

ENGINEERING SPECIFICATION

Project No.:	Location:	No. Req'd: 3	Spec. No.:
Description: Horizontal Peeler Centrifuge			Item No.:
Tag Nos			
Layout Drawing No.:			
P&I Drawing No.:			
Enclosures: Standards			

1. SCOPE

- 1.1. Furnish horizontal Peeler Centrifuges as described herein
- 1.2. The vendor shall provide all necessary labor, equipment, and material required to design, document, manufacture, assemble, test and ship Horizontal Peeler Centrifuges, Model HZ 125/3.2Si.
- 1.3. The vendor shall furnish Krauss Maffei Horizontal Peeler Centrifuges Model HZ 125/3.2Si complete with:
 - 1.3.1. Hastelloy C-22 filtration media w/ PVDF Backing (Total 10 - Three (3) installed and seven (7) spare).
 - 1.3.2. Main shaft seal with purge.
 - 1.3.3. Feed pipe with distributor mouth.
 - 1.3.4. Thermal feed controller (TFKR) with level and temperature analog outputs.
 - 1.3.5. Wash pipe with nozzles.
 - 1.3.6. Broad peeler mechanism with hard faced knife.
 - 1.3.7. Solids discharge screw conveyor.
 - 1.3.8. Inert gas purge connection.
 - 1.3.9. Door lock with zero speed monitor.
 - 1.3.10. Sight glass (2) with rinse.
 - 1.3.11. ANSI flanged connections.
 - 1.3.12. Rear housing vent connection.
 - 1.3.13. Overflow/housing drain pipe.
 - 1.3.14. Vibration isolation elements.
 - 1.3.15. Lubrication unit.
 - 1.3.16. Hydraulic power unit.
 - 1.3.17. Vibration monitor.
 - 1.3.18. Transport lock.
 - 1.3.19. Variable frequency drive system with drive motor and v-belt drive with guard.
 - 1.3.20. Instrumentation and wiring as described in Section 3.0.
 - 1.3.21. One set of special tools.
 - 1.3.22. Provisions to install heel removal system in the future. This includes a port in the door and space on the hydraulic manifold to add two hydraulic control valves in the future.
 - 1.3.23. Provisions for Clean In Place (CIP) system for in-situ cleaning of housing shell, housing/basket rear, basket interior, and door components.
- 1.4. Purchaser will furnish the following:
 - 1.4.1. Foundations, including inertia blocks, based on dimensions and design information furnished by vendor.
 - 1.4.2. Motor service disconnect, electrical wiring and installation.
 - 1.4.3. Receiving, storage and field erection.
 - 1.4.4. DCS control system for operating the centrifuge.

* DENOTES INFORMATION TO BE SUPPLIED OR VERIFIED BY VENDOR

REVISIONS	4			Spec. By	
	3			Checked By	
	2			Plant Engineer	
	1			Process Engineer	
	0	For Purchase		Project Approval	
	P	For Quotation			

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2. CODES AND STANDARDS

- | 2.1 | Standard | Description |
|-----|----------|---|
| | 5.2.1 | Mechanical Equipment, Supplementary Design & Fabrication Specifications. |
| | 16150 | Motor Specification |
| | MKC 404 | Manufacturer's Data Requirements for Mechanical and Electrical Equipment. |
| | MB 405 | Manufacturer's Data Copy Requirements for Vessels and Fabricated Equipment. |
| | MB 405A | Requirements for Design Drawings of Centrifuges |
- 2.2 The components and wiring methods shall comply with all the applicable and current standards of NEMA (National Electrical Manufacture's Association) and UL (Underwriter's Laboratories, Inc.).
- 2.3 The complete electrical installation shall conform to the requirements of the current edition of the National Electrical Code, National Fire Protection Association Standards and Practice (NFPA) including publications #497A and 497B, and any local codes or regulations having jurisdiction.

3.0 INSTRUMENTATION AND CONTROLS PROVIDED BY VENDOR

3.1 Equipment Manufacturers

- 3.1.1 All required electrical, controls, and instrumentation equipment supplied by the vendor shall be from the Bayer approved manufacturers as identified in this specification. Any deviation from these listed manufacturers shall be identified as a non-conformance.
- 3.1.2 Any required electrical, controls, and instrumentation equipment, where the Bayer preferred manufacturer is not indicated in this specification, shall be listed with manufacturer and model number as part of the vendors bid submittal.

3.2 Service Conditions

- 3.2.1 Equipment shall perform satisfactorily when operated in the environment described in the mechanical sections of this specification. The Electrical Area Classification for the area where the equipment will be located will be: Class 1, Division 2, Group D.

3.3 Electrical Loads

- 3.3.1 Vendor shall provide a complete list of all electrical loads for the equipment being supplied.
- 3.3.2 The vendor load list shall include all motors, VFD drives, load panels, distribution panels, transformers, power feeds, etc.
- 3.3.3 The vendor shall provide complete power consumption information for each load to include all applicable information such as voltage, current, watts, HP, KVA, etc. as applicable.

3.4 Motors, Variable Frequency Drives, and Starters

- 3.4.1 Motors shall meet the requirements of the attached motor specification.
- 3.4.2 Unless specifically stated otherwise in this specification, Bayer shall provide all motor control center full voltage starters required by the vendor's equipment.
- 3.4.3 The vendor shall supply all variable frequency drives as required by the equipment.
- 3.4.4 Motors shall include, but not be limited to:
- 3.4.4.1 Centrifuge Main Drive motor
 - 3.4.4.2 Centrifuge Screw Conveyor motor
 - 3.4.4.3 Hydraulic Pump motor
 - 3.4.4.4 Lubrication Pump motor

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3.5 Control System

- 3.5.1 Control functionality of the centrifuge shall be performed through the Owner supplied Fisher Provox DCS System.
- 3.5.2 The Owner's DCS system utilizes 24VDC field interrogation voltage as the preferred method of field device signaling.
- 3.5.3 The Owner's DCS system utilizes Intrinsic Safe Wiring Design where approved devices are used.

3.6 Junction Boxes

- 3.6.1 The vendor shall provide separate junction boxes for 480VAC, 120VAC, 24VDC non-intrinsic, and 24VDC Intrinsic.
- 3.6.2 The vendor shall provide information for any device that exceeds the above listed voltages.
- 3.6.3 Devices requiring external connections shall be wired to terminals or lugs in the appropriate junction box.
- 3.6.4 Junction boxes shall be non-metallic construction, rated NEMA 4X, and rated for the electrical classification of the area.
- 3.6.5 Type Z purging shall be allowed as an acceptable method for meeting Class 1, Division 2 electrical classification. The vendor shall provide the complete Type Z purging system if this method is utilized.

3.7 Wiring Methods

- 3.7.1 Intrinsic safe wiring methods, for approved devices, shall be used throughout the control wiring.
- 3.7.2 Non-intrinsically safe wiring, where required, shall be in a separate junction box from the intrinsic safe wiring.
- 3.7.3 The vendor shall furnish and mount NEMA 4/4X rated junction boxes with Class I, Div. 2, Group D electrical classification on the centrifuge.
- 3.7.4 All vendor supplied junction boxes shall be clearly labeled on the exterior of the box with either "Intrinsic Safe Wiring" or Non-intrinsic Safe Wiring" as applicable.
- 3.7.5 The vendor shall pre-wire all field instrumentation and electrical devices to vendor supplied terminal blocks in the junction boxes.
- 3.7.6 Intrinsic Safe Barrier devices shall be Pepperl+Fuchs.

3.8 The vendor shall provide a common air header that supplies air to all the solenoid valves used in the hydraulic system.

3.9 Instrumentation

- 3.9.1 Centrifuge Unit: The vendor shall provide the following field devices pre-wired to the centrifuge field junction box:
 - 3.9.1.1 Pepperl+Fuchs Namur-type inductive proximity sensors for:
 - 3.9.1.1.1 Access door locked
 - 3.9.1.1.2 Access door closed
 - 3.9.1.1.3 Peeler knife in
 - 3.9.1.1.4 Peeler knife out
 - 3.9.1.1.5 Siphon in
 - 3.9.1.1.6 Siphon out
 - 3.9.1.1.7 Siphon prime
 - 3.9.1.1.8 Siphon work
 - 3.9.1.1.9 Centrifuge speed
 - 3.9.1.1.10 Screw Conveyor speed
 - 3.9.1.2 Thermal Feed Controller System potentiometer.
 - 3.9.1.3 Thermal Feed Controller System temperature
 - 3.9.1.4 Safety Door Lock solenoid (24VDC coil)
 - 3.9.1.5 Vibration Transducer and cable for termination in centrifuge field junction box.

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- 3.9.1.6 The vendor shall provide mounting brackets for Berthold nuclear density source and sensors mounted to provide an unobstructed view through the basket of the centrifuge.
- 3.9.2 Hydraulic Unit: The vendor shall provide the following field devices pre-wired to the hydraulic unit field junction box as follows:
- 3.9.2.1 Hydraulic control pressure switch.
- 3.9.2.2 Hydraulic filter Not Clogged switch.
- 3.9.2.3 Hydraulic Tank Level switch.
- 3.9.2.4 Tank Temperature switch.
- 3.9.2.5 The vendor shall provide a dry contact interface rated for 24VDC for all switch devices.
- 3.9.3 Lubrication Unit: The vendor shall provide the following field devices pre-wired to the lubrication unit field junction box:
- 3.9.3.1 Front Bearing oil flow switch.
- 3.9.3.2 Rear Bearing oil flow switch.
- 3.9.3.3 Oil Filter Not Clogged switch.
- 3.9.3.4 Lube Tank Level switch.
- 3.9.3.5 Lube Tank Temperature switch.
- 3.9.3.6 The vendor shall provide a dry contact interface rated for 24VDC for all switch devices.
- 3.9.4 Loose Devices: The vendor shall provide the following devices loose in shipment ready for installation by Owner into Owner's "safe area" control room:
- 3.9.4.1 VFD Drive system for centrifuge unit.
- 3.9.4.2 Thermal Feed Controller System (TFKR unit):
- 3.9.4.2.1 Control module
- 3.9.4.2.2 Keypad
- 3.9.4.2.3 LCD display
- 3.9.4.2.4 Cables
- 3.9.4.3 Vibration switch and signal converter
- 3.9.4.4 Intrinsic Safe barriers for vibration signal.
- 3.9.4.5 Screw conveyor zero speed switch/intrinsic safe barrier.
- 3.9.4.6 Parker/Skinner Intrinsically safe solenoid valves for:
- 3.9.4.6.1 Siphon In
- 3.9.4.6.2 Siphon Out
- 3.9.4.6.3 Peeler In
- 3.9.4.6.4 Thermal Feed Controller System (TFKR) Level Sensor
- 3.9.4.6.5 Solenoid valves shall be intrinsically safe solenoid valves with 24VDC coils and brass or aluminum bodies.
- 3.9.4.6.6 Solenoids shall utilize intrinsically safe design with air pilot actuation as necessary.
- 3.9.4.7 Centrifuge speed sensor signal converter/intrinsic safe barrier. Safe area speed signal shall be 4-20ma.
- 3.9.5 Tagging
- 3.9.5.1 For the purpose of physical tagging, drawing tag reference and description of operation tag reference; the devices shall be tagged for each centrifuge provided according to the "*Centrifuge Device Tagging List*" (to be provided later).
- 3.9.6 Documentation
- 3.9.6.1 The successful vendor shall provide the following documentation within three weeks from the award of contract:
- 3.9.6.1.1 Power requirements list for the centrifuge package including motors, transformers, and power feeds including all voltage, amperes, watts, HP, and KVA requirements.
- 3.9.6.1.2 Detailed Wiring Diagrams showing all internal wiring and external customer connections for power and signaling.
- 3.9.6.1.3 Hydraulic Schematics and Bill of Materials.

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- 3.9.6.1.4 Layout and Bill of Materials for all junction boxes and associated field devices.
- 3.9.6.1.5 Bill of Materials for loosely shipped items.
- 3.9.6.1.6 Manufacturer's installation and startup procedures for package including all major supplied components including, but not limited to:
 - 3.9.6.1.6.1 VFD system
 - 3.9.6.1.6.2 TFKR system
 - 3.9.6.1.6.3 Manufacturer's catalog cutsheet information for all devices supplied.
 - 3.9.6.1.6.4 Description of Operation

4.0 SERVICE CONDITIONS AND PERFORMANCE REQUIREMENTS

4.1 JAU Step 6 Service

4.1.1 Feed Material Specifications

Feed Material: JAU Hydrazine Slurry
 Feed Rate: 1,320 lb/batch
 22 gpm
 Solids Content of Feed: 24% by weight

Note: Batch time is approximately 0.5 hours. Before each cycle, the centrifuge is backflushed with 50 gallons of toluene.

4.1.2 JAU Hydrazine Slurry

Feed Material: JAU Hydrazine Slurry
 Temperature: 40 Deg C
 Viscosity: <1.5 cP
 Specific Gravity: 0.96
 Cake Density: 570 kg/m³

4.1.3 Wash Liquid No. 1 (Toluene)

Wash volume: 25 gallons
 Temperature: 20-30 Deg C
 Viscosity: <1 cP
 Specific Gravity: 0.86

4.1.4 Wash Liquid No. 2 (Toluene) Used for clean-out purposes only.

Wash Volume: 100 gallons
 Temperature: 20 -30 Deg C
 Viscosity: <1 cP
 Specific Gravity: 0.86

After the wash, the cake is spun for 12 minutes to dry the solids to below 20 wt % moisture content. The cake weight is approximately 310 pounds (dry basis) after being washed and spun. The centrifuge system is kept under a negative pressure of -5 in W.C. and inerted with nitrogen.

Note: Any elastomers used in the centrifuge must be compatible with both Hydrazine Hydrate and Toluene.

4.2 JAU Step 8 Service

4.2.1 Feed Material Specifications

Feed Material: Centrifuge Feed Slurry
 Feed Rate: 1600 lb/batch

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Solids Content of Feed: 45 gpm
24.5% by weight

Note: Batch time is approximately 20 minutes. Before each cycle, the centrifuge is backflushed with 25 gallons of *toluene*.

4.2.2 JAU in Toluene Slurry

Feed Material: JAU Toluene Slurry
Temperature: 5 - 10 Deg C
Viscosity: <5 cP
Specific Gravity: 0.89
Cake Density: 760 kg/m³

4.2.3 Wash Liquid No. 1 (Toluene)

Wash volume: 25-50 gallons
Temperature: 5-10 Deg C
Viscosity: <1 cP
Specific Gravity: 0.88

4.2.4 Wash Liquid No. 2 (Toluene) Used for clean-out purposes only.

Wash Volume: 100 gallons
Temperature: 20-30 Deg C
Viscosity: <1 cP
Specific Gravity: 0.86

After the wash, the cake is spun for 5 to 10 minutes to dry the solids to below 10-20 wt % moisture content. The cake weight is approximately 395 pounds (dry basis) after being washed and spun. The centrifuge system is kept under a negative pressure of -5 in W.C. and inerted with nitrogen.

Note: Any elastomers used in the centrifuge must be compatible with THF, Hydrazine Hydrate, and Toluene.

4.3 Cycle Times/Volumes

4.3.1 Step 6 Operation (based on Bayer Piloting Information).

4.3.1.1 Cycle Description – Start to End

Duration: 30 minutes
Basis: 2 cycles/hour

4.3.1.2 Backflush w/Toluene

Volume of Feed: 25 gallons
Duration: 0.5 minutes
Feed Rate: 50 gpm

4.3.1.3 Feed/Filling

Volume of Feed: 170 - 190 gallons
1320 pounds (slurry)
Duration: 10 minutes
Feed Rate: 22 gpm

4.3.1.4 Wash (Toluene)

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Volume of Feed: 24 gallons
170 pounds
Duration: 2.5 minute
Average Feed Rate: 10 gpm

4.3.1.5 Dry Spin
Duration: 12 minutes

4.3.1.6 Discharge
Duration: 1 minute
Moisture Content 20 wt %
Cake Weight 310 pounds (dry basis)

4.3.2 Step 8 Operation (based on Bayer Piloting Information).

4.3.2.1 Cycle Description – Start to End
Duration: 20 minutes
Basis: 3 cycles/hour

4.3.2.2 Backflush w/Toluene
Volume of Feed: 25 gallons
Duration: 0.5 minutes
Feed Rate: 50 gpm

4.3.2.3 Feed/Filling
Volume of Feed: 180 gallons
1600 pounds (slurry)
Duration: 5 minutes
Feed Rate: 45 gpm

4.3.2.4 Wash (Toluene)
Volume of Feed: 25-50 gallons
180-370 pounds
Duration: 2.5 minute
Average Feed Rate: 25 gpm

4.3.2.5 Dry Spin
Duration: 5 minutes

4.3.2.6 Discharge
Duration: 1 minute
Moisture Content 10-20 wt % (Toluene)
Cake Weight 395 pounds (dry basis)

Note: 5 minutes are included in the cycle time for changing speeds.

4.4 Filter/Gasket Material of Construction

Filter cloth: Hastelloy C-22 w/ PVDF Backing, 25 micron (maximum)
Gaskets: PTFE

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4.5 General Service Conditions

Service:	Continuous
Location:	Indoors
Elevation:	730 ft above sea level (14.39 psia)
Power Available:	460v/3ph/60hz for ½ HP and larger motors 110v/3ph/60hz for motors smaller than ½ HP
Electrical Enclosures:	Refer to Motor Specification

5.0 MATERIALS AND DETAILS OF CONSTRUCTION

5.1 Housing

The centrifuges shall be a welded steel plate design with the housing, bearing block and base plate making up a single welded unit. Rear housing vent connection and tangentially arranged filtrate discharge pipe shall be furnished on the housing. The housing door shall extend over the full diameter of the front of the housing and shall swing on maintenance-free hinges. Clamping screws shall hold the door closed and an FEP encapsulated o-ring shall seal the door. The door shall have flanged connections for the feed pipe, wash pipe, discharge pipe, feed control unit and sight glass. All parts in contact with the process shall be Hastelloy – C22. The maximum design pressure of the centrifuge shall be 0.6 psig at 80 degrees centigrade. Suitable grounding clips of the manufacturer's standard design shall be provided on the housing. External bolting shall be stainless steel.

5.2 Filter Basket

The filter basket shall be of solid Hastelloy – C22 having a solid bowl design capable of backflushing the filter cake. The basket shall be dynamically balanced and all welding seams shall be 100% x-rayed. The basket shall be attached to the centrifuge shaft by a bolted and flanged connection. A spacer mesh and support screen shall be fastened to the basket to support the filter cloth. The Hastelloy C-22 w/ PVDF backing filter cloth shall be fixed by manufacturer's method. A total of 10 clothes shall be provided.

5.3 Each centrifuge shall have a mounting bracket for a Berthold nuclear density sensor, mounted to provide an unobstructed "view" through the basket.

5.4 Shaft, Seal and Bearings

The centrifuge drive shaft shall be 25 Cr. Mo. 4 (ASTM 4130), forged and heat treated, designed to withstand extreme load imbalances. The shaft protection bushing shall be Hastelloy C-22 (DIN 2.4602). The shaft seal shall be designed for nitrogen purging. The bearings shall be designed for long service life and reliability, with an L-10 life of 40,000. Bearings shall be lubricated by a manufacturer's standard lubrication unit including pump and reservoir with all necessary controls and interlocks required for the lubrication system.

5.5 Feed Pipe

The feed pipe shall be ANSI flanged and designed to uniformly distribute the feed slurry into the bowl. It shall be equipped with a distributor that can be adjusted to the requirements of various fluid properties. All parts of the feed pipe and distributor mouth in contact with the process liquids shall be of Hastelloy – C22.

5.6 Backwash Pipe

The backwash pipe shall be ANSI flanged and designed to introduce toluene into the backflush chamber for backflushing the residual heel cake. All part of the backwash pipe in contact with process liquids shall be of Hastelloy – C22.

5.7 Controller

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Each unit shall include liquid and cake level measurement devices to prevent overflowing of the centrifuge. Discrete signals from this unit are sent to a user provided DCS system, which is used to control the centrifuge operation.

5.8 Wash Pipe

A wash pipe shall be furnished and shall include spray nozzles for washing cake. The wash pipe shall be of Hastelloy –C22 and shall be furnished with an ANSI flanged connection on the housing door.

5.9 Peeler Mechanism

The peeler shall be the broad knife type with the peeler knife being as wide as the solids layer in the basket. The peeler shall be fixed on a pivoting device with the shaft load being carried on tapered roller bearings. The mechanism shall be equipped with a hydraulic drive unit complete with motor. The shaft shall be provided with a seal where it passes through the housing door. Parts of the peeler unit in contact with the process shall be constructed of Hastelloy – C22.

5.10 Solids Discharge Screw Conveyor

Discharge of the peeled solids shall be accomplished by a discharge screw conveyor. The screw conveyor shall be mounted in a cylinder with the shaft riding on grease-lubricated bearings on the drive end and a teflon bushing on the tail end. The screw conveyor shall be furnished with its own electrical drive motor. All parts of the screw conveyor in contact with the process shall be of Hastelloy – C22.

5.11 Vibration Isolators

One set of spring type vibration isolators for resilient mounting of the inertia block and centrifuge shall be provided for each centrifuge. An extra set (1) of spring type vibration isolators shall be provided for a future centrifuge. The machine shall be designed for installation on a manufacturing floor without special provisions for vibration or vibration isolation beyond that provided by the inertia block and vibration isolators. The inertia block is provided by others.

5.12 Variable Frequency Drive System

Each centrifuge motor shall be driven by a 100 HP, 1800 rpm, TEFC motor with V-belt drive through a ABB Automation PWM regenerative variable frequency drive, Model 800. Electrical braking and ramping of the machine shall be provided. The variable speed drive shall be mounted in a free standing enclosure with the door interlocked to the input circuit breaker. Bayer will install the variable frequency controller in an unclassified Motor Control Center. System shall accept a dry contact input from the customers safety system. An open contact shall invoke the emergency electrical braking.

System shall provide input noise suppression. System shall provide for a spinning load start. System shall provide a separate output; fault analysis accessible via ABB software. All software for programming the system from an MS Windows compatible laptop shall be provided.

LCD digital display and keypad on front face of VFD that will include the following functions and displays:

- 5.12.1 Power “ON” light
- 5.12.2 Motor “RUN” Indication
- 5.12.3 VFD “FAULT” Indication
- 5.12.4 “RESET” push-button
- 5.12.5 RPM Indication
- 5.12.6 Voltage Indication
- 5.12.7 Amperage Indication
- 5.12.8 “Local / Remote” selector switch
- 5.12.9 “START/STOP” push-buttons

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5.12.10 Manual speed set via keypad

5.12.11 Current

5.12.12 Frequency

5.12.13 KW indication

5.13 Vibration Monitor

Each centrifuge shall be furnished with a Schenk Model Vibrocontrol 920 vibration monitor (accelerometer) to shut down the machine if excessive vibration occurs. The monitor shall be programmable and all software shall be included.

5.14 Lubrication Unit

Each centrifuge shall have a lubrication unit to lubricate the centrifuge bearings. The unit shall include all necessary pumps, motors, tanks, piping, wiring and instrumentation to provide a complete unit.

5.15 Hydraulic Unit

Each centrifuge shall have a hydraulic unit for operating the peeler mechanism with all necessary hydraulic pumps, motors, accumulator and instruments.

5.16 Motors

All motors other than main centrifuge drive motors shall be furnished according to Bayer Engineering Standard "Motor Spec Sheet for TEFC Standard Efficiency Motors." Bayer will provide starters and power wiring.

5.17 V-Belt Drives

V-belts shall be static conducting type furnished according to Bayer Standard 5.2.1, Section 9. V-belt guards shall be furnished per Bayer Standard 5.2.1, Section 8.3.

5.18 Nitrogen Blanket

Each centrifuge shall be designed for a nitrogen blanket.

5.19 Each centrifuge shall have a TFKR Thermal Feed Controller for optimum feed level and solids' protection control, complete with electrical hardware and hardware for hydraulic power pack.

5.20 Sealings shall consist of the following:

- Flat Gaskets PTFE
- Radial Sealings FEP Encapsulated Viton
- Non-Wetted Sealings Buna-N
- Shaft Sealing Disc PTFE, Graphite
- Shaft Seal Ring 1.4571/PTFE mod.

6.0 CONTROL SYSTEM

Control of each centrifuge's operation will be by a user supplied Fisher Provox DCS system.

7.0 PAINTING

Limit paint lead content to 5 ppm or less. Painting shall be manufacturer's standard for severe chemical service.

Primer: Two part zinc rich primer Permacor 2311/Rapid (epoxy resin)

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Intermediate: Two part EP-MIO Coating Permacor 2329/EG-Rapid (epoxy – micaceous iron oxide coating)

Top Coats: Two part AY-PUR Permacor 2330 (acrylic polyurethane)

Standard Color RAL 5010 (Royal Blue)

Do not paint stainless steel or Hastelloy – C22. Unpainted carbon steel machined surfaces exposed to the atmosphere, shall be coated with rust preventative. All painted surfaces shall be free of rust, grease, oil, mill scale, etc prior to painting. Touch-up paint for repainting of up to 20% of the machine shall be provided.

8.0 ASSEMBLY AND START-UP ASSISTANCE

Manufacturer's qualified engineer will be required at the job site to instruct and assist Bayer personnel with assembly, installation, care and maintenance of the equipment and with start-up. The seller shall include five days of service at no charge and quote a per-diem rate for any additional services.

9.0 SPECIAL TOOLS

One set of special tools required for operation and maintenance of the centrifuge shall be furnished. They shall include basket and shaft lifting tool, peeler bearing tool, main bearing tool, and a set of metric hand tools with tool box.

10.0 TESTING

The vendor shall submit certified inspection reports for the following tests:

- Radiographic examination of basket welds
- Dynamic balancing of filter basket
- Vibration measurements
- Run test

11.0 PREPARATION FOR SHIPMENT

11.1 Preparation for shipment shall be manufacturer's standard for protection against damage and loss. Flanged connections shall be covered with wood or other suitable material and fastened securely.

11.2 All surfaces of equipment, both interior and exterior, shall be cleaned of grease, chips, dirt and other foreign material.

11.3 Threaded connections shall be inspected and irregularities corrected. Threads shall be given a rust preventative coating and shall be protected from damage.

11.4 Small items shall not be shipped loose. They shall be placed in cloth bags, wooden crates or boxes that shall be properly identified with equipment name, item number and purchaser's purchase order number.

11.5 Shipments to the site shall contain complete units with drives (unless otherwise requested) to reduce field assembly. If complete units are too large to ship assembled, then each shipped unit shall be match-marked for ease of field assembly.

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- 11.6 Any shipping cradles must be fastened to the centrifuge so they stay attached as the centrifuge is unloaded from the truck. (This makes it safer for the crew that unloads the centrifuge and sets it on the ground. They don't have to position the cradle under the centrifuge while it is suspended from the unloading crane.)

12.0 ENGINEERING INFORMATION

- 12.1 The following engineering information is to be transmitted by the vendor as an anchor bolt plan for the design of footing and foundation by others.

- 12.1.1 The size, number and location of all bolt holes
- 12.1.2 Location of each bolt hole as dimensioned from the drive end
- 12.1.3 Anchor loadings
- 12.1.4 Center of gravity for all major components
- 12.1.5 Static and dynamic loads in the X, Y, and Z planes
- 12.1.6 Location of vibration isolators and placement of inertia block

- 12.2 Complete drawings for purchasers' approval of the basic design and arrangement only. The vendor shall be responsible for correct dimensions, design and function of the equipment. Drawings and data shall be identified with the purchase order, work order, and equipment numbers and transmitted according to the instructions given in the purchase order and the attached "Vendor Data Requirements Form" for required number of submittals. Maximum drawing size shall be 22" x 34".

- 12.3 Required clearances from edge of unit for vibration.

13.0 ACCEPTANCE AND INSPECTION

- 13.1 A factory acceptance test (FAT) will be conducted at the vendor's facility prior to shipment. The vendors computerized test stand shall be used to test and simulate the operation of the centrifuge from an electrical / mechanical standpoint. The vendor shall submit proposed FAT procedures to purchaser for approval at least 60 days prior to FAT. The vendor shall notify the purchaser thirty days prior to FAT of the proposed schedule for the test. Purchaser reserves the right to delay the test up to two weeks.

- 13.2 Upon completion of installation, purchaser may require an acceptance test. If the test is required, purchaser shall notify vendor of readiness for test that shall be conducted within thirty days after start-up. Vendor, at his option, may be represented at such a test that shall consist of eight hours of system operation under the design conditions. For purposes of testing, purchaser shall furnish sufficient supervisory and other personnel, material specified to be handled, power, utilities and facilities so that any testing may proceed without delay. The vendor shall be responsible for correcting any equipment deficiencies as determined by the test that are due to deficiencies in the design of vendors supplied equipment. This may include additional or replacement equipment.

14.0 GUARANTEES

- 14.1 The vendor shall guarantee the mechanical design, workmanship and materials of the equipment. The guarantee period shall be twelve months after start-up but no longer than 18 months after shipment.
- 14.2 If any defective parts or workmanship are found within the guarantee period, vendor shall, upon prompt written notice by the purchaser of said defect, at purchasers' option, do one of the following:

Project No.:	Location: Kansas City, MO	No. Req'd: 3	Spec. No.:
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- 14.2.1 At vendor expense, and at the earliest mutually agreed time, make necessary repairs or replacement required to correct the deficiency at the purchasers' plant.
- 14.2.2 Reimburse purchasers' costs for necessary repairs or replacement immediately after notification by the purchaser.

14.3 The vendor shall guarantee field free noise levels at 3 feet of 80 db(A) or less.

15.0 TECHNICAL INFORMATION (per quotation)

Manufacturer:	Krauss-Maffei
Model No.:	<i>HZ 125/3.2Si</i>
Basket Diameter, mm:	1250
Basket Length, mm:	800
Filter Cake Volume, Cu. Ft.	11.65 Nominal/10.77 Active
Basket Speed, rpm (Operating):	1295
Basket Speed, rpm (Maximum):	1295
Max Centrif Force, G-Factor:	1165
Feed Pressure Required, psig:	7
Housing Design Press, psig:	0.6
Nitrogen Purge Press, psig:	3-10
Nitrogen Purge Flow, scfm:	1-5
Wash Liquid Press, psig:	30-45
Materials of Construction:	
Housing:	Solid Hastelloy – C22
Door:	316 SS w/ 3 mm Hastelloy C-22 Lining
Backwall:	Carbon Steel w/ 5mm Hastelloy C-22 Lining
Main Shaft:	25 Cr Mo 4 (ASTM 4130)
Filter Media:	Hastelloy – C22 w/ PVDF backing.
Feed Pipe:	Solid Hastelloy – C22.
Wash Pipe:	Solid Hastelloy – C22.
Peeler Knife:	Solid Hastelloy – C22.
Discharge Screw:	Solid Hastelloy – C22.

Connection Sizes, Inches (ANSI/150#)

Feed Inlet:	3
Cake Wash:	1 ½
Backwash:	2
Nitrogen Purge:	½ NPT w/1" ANSI 150# RF Adapter
Solids Discharge:	10
Filtrate Discharge:	3
Housing Drain:	6
Vent:	3

Centrifuge Drive Equipment:

Drive Motor:	
Manufacturer:	TECO
Enclosure:	TEFC/Mill-Chem
Frame No.:	365T
HP/rpm:	100/1800
V-Belt Drive:	
No. of Belts:	6

ENGINEERING SPECIFICATION

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Project – Area – Item

Project No.:	Location: Kansas City, MO	No. Req'd: 3	Spec. No.:
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Belt Size: 5V x 1180
 Service Factor: 1.3
 Drive Sheave, In 11.2
 Driven Sheave, In 15.4

Bearings:

Manufacturer/Model: FAG
 Bearing Type: Roller/Ball
 Bearing Size: NU244
 Lubrication: Oil
 L10 Life: 40000

Shaft Seal:

Type/Size: Sealing Disk
 Materials: PTFE Graphite
 Purge Press, psig: 3
 Purge Flow, cfm: 0.6-1.0

Discharge Screw:

Screw Diameter, inches: 10
 Screw Speed, rpm: Approx. 100
 Drive Motor:
 Manufacturer: TECO
 Enclosure: TEFC/Mill-Chem
 Frame No.: 184T
 HP/rpm: 3/1800

Lubrication Unit:

Reservoir Size, Gallons: 20
 Pump Rating, gpm: 1.8
 Pump Disch Press, psig: 65
 Drive Motor:
 Manufacturer: TECO
 Enclosure: TEFC/Mill-Chem
 Frame No.: 143TC
 HP/rpm: 1.0/1800

Hydraulic Power Unit:

Reservoir Size, Gallons: 20
 Pump Rating, gpm: 2.9
 Drive Motor:
 Manufacturer: TECO
 Enclosure: TEFC/Mill-Chem
 Frame No.: 145TC
 HP/rpm: 2.0/1800