



130 BPM Single Trailer Mounted Blender

1.0 General Unit Specification

This technical specification covers the construction and design requirements for a **1320 HP Trailer-Mounted Blender** unit capable of blending and delivering homogeneous slurry mixes required for general oilfield fracturing and stimulation services in ambient conditions of -40 °F (-4 °C) to 115 °F (46 °C).

The unit will be equipped to convey and introduce fracturing proppants, dry chemical products, and liquid chemical products to the process slurry through a well designed and maintainable fluid handling system. Manual and automated controls will be installed on the unit to allow complete operator control and customized programming for job specific applications and treatment plans.

This technical specification also outlines the completion, warranty, and service agreement to accompany the delivery of any quantity of this unit. All specifications as listed in this Revision are subject to change or clarification as requested by the customer.

1.1 Unit Operational Limits

The unit, as specified, will be capable of pumping the following pressures and rates:

- Maximum working fluid rate: 130 BPM (20,668 LPM)
- Maximum discharge pressure: 70 PSI (482 kPa)
- Maximum proppant concentration: 22 PSA (1.78 SGU)
- Maximum Proppant/Sand delivery rate: 21,000 lbs/min

1.2 Unit Dimensions & Permitting

The unit dimensions (excluding the customer supplied tractor) will be within:

- Length: 46'-0" (14 meters)
- Width: 8'-6" (2.6 meters)



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- Height: 13'-6" (4.1 meters)
- Weight: 50,000 lbs (22,679 kgs)

The unit/tractor combination will comply with all US & TX DOT regulations for unit dimensions, but could exceed the standard 80,000 lbs vehicular weight allowed depending on customer tractor selection and options. Axle loading will be properly distributed to allow overweight/oversize permitting in the continental United States and compliance with US Federal Bridge Law.

The unit systems are detailed as follows:

2.0 Equipment Systems

2.1 Trailer Specifications

The trailer will be a heavy duty, mobile, multi-purpose platform that will include the following features and compliances:

- Single drop trailer frame
- US and TX DOT Compliant for On-Road Transportation
- A36 Steel Beam/Frame Construction (at minimum) w/ frame members built on 35" centers
- Heavy duty 2" King Pin with 3/8" Bolster Plate mounted to receive a 52" tall 5th-wheel hitch
- 83" King Pin turning radius
- Standard tractor air "glad-hands" and electrical connector accessible at the front of trailer
- Sealed electrical wiring and protected air-lines
- Dual Axle Tandem w/ 25,000 lb rated axles and 25,000 lb rated Monopivot Air-Ride Suspensions
- 16 ½" x 7" S Cam Brakes w/ ABS system installed on both axles
- Eight (8) 11R22.5 Tires
- Eight (8) 8.25 x 22.5, 10-Hole, Hub Piloted Steel Wheels
- Holland Mark V Landing Gear, manual 2-speed gearbox crank



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- DOT compliant vehicle lighting and conspicuity marking
- Heavy duty rubber Mud-Flaps installed on rear axle
- Heavy duty fenders

2.2 Power Units/Drivetrains

2.2.1 Discharge Pump Drive Engine

To drive the unit discharge pump, installed on the lower trailer frame will be one (1) QSX15 Tier 3 Cummins Diesel Engine rated at 665 BHP @ 2100 RPM. It will be supplied in a standard configuration to allow ease of access to oil-fill ports, filters, and service points. The engine will be accessorized and installed to drive the discharge pumping process as follows:

- 24 VDC ECM and electronics
- 24 VDC Alternator
- SAE 1 Flywheel housing w/ clutch drive
- Hydraulic starter powered by tractor mounted wet kit
- Spin-on Fuel Filtration System
- Spin-on Water Filtration System
- Spin-on Lube Oil Filtration System
- Customer designated safety derates included in Engine Calibration
- Heavy duty air cleaner pair w/ high filtration pre-cleaners and restriction indicator
- Carbon steel muffler w/ spark arrestor and carbon steel rain cap
- Heavy duty muffler brackets suitable for rough terrain
- Stainless steel flex connector from turbo exhaust connection to muffler intake
- Gear Reduction Transmission w/ clutch, installed directly on flywheel housing
- Heavy duty 1880 Series Spicer output flange
- Driveline guard included from drive box to centrifugal pump
- One-piece heavy duty Spicer-type driveshaft assembly w/ U-Joints



- Vertically mounted Radiator/Cooling Assembly (120 F) with sections for the following:
 - Engine Jacket Water System (Air to Water)
 - Engine Charge Air Cooling System (Air to Air)
 - Gear Reducer/Transmission Cooling Core (Air to Oil)
 - Fuel Cooler Core (Air to Fuel)

2.2.2 Hydraulic Drive Engine

To supply hydraulic power requirements, installed on the trailer front deck area will be one (1) QSX15 Tier 3 Cummins Diesel Engine rated at 665 BHP @ 2100 RPM. It will be supplied in a standard configuration to allow ease of access to oil-fill ports, filters, and service points. The engine will be accessorized and installed to drive the discharge pumping process as follows:

- 24 VDC ECM and electronics
- 24 VDC Alternator
- SAE 1 Flywheel housing w/ clutch drive
- Hydraulic starter powered by tractor mounted wet kit
- Spin-on Fuel Filtration System
- Spin-on Water Filtration System
- Spin-on Lube Oil Filtration System
- Customer designated safety derates included in Engine Calibration
- Heavy duty air cleaner pair w/ high filtration pre-cleaners and restriction indicator
- Carbon steel muffler w/ spark arrestor and carbon steel rain cap
- Heavy duty muffler brackets suitable for rough terrain
- Stainless steel flex connector from turbo exhaust connection to muffler intake
- 3 or 4 position “SAE C” Pad Pump Drive installed directly to the flywheel housing.
- Vertically mounted Radiator/Cooling Assembly (120F) with sections for the following:
 - Engine Jacket Water System (Air to Water)
 - Engine Charge Air Cooling System (Air to Air)



- Hydraulic Cooler Core (Air to Oil)
- Fuel Cooler Core (Air to Fuel)

2.2.3 Fuel System

This unit will be equipped with a diesel fuel storage and distribution system with the following specifications:

- One (1) 200 Gallon Fuel Tank configured as follows:
 - Steel construction
 - 26" diameter cylindrical build w/ capped ends
 - Immersion heater pick-up tube for cold weather operations
 - 2" Drain valve on the tank
 - Tank breather fitting
 - Filtration screen installed in fill neck
 - Fuel level sender unit
- Tank fill-neck accessible from the ground or front service deck for filling on road-side
- Tanks "soft" mounted to unit via rubber lined straps and cradles

2.2.4 Hydraulics System

Hydraulic power will be installed on this unit with circuits to drive the following items:

- One (1) closed loop circuit to power the unit suction pump
- One (1) closed loop circuit to power the mixing tub agitator
- Three (3) closed loop circuits to power the unit proppant augers
- Open loop circuit(s) to power the following items:
 - One (1) AC Compressor
 - Four (4) Process Valve Actuators (Two gel line, One master suction, One quick flush)



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- One (1) Tub level control valve
- One (1) Dry Chemical feeder auger
- Five (5) Liquid Chemical Metering Pumps
- One (1) Chemical transfer pump
- Two (2) Proppant Auger Lift/Extension Cylinders
- Hydraulic Oil cooling loop

Features of the hydraulic system to include:

- Sauer-Danfoss hydraulic components (proven w/ excellent supply chain)
- Pressure compensated piston hydraulic pump technology
- Pressure taps and pressure tap fittings at all hydraulic pump suctions, case drain fittings, and returns.
- Hydraulic valve stack(s) to control hydraulic flow to open loop components
- Common hydraulic reservoir equipped as follows:
 - Steel construction
 - Internal baffling to stabilize hydraulic fluid returns and suctions
 - Removable suction strainer assemblies
 - Tank mounted filters and common inlet/outlet manifolds
 - Heat exchanger for cold weather service
 - Level gauge visible from operators platform and both sides of the unit
 - Oil temperature sensor
 - Filtered fill port
 - Filtered breather cap
 - Clean out covers/manway access
- All hosing, fittings, and tubing necessary to complete the system. Hoses will be pressure rated rubber “Aeroquip” or “Gates” hydraulic hose line. All standard cleanliness and “pigging” procedures will be followed in hose construction and installation.



The installation of the hydraulics system will be performed in a clean environment. The system design will minimize risk for contamination and failure as much as practicable, yet afford complete diagnostic interface through quick-disconnect pressure taps at component orifices. All hydraulic fluid will be filtered during the initial system fill process. The hydraulic reservoir will be installed to apply as much NPSH to hydraulic pump suctions as possible. During startup all component case drain pressures will be monitored to insure correctness of installation and health of the system.

2.2.5 Pneumatic System

Utilizing the tractor supplied trailer air system; the following pneumatic features will be included on the unit:

- Two (2) signal horns will be mounted around the unit control cabin
- The trailer air ride system will be configured such that the air bags will automatically dump prior to lowering of the sand screw assemblies

2.3 Fluid Handling System

2.3.1 Discharge Pump

Installed in the center of the unit frame will be 14 x 12 X 22 Mission Magnum XP High Chrome centrifugal Pump with the following technical and performance specifications:

- 130 BPM @ 8.34 PPG (500 HP) (example)
- 41 BPM @ 25 PPG (500 HP) (example)

2.3.2 Discharge Piping & Manifold

The discharge manifold will be installed on the driver side of the unit and will consist of a Discharge manifold, discharge centrifugal pump and the necessary connections to tie the Manifold assembly to the blender mixing tub. Installed in the piping shall be a driveline driven Mission Magnum XP High Chrome centrifugal pump. The suction side of the pump will be connected to the blender tub outlet with a properly sized pipe mounted as straight as possible. The inlet pipe will be mounted such that Victaulic connections are utilized to facilitate removal for service or cleaning.



Installed on the discharge side of the centrifugal pump shall be an 8" turbine flow meter and an 8" mag flow meter for discharge rate indicators. The piping shall also include a properly sized pipe spool for installation of a customer supplied densitometer. Also installed on the discharge piping shall be included a 3" prime up/recirculation line which shall have an operator accessible 3" butterfly valve. The prime up/recirculation line shall be constructed such that abrasive wear caused by the slurry shall be minimized as much as possible.

The discharge manifold shall be constructed with twelve (12) 4 inch Fig 206 union, thread half connections. Each Fig 206 union will be equipped with a 4" butterfly valve and cap with chain. The discharge line will not be configured for dual-side operation (matching manifold on passenger-side) unless requested by purchaser. This discharge line will include a 5" gel line with two (2) 4" butterfly valves, Fig 206 wing half unions, and caps with chains, mounted on the passenger side of the unit.

These valves will be controlled from the operator interface panel and will be hydraulically operated.

2.3.3 Suction Pump

Installed on the curb-side of the unit will be a hydraulically driven 612L 20-B 12 x 12 x 14-7/8 Gorman Rupp Centrifugal Pump with the following technical and performance specifications:

- 130 BPM @ 125 HP

2.3.4 Suction Piping & Manifold

Installed on the passenger side of the unit shall be an integrated manifold assembly consisting of the low pressure inlet piping, centrifugal pump, and discharge piping to blender mixing tub.

The inlet piping shall consist of Fourteen (14) Fig 206 union, wing half connections. Each union connection shall include a 4" butterfly valve and cap with chain. The centrifugal pump shall be installed at the outlet of the suction manifold and shall include a 12" butterfly valve to enable the operator to prevent mixing tub overflow in the event of a shutdown. The 12" butterfly valve shall be hydraulically controlled and operated from the operator interface panel. The pump discharge piping shall be constructed to run as straight as possible to the mixing tub inlet. Included in the discharge piping shall be an 8" flow meter and 8" mag meter. The tub level control valve shall be an 8" valve with hydraulic actuator with integrated linear potentiometer. Included in the discharge line shall be an additional 8" butterfly valve, accessible to the blender operator as a backup in case of tub level control valve failure.



All piping shall be constructed with appropriate Victaulic connections to facilitate removal for service.

The suction inlet manifold will not be configured for dual-side operation (matching manifold on driver-side) unless requested by purchaser.

Also included shall be a tub bypass to enable the operator to go to quick flush mode of operation. The tub bypass line shall consist of 8" pipe with 8" inch butterfly valve, hydraulically controlled and operated from the operator interface panel.

2.4 Blending System

2.4.1 Blending Tub Assembly

Installed toward the rear of the unit frame, between the discharge centrifugal pump and the proppant augers will be a cylindrical mixing tub with the following technical and performance specifications:

- 60" diameter x 43" maximum depth with rolled bottom head to improve mixing performance
- 8 BBL Nominal fluid capacity during operation
- Integrated, flange mounted center discharge pipe enters tub from below fluid level
- Frac fluid exits discharge pipe tangential to proppant flow to improve proppant wetting and flow. Fluid exit is slightly below the static fluid level in the mix tub.
- Paddle assembly sized to provide maximum shear to frac fluid. Paddle assembly consists of rotor and stator blades and includes vertically mounted blades on tank bottom to prevent settling.
- Paddle assembly includes a diffuser installed in the center of the upper rotor element. The diffuser is centered over the discharge pipe outlet and permits laminar flow of the frac fluid as it exits into the mix tub volume. The paddle design facilitates de-aeration and prevents vortexing at the discharge pump inlet piping.



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- The mixing tub is an open top design and has a flanged lip to prevent process fluid splash. The paddle drive consists of a planetary gearbox, powered by a hydraulic motor. This provides high torque to the paddle assembly without the need for a large hydraulic motor. The planetary gearbox and motor are mounted above the working fluid level, centered in the tub.
- The discharge pump inlet is a pipe blended into the bottom and side of the mixing tub and is constructed to maximize NPSH.

2.4.2 Proppant Augers/Sandscrews

Auger assemblies shall consist of two (2) 12" nominal (9,500 lb/min) and one (1) 6" nominal assembly (4000 lb/min). The maximum proppant rate for this configuration shall be 21,000 lb per minute. The auger assembly shall include a common hopper with back stop to prevent sand spillage, and also to include a hinged, drop down section across the back of the hopper to enable dump truck operation. The maximum height from ground to edge of hopper shall no greater than 32". The auger assembly shall be raised and lowered hydraulically with controls in the operator interface panel. Included in the control is a failsafe feature that prevents lowering the augers prior to lowering the rear suspension (dumping the air bags). A mechanical lock is included on the auger assembly so that the augers can be locked in transport position.

The auger assembly will include an automatic grease dispensing system to provide lubricant to the lower auger bearings.

(Note) the 21,000 lb per minute proppant rate does not take into consideration full output of the 6" auger due to discharge pump limitations. The hydraulic system drive for the augers will be sufficient to power all at 100% output.

2.4.3 Dry Chemical Add System

Installed above the blending tub will be an auger driven dry chemical add system with the following technical and performance specifications:

- One (1) Acrison 101-5z vane feeder
- Size E auger, 1.01 cu in/rev 38.06 lb min
- Size M auger 26.88 cu in/rev 119.38 lb/min



- The hopper is 1 cu ft. The unit is stainless steel construction, hydraulically driven, with quick change auger capabilities.
- Horizontal discharge above tub fluid level is the standard configuration, vertical gravity discharge available to prevent spillage if requested by customer

2.4.4 Liquid Chemical Add System

Installed on the road-side of the unit will be a liquid chemical add system that will be comprised of the following metering pumps:

- T921 General Triplex pump 5 gpm
- CW 1012 General Triplex pump 12 gpm
- 3CL3 Continental progressive cavity pump 10 gpm
- 3CL4 Continental progressive cavity pump 18 gpm
- 3CL6 Continental progressive cavity pump 36 gpm
- Fluid transfer pump 20 gpm
- Each pump (except the fluid transfer pump) shall include a magnetic pickup or encoder (to be determined) and Endress Hauser coriolis meter.
- Three 80 gallon stainless steel DOT Tote tanks will be installed with mounting racks and suction piping.

Pump metering will be through stainless steel pipe nipples attached to the mixing tub and turned down toward the tub fluid level to prevent splashing. In addition, chemical additive entry points will be added at other points in the system at customer request.

2.5 Controls System

2.5.1 Operator Platform

Installed in the middle of the unit, between the displacement tanks and the control cabin, will be an elevated operator platform that allows entry into the control cabin, access to the displacement



tanks, and a clear view of the unit and surrounding environment. The operator platform specification is as follows:

- Carbon steel construction for platform frame, handrails, and ladders
- Abrasive, removable plastic grating floor (weight savings and personnel safety)
- Removable/bolt-on handrails if needed to aid platform removal
- OSHA compliant polymer swing-gate w/ stainless steel spring hinges installed at entries
- Ladder/entry access on both sides of the unit
- OSHA compliant handrails, ladders, and toe-boards
- Designed for “quick” removal with minimal mount points, connection points, and equipment and wiring attachments. This minimizes downtime caused when platform removal may be necessary for platform replacement or to access other components on the unit for service.

2.5.2 Control Cabin

Installed on the operator platform in the middle of the unit shall be a climate controlled operator or control cabin. The control cabin shall house the unit operator control panel, and allow a clear view of the unit mixing tub, proppant augers, engine assemblies, and the surrounding environment. The control cabin shall be configured as follows:

- Aluminum construction (weight savings & corrosion resistant)
- Complete primer and paint system to withstand corrosion
- 4' wide x 4' deep x 6-1/2' head clearance
- Mounted on heavy rubber vibration isolators
- Completely sealed and insulated from outside environment
- Sealed and labeled bulkhead plate for wiring and hosing entry into the cabin
- Tinted sliding windows in every wall
- Control console installed on passenger-side wall
- One (1) 24 VDC Fan mounted in cabin corners above the control console for operator use
- One (1) 120 VAC standard 3-prong/2-plug outlet available inside cabin



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- Shelf and connections for radio and speakers above control console
- Designed for “quick” removal with minimal mount points, connection points, and equipment and wiring attachments. All wiring and hosing to be terminated in labeled bulkheads that can be quickly dismantled. This minimizes downtime caused when cabin removal may be necessary for replacement or service purposes.
- Mounted on tracks/rollers to permit control cabin to be moved back to permit access to discharge pump for service.

2.5.3 Control Console/Panel

A unit control console with control panel will be installed on the passenger-side wall of the control cabin. The console and panel will be of stainless steel construction with etched labeling of all control components. All wiring and hosing entry into the console and cabin will be bulk headed, sealed, and labeled using mil spec bayonet connectors, industrial JIC bulkhead fittings, quick disconnect or autoclave fluid fittings, and Rox-Tec type gasket bulkhead seals.

Within the console will be installed the following pre-mounted systems:

- 200 terminal wiring backboard with all unit circuitry included

Installed in the control panel will be the following controls and feedback devices:

- One (1) Unit Power Switch
- Two (2) engine key-switches (On-Off)
- Two (2) engine start switches (Momentary On)
- Two (2) engine digital data J1939 displays
- One (1) fuel tank level gauge
- Two (2) engine throttles (potentiometer type)
- One (1) emergency kill switch (covered w/ red toggle switch guard)
- Two (2) engine diagnostic connectors
- One (1) Gear reducer/transmission pressure gauge
- One (1) Gear reducer/transmission temperature gauge
- One (1) general open loop hydraulic pressure gauge



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- Five (5) closed loop hydraulic charge pressure gauges
- Five (5) closed loop hydraulic pressure gauges
- One (1) hydraulic temperature gauge (oil reservoir temperature)
- Two (2) centrifugal pump speed controls (linear throttle type)
- Five (5) liquid chemical add speed controls
- Three (3) proppant/sandscrew speed controls
- One (1) dry chemical add auger speed control
- One (1) pneumatic signal horn switch
- One (1) work light toggle switch (On-Off)
- Two (2) Webasto/Arctic Fox power switches to engage cold weather heating circuits
- One (1) unit process schematic with:
 - Color coded piping runs
 - All actuated valve switches imbedded in the process schematic
- One (1) Digital Automated Control Display

2.5.4 Climate Control System

Integrated into the control cabin will be an industrial grade climate control package. This air conditioning system will be configured as follows:

- All A/C controls will be accessible inside the cabin
- DTAC or equivalent A/C Condenser mounted to cabin wall with exterior venting
- DTAC or equivalent A/C Evaporator unit mounted with interior venting to discharge cool air
- Thermostat controlled A/C compressor with integrally mounted hydraulic motor drive
- A/C Refrigerant Hosing properly installed and charged in a small bundle
- Single-core heater unit with dual-speed fan mounted inside cabin for warm air circulation



2.6 Automated Blender Control System

This unit shall be equipped with an automated control system provided by Advanced Measurements. The system will utilize National Instruments hardware, and Prophet Software as developed by Advanced Measurements.

The Prophet Blender control system operates in a similar manner to a standard blender, with the added capability to control additional, redundant blender pumps and hydraulics. The Prophet Blender is capable of operation in several modes. The unit can be operated locally from the Prophet operator panel or remotely from the Data Van, provided the Data Van is equipped with the Prophet system.

Monitored Sensors (the following I/O are monitored):

- Density (analog input)
- Suction rate ,turbine or mag flow meter (frequency input)
- Discharge rate, turbine or mag flow meter (frequency input)
- Suction pressure (analog input)
- Discharge pressure (analog input)
- Suction pump rpm (digital input)
- Discharge pump rpm (digital input)
- Engine speed and other values via J1939
- Tub paddle speed (digital input)
- Tub level (analog input)
- Up to 4 sand auger speeds (digital input)
- Hydraulic tank temperature (analog input)
- Open/close status of process valves, up to 32 valves (digital input)
- Open/close status of recirculation valves (digital input)
- Open/close status of bypass valves (digital input)
- Rig saver, (engine air intake shutdown), (digital input)
- Auger auto/manual (digital input)



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- Suction pump/discharge pump/tub paddle control auto/manual (digital input)

All rate inputs are high level signals

Controlled actuators (the following are controlled):

- Sand control, open loop based on up to 4 independent auger controls
- Tub level control, closed loop control of suction rate based on tub level
- Tub bypass valve control
- Recirculation valve control
- Future capability for 8 automated discharge valves, open/maintain, close control only
- Future capability for 8 automated suction valves, open/maintain, close control only
- A suction throttle valve to permit low flow rates to be achieved. This cannot be controlled from the Data van

Functionality (Blender features):

- Sand delivery control via multi-level PID (Sand concentration K-factor Compensation, auger speed)
- Responds to variations or unexpected changes in the process
- Four modes of operation (Clean/auger, dirty/auger, clean/dirty, inline concentration) to suit different field situations. A custom mode is required for the mix of the clean fluid and dirty fluid at the wellhead to yield the desired concentrations.
- Volume totalizers
- The blender can be controlled from the data van or locally on the blender (if the data van has Prophet controls) This is set by a remote/local switch on AMI screens
- The data van has full automatic or manual control of the blender in remote mode
- If the blender is in manual mode (controlled by the manual panel), the mode cannot be changed from the data van. This also means that any controls and valves cannot be changed from the data van and are only controlled by the switches and pots on the manual control panel
- Integral data logging and event/alarm capture



Control System Hardware. The control system includes:

- A local control panel with both discrete controls and a touch-screen user interface. This panel is mounted on the front of the control box, which houses the control wiring, controllers, I/O modules and associated signal conditioning. The control box requires clean 12 or 24VDC, 20A power. The control equipment is suitable for operations between 0 deg C and +60 deg C. The control panel is designed to withstand the shock and vibration expected for fracturing operations, including appropriate vibration mounting. All control signals and channel inputs feed into the control box through bulkhead connectors.

Maintenance Monitoring:

- ECM data from the blender engines are monitored and transferred to the data van for maintenance purposes, (if the data van has prophet controls).
- It is desired that engine parameters be acquired, logged and made available to a database so that preventive maintenance tracking can be accomplished. This will require additional parameters be acquired by the system.

The parameters acquired for maintenance monitoring/tracking are:

- Fault codes
- Blow by pressure
- Fuel consumption
- Intake temp
- Intake restriction
- RPM
- Torque
- Fuel temp
- Coolant temp
- Battery voltage
- Engine hours
- Engine oil level
- Engine cycles in the form of engine oil %



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- Oil temp
- Oil pressure
- Coolant pressure
- Coolant rate
- Coolant low level
- Ambient temp

Available monitoring **options** which can be developed and offered include:

- Blender hydraulic temperature monitoring. This allows monitoring, recording, and subsequent alarm in the case of blender hydraulic temperature runaway. With a compatible Prophet data van, personnel in the data van can monitor and be alerted to unusual hydraulic temperatures. Includes cables and sensors.
- Blender hydraulic charge pressure monitoring. This allows monitoring, recording, and subsequent alarm in the case of unusual hydraulic charge pressures. With a compatible Prophet data van, personnel in the data van can monitor hydraulic charge pressure. Includes cables and sensors.
- Blender fuel level and temperature monitoring. This allows monitoring, recording, and subsequent alarm in the case of marginal blender fuel levels and temperatures. With a compatible Prophet data van, personnel in the data van can monitor and be alerted to low or unusual fuel levels and temperatures. Includes cables and sensors.
- Control blender liquid adds. This allows control of 4 blender liquid add loops. With a compatible Prophet data van, personnel in the data van can monitor and control blender liquid adds. Includes cables and sensors.

2.7 Cold Weather Service Kit

To aid unit starts and operations in sub-freezing conditions, an Arctic Fox coolant circulation kit will be installed on each drivetrain for a total of two (2) kits. These kits and all associated hosing will be completely isolated from each other to avoid any possibility of cross-hosing/cross-filling jacket water systems.



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The Hydraulic Drive Engine coolant circulation kit will be driven by one (1) Webasto diesel-fired coolant heater w/ a coolant circulation pump. The Webasto will pull, heat, and circulate coolant from the engine block through the following circuits (immersion heaters) before returning the spent coolant back to the engine block:

- One (1) Diesel Fuel Tank immersion heater
- One (1) Hydraulic Reservoir immersion heater
- One (1) Control Cabin heater core

The Discharge Pump Engine coolant circulation kit will be driven by one (1) Webasto diesel-fired coolant heater w/ a coolant circulation pump. The Webasto will pull, heat, and circulate coolant from the engine block through the following circuits (immersion heaters) before returning the spent coolant back to the engine block:

- One (1) Diesel Fuel Tank immersion heater

All coolant hosing through these circuits will be insulated and wrapped to maintain circulating coolant warmth as efficiently as possible.

The unit will also be equipped with deep cycle gell-cell Odyssey type batteries for better cold weather performance. The battery pack will be permanently wired to a 120VAC “plug-in” type marine grade battery charger mounted with the unit battery back. The power receptacle for the charger will be accessible from the ground for plug-in while at the equipment yard.

2.8 Equipment & Parts Stowage

The unit will be equipped with the following equipment and parts storage:

- Suction/Discharge Hose racks sufficient to store:
 - Twelve (12) 20 ft low pressure suction/discharge hoses
- One (1) 48” wide x 30” deep x 18” tall junk basket for general fittings storage
- One (1) 36” wide x 18” tall x 18” deep toolbox for general tool storage



3.0 Unit Completion & Delivery

3.1 Customer Paint Scheme

Unit will be blasted, primed, and coated per customer paint specifications.

3.2 Unit Lighting

The unit will be equipped with adequate work lights placed strategically on the unit to illuminate the unit work zones and surrounding area.

3.3 General Assembly Practices

The following general procedures will be used in the design and assembly of this unit:

- Utilize stainless tubing rack inside trailer frame rails to neatly run hydraulic lines
- All hosing or wiring in contact with any metallic surface will be protected with rub guard(s)
- All hosing or wiring in close proximity with hot surfaces (i.e. engine exhaust manifold) will be secured to a heat-shielded cable mount
- All fuel lines will be shielded, secured, and routed to avoid any rubs or contacts
- All hosing systems will be produced and recorded as system kits, and are re-producible
- All wiring systems will be produced as molded cables and recorded as system kits
- All components will be labeled with stainless steel I.D. tags
- All hosing and wiring will be labeled or tagged on both ends for easy identification
- Bulkheading with labels will be utilized for all wiring and hosing entries into control cabin
- Grade 8 or Grade 10.9 marked bolting and hardware will be used for unit assembly
- Trace-able quality documents will be maintained for every process and component

3.4 Unit Documentation

The following documentation will be provided with each unit:



- Two (2) bound paper copies of the Unit Operations and Service Manual
- Two (2) electronic copies (on CD) of the Unit Operations and Service Manual
- One (1) bound paper copy of the Unit Quality Book (includes unit testing sheets)
- One (1) electronic copy (on CD) of the Unit Quality Book (includes unit testing sheets)
- A complete unit BOM/Catalog included in Operations and Service Manual for quick reference and procurement of replacement parts

3.5 Warranty & Service

Each unit will be covered under a 1yr manufacturer's warranty. This warranty coverage will apply to all defective components or flaws in workmanship, or any inherently poor design or installation practices.

Manufacturer Field Service Support will be extended to cover all warranty events within the 1yr warranty period, and will be available throughout the life of the unit for service events as they occur.