CONFIDENTIAL

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United States

Attn: Patrick (PJ) Gleeson

GEA Spray Dryer PHARMASD™ PSD-3-CC

Operation with inert gas for aqueous feeds

Proposal No. 30201053 Rev3

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GEA Systems North America LLC

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1.0 *CONTACTS*

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2.0 *SCOPE OF SUPPLY*

The extent of delivery is for one (1) PHARMASD™ Spray Dryer, Size 3, in closed cycle (PSD-3-CC) execution for aqueous feeds and nitrogen as the drying gas. The proposal is in accordance with Sutro Biopharma URS-0079 Revision 00 and "Spray Dryer System" document section 423233 (GEA exceptions and clarification noted in section 19 of this proposal). Additionally, this proposal is subject to all pre-engineering work executed and completed by GEA during project number 22311-001.

3.0 *PRICING*

Base System (Section 15.0)
Base System Price, PHARMASD™ Size 3 Closed Cycle (PSD-3-CC)
Pre-Engineering Credit
GEA Discount
Total Sales Price

Optional Features, Equipment and Services (Section 16.0)
(Add to Base System Price)

High Pressure Feed Pump and Nozzle System

SAT / IQ /OQ Documentation Package for Spray Dryer

Material Traceability Certificates

All prices indicated are in US dollars.

The price excludes taxes, including, without limitation, sales, use, value added, excise, gross receipts, contractor's, or similar taxes; any such taxes that may be payable with respect to this sale shall be the sole responsibility and liability of Customer.

Delivery Terms: following Incoterms® 2010 shall be FCA (Free Carrier) point(s) of manufacturer. Freight can be prepaid and added, and invoiced on the basis of the actual cost at time incurred if desired.

4.0 *PAYMENT TERMS*

The following payment terms are contingent upon Customer's credit rating approval by GEA:

5.0 *DELIVERY TIME*

The estimated current delivery time is a sum of the following:

- Time from Customer approval until readiness to ship is estimated to be 9-10 months after completion of the pre-engineering order and client approval of the basic engineering package.
- Time for transport from GEA location to Customer's site.

GEA project manager will develop a detailed project schedule after order.

6.0 *VALIDITY*

7.0 *FIELD SERVICE RATES FOR NORTH AMERICAN PERSONNEL*

8.0 *EXCEPTIONS AND CLARIFICATIONS*

9.0 *TERMS AND CONDITIONS*

10.0 *PROJECT MANAGEMENT*

The GEA Project Manager will manage the project throughout its duration and perform the following:

- arrange the internal turnover meeting
- issue an order confirmation
- issue a detailed project schedule
- issue the necessary project documentation
- arrange a teleconference kick off meeting with the Customer
- arrange internal design review meetings
- manage the documentation process with the Customer

11.0 *DOCUMENTATION*

All documentation is based upon GEA standards. The manual is in English and included, prepared in electronic format only. It contains PDF files with the following content, where relevant:

- detailed project documentation list
- user information
- system functional design specification (SFDS)
- operational procedures
- process control / data sheets
- control system functional specification (CSFS)

12.0 *MECHANICAL / CONTROLS INSPECTION*

Main components will be visually inspected for compliance to the design drawings and parts list, as deemed necessary by GEA. The Customer is welcome to attend these activities; however, Customer expenses are not included. The tests are informal and un-documented unless specific requirements exist for test protocol and resulting documentation.

13.0 *SITE SERVICES (NOT INCLUDED)*

Allow three (3) weeks' notice prior to GEA arriving on site. Unless agreed otherwise, site services (assistance during unloading, installation, start up, commissioning, SAT, qualification, training, operation, troubleshooting and maintenance) are not included, but are available at the site service rates in Appendix A.

14.0 *DESIGN BASIS*

14.1 TECHNICAL DATA

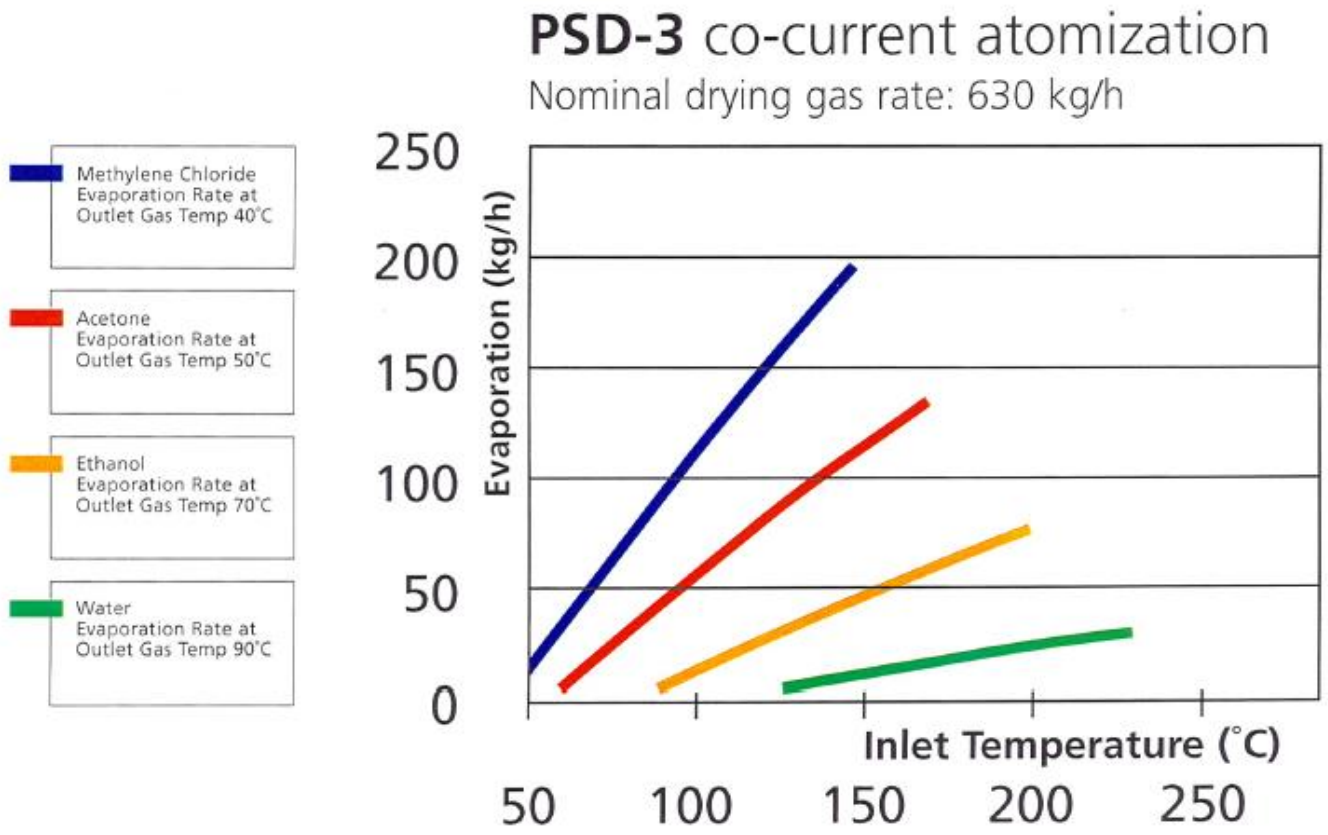
Unless otherwise agreed upon, the installation is designed for operation with non-hazardous products. The plant is suited for operation with aqueous products only.

14.1.1 Electrical area classification

- the proposed plant is designed for installation in non- classified area. The main HMI, PLC and MCC panels are placed in a non-classified area.

14.1.2 Evaporation capacity

- the nominal evaporation capacity depends on the temperature, type of solvent and operation conditions. Please refer to the below capacity diagram. Note: this unit is specifically designed for aqueous products only.



14.1.3 Temperature

Normal Operation

- maximum inlet temperature: 210°C with standard silicone gaskets.
- maximum outlet temperature acceptable for parts downstream: 120 °C

Sanitization Operation

- sanitization gas temperature: 230°C
- sanitization stainless steel surface temperature: 150°C
- sanitization zone gasket temperature rating: 150°C

14.1.4 Sanitization path

- During sanitization process, fresh air will be pulled into the system by the supply fan via the Air Filter. The air will be heated by the process heater and then filtered by the inlet HEPA filter. The heated air will then pass through the drying chamber, interconnecting duct, the cyclone and exhaust via sanitization vent path. Some areas in this path will be enhanced with auxiliary heating to achieve the temperature as outlined in 14.1.3. The sanitization zone starts from the CIP isolation valve (FV-70A) and ends at the CIP isolation valves (FV-70B and C).

14.1.5 Process gas rate at 200 °C

- nitrogen 630 kg/h* (nominal)
  *system capable of 725 kg/hr @ 160°C on chamber inlet

14.1.6 Feed pump

- peristaltic pump
- high pressure pump (optional)

14.1.7 Atomizing

- two fluid nozzle
- high pressure nozzle (optional)

14.1.8 Filters

- inlet pre-filter (type F9) for ambient air to non-product contact supply
- inlet filter (type H14) for hot process gas
- inlet filter (type H14) for nozzle protection gas
- bag filter
- outlet filter (type H14) for exhaust process gas

14.1.9 Heaters

- main heater: electrical
- conditioning reheater: electrical
- nozzle protection gas: electrical

14.1.10 Power supply

- 3 phase with ground, 480 V, 60 Hz
- voltage must be within ±10 % of nominal value, frequency within ±1 %

14.1.11 Compressed air supply

- 6 bar(g) at panel inlet, clean, oil and water free

14.1.12 Nitrogen supply

- 6 bar(g) at panel inlet, clean, oil and water free

14.2 DESIGN STANDARDS

14.2.1 Material

In Section 15.0, the general description of material is defined as per the AISI standards. The delivered construction material will, however, in GEA's choice be in accordance with the following:

- AISI 316 or EN 1.4401/1.4436, AISI 316L or EN 1.4404/1.4435 for steel parts

Please note: Except where specifically described in section 15.0, components will be made in stainless steel. Components like motors and exterior of valves (and interior, if not in product contact) are typically made in other materials and possibly painted.

14.2.2 Surface treatment

- in the product contact zone, from the Inlet HEPA filter isolation valve to Outlet HEPA filter isolation valve, the interior surfaces are $R_a \leq 25$ µin and mirror polished (where applicable). The exterior surfaces of the chamber, cyclone and bagfilter will have a “bead blasted” finish.
- in the technical zone outside the product contact zone, interior surfaces are cold rolled 2B with welding zones polished to $R_a \leq 32$ µin (where accessible). Exterior surfaces are 'bead blasted' finish.

14.2.3 Material, gaskets (standard)

- PTFE, Silicone and Viton as applicable (varies with application)

14.2.4 Insulation

- GEA to provide insulation and fully welded cladding on main equipment (chamber, cyclone, HEPA filters, condenser and bag filter) and ductwork located in GMP space. Insulation on all other required equipment, ductwork and devices by others.

14.2.5 Electrical

All control panel(s) will be provided as UL listed.

15.0 *TECHNICAL DESCRIPTION – PSD-3 CLOSED CYCLE (PSD-3-CC)*

15.1 FEED SYSTEM

15.1.1 Feed pump for TFN nozzle

- peristaltic pump
- feed tubing (material type to be clarified during detailed engineering)
- motor rated for non-hazardous location
- frequency converter (Danfoss) and associated power distribution

15.2 ATOMIZING SYSTEM

15.2.1 Two fluid nozzle lance

- make GEA, comprising
- nozzle rod
- 3 set of nozzle inserts (sizes tbd)
- includes point of use filter for atomizing gas
- finish: ref. 14.1.12 (surface finish)

15.3 NOZZLE PROTECTION GAS SYSTEM

15.3.1 Nozzle cooling supply fan

- centrifugal fan
- gas tight design
- nitrogen purged shaft-sealing with double carbon ring
- automatic speed regulation by frequency converter
- fan motor, estimated 3 HP, non-hazardous area
- sound level: estimated 80 dBA @ three (3) feet (noise insulation, if required, by others)

15.3.2 Nozzle cooling gas heater, electrical

- electrical classification, non-hazardous area
- outlet gas temperature from 20°C to 80°C at nominal gas flow
- high temperature safety switch on surface of heating elements to allow for heater sheathing temperature limitation
- maximum: estimated 20 kW
- continuously controlled temperature
- heater housing uninsulated (to be fully insulated by others)

15.3.3 Nozzle cooling gas filter, 'bag-in / bag-out' type

- HEPA filter housing for nozzle protection gas
- bag-in / bag-out design
- designed for safe change of filter insert
- class H14 according to EN 1822. Make: CAMFIL D-Pyro
- filter efficiency: 99.995% min at MPPS
- filter media: micro-glass fiber / acrylic resin binder (NON-Shedding)
- filter sealant and gasket material: high temperature silicone

- heat resistant to 350 °C
- continuous pressure drop measurement using studs with tri-clamp connection
- above studs are also used for DOP testing
- insulated and covered by a fully welded cladding

15.3.4 Nozzle cooling duct connections

- from main closed cycle ductwork to nozzle cooling inlet
- assembled by means of tri-clamps

15.4 PROCESS GAS SUPPLY SYSTEM

15.4.1 Pre-filter for ambient air

- Class F9 according to CEN/EN 1822 or similar US standard

15.4.2 Duct connection with valve

- from pre-filter to closed loop
- assembled by means of flanges

15.4.3 Supply fan

- centrifugal fan
- gas tight design
- nitrogen purged shaft-sealing with double carbon ring
- automatic speed regulation by frequency converter
- fan motor, estimated 10 HP, non-hazardous area
- sound level: estimated 90 dBA @ three (3) feet (noise insulation, if required, by others)

15.4.4 Duct connection

- from supply fan to process gas heater
- assembled by means of flanges

15.4.5 Process gas heater, electrical

- electrical classification, non-hazardous area
- outlet gas temperature from 20°C to 230°C at nominal gas flow
- high temperature safety switch on surface of heating elements to allow for heater sheathing temperature limitation
- maximum consumption: estimated 80 kW
- continuously controlled temperature
- heater housing uninsulated (to be fully insulated by others)

15.4.6 Duct connection

- from process gas heater to inlet HEPA filter
- assembled by means of flanges
- insulated to flanges and covered by a fully welded cladding
- tri-clamp connections covered by removable (not gas tight) AISI 316L cover for personal protection, by others

15.4.7 Inlet HEPA gas filter, 'bag-in / bag-out' type

- HEPA filter housing for hot process gas
- designed for safe change of filter insert
- class H14 according to EN 1822. Make: CAMFIL D-Pyro
- filter efficiency: 99.995% min at MPPS
- filter media: micro-glass fiber / acrylic resin binder (NON-Shedding)
- filter sealant and gasket material: high temperature silicone
- heat resistant to 350 °C
- continuous pressure drop measurement using studs with tri-clamp connection
- above studs are also used for DOP testing
- insulated and covered by a fully welded cladding, bead blasted finish
- internal surface before filter element towards spray drying chamber: $R_a \leq 25$ µin
- internal surface from filter element towards heater: Cold rolled 2B plates with welding zones polished to $R_a \leq 32$ µin

15.4.8 Duct connection

- from inlet HEPA filter to chamber
- assembled by means of flanges
- insulated to flanges and covered by a fully welded cladding

15.4.9 Isolation valve

- mounted in duct between inlet HEPA filter and chamber
- for isolating and protecting the HEPA filter during CIP

15.4.10 Safety membrane

- for safety release of too high pressure or vacuum in the system
- mounted on duct between isolation valve and chamber
- activates at a specified pressure / vacuum

  Note: To be connected to a safe place. Ducting by others.

15.5 SPRAY DRYING CHAMBER SYSTEM

15.5.1 Process gas disperser for nozzle atomization

- Welded to the drying chamber
- type DPH
- creating a laminar flow of hot process gas at a speed specially suited for nozzle atomization
- sanitary design
- drainable

15.5.2 Drying chamber type PSD-3

- cylinder internally: ø=2000mm (78.74”), h=2000mm (78.74”), cone 40°
- disperser cooling in chamber roof for cold air
- disperser cooling fan w/ filter
- four (4) observation panes for inspection during operation, one with light-source
- access to chamber through ø=500mm (19.68”) swing cone bottom opening
- all equipment access platforms and ladders by others
- insulated, covered by fully welded cladding

15.5.3 Swing cone for drying chamber

- conical chamber bottom cone tightly connected to the drying chamber by a system allowing for horizontally removing, providing access to the internals of the drying chamber, opening size ø=500mm (19.68”)
- insulated, covered by fully welded cladding
- regulated electrical heat tracing in upper/lower flange
- pneumatic hammers are not recommended on swing cone

15.5.4 Pneumatic hammer system

- for minimizing possible powder deposits in the drying chamber
- four (4) hammers for the chamber wall and upper cone
- two (2) mounting assemblies for future hammers. Locations TBD.
- the hammers consist of a steel pipe with a steel piston, which is blown periodically against a knocking plate on the chamber wall by means of compressed air
- knocking plate: PUR (Polyurethane), support: POM (Polyacetal)
- inclusive of solenoid valves
- control system in pneumatic panel for regulation of the frequency, user adjustable
- oil/water separator with reduction valve, safety valve, and pressure gauge for compressed air to the hammer
- consumption of compressed air, each: approximately 0.1 m^3/h (0.06 CFM) at a pressure of 1 barg (14.5 psig)

  Note: Solenoid valves are placed in de-centralized cabinets – piping between cabinets and hammers is not included

15.6 OUTLET PROCESS GAS AND POWDER COLLECTION SYSTEM

15.6.1 Duct connection

- leading the exhaust process gas and dried powder from the chamber outlet to the cyclone
- assembled by means of flanges
- insulated to clamp connection and covered by a fully welded cladding
- flanges covered by removable (not gas tight) AISI 316L cover for personal protection, by others

15.6.2 Cyclone system

- CEE-375 cyclone
- for separating the powder from the exhaust gas
- one (1) hammer for the cyclone cone
- insulated and covered by fully welded cladding

15.6.3 Discharge and air lock system

- two (2) butterfly isolation valves
- controls connections for proximity switches
- assembled by means of tri-clamps
- insulated to flanges and covered by a fully welded cladding
- contained product collection system: ref section 16

15.6.4 Duct connection

- leading the exhaust process gas and fines from the cyclone to the bag filter
- assembled by means of flanges
- insulated to flanges and covered by a fully welded cladding
- flanged connections covered by removable (not gas tight) AISI 316L cover for personal protection, by others

15.6.5 Bag filter system

- housing internally ø=1100 mm (43.31”)
- filter length = 2000mm (78.74”)
- PTFE woven filament filter bags (12 total)
- cages for filter bags, material: ref. section 14.2 (design standards)
- jet pulse cleaning system with adjustable pulse frequency using nitrogen
- solenoid valves, non-hazardous area
- provision for electrical heat tracing mounted at the external side of the internal housing for avoiding possible condensing problems
- supports for mounting on platform
- insulated and covered by fully welded cladding
- two (2) hammer mounted on the cone of the bag filter

15.6.6 Discharge and air lock system

- two (2) butterfly isolation valves
- controls connections for proximity switches
- assembled by means of tri-clamps
- insulated to flanges and covered by a fully welded cladding
- contained product collection system: ref section 16

15.6.7 Duct connection

- leading the cleaned exhaust process gas to the valve before police / HEPA filter
- assembled by means of flanges
- insulated to flanges and covered by a fully welded cladding

15.6.8 Isolating valve and venting valve

- two (2) mounted in duct for isolating and protecting the bag filter during extended CIP
- two (2) mounted in duct bypass of the bag filter during extended CIP
- one (1) mounted in duct bypass of the bag filter for sanitization process gas
- two (2) mounted in duct for isolating and protecting the outlet HEPA during extended CIP
- two (2) mounted in duct bypass of the outlet HEPA during extended CIP

15.6.9 Outlet HEPA gas filter, 'bag-in / bag-out' type

- HEPA filter housing for cleaned exhaust process gas
- designed for safe change of filter insert
- class H14 according to EN 1822. Make: CAMFIL KH
- filter efficiency: 99.99% min at 0.3 microns
- filter media: micro-glass fiber / acrylic resin binder
- filter sealant and gasket material: high temperature silicone
- heat resistant to 260 °C
- continuous pressure drop measurement using studs with tri-clamp connection
- above studs are also used for DOP testing
- provision for spray nozzle insertion (nozzle by others) and drain located in the bottom of the housing
- insulated and covered by a fully welded cladding, bead blasted finish
- internal surface before filter element towards bagfilter: $R_a \leq 25$ µin
- internal surface from filter element towards exhaust fan: Cold rolled 2B plates with welding zones polished to $R_a \leq 32$ µin

15.6.10 Duct connection

- leading the cleaned exhaust process gas to the exhaust fan
- assembled by means of flanges
- not insulated
- provisions for insertion of one (1) static spray ball for interior wetting
- drain valve in HEPA filter housing bottom

15.6.11 Exhaust fan

- centrifugal fan
- gas tight design
- nitrogen purged shaft-sealing with double carbon ring
- automatic speed regulation by frequency converter
- fan motor, estimated 15 HP, non-hazardous area
- sound level: estimated 95 dBA @ three (3) feet (noise insulation, if required, by others)

15.6.12 Duct connection

- leading the process gas from exhaust fan to the condenser inlet
- assembled by means of flanges
- not insulated

15.6.13 Shell & tube condenser

- counter-current operation
- tube side condensing
- inlet/outlet studs for chilled water
- outlet valve for condensate controlled by a level switch
- insulated and covered by a fully welded cladding
- two-way valve for condenser outlet temperature control
- condensate bucket and condensate pump by others

15.6.14 Duct connection

- leading the clean and cold exhaust process gas to the electric reheater
- assembled by means of flanges
- insulated by others

15.6.15 Process gas re-heater, electric

- electrical classification, non-hazardous area
- outlet gas temperature from 11°C to 25°C at nominal gas flow
- high temperature safety switch on surface of heating elements
- maximum consumption: estimated 15 kW
- continuously controlled temperature
- heater housing uninsulated (to be fully insulated by others)

15.6.16 Duct connection

- leading the tempered exhaust process gas to the supply fan
- assembled by means of flanges
- insulated by others

15.6.17 Process gas balancing and quality system in the closed cycle loop

- system of valves and instruments for maintaining the correct pressure and quality of process gas in the system

15.7 CIP OF SPRAY DRYER

GEA scope of supply is limited to the CIP spray balls, nozzles, and local zone valves and drains specified below. Depending on the system layout, additional cleaning devices and zone valves may be required at an additional cost. CIP methods and devices of the spray dryer are currently in the engineering stage and is subject to change.

15.7.1 CIP nozzles (estimated counts)

- Inlet HEPA to chamber – after the CIP isolating valve
  - two (2) sanitary retractable cleaning nozzles
- Process gas disperser
  - five (5) static sanitary spray balls for cleaning of duct and air disperser guide vanes
- Drying chamber
  - one (1) sanitary 360° orbital cleaning device
  - venting valve arrangement using the nozzle protection gas system to provide an over or under pressure in the drying chamber during cleaning
- Drying chamber to cyclone
  - six (6) sanitary retractable cleaning nozzles
  - one (1) drain valve
- Cyclone
  - five (5) sanitary retractable cleaning nozzles
- Cyclone to bag filter duct work
  - six (6) sanitary retractable cleaning nozzles
- Bag filter housing
  - one (1) sanitary 360° orbital cleaning device
  - seven (7) sanitary retractable cleaning nozzles

  * Note- the filter bags need to be removed from bag filter housing prior to cleaning
- Bag filter housing to outlet HEPA – before the CIP isolating valve
  - two (2) sanitary retractable cleaning nozzles
- Outlet HEPA – after the CIP isolating valve
  - not considered CIP, see section 15.6.9

15.7.2 CIP Zone Valves (estimated counts)

- estimation of thirteen (13) actuated special butterfly valves, AISI 316l – used for the distribution of the CIP liquid to the various CIP zones on the dryer. This amount may be change during project execution due to equipment layout variations

15.8 CONTROL AND INSTRUMENTATION SYSTEM

15.8.1 HMI Panel

- wall mounted with HMI and Emergency Stop pushbutton
- HMI is a color touchscreen
- HMI will include a Thin Client “box” to interface with the customer’s Thin Client Server(s)
- Graphic software will be Allen Bradley Factory Talk
- panel is AISI 304 Stainless Steel rated with a NEMA 4X rating and will be UL listed
- panel is suitable for installation in a non-hazardous area area

The HMI has animated flow diagrams to cover the following functions:

- on/off and speed control for motors and other devices
- controller for indication and continuous regulation of the inlet process gas temperature
- indication of outlet process gas temperature
- indication and control of supply blower and feed pump speed
- display of most recent alarms
- display of interlock conditions

*see the P&ID for the HMI control functionality

GEA will develop and test the graphic software using in-house development software and hardware. The customer will be responsible for providing all Server hardware, software, and application licenses for Thin Client operation. GEA will provide the customer with a test software file for installation in the Customer’s Thin Client server.

15.8.2 Electro-pneumatic panel

- mounted in a mechanical space
- panel is made of painted carbon steel and is NEMA 12 rated
- panel is UL listed and suitable for installation indoors in a non-hazardous area
- panel exterior will have a power ON status light

Panel interior will have:

- an Allen Bradley Compact Logix PLC with all necessary IO cards
- terminals for IO wiring and other necessary equipment
- suitable for 24 VDC supply from MCC panel
  Note: intrinsically safe barriers can be provided in the control panel to simplify field wiring in the hazardous area as an option. Please consult with GEA.

15.8.3 MCC panel

- mounted in a mechanical space.
- panel is made of painted carbon steel and is NEMA 12 rated with fan and filter for ventilation.
- panel is UL listed and suitable for installation indoors in a non-hazardous area.

panel exterior will have:

- main power disconnect
- power ON status light
- VFD interface modules
- panel interior will have:

- main disconnect, power distribution block, circuit breakers and Danfoss VFD's for motor control
- thyristor (SCR) heater power controller - Watlow
- transformer and 24 VDC power supply
- terminals blocks for IO connections

15.8.4 Field Instruments

Field instruments necessary to operate and monitor the process equipment are provided. Instruments include RTD's, pressure and differential pressure transmitters, feed flow meter, Oxygen analyzer (for closed cycle systems), and various switches. Instrument brand will be Endress + Hauser (pressure, differential pressure, and mass flow) and N-Tron oxygen analyzer/transmitter. See the P&ID for the final scope of instrumentation.

15.8.5 CIP controls for client supplied CIP system

GEA will add control system features to support effective CIP actions and interface with the customer-provided CIP Media Make-Up system ("Kitchen").

Features provided by GEA will include:

- Appropriate hand-shake and data exchange signals between the GEA Spray Dyer and the Customer-Provided CIP Kitchen. Typical interface signals expected would be:
  - Kitchen Ready for use
  - Spray Dryer ready to clean
  - Liquid delivery in progress
  - Liquid delivery "pause" request / Delivery paused status
  - Resume liquid delivery / Delivery resumed
  - Dryer sequence complete
  - Kitchen sequence complete
  - Other interface signals will be determined in detail engineering.
- Pre-set sequence of approximately 13 cleaning zone valves and wash devices within each zone
- Pre-set flow rate (signal sent to CIP Kitchen for use) for each zone to ensure proper spray device operation
- User-configurable data table for time duration of each zone
- Storage/retrieval of approximately 10 timing tables to support cleaning options. (example; short wash, long wash, rinse only, etc)

CIP Kitchen interface with Spray Dryer to include:

- Corresponding hand-shakes
- Control of Cleaning media make-up, conditions, and delivery to Spray Dryer valve manifold.
- Ability to vary the delivery flow rate for each zone based on signal from GEA control system.
- Return liquid collection and handling.

Note: the CIP Kitchen PLC logic, control panel and all associated instrumentation is by others. GEA will define tie points for the spray dryer CIP supply, return and drain connections.

16.0 *OPTIONAL FEATURES, EQUIPMENT AND SERVICES*

16.1 EQUIPMENT ADDERS

16.1.1 High Pressure Feed Pump and Nozzle System

High pressure pump to include:
- membrane pump w/ motor
- 80 bar outlet pressure
- motor rated for non-hazardous location
- frequency converter (Danfoss) and associated power distribution

Pressure nozzle to include:
- make Delavan SDX (or similar)
- nozzle rod
- feed pipe in nozzle rod
- 3 set of nozzle inserts (sizes tbd)

Note: all interconnecting high pressure piping from high pressure pump and pressure nozzle is by others.

16.2 DOCUMENTATION ADDERS

16.2.1 SAT / IQ /OQ Documentation Package

All documentation written in accordance to GEA standard protocols

Documentation for customer's Site Acceptance Test (SAT)
- SAT Protocol and sub protocol templates for customer to complete on the controls specific parts
- test acceptance sheets
- calibration documents

Note: no site service is included with this option. Site service is available at the rates stipulated in Appendix A

Documentation for customer's Installation Qualification (IQ)
- IQ Protocol and sub protocol templates (where applicable)
- test acceptance sheets
- calibration documents

Note: no site service is included with this option. Site service is available at the rates stipulated in Appendix A

Documentation for customer's Operation Qualification (OQ)
- OQ Protocol and sub protocol templates for customer to complete on the controls specific parts
- test acceptance sheets

Note: no site service is included with this option. Site service is available at the rates stipulated in Appendix A

16.2.2 Material Traceability Certificates

Material traceability certificates are included for all stainless steel surfaces with product contact from drying chamber inlet to powder recovery component outlet (cartridge / bag filter). All product contact elastomers will include a general certificate of conformity.

17.0 *ITEMS NOT INCLUDED*

FOR INFORMATION- NOT INTENDED AS AN ALL-INCLUSIVE LIST

Transportation	Freight, (pre-paid and invoiced at cost)
	Unloading or local transport of equipment on site
Building & Civil works	All building and architectural work, foundations, wall or floor penetrations, structural steel, site preparation & excavation, flashing and counter-flashing, stair towers, supporting structures, monorails, hoists, lighting, heating, ventilation systems, hub drains, hose stations, heating and ventilation and fire protection connections, grouting of floors etc. except where specified in the technical section
	Access platforms, stairways and handrails
	Control and electrical rooms
Utilities	Utility piping & tubing
	Chilled water supply system
	Instrument air compressor to supply dry, oil-free air
Installation	Mechanical erection of the equipment including scaffolding, cranes, backing gas etc.
	Assembly of equipment in the workshop nor on site
	Installation of instrumentation
	Installation of insulation
	Manufacture or installation of support structures and pipe routes to and from GEA provided equipment
	Final painting of mild steel components
	Permits for installation of the equipment.
Insulation	Insulation work or insulation material if not specified in the technical section
Passivation	Passivation of equipment
Documentation	Material certifications or certificates of conformity, other than stated
	Qualification documentation, if not purchased as an option
Cleaning (CIP)	CIP Chemical storage
	CIP chemical dosing pumps
	Piping/tubing between chemical dosing pumps and dosing point
	CIP skid or kitchen
	CIP piping from CIP skid to equipment
	CIP equipment if not stated in the technical section
Electrical & Controls	Motor Controls Center (MCC)
	Power to MCC or MCP
	VFD's if not specifically mentioned in the technical section
	Lighting fixtures
	Provisions for grounding
	Lightning protection
	Instrument air or pneumatic signal lines and accessories
Upstream equipment	Any Mixing or feed preparation / storage equipment
	Evaporation or filtration equipment
	Feed tank or feed pump if not specified in the technical section
Exhaust and downstream equipment	Exhaust stack
	Emissions, odor, noise, or other Pollution control
	Product conveying system from discharge point
	Powder packing / handling or similar equipment
Miscellaneous	Spare parts if not specified in the technical section
	Federal, State, local or other taxes, present or future.
General	**Any item not specifically mentioned in the Proposal**

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