01. One each Wenger X-185 Optima Extruder:

◆ Extruder Frame:
   ◦ Hygienic design, mild steel extruder frame.
   ◦ Controls configured as left hand.
   ◦ Extruder base elevated at a height of 0.00” (0mm).

◆ Extruder Drive:
   ◦ Oil lubricated bearing housing with extruder drive shaft, including oil reservoir, oil pump and 0.4 kW (0.5 hp) motor.
   ◦ V-belt extruder drive suitable for up to 300 kW (400 hp) with variable frequency drive.
   ◦ Motor slide rails furnished by Wenger.

◆ Rail Hoist System:
   ◦ Mounts over extruder barrel and extends forward of barrel.
   ◦ Normally free standing from floor with legs. Optionally may be hung by client from ceiling or walls.
   ◦ Mild steel construction.
   ◦ Beam rail with manual chain hoist for moving extruder heads and other barrel components as required.
   ◦ If back pressure valve (BPV) is included, hoist may be used to move it out of way for maintenance or when BPV not required for some products:
      ▶ For that purpose it includes a transfer cart with castors to support BPV.
   ◦ When pneumatic hood option is included, it includes a tubular support frame:
      ▶ This permits hood to be moved to accommodate changes in die location, and to be moved completely out of way for barrel maintenance.
      ▶ Requires that hood be connected to negative airlift conveying system with suitable flexible hose section.
   ◦ It includes a tubular support frame for hanging knife stand frame free of floor:
      ▶ It permits knife drive to be moved to accommodate changes in die location, and to be moved completely out of way for barrel maintenance.

◆ Back Pressure Valve (BPV):
   ◦ Permits control of extruder barrel pressure independent of final die to control piece density, degree of cook and cell structure.
   ◦ Permits diversion discharge of product before die during start up and shut down.
   ◦ Mild steel housing to adapt between extruder final head and die plate.
Valve stem of stainless steel construction:
- Valve seat position C for die relief.
- Includes mechanical stop to prevent valve from being stopped in a completely blocked position.
- Valve seat position A for adjusting back pressure on extruder barrel.
- Valve seat position B for discharge to waste.

BPV Floor Cart:
- Stainless steel cart to support BPV when needed to move BPV out of way for maintenance.
- Cart mounted on castors.

Electric Linear Positioner:
- Electrical cylinder with ball lead screw.
- Process/reject pushbuttons mounted in fiberglass control box mounted near extruder downspout.
- Brushless servo motor with servo drive, rated for 6 ampere continuous duty.
- 6 kVA, 3 phase, isolation transformer with shield and copper windings (shipped loose).
- IP65 (NEMA 4) (water tight) mild steel control panel enclosure to be installed by client:
  - Includes cable set to connect to servo motor on BPV:
    - 15 meters (49 feet) is furnished unless otherwise specified.
    - Cable sets up to 25 meters (82 feet) may be furnished if requested. Longer cables will be at extra cost.
  - Designed for control from extruder APM using 0-10 V signal.

Note: Barrel pressure behind Back Pressure Valve is not to exceed 100 bar (10000 kPa) (1500 psig).

Extruder Main Drive Motor With Variable Frequency Drive:
- 300 kW (400 hp) drive motor (inverter duty) with variable frequency drive.
- Client to provide environment for IP10 (NEMA 1) controller enclosure such that ambient conditions do not exceed 95% relative humidity and 40 °C (105 °F) temperature.

Extruder Section:
- Extruder barrel consisting of seven segmented heads and rotating elements.
- Non-sleeved inlet head.
- Intermediate and final extruder heads sleeved with replaceable wear resistant stainless steel liners.
- Extruder rotating elements constructed of special hardened alloy stainless steel.
 Barrel end shaft support.
 Instrumentation and injection ports along length of extruder barrel.
 Injectors for adding steam and water into extruder barrel.

◆ Extruder Dies:
 Four extruder dies for four distinct products.
 Designed to make standard Wenger products described in Section C. If client requires certain product specifications, development and refinement costs to achieve those specifications are not included, and are detailed in Section I.
 Die specifications may be specified by client. If client die specifications are not received by Wenger at least eight weeks prior to load date, dies will be selected by Wenger Process Team experts to make products listed. Any changes to dies required by client will be at client expense.
 One die hinge assembly.

◆ Model 1500 High Intensity Preconditioner:
 Designed to substantially increase distributive mixing.
 Double shafted, differential speed preconditioning system of 304 stainless steel construction. (316 stainless steel construction is recommended for acid injection or other low pH applications. Special Order required for 316 stainless steel construction.)
 1500 liter (54 cubic feet) free volume.
 Includes hinged access doors for inspection, service and cleaning.
 Fixed beaters.
 Injection ports are included for steam, water and other liquid ingredients.
 Steam/Water mixing injection (SMI) system:
  ☳ Water and steam plumbing components and injectors to static mixer.
  ☳ Static mixer column.
  ☳ Automated process liquid control valve for delivery of steam/water blend to preconditioner.
  ☳ Automated condensate RTD and solenoid valve.
 Dust-tight Downspout Diverter Assembly:
  ☳ Enclosed, air operated swinging bucket diverter with bypass spout of stainless steel construction.
  ☳ Manufactured to close tolerances to contain excess steam and fines.
  ☳ Hinged, swing-out design to allow easy access for maintenance and cleaning.
 Cylinder support structure.
 Meat injection port.
 22 kW (30 hp) and 38 kW (50 hp) constant speed drive motors with variable frequency drives. (Allows both variable speed and reversing.)
 During installation client responsible for having both drive motors professionally laser aligned to specifications detailed in Wenger Installation Manual.
◊ Wenger control panel (manual or APM) permits choice of high, medium or low mixing intensity.

◆ Model 9 Screw Feeder:
  ◊ Stainless steel screw and housing with quarter section cleanout.
  ◊ 2.2 kW (3 hp) drive motor with variable frequency drive.

◆ Model 150 Bin:
  ◊ Anti-bridging circular bin of stainless steel construction.
  ◊ High and low level switches.
  ◊ Inspection door and sight glasses.
  ◊ 5.5 kW (7.5 hp) constant speed drive motor.
  ◊ Client to suspend feed system from ceiling.

◆ Gravimetric (Loss-In-Weight) Feed Control:
  ◊ Stainless steel surge bin with air operated slide gate.
  ◊ Load cells and summing box for extruder live bin.
  ◊ Controls included in APM System.

◆ Slurry Injection System:
  ◊ For injecting meat slurry into preconditioner.
  ◊ All product contact parts are stainless steel.
  ◊ Sanitary design injection pump for pumping slurry into process:
      ◊ 0.2 cubic meter (7 cubic foot) surge hopper.
      ◊ High/low level indicators.
      ◊ Driven by a 2.2 kW (3.0 hp) motor with a variable frequency drive.

◊ Plumbing:
  ◊ One flow meter to measure slurry flow rate.
  ◊ Interconnecting piping not provided.

◆ Extrusion System Components for Colored Products:
  ◊ Intended for addition of one color to extruder.
  ◊ Color delivery system consisting of following:
      ◊ Model 30 Feed Tank for maintenance of liquid while it is fed to extruder or conditioning cylinder:
          ◊ 114 liter (30 gallon) stainless steel tank with hinged lid and support legs.
          ◊ Agitator with integrally mounted fractional horsepower motor.
          ◊ High/low level indicators.
          ◊ Flow meters for measuring quantity of liquid supplied to extruder or conditioning cylinder.
          ◊ Feed pump with 0.55 kW (0.75 hp) gear motor and variable frequency drive.
          ◊ Interconnecting piping and shut off valves are not provided.
◆ Knife Drive:
   ◦ Knife bearing housing with heat treated stainless steel knife blades.
   ◦ Knife hanger of stainless steel construction.
   ◦ 5.5 kW (7.5 hp) drive motor with variable frequency drive.
   ◦ Safety disconnect switch.

◆ Pneumatic Pickup Hood:
   ◦ Vertical configuration.
   ◦ Stainless steel construction.
   ◦ Integral pneumatically operated air bypass.
   ◦ Pneumatic hood requires 9000 standard cubic meters/hour (5300 scfm) of conveying air at hood to operate properly. At this air flow, static pressure drop across hood will be 50 mm (2 inch) water column.
   ◦ Pneumatic hood designed to connect to 305 mm (12.0 inch) outside diameter pneumatic conveying line.

◆ Pasteurizing Burner System for Pneumatic System:
   ◦ Gas burner equipment with gas valve train:
     ◦ Combustion air blower with 3.7 kW (5.0 hp) motor.
     ◦ Burner sized to heat up to 18m (60 feet) of total conveying line, hood, and ducting. If longer, client supplied insulation may be required for parts of line, ducting and components to achieve pasteurization temperatures for entire system.
     ◦ Includes temperature sensors for burner, HEPA filter, and cyclone (latter two used to verify pasteurization temperatures at system extremities).
     ◦ Combustion safeguard system to meet FM requirements.
     ◦ Gas train enclosures are IP52 (NEMA 12) (dust tight).
   ◦ Intended for installation in pneumatic conveying line between pickup hood and cyclone:
     ◦ Includes fabricated tee with shut-off valve for installation in conveying line.
   ◦ Intended to be operated for a short time, only after all operational components (die, knife, and hood) are in place and before starting pneumatic system fans.

◆ Extruder Plumbing:
   ◦ Plumbing manifolds and valves for extruder head jackets.
   ◦ Automatic temperature control:
     ◦ Automatic actuators for temperature control valves.

◆ Ancillary Plumbing Accessories:
   ◦ Water injection:
- One surge tank containing air over water separated by a flexible rubber diaphragm. As water fills tank, air pressure increases to equal water pressure. Intended to reduce pressure fluctuations.
- One pressure regulating valve to control pressure of water into extruder system.
- Two water flow meters with digital readout for measuring flow of water into processing zone of extruder and conditioning cylinder.
- Two remote actuated valves to control injection of water into processing zone of extruder and conditioning cylinder.

- **Steam injection:**
  - Two pressure regulating valves to control pressure of steam into processing zone of extruder and conditioning cylinder.
  - Two steam flow meters with digital readout for measuring flow of steam into processing zone of extruder and conditioning cylinder.
  - Two remote actuated valves to control injection of steam into processing zone of extruder and conditioning cylinder.

- **Wenger Extrudate Temperature Monitoring System:**
  - Includes extruder barrel adaptor plate, dual RTD temperature probe with associated devices and equipment.
  - Temperature displayed on control system.

- **Pre-plumb and Pre-wire Package:**
  - **Pre-plumbing:**
    - Plumbing rack of mild steel construction.
    - Ancillary plumbing components will be mounted on a separate skid package, pre-piped and connected to common headers.
    - Flanged connections will be provided for connecting each major component to plumbing skid.
    - Manual blowdown and switching valves, strainers, steam trap, check valves and pressure gauges included.
    - Client will furnish main shut-off valves and all insulation.
  - **Pre-wiring:**
    - All control devices will be wired to junction boxes on each major component.
    - Numbered terminal strips will be provided for connecting junction boxes during installation.
    - Client will furnish motor starters and all wiring to motors and starters except where specifically noted otherwise.

- **Factory Assembly and Shipping Procedures:**
  - Equipment will be completely assembled in factory and tested to extent possible.
  - Equipment will be disassembled only enough for shipping by open truck with oversize load permits.
Installation: Client will be required to do following:

- Provide interconnection plumbing and wiring to control panel and motor control center. No 3-phase wiring is provided by Wenger.
- Have both HIP drive motors professionally laser aligned to specifications detailed in Wenger Installation Manual.
- Install all items not furnished by Wenger.
- Optional technical service installation supervision available at regular service rates described in Section H below.

02. One each Extru-Tech Mix Head Die:

- Mix Head Die System for Four Colors:
  - Intended to separate extruder output into streams for addition of color to produce product with multiple colors (one color per product piece).
  - Mixer Assembly:
    - All components of mild steel construction, unless otherwise noted.
    - Drive stub to connect extruder shaft to mixer shaft.
    - Adapter plate to connect standard extruder cone head to a split construction flare-out adapter.
    - Split construction flare-out adapter to connect color die heads:
      - Flare-out distributes product into multiple mixing chambers.
    - Four Mixing Chambers with:
      - Outer chamber with mild steel product transfer tubes.
      - Jacketed construction to allow cooling water circulation.
      - Replaceable spiral bore wear liner constructed of heat-treated stainless steel.
      - Proprietary dynamic mixer section, constructed of alloy heat-treated steel.
      - Integral product separation plate to keep color contained to individual head segment.
      - Internal wear bushing, constructed of heat-treated steel.
  - Mixer drive shaft:
    - Keys to drive shaft and rotating mixer.
    - Bolted end cap to hold mixing elements secure.
  - Four color injectors.
  - Final distribution adaptor to merge four flow streams to one final four-color die plate.
  - Fasteners and lifting lugs as required for assembly.
  - 250 mm (10 inch) diameter castors for moving cart.
  - Note 1: Prior to purchase of this system, a test run will be required at our Technical Center to verify running conditions using client provided formula. This Order includes cost to conduct said run on one multi-color product in Sabetha, Kansas,
USA. If additional testing is required beyond this, additional costs (ingredients, Technical Center lease fees, etc.) will be at client expense.

✧ Note 2: Maximum of 300 kW (400 hp) drive motor with variable frequency drive (VFD) may be used.
✧ Note 3: Product mixtures dependent on open area similarity of product shapes.
✧ Note 4: Client required to have capability to add oil into preconditioner at startup and shutdown. Pump should consistently pump (+/- 0.25% of setpoint) in range of 0.5-5.0% of dry feed.
✧ Note 5: A rotary sifter is required to be installed prior to extrusion system to ensure raw materials do not exceed requirements of dies.
✧ Die Assembly:
  ✧ One heat treated wear ring with up to four shapes:
    ✧ One extruder wearplate die for standard dry expanded dog food at capacity indicated.
    ✧ Designed to make standard Wenger products described in Section C. If client requires certain product specifications, development and refinement costs to achieve those specifications are not included, and are detailed in Section I.
    ✧ Die specifications may be specified by client. If client die specifications are not received by Wenger at least eight weeks prior to load date, dies will be selected by Wenger Process Team experts to make products listed. Any changes to dies required by client will be at client expense.
  ✧ One blade knife holder with two sets of blades.
  ✧ Requires knife drive assembly provided separately.
◆ Additional equipment intended for mixing and delivering color solutions to hardware for multiple color products:
  ✧ Note: Pumps cannot handle titanium dioxide.
  ✧ Tank and pumping system, including following:
    ✧ Four mass flow meters.
    ✧ Two high-pressure duplex pumps with manual stroke adjustment.
    ✧ Two variable frequency drives.
    ✧ Four line strainers.
    ✧ Couplings and fittings to connect injectors to pumps.
    ✧ Pressure gauge for each color.
    ✧ Bank of eight 200 liter (50 gallon) polyethylene tanks with lids, (one mix tank and one delivery tank per color).
    ✧ Eight tank mixers.
    ✧ Four transfer pumps.
    ✧ Four tank and pump stands.
    ✧ Miscellaneous plumbing to connect tanks and pumps.
03. One each Negative Airlift Conveying System (Extrusion to Drying):

◆ Negative Airlift Conveying System:
  ✷ Designed to convey product from extruder to dryer.
  ✷ Uses pickup from another item.
  ✷ One hose to connect pickup to conveying line.
  ✷ Group of stainless steel conveying lines and fittings:
    ✷ Tubing, couplings and elbows are included for a horizontal distance of up to 18 m (60 feet) and a vertical distance of up to 6 m (20 feet) with two 90° elbows.
  ✷ High efficiency cyclone receiver of stainless steel construction.
  ✷ Cast stainless steel food grade rotary airlock with roller chain drive and 2.2 kW (3.0 hp) gear motor for discharging product from receiver.
    ✷ Airlock is quick clean sanitary design:
      ✷ Cast 316 stainless steel body and end covers.
      ✷ 304 stainless steel open end rotor.
      ✷ Rotor removal rail system:
        ✷ Aluminum mount plate, linear ball bearings with food grade lubricant and double lip seals.
        ✷ Aluminum bearing blocks, stainless steel precision rails and stainless end bracket.
        ✷ Non-drive endplate includes T-handle fasteners for tool free removal.
        ✷ Non-contact safety switch.
  ✷ Group of aluminum clean air line and fittings for connecting receiver to fan inlet:
    ✷ Tubing, couplings and elbows are included for a total distance of 6 m (20 feet) with one 90° elbow.
  ✷ High static pressure mild steel fan including v-belt drive and 75 kW (100 hp) motor.

04. One each Wenger Model 30G31-3 Modular Design Horizontal Dryer:

◆ Style: AFII.
◆ Sizing:
  ✷ Three pass dryer.
  ✷ One pass cooler.
  ✷ Each dryer pass with three 2.1 m (7.0 foot) long sections of dryer for a total drying area of 58.5 square meters (630 square feet).
  ✷ One section of attached external cooler for a total cooling area of 6.5 square meters (70 square feet).
Modular construction – capacity may be increased by adding sections.
Floor between passes to separate air flows.
Dryer is divided into two temperature and airflow zones.

**Construction:**
- Maximum temperature of insulated enclosure is 175 °C (350 °F).
- Housing in form of welded mild steel tubular frame with insulated, mild steel panels. All side panels where practical will be doors which can be opened for cleaning inside of unit.
- Housing built in 2.1 m (7-foot) sections and designed for containerization:
  - Insulation is high temperature fiberglass.
  - Top insulation is 75 mm (3 inch), doors are 62 mm (2.5 inch), floors and end section sides are 50 mm (2 inch).
- Stainless steel in following high-corrosion areas:
  - Interior of return section.
  - Ceiling above product.
  - Dryer external side door interiors.
  - Floor below conveyors.
  - Flashing and airlock curtains.
- Stainless steel construction of all metal items contacting product.
- Cooler is an extension of bottom pass of dryer and extends outside of dryer and is not insulated.
- Support stand:
  - Special Heavy Duty Support Frame.
  - Furnished with a final product discharge height of 2489 mm (98 inches).
- All assembly fasteners, shafts and bearings to be metric.

**Product Spreader:**
- Oscillating spout spreader to spread product across width of conveyor.
- Spout is stainless steel construction.
- Welded tubular frame.
- Driven by 0.55 kW (0.75 hp) motor.
- Spout speed controlled by variable frequency drive.
- On-line stroke adjustment and on-line dwell adjustment.

**Product Conveyors:**
- Conveyors are overlapping pan design:
  - Stainless steel product carrying trays.
  - Slotted holes in trays, with 2.4X13 mm (0.095X0.51 inch) slots.
- Special Nomex product isolation seal 6 mm (0.25 inch) between conveyor side plates and flashing.
- Top pass driven by 0.8 kW (1.0 hp), middle pass driven by 0.8 kW (1.0 hp), and bottom pass driven by 0.8 kW (1.0 hp) motors.
- Conveyor speed of all passes controlled by variable frequency drives (sensorless vector control).
- Product conveyors shear pin protected.

**Fans and Ducting:**

- **Dryer Air Recirculation:**
  - Dryer recirculation of air for efficiency.
  - Two plug style recirculating fans for each dryer section driven by 11.2 kW (15 hp) motors.
  - Airflow can be directed in an up or down configuration to both top and bottom beds in each dryer section. Initial configuration is airflow through product alternates up and down by pass and zone with top pass and zone being up.
  - Each section includes manual dampers for controlling relative quantity of fresh air to each section and exhaust air from each section.

- **Dryer Air Exhaust:**
  - Dryer exhaust fan with 56.2 kW (75 hp) motor.
  - Fan speed controlled by variable frequency drive.

- **Cooler Air Exhaust:**
  - Air flow through cooler is down.
  - Cooler fan with 30 kW (40 hp) motor.

- Client to supply external exhaust ducting and cyclone dust collectors, using design parameters specified by Wenger:
  - Exhaust fans are clockwise rotation top horizontal discharge design, designed for outside installation, and includes rain hood, bird screen and manual dampers.
  - Dryer exhaust fans are designed for a maximum design static pressure drop in ducting and cyclone of 255 mm (10 inches) water column.
  - Cooler exhaust fans are designed for a maximum design static pressure drop in ducting and cyclone of 255 mm (10 inches) water column.

**Fines System:**

- Fines wipers attached to bottom conveyor for wiping bottom floor of dryer/coolers.
  - Wipers are stainless steel, flat wire design.
- Additional fines wipers are included for wiping sub floor.
- Fines deposited in three cross augers, which are driven by 0.25 kW (0.33 hp) motors.

**Heating System:**

- Gas burner equipment with one burner per section:
  - Combustion air blower with 0.56 kW (0.75 hp) motor.
Combustion safeguard system to meet FM requirements is furnished, mounted in control panel.
Gas train enclosures are IP52 (NEMA 12) (dust tight).
All necessary plumbing items are furnished pre-assembled, with interconnection piping between sections, and pre-wired to junction boxes.
Client to furnish interconnection wiring between sections.

Control Panel:
Controls are included in APM system.

Add-on for Enhanced Sanitary Features:
Elimination of internal horizontal surfaces at dryer inlet and cooler discharge.
Additional side exterior access panels at dryer and/or cooler end sections.
  Improved access for cleaning, inspection and maintenance.
  Quick access latches for easy removal.
Double wall construction of dryer end sections.
Additional insulated exterior side access doors below process air fans.
Enhanced dryer plenum fines augers:
  Two fines augers for recovering fines from side air plenums, driven by 0.25 kW (0.33 hp) motors. Stainless steel construction of all sheet metal components.
  Fines augers are connected to provide one common discharge point.
  Quick access latches for easy access for cleaning and inspection, and maintenance.
Polyester air filters on dryer and cooler makeup air openings to filter room air.
Elimination of horizontal surfaces on support stands for dryer/cooler.

Factory Assembly and Shipping Procedures:
Equipment will be completely assembled in factory and tested to extent possible.
Equipment will be disassembled for containerized shipping.

Installation: Client will be required to do following: (Depending on amount of disassembly required for shipping method used, some may already be done.)
Bolt together support stand and frame section pieces.
Mount recirculation fans.
Reassemble conveyor chain and components.
Mount exhaust fans, gas train package and control panel.
Reconnect piping between sections.
Provide interconnection wiring between sections and to control panel and motor control center. No 3-phase wiring is provided.
Install all items not furnished by Wenger.
Optional technical service installation supervision available at regular service rates described in Section H below.
Note: Increased levels of stainless steel are optionally available.
Note: Fire suppression manifold is optionally available.
Note: Safety rails around dryer roof optionally available.

05. One each Wenger Fat Coating System for Pet Food:

◆ For application of external liquid coating at rates of 2-8%.
◆ For application of external liquid digest coating at rates of 1-5%.
◆ For external application of dry powders at rates of 1-4%.
◆ Dual Shaft Applicator Model DSC1650:
  ◇ Applicator body of dust tight design:
    ▷ All product contact areas will be 316 stainless steel.
    ▷ Includes hinged access doors for inspection, service and cleaning.
    ▷ Inlet and discharge spouts.
    ▷ Two counter-rotating shafts for mixing and conveying of product.
    ▷ 600 mm (24 inch) diameter by 3 m (10 foot) long.
  ◇ Driven by 5.5 kW (7.5 hp) gear motor with variable frequency drive (VFD).
◆ Support framework:
  ◇ Applicator bottom discharge elevated as required up to 2 m (6.6 feet).
  ◇ Mild steel construction.
  ◇ Supports applicator, nebulizer, weigh belt and surge bin.
◆ Nebulizer:
  ◇ Continuous disk liquid coating system.
  ◇ Stainless steel product contact.
  ◇ Driven by 0.55 kW (0.75 hp) gear motor.
◆ Two Model 270 Tanks:
  ◇ 1020 liter (270 gallon) stainless steel tank.
  ◇ Jacketed, dish bottom for steam heating.
  ◇ Agitator with 0.25 kW (0.33 hp) drive motor.
  ◇ Rotary positive displacement pump with 0.55 kW (0.75 hp) motor with variable frequency drive.
  ◇ Steam Plumbing Accessories:
    ▷ Steam control system for jacketed tank with steam traps, pressure relief valve, check valves, pressure gauge, and strainer.
◆ Dry Ingredient Feeder:
  ◇ Dry powder feeder with 0.19 kW (0.25 hp) motor.
  ◇ Manually filled bin.
With support frame at correct height with stairs and castors.

Control Panel:
- Controls are included in control panel furnished with other equipment.

Ratio Control System:
- Weigh-belt feeder with pyramidal surge bin with level controls and lid.
- Two-way diverter valve.
- Mild steel support frame.
- Surge hopper is mild steel product contact.

Factory Assembly and Shipping Procedures:
- Equipment will be completely assembled in factory.
- Equipment will be disassembled only enough for shipping by open truck with oversize load permits.

Installation: Client will be required to do following: (Depending on amount of disassembly required for shipping method used, some may already be done.)
- Bolt together major pieces.
- Provide interconnection wiring between components and to control panel and motor control center. No 3-phase wiring is provided by Wenger.
- Install all items not furnished by Wenger.
- Optional technical service installation supervision available at regular service rates described in Section H below.

Note: Increased levels of stainless steel are optionally available.

06. One each Extru-Tech Advanced Feature Model R108 Vertical Cooler:
- Cooler is circular to eliminate potential product build-up and contains no internal moving parts that can damage product during cooler discharge.

Inlet Rotary Airlock:
- Cast 316 stainless steel body and end covers.
- 304 stainless steel open end rotor with relieved tips.
- Rotor removal rail system:
  - Aluminum mount plate, linear bearings with seals, machined aluminum bearing blocks, stainless steel rails, and stainless steel endplate.
  - T-handle fasteners for tool-free movement.
- 1.5 kW (2 hp) motor.

Cooling Bin:
- 2745 mm (108 inch) diameter with external air plenum.
- Stainless steel construction.
Working volume in cooling bin of 7.4 cubic meters (262 cubic feet).
Hinged door at top of cooler for internal access.
Mild steel support legs for unit.

◆ Cone Section:
Stainless steel sanitary cone-in-cone air inlet design.
Cooling air inlets all around cone drawing air from plant:
  △ Laser level probe used for product level adjustment.
Flanged air discharge located in top of cooling bin.
Safety rail around top of vertical cooler.

◆ Vibratory Discharge Conveyor:
Heavy duty.
Slide rail system mounting for horizontal movement away from cooler for maintenance and cleaning.
Stainless steel construction, with bolt on cover.
Air operated flap gate on discharge.

◆ Exhaust Fan:
Stainless steel air stream housing and wheel with mild steel support frame.
Driven by 45 kW (60 hp) motor.
With variable frequency drive (VFD)
Remote mounted on clean air side of a centrifugal cyclone collector.
Client to furnish exhaust ducting and dust collector, using design parameters specified by Wenger.

◆ Controls included with other equipment.

07. One each Wenger Automated Process Management (APM) System for Computer Control of Extruder, Dryer/Cooler & Coating:

◆ Automated Process Management (APM) System for Computer Control of Extruder:
  Human-Machine-Interface (HMI):
    915 mm (36-inch) wide x 1118 mm (44-inch) tall x 940 mm (37-inch) deep IP52 (NEMA 12) mild steel operator console enclosure.
    Workstation computer including hard disc drive, backup system, communications module and un-interruptible power supply.
    559 mm (22-inch) flat panel color touch screen monitor.
    Sealed keyboard with integral pointing device.
    Emergency stop pushbutton.
    Alarm horn and beacon.
    Wenger software package:
      Microsoft Windows.
Rockwell Software Factory Talk SE Runtime.
RSLogix 5000 PLC programming software.
Wenger application program:
  + Graphic displays of all equipment controlled including device status and processing conditions.
  + Capability of storing up to 10,000 formulas.
  + Enhanced alarm handling including historical alarm retrieval.
  + Scheduled maintenance reminders for extruder.
  + Real time and historical process trending.
  + Data logging of process parameters to hard disc.

Allen-Bradley ControlLogix programmable controller system with Ethernet communications:
  ⊗ IP65 (NEMA 4) (water tight) mild steel enclosure.
  ⊗ Control program to control:
    + Motor start/stop interlock logic.
    + Gravimetric (Loss-In-Weight) dry feed rate.
    + Temperature of extruder barrel thermal zones.
    + Speed of all VFD controlled motors.
    + Specific Mechanical Energy Measurement (SME) of main drive.
    + Water, steam and four additional liquid injection flow controls as a function of dry feed rate.
  ⊗ Other Equipment including:
    + Negative airlift conveying system.
    + Back pressure valve (BPV).
    + Slurry injection equipment.
    + Mix Head Die color injection equipment.
  ⊗ Mounting rack with power supply.
  ⊗ I/O blocks necessary to interface with equipment.
  ⊗ Remote access via client supplied high speed internet connection.
  ⊗ Motor starters are not included in this item. No three-phase wiring included.
  ⊗ Client to provide interconnection wiring and fittings between control panel and other equipment.
  ⊗ HMI console must be installed in an air-conditioned room with air temperature not to exceed 27 °C (80 °F) and relative humidity not to exceed 75% RH.

◆ Auto Density Control (ADC) Function:
  ⊗ Requires full APM, BPV and Source Tech BDS.
  ⊗ When ADC is enabled system controls wet bulk:
    ⊗ ADC is intended to be enabled after startup to maintain a consistent bulk density.
    ⊗ Source Tech BDS communicates product bulk density to APM.
APM then controls BPV opening.
APM graphics display wet bulk density SP and PV, and BPV position.

◆ Additional Components to add Dryer, Cooler and/or Other Equipment To Extruder APM:

✧ HMI and PLC will be shared with extruder.
✧ Control program will control:
  ✧ Motor start/stop interlock logic.
  ✧ Temperature of each temperature zone.
  ✧ Dryer and cooler retention time.
  ✧ Speed of all VFD controlled motors.
  ✧ Other Equipment including:
    ✧ Coating system.
    ✧ Post coating cooler.

✧ Mounting rack with power supply.
✧ I/O blocks necessary to interface with equipment.

◆ Wenger Moisture and Energy Control System:

✧ Requires:
  ✧ Extruder must have Wenger APM Control System to provide incoming product moisture and rate.
  ✧ Requires dryer have an APM Basic or a full APM Control System (either its own or added to extruder APM).

✧ Operator Interface:
  ✧ Added to dryer APM control system.

✧ Energy Control:
  ✧ Dew cell to measure temperature and humidity of exhaust air.
  ✧ Intended to maximize dryer energy efficiency by controlling exhaust humidity at desired values:
    ✧ Exhaust volume is controlled to desired ASR (adiabatic saturation ratio). This allows minimum possible exhaust energy level without condensation in exhaust duct.

✧ Dryer Feed Forward Moisture Control System with manual feedback:
  ✧ Control program:
    ✧ Control algorithm is a proprietary design that simulates a dryer and predicts product exit moisture based on many variables.
    ✧ Parameters for each product are stored in recipe for that product:
New products require operator to manually adjust dryer to stable run conditions with control system in "learn mode" while control system calibrates itself.

- Dryer control receives product moisture load (rate and moisture percent) from extruder.
- Dew cell to measure temperature and humidity of ambient air.
- Program then controls temperature set point for each zone based on recipe values and predictions of control algorithm.
- During startup and shut down, program ramps temperature for each zone between minimum setting and calculated operating temperature.
- Control algorithm is automatically adjusted over time based on product final moisture readings manually determined and entered by operator. This compensates for minor changes in product not detectable otherwise:
  - Program ignores values if incoming moisture load has changed in a time interval based on retention time before reading. In other words, exit moisture changes are ignored until dryer has stabilized.
  - This allows control to maintain final moisture close to desired value.
- Dryer exhaust fan requires variable frequency drive.

08. Source Technology Wet Bulk Density Measuring System:
- To be positioned by client near dryer inlet (for optimum operation final location and specific installation to be agreed upon by Wenger).
- Inline sampler model BDS (Bulk Density System).
- Piston type unit with built-in sampling cup (polyethylene).
- Bypass hood for external product sample release (if requested).
- Maximum sampling frequency of 45 seconds.
- Frame and inspection doors in stainless steel.
- Readout of wet bulk density in extruder APM (for display only).
- Controls integrated into extruder APM.
- Flange mount transition piece with window for view of sampling arm.

09. Source Technology Dry Bulk Density and Moisture Measuring Equipment:
- To be positioned by client after dryer (for optimum operation final location and specific installation to be agreed upon by Wenger).
- Inline sampler model BDS (Bulk Density System).
- Piston type unit with built-in sampling cup (polyethylene).
- Maximum sampling frequency of 45 seconds.
- Bypass hood for external product sample release (if requested).
Frame and inspection doors in stainless steel.
Digital readout of dry bulk density and moisture in extruder APM (for display only).
Control system in stainless steel panel with touch screen for general settings and calibration.

Moisture Measuring Add-On to Bulk Density Monitoring System:
- Moisture sensor (resonance technology) for moisture measuring in range of 5-15%.

SECTION F
TECHNICAL NOTES

EQUIPMENT AND UTILITY SPECIFICATIONS CHECKLIST:

<table>
<thead>
<tr>
<th>Electrical Specifications</th>
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<th>Wenger Standard</th>
</tr>
</thead>
<tbody>
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<td>3-phase voltage</td>
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</tr>
<tr>
<td>1-phase voltage</td>
<td>110</td>
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</tr>
<tr>
<td>Frequency</td>
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<td>24</td>
<td>24Vdc</td>
</tr>
<tr>
<td>Motor starter coil voltage</td>
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