment

* 40 L SS 316 L Four Each
* 4 L SS 316 L Three Each
* 10 L SS 316 L Two Each
* 20 L SS 316 L Two Each

Finishing/Drying Equipment

* 10L Pressure Filter SS 316 L
* 10L Pressure Filter SS 316 L
* 10L Pressure Filter Hastelloy
* Vacuum Tray Dryer 0.24m_2 SS316L
* Vacuum Tray Dryer 0.24m_2 SS316L

Miscellaneous Support Equipment for use as receivers storage, and feed vessels

* 2 X 50 L Glass Rotary Evaporators
* 14 X 20 L Glass, 4 X 114 L SS 316 L, 2X80 L SS316L

Reactors are located in four separate hooded suites. All material handling including product filtration and drying are conducted in glove boxes. Cryogenic cooling to -80^{o}C is available.

2: Mini Plant

Volume Material Comments

Reactors (Operating Range of -50^{o}C to +120^{o}C)

* 80 L Hastelloy
* 80 L G/L Steel
* 120 L G/L Steel With Distillation Column
* 80 L Hastelloy
* 120 L G/L Steel With Distillation Column
* 200 L G/L Steel
* 420LX2 SS316L
* 150L Hastelloy Hydrogenator

Receiver

* 120 L G/L Steel
* 120 L G/L Steel
* 120 L G/L Steel
* 120 L G/L Steel

Finishing/Drying Equipment

* 120 L G/LSteel Crystallizer
* 120 L G/LSteel Crystallizer
* 20 L SS 316 L Pressure Filter
* 20 L SS 316 L Pressure Filter
* Vacuum Tray Dryer SS 316 L 2.64m^{2}
* Vacuum Tray Dryer SS 316 L 2.64m^{2}
* Vacuum Tray Dryer SS 316 L 2.64m^{2}

Two fluid precision controlled heat transfer systems are available for connection to any reactor for specific reaction control or for use as a crystallizer.

All material handling including product filtration and drying are isolated in glove boxes.

One set of cryogenic facilities is connected to an 80-L Hastelloy C276 reactor capable of operating temperatures as low as minus 80^{o}C.

Two heat transfer fluid unit using thermal oil as the heating media is connected to two 420 L SS 316 reactors capable of operating at temperatures up to 160^{o}C.

3: Pilot Plant

Volume Material Comments

Reactors (Operating Range of -20$_0$C to +150$_0$C for all)

* 1200 L G/L Steel
* 1200 L G/L Steel
* 800 L G/L Steel
* 1200L SS 316L (**-80$_0$C**) Hydrogenation Reactor
* 1200 L SS 316 L
* 2000 L G/L Steel With Distillation Column
* 800 L G/L Steel With Distillation Column

Material Charging Equipment

* 400 L Hastelloy C
* 800L SS 316 L
* 200L SS 316 L

Finishing/ Drying Equipment

* 800 L G/L Steel Crystallizer
* Heinkel Centrifuge Hastelloy 450 mm
* 420 L Krauss Maffei Agitated Conical Dryer Hastelloy
* Hosokawa Stott Laminar Flow Packaging System SS 316 L
* Vacuun Tray Dryer x 2 SS 316 L 2.64m$_2$

Miscellaneous Support Equipment

* Centrifuge Hastelloy Cladding Steel 42"
* Niagara Horizontal Plate Filter Hastelloy 18"
* Niagara Horizontal Plate Filter SS316 L 18"

Miscellaneous Support Equipment for Use as Receivers, Storage, or Feed Vessels

* SS:1X200L,3X4000L; G/LSteel:2X800L,1X400L,1X4000L
* FRP:1X200L,1X20000L

Three fluid precision controlled heat transfer systems are available: one set is for connection to any reactor for specific reaction control and other two are dedicated to the crystallizer and dryer.

4: Small Manufacturing Unit (SMU)

Volume Material Comments

Reactors (Operating Range of -15^{0}C to +150^{0}C for all)

* 1136 L (300 gal) SS 316 L
* 1136 L (300 gal) SS 316 L (**-80^{0}C**)
* 757 L (200 gal) G/L Steel
* 757 L (200 gal) G/L Steel With Distillation Column
* 1136 L (300 gal) G/L Steel
* 1893 L (500 gal) G/L Steel
* 2893 L (750 gal) G/L Steel With Distillation Column

Material Charging Equipment

* 379 L (100 gal) Hastelloy
* 189 L(50 gal) SS 316 L
* 757 L (200 gal) SS 316 L

Finishing/DryingEquipment

* 1136L(300gal) G/L Steel Crystallizer
* Heinkel Centrifuge Hastelloy 450mm
* 420 L Krauss Maffei Agitated Conical Drier Hastelloy
* FitzmillD6A Mill SS316 L
* Hosokawa Stott Packaging System SS 316 L
* Vacuum Tray Dryer x2 SS 316 L 2.04 m^2

Miscellaneous Support Equipment

* Centrifuge Hastelloy Cladding Steel 42"
* Niagara Horizontal

Plate Filter SS 316 L 18"

* Plate filter SS 316 L 2 X 2.5 m^2

Miscellaneous Support Equipment for use as receivers, storge, and feed vessels

* 1x400L, 1X600L, 3X3785 L((1000 gal)
* G/L Steel: 1 X 379 L (100 gal), 2 X 757 L (200 gal), 1 X 3785 L(1000 gal) (1000 gal)

Three fluid precision controlled heat transfer systems are available: one set is for connection to any reactor for specific reaction control and other two are dedicated to the crystallizer and dryer.

5: Large Production Facility-Bay 1

Volume Material Comments Reactors (Operating Range of -20°C to +150°C for all)

* 2839 L(750 gal) G/L Steel
* 2839 L (750 gal) G/L Steel With Distillation Column
* 3785 L (1000 gal) G/L Steel With Distillation Column
* 5678 L (1500 gal) G/L Steel
* 1893 L (500 gal) SS 316 L
* 3785 L (1000 gal) SS 316 L With Distillation Column
* 5678 L (1500 gal) G/L Steel
* 3785L (15000 gal) G/L Steel

Material Charging Equipment

* 379 L (100 gal) Hastelloy
* 379 L (100 gal) SS 316 L
* 1893 L (200 gal) SS 316 L

Finishing/DryingEquipment

* 7570L(2000gal) G/L Steel Crystallizer
* Heinkel Centrifuge SS 316 L 600mm
* 1000 L Krauss Maffei Agitated Conical Drier SS 316 L
* FitzmillD6A Mill SS 316 L
* Hosokawa Stott Packaging System SS 316 L
* Filter Dryer SS 316 L 0.5 m^2

Miscellaneous Support Equipment

* Plate filter SS 316 L 5 m^2

Miscellaneous Support Equipment for use as receivers, storge, and feed vessels

* ss: 3x18925 L((5000 gal)
* G/L Steel: 1 X 1136 L (300 gal), 2 X 1893 L (500 gal), 1 X 18925 L (1000 gal) (5000 gal)
* FRP: 1 X 45000 L (For waster water)

Three fluid precision controlled heat transfer systems are available: one set is for connection to any reactor for specific reaction control and other two are dedicated to the crystallizer and dryer.

6: Large Production Facility-Bay 2

Volume Material Comments

Reactors (Operating Range of -20$_0$C to +150$_0$C for all)

* 3785 L (1000 gal) G/L Steel
* 3785 L (1000 gal) G/L Steel With Distillation Column
* 5678 L (1500 gal) G/L Steel
* 5678 L (1500 gal) G/L Steel (**200$_0$C**) With Distillation Column
* 3785 L (1000 gal) SS 316 L (**-80$_0$C**)
* 5678 L (1500 gal) SS 316 L With Distillation Column
* 2600 L (684 gal) Hastelloy Hydrogenator (22 Bar)6000 L (1580 gal) Monel

Material Charging Equipment

* 1893 L (500 gal) SS 316 L Hastelloy Hastelloy
* 1893 L (500 gal) SS 316 L
* 2839 L (750 gal) SS 316 L

Finishing/DryingEquipment

* 7570L(2000gal) G/L Steel Crystallizer
* Heinkel Centrifuge Hastelloy 600mm
* 1500 L Krauss Maffei Agitated Conical Drier Hastelloy
* FitzmillD6A Mill SS 316 L
* Hosokawa Stott Packaging System SS 316 L

Miscellaneous Support Equipment

* Plate filter SS 316 L 5 m$_2$
* Plate filter Hastelloy 2.5 m$_2$
* LPLC Column (10 Kg/ cm$_2$) SS 316 L 120 L, 8L/min
* LPLC Column (20 Kg/ cm$_2$) SS 316 L 300 L, 500 L/min

Miscellaneous Support Equipment for use as receivers, storge, and feed vessels

* SS 3x18925 L (5000 gal)
* G/L Steel: 3X 1896 L (500 gal), 2 X 1893 L (5000 gal).
* FRP: 1 X 45000 L (For waste water)

Three fluid precision controlled heat transfer systems are available: one set is for connection to any reactor for specific reaction control and other two are dedicated to crystallizer and dryer.

7: Large Prodcution Facility-Bay 3

Volume Material Comments Reactors (Operating Range of -20ºCto +150ºC for all)

* 3785 L (1000 gal) SS 316 L
* 5678 L (1500 gal) SS 316 L With Distillation Column
* 5678 L (1500 gal) G/L Steel
* 7570 L (2000 gal) G/L Steel
* 7570 L (2000 gal) G/L Steel With Distillation Column

Material Charging Equipment

* 1893 L (500 gal) Hastelloy
* 1893 L (500 gal) SS 316 L
* 3785 L (1000 gal) SS 316 L

Finishing/Drying Equipment

* 7570 L (2000 gal) G/L Steel Crystallizer
* Heinkle Centrifuge SS 316 L 600 mm
* 2000 L Krauss Maffei Agitated ConicalDrier SS 316 L
* Hosokawa StottPackaging System SS 316 L

Miscellaneous Support Equipment

* Plate Filter SS 316 L 5 m^2

Miscellaneous Support Equipment for Use as Receivers, Storage, or Feed Vessels

* SS: 3 X 18925 L (5000 gal)
* G/L Steel: 2 X 2839 L (750 gal), 1 X 1893 L, 2 X 18925 L (5000 gal)

Three fluid precision controlled heat transfer systems are available: one set is for connection to any reactor for specific reaction control and other two are dedicated to crystallizer and dryer.

8: Large Production Facility-Bay 4

Volume Material Comments Reactors (Operating Range of -20oC to +120oC for all)

*8000 L (2114 gal) G/L Steel

*8000 L (2114 gal) SS316L

*6000 L (1585 gal) SS316L

*6000 L (1585 gal) SS316L

*6000 L (1585 gal) G/L Steel

*4000 L (1057 gal) G/L Steel

*2000 L (528 gal) Hastelloy

*600 L (159 gal) G/L Steel

*400 L (106 gal) SS316L

* 1000 L (264 gal) Hastelloy

Finishing/Drying Equipment

* 8000 L (2114 gal) Hastelloy Crystallizer

* 4000 L (1057 gal) G/L Steel Crystallizer

* Heinkle Centrifuge SS 316 L 600 mm

* 2000 L Helical dryer SS 316 L

Miscellaneous Support Equipment for Use as Receivers, Storage, or Feed Vessels

* SS: 3 X 18925 L (5000 gal)

* G/L Steel: 3 X 3000 L (793 gal), 1 X 18925 L (5000 gal)

9: Large Production Facility-Bay 5

Volume Material Comments

Reactors (Operating Range of -20 C to +120 C for all)

*3000 L (793 gal)	G/L Steel	
*2000 L (528 gal)	G/L Steel	
*1000 L (264 gal)	SS316L	
*500 L (132 gal)	SS316L	

Finishing/Drying Equipment

*2000 L (528 gal)	SS316L Crystallizer	
Filter Dryer	SS316L	1.1 m^2
Filter Dryer	SS316L	0.5 m^2

Miscellaneous Support Equipment

* 2 X Plate Filter SS 316 L 2.5 m^2

Miscellaneous Support Equipment for Use as Receivers, Storage, or Feed Vessels

* SS: 1 X 400 L (106 gal) , 2 X 300 L (79 gal)

10: Mini Bay

This is a dedicated plant for producing cytotoxic product. The major equipment is list as below:

Volume Material Operating Temp. Range

*** Reactors**

63 L (X 4) G/L Steel - 20^0C ~ 200^0 C

50 L (X 2) G/L Steel - 20^0C ~ 200^0 C

80 L (X 1) SS 316 L - 60^0 C ~ 200^0C

100 L (X 1) SS 316 L - 60^0 C ~ 200^0C

*** Extractors**

200 L (X 2) SS 316 L - 60^0 C ~ 200^0 C

*** Finishing/Drying Equipment**

Tray Dryer (X 2) SS 316 L

Pressure Filter (X 2) SS 316 L

11: Kilo Lab 2

This is a dedicated plant for producing GMP product. The major equipment is list as below:

Volume Material Operating Temp. Range

*** Reactors**

15 L (X 1) G/L Steel - 20^0 C ~ 200^0C

30 L (X 1) G/L Steel - 20^0 C ~ 200^0C

200 L (X 1) SS 316 L - 80^0 C ~ 230^0 C

*** Extractors**

Rotary Evaporator (X 2) Glassware 40^0 C ~ 180^0 C

*** Finishing/Drying Equipment**

Tray Dryer (X 1) SS 316 L

Pressure Filter (X 1) SS 316 L

*** Miscellaneous Support Equipment**

196-L 15-bar LPLC column and pumping skid system

70-L 30- bar MPLC column and pumping skid system

12: Early Stage Plant 2

This plant is to produce GMP Materials used in early stage project especially in phase1 and

phase 2. The major equipment is list as below:

Volume Material Operating Temp. Range

*** Reactors**

30 L (X 4) Glassware - 20^0C ~ 200^0 C

50 L (X 1) G/L Steel - 20^0C ~ 200^0C

50 L (X 1) Hastelloy - 80^0 C ~ 200^0C

*** Material Charging Equipment**

20 L (X 4) SS 316 L

*** Finishing/Drying Equipment**

Pressure Filter

10 L (X 2) SS 316 L

10 L (X 1) Hastelloy

Tray Dryer (X 2) SS 316 L

Filter Dryer (X 1) SS316 L

11:Peptide Purification Plant

This plant is designed to purify final peptide products by using Chromotagraphy technology.

The major equipment includes:

* 22-L 70-bar HPLC column and pumping skid system

* 38-L 20-BAR MPLC column for salt-exchange

* 15-L 0.76 M^2 heat transfer area Lyophilizer

12: Solid phase peptide synthesis plant (SPPS)

This plant is designed to produce crude peptide products by using peptide synthesis technology. The major equipment includes:

*** Reactor**

50 L (X 1) G/L Steel - 20^0 C ~ 200^0C

*** Peptide Syntheizer**

20 or 80-L (X 1) Glass

Miscellaneous Support Equipment

- Plate Filter Hastelloy 0.07 m^2

Miscellaneous Support Equipment for Use as Receivers, Storage, or Feed Vessels

* SS: 2 X 50 L, 2 X 100 L, 3 X 200 L

13: Peptide Purification Plant

This plant is designed to purify final peptide products by using Chromotagraphy technology.

The major equipment includes:

* 22-L 70-bar HPLC column and pumping skid system
* 38-L 20-BAR MPLC column for salt-exchange
* 15-L 0.76 M_2 heat transfer area Lyophilizer

14: Solid phase peptide synthesis plant (SPPS)

This plant is designed to produce crude peptide products by using peptide synthesis technology. The major equipment includes:

*** Reactor**

50 L (X 1) G/L Steel - 20^0 C ~ 200^0C

*** Peptide Syntheizer**

20 or 80-L (X 1) Glass

Miscellaneous Support Equipment

- Plate Filter Hastelloy 0.07 m^2

Miscellaneous Support Equipment for Use as Receivers, Storage, or Feed Vessels

* SS: 2 X 50 L, 2 X 100 L, 3 X 200 L