Batch Mixer
Owner's Manual

Missoula Technology and Development Center
5875 Highway 10 West
Missoula Mt 59808-9361

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Theory of Operation

The batch mixer mixes gelling agent with gasoline by agitating and re-circulating gasoline through a pump. This pump is also used to fill the helitorch from the batch mixer. The pump takes suction from a 90-degree valve installed in the bottom of the tank. Flow from the pump is discharged through a 3-way valve that may be set in the re-circulation or discharge position. When the valve is set in the re-circulation position, the gasoline flows through a shutoff valve in the end of the tank, into a re-circulation tube, through the re-circulation tube flow nozzles, and back into the tank. The configuration of the re-circulation tube causes agitation of the gasoline. This agitation mixes the gelling agent with the gasoline.

When the 3-way valve is set in the discharge position, flow from the pump is diverted to the hose reel and out to fill the helitorch.

The batch mixer is also equipped with a pressure relief system. During normal operation, the relief valve should remain closed. If the system experiences an overpressure from a closed dry break, closed tank valve, or other cause, the relief valve will open and allow fuel from the pump discharge to flow to the inlet side of the pump. If the relief valve opens the system should be shut down and the cause of the overpressure determined.

Relief Valve

Design Features

The batch mixer has several design features that contribute to its performance and safety:

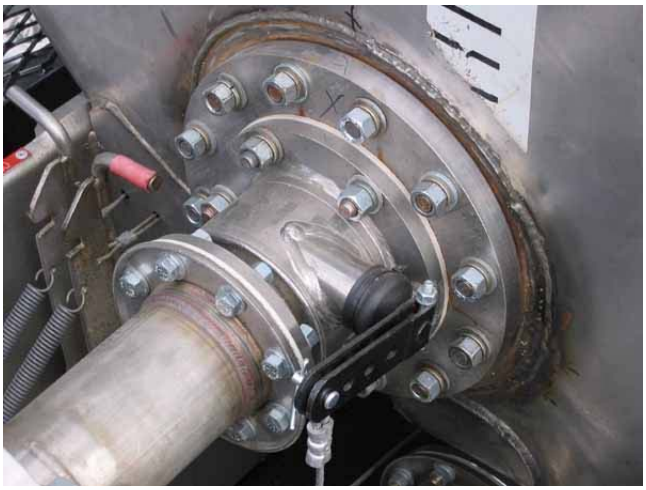
240 gallon DOT 406 stainless steel tank

DOT 406 Tank

4” stainless steel sump valve

Sump Valve – Looking Underneath Tank

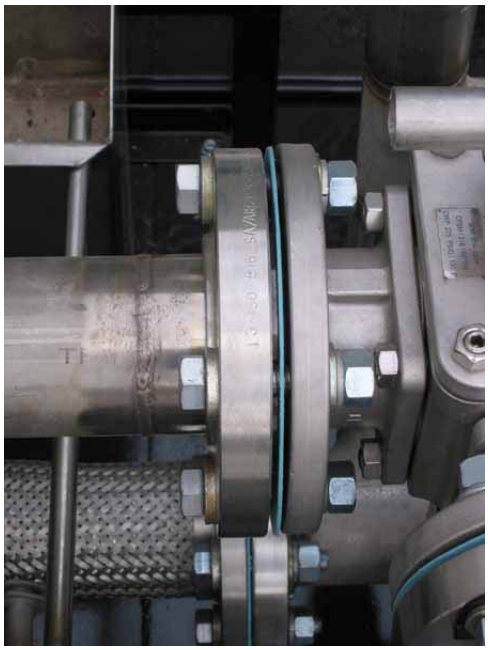
3” stainless steel tank re-circulation valve



Tank Re-circulation Valve

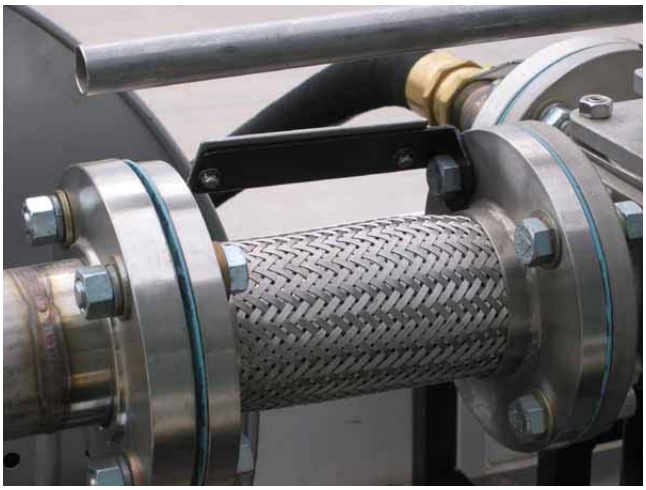
3” stainless steel piping

3” 150# flanged connections



3” 150# Flanged Connection

3” stainless steel pump connector hose assemblies



Pump Connector Hose Assembly

120 gallons per minute bronze gear pump

Pump

0 – 100 psi gage isolated from gel with diaphragm

Gage and Diaphragm Assembly

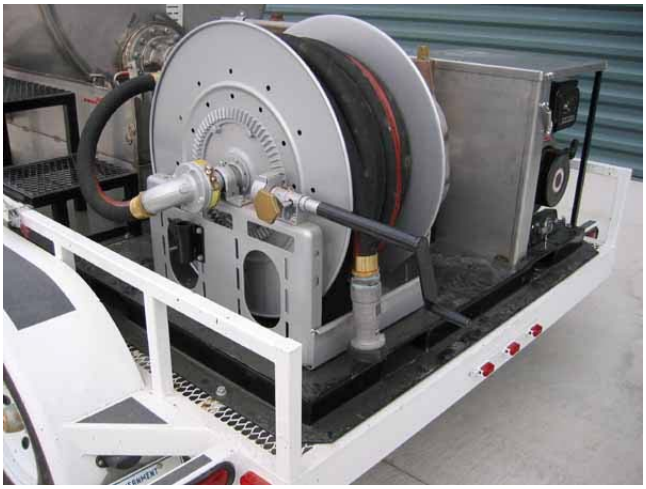
3” full flow 3-way stainless steel directional control valve

Directional Control Valve

5 nozzle re-circulation tube equipped with fan spray nozzles

Re-circulation Tube and Nozzles

Manually operated hose reel



Hose Reel With Crank Installed

90 feet of 1-1/2” electrically conductive hose

10 horsepower air-cooled diesel engine

Diesel Engine

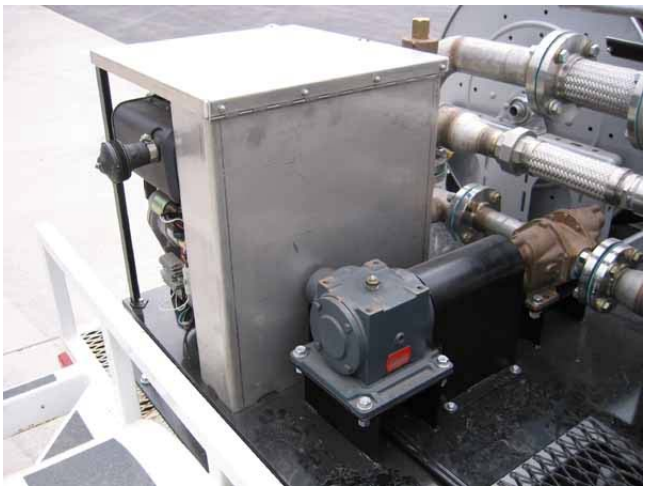
3 to 1 gear reducer

Gear Reducer

Remote operation of emergency closure valve

Emergency Valve Closure Lever

Shielding installed between the diesel engine and the pump and piping to prevent gelled gasoline from contacting the engine in the event of a leaking pipe joint or pump seal.



Engine Shielding

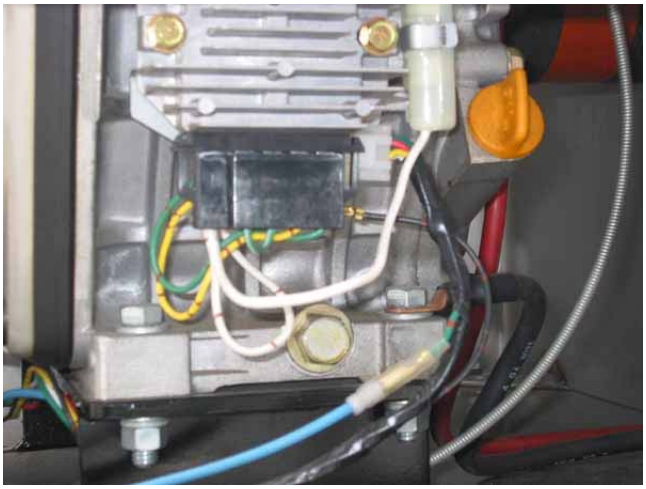
Pre-Operation

Prior to beginning operation of the batch mixer verify that the spark arrestor is clean and check the following fluid levels. Replenish as needed using the fluids recommended below:

Battery Fluid level – use distilled water

Battery Box

Engine oil – use 10W30 oil with an API service classification of CC or CD



Engine Oil Drain Plug and Dip Stick

Engine diesel – fill the engine fuel tank when the engine is cold - use Number 2 diesel

Gear reducer oil – use Hub City GL-90 gear oil

Gear Reducer Oil Level Plug

Setting up the System

Park trailer on level surface, chock the trailer wheels

Attach one end of the vapor hose (50' minimum length) to the cam lock vapor connection on the tank. Attach the flame arrestor to the other end of the hose. Place a No Smoking sign near the flame arrestor.

Vapor and Fill Connections

Vapor Hose Flame Arrestor

Vapor Hose Arrangement

Attach the emergency close lanyard to the emergency valve closure lever. Set the orange cone approximately 20 feet in front of the trailer and place the emergency close lanyard triangular handle on top of the cone.

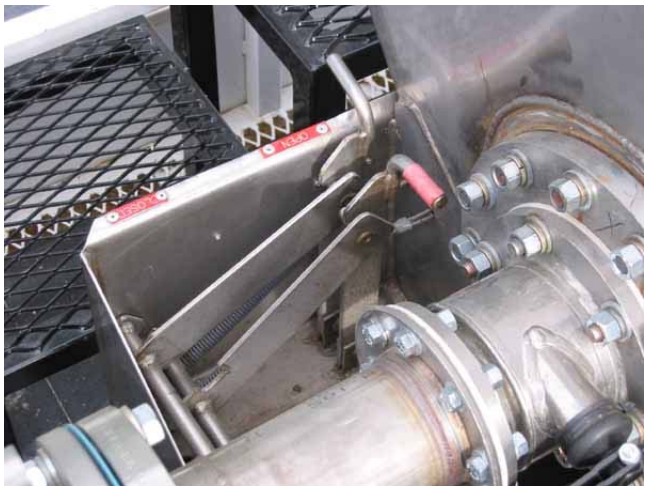
Emergency Closure Lever and Lanyard Attachment

Emergency Close Lanyard Handle on Orange Cone

Emergency Close Cable Arrangement

Open the 4” tank sump valve and the 3” tank re-circulation valve.

Tank Sump and Re-circulation Valve Actuators
Shown With Both Valves Open



Tank Sump and Re-circulation Valve Actuators – Side View
Shown With Both Valves Open

Fill the tank with gasoline:

Bond the fuel truck to the tank

Remove the cam lock fill cap on top of the tank

Fill and Vapor Connections
Fill Connection in Foreground

Insert fuel nozzle in fill connection and dispense fuel into tank – do not exceed 200 gallons

Remove fuel nozzle from fill connection and replace cam lock fill cap.

Remove bonding cable

Mixing

Position the handle of the directional control valve to the "Flow to Tank" position.

Directional Control Valve
Handle in "Flow to Tank" Position

Start the diesel engine by:

Pulling the throttle handle out as far as possible.

Turn the throttle handle clockwise until it is tight

Turn the key until the engine starts

Diesel Engine Controls Shown in Start/Full Throttle Position

Inspect the system for leakage.

Add gelling agent to the gasoline as it is re-circulating

Once all of the gelling agent has been added, continue to re-circulate the gasoline for 5 to 10 minutes or until the gelling agent has been thoroughly mixed with the gasoline.

Once the gasoline and gelling agent have been completely mixed push the throttle handle in until the engine is idling and allow the engine to idle for approximately 1 minute to cool down.

Diesel Engine Controls
Throttle Shown in Idle Position

Once engine has cooled, push the throttle handle all the way in to the panel to turn the engine off. Turn key on the panel counterclockwise.

Allow the fuel to gel.

Dispensing to Torch

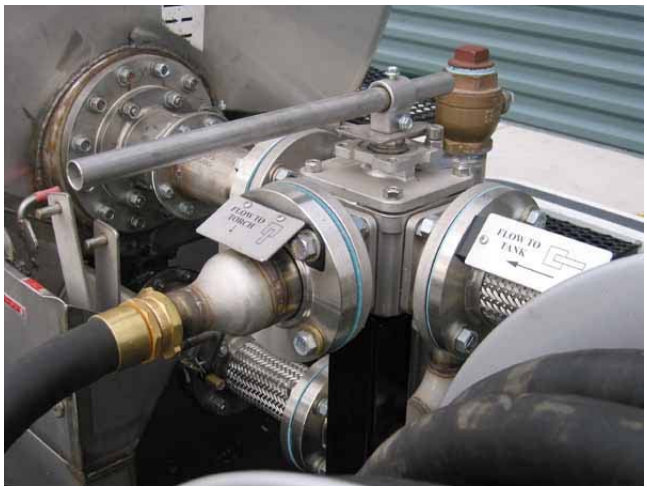
Position the handle of the directional control valve to the "Flow to Tank" position.

Start the diesel engine

Connect the fuel hose and vapor hose to the helitorch per the Interagency Aerial Ignition Guide.

Ensure the dry break connected to the helitorch is in the open position

When the person fueling the helitorch gives the signal, turn the handle of the directional control valve to the "Flow to Torch" position.



Directional Control Valve
Shown in "Flow to Torch" Position

When the person fueling the helitorch signals he or she is done fueling, turn the handle of the directional control valve back to the "Flow to Tank" position.

Turn off the diesel engine

Drafting from a Spare Drum or Helitorch

Connect a hose from the bottom of the spare drum or helitorch to the valve located in the pressure relief piping of the batch mixer.

Position the handle of the directional control valve to the "Flow to Tank" position.

Start the diesel engine

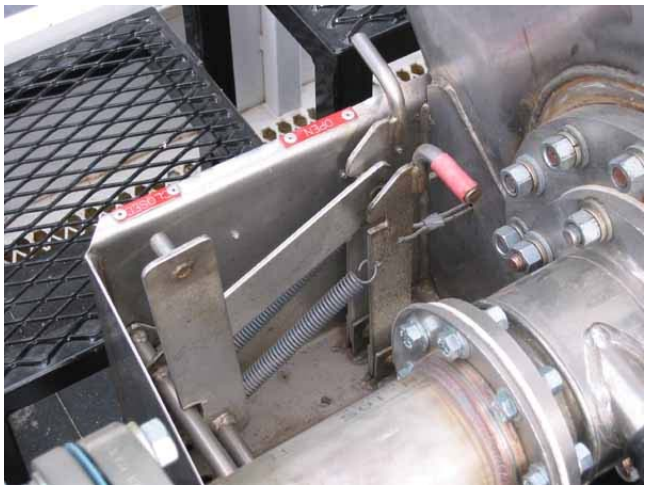
Allow the fuel in the batch mixer to re-circulate

Ensure all valves between the spare drum or helitorch are open.

Ensure the spare drum or helitorch is vented to prevent collapsing of the drum or helitorch

Slowly close only the 4" sump valve on the batch mixer until the pump is drafting completely from the spare drum or helitorch.

Valve Actuator
Shown With Sump Valve Closed



Valve Actuators (Side View)
Shown With Sump Valve Closed

When the spare drum or helitorch is completely empty turn off the diesel engine.

Open the 4” sump valve.

Post Operation Clean Up

Pump as much gel out of the tank, piping, and hoses as possible.

Dispense 15 to 20 gallons of diesel or Jet A into the tank through the fill connection.

Position the handle of the directional control valve to the "Flow to Tank" position.

Start the diesel engine and allow the diesel or Jet A to circulate through the system.

Clean the hose and inside of the tank:

> **Open the hatch on the top of the batch mixer tank and hold the end of the hose in the hatch opening.**
>
> **Install a dry break adapter in the dry break coupler on the end of the hose.**
>
> **With the diesel or Jet A re-circulating, rotate the handle of the directional control valve to the "Flow to Torch" position.**
>
> **Use the discharge from the end of the hose to clean out the inside of the tank as needed.**
>
> **Once the hose and inside of the tank are clean, hold the end of the hose in the tank hatch opening and rotate the handle of the directional control valve to the "Flow to Tank" position.**
>
> **With the end of the hose in the tank opening, remove the dry break adapter from the end of the hose.**

Once the piping, hoses, and tank are clean shut off the diesel engine.

Close both tank valves for transport.

Routine Maintenance

Change the engine oil prior to the beginning of each burning season and every 50 hours afterward. Use 10W30 oil with an API service classification of CC or CD

Change the gear reducer oil prior to the beginning of each burning season. Use Hub City GL-90 gear oil.

Clean engine spark arrestor prior to beginning of each season.

Engine Spark Arrestor

Trouble Shooting

Pump will not draft from tank.

4” sump valve closed

4” sump valve cable broken or disconnected

4” sump valve fusible link broken

Sump Valve Fusible Link (Brass Hex Nut) and Cable

Engine bogs down and dies – directional valve handle in "Flow to Tank" position

3" tank re-circulation valve closed

3" tank re-circulation valve cable broken or disconnected

3" tank re-circulation valve fusible link broken

Tank Re-circulation Valve Fusible Link and Cable

Engine bogs down and dies – directional valve handle in "Flow to Torch" position

Dry break not connected

Dry break coupler handle not completely rotated to the open position.

No re-circulation

Directional valve in “Flow to Torch” position

4” sump valve closed

Handle closed

Fusible link broken

Actuating cable broken

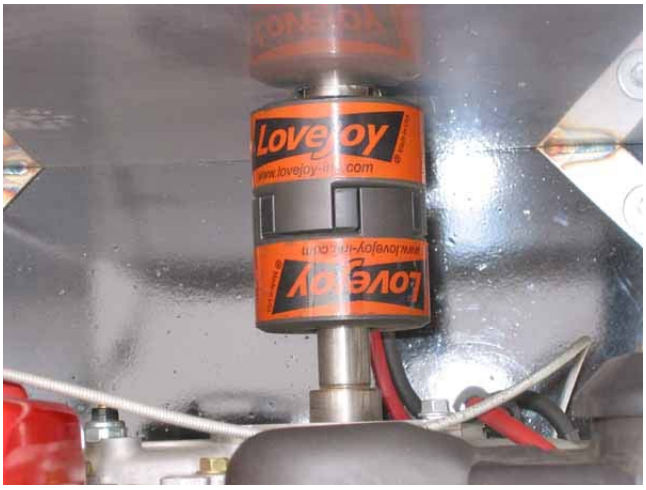
3” tank re-circulation valve closed

Handle closed

Fusible link broken

Actuating cable broken

Gear box couplings disconnected or broken



Engine to Gearbox Coupling

No flow to torch

- **Directional valve in "Flow to Tank" position**
- **Dry break not connected**
- **Dry break coupler handle not completely rotated to the open position.**
- **4" sump valve closed**
  - **Handle closed**
  - **Fusible link broken**
  - **Actuating cable broken**
- **Gear box couplings disconnected or broken**

Engine will not turn over

- **Battery dead**
- **Battery connections corroded, loose, or disconnected**

Leaking piping connections

- **Tighten connections or flange bolts**
- **Replace flange gaskets**

DOT Requirements

License requirements: Commercial Drivers License (CDL) with hazmat endorsement

Driver Training: General awareness, function specific, safety, and security

Placarding requirements: Placarding with UN1993 identification number required on 4 sides of tank, vehicle, or trailer

Inspection requirements: The following inspections are required. These must be performed by a qualified tank inspection facility. The month and year of each test must be indicated on the side of the tank.

Yearly

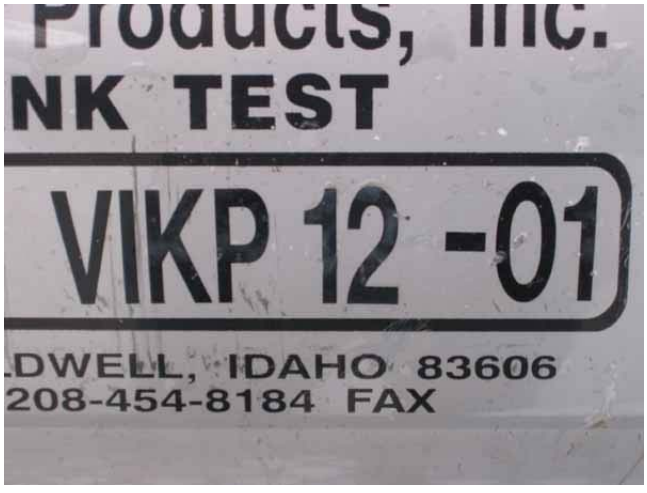
External Visual Inspection (indicated by letter V)

Leakage Test (indicated by letter K)

Every 5 years

Internal Visual Inspection (indicated by letter I)

Pressure Test (indicated by letter P)



Tank Inspection Information
This Tank Was Last Inspected December 2001

Parts List

Hose Reel

Hannay 22-30-31 LT

Hannay Reels, Inc
553 State Rt 143
Westerlo, Ny 12193-0159
(518) 797-3791
(518) 797-3259 (fax)
www.hannay.com
email: reels@hannay.com

Relief Valve

Kunkle 912BJHM01ME005

TVC NW; Star Brass Seattle
5813 Airport Way South
Seattle,Wa 98108
(206) 762-8001
(206) 762-4722 (fax)

Pressure Gage and Diaphragm

Pressure gage: NOSHOK part number 25-300-100
Diaphragm: NOSHOK part number 25-02SS-SS-02SS
Fill: Glycerin

NOSHOK Inc
1010 West Bagley Road
Berea, Oh 44017
(440) 243-0888
(440) 243-3472 (fax)
web site: www.noshok.com
email: noshok@noshok.com

Vapor Hose Flame Arrestor

Enardo Model Number 8802/D-AAC

Enardo Manufacturing Company
4470 South 70th East Avenue
Tulsa Ok 74145-4607
(800) 336- 2736
(918) 622-0004 (fax)
web site: www.enardo.com
email: sales@enardo.com

Diesel Engine

Engine: Yanmar L100AE-DEG

Wiring Harness and Panel: Yanmar Part No 114350-77500

Spark Arrestor: Yanmar Part No 183650-13300

Yanmar Diesel America Corp
951 Corporate Grove Drive
Buffalo Grove, Il 60089-4508
(847) 541-1900

Gear Reducer, Base Mounting Kit, Lubricant

Gear Reducer: Hub City Model 66, Style C, 3:1 Reduction Ratio

Base Mounting Kit: Hub City Model 66, Part Number 02-29-00011-066

Lubricant: Hub City GL-90, Part Number 8-58-00-01-009

Hub City
2914 Industrial Avenue
P.O. Box 1089
Aberdeen, SD 57402-1089
(605) 225-0360
(605) 225-0567 (fax)

Coupling (Pump and Engine Shaft)

Pump and Engine Shaft: Lovejoy L110 X 1 Bore Hub with 1/4 X 1/8 keyway, Item number 68514411739

Gear Reducer Shafts: Lovejoy L110 X 1-1/4 Bore Hub with 1/4 X 1/8 keyway, Item number 68514411743

Coupling Spiders: Lovejoy L110SOX, Item Number 68514411724

Lovejoy, Inc
2655 Wisconsin Avenue
Downers Grove, Il 60515-4299
(630) 852-0500
(630) 852-2120 (fax)
web site: www.lovejoy-inc.com

Pump

Oberdorfer N26HDL

Oberdorfer Pumps Inc.
5900 Firestone Drive
P.O. Box 4770
Syracuse, Ny 13221
(315) 437-0361
(315) 463-9561 (fax)
www.obderdorfer-pumps.com

Directional Control Valve

Marwin 3T-2S33FTRF1-30

Marwin Valve
A Division of Richards Industries
3170 Wasson Road
Cincinnati, Oh 45209
(513) 533-7340
(513) 533-7343 (fax)
web site: www.marwinvalve.com
email: marwin@richardsind.com

Camlock Fittings

Cap: PT Coupling VSL2 2" Aluminum Self Locking Dust Cap (Also McMaster Carr Part Number 51415K185)

Adapter: 2" F Aluminum Adapter – Adapter End X NPT Male End, McMaster Carr Part Number 51415K45

McMaster Carr Supply Company
9630 Norwalk Blvd
Santa Fe Springs, Ca 90670-2932
(562) 692-5911
(562) 695-2323 (fax)
web site: www.mcmaster.com
email: la.sales@mcmaster.com

Tank Re-Circulation Valve and Gaskets

Tank Re-Circulation Valve: Betts Assembly Number EV46326SSTS

Tank to Flange Gasket: Betts Part Number G25507TF or G25507TF-MIL

Flange to Valve Gasket: Betts Part Number G15181TF or G15181TF-MIL

Betts Industries, Inc
1800 Pennsylvania Avenue W.
Box 888
Warren, Pa 16365-0888
(814) 723-1250
(814) 723-7030 (fax)
email: betts@penn.com

Tank Sump Valve and Gaskets

Sump Valve: Betts Assembly Number EV46242SSTS

Sump Gasket: Betts Part Number G15266TF or G15266TF-MIL

Betts Industries, Inc
1800 Pennsylvania Avenue W.
Box 888
Warren, Pa 16365-0888
(814) 723-1250
(814) 723-7030 (fax)
email: betts@penn.com

Tank Valve Operator Fusible Link Assemblies

Fusible Bushing Nut: Betts Part Number 19724BR

Lock Nut: Betts Part Number 9Q5808A

Adjusting Bolt: Betts Part Number 20040A

Clamping Nut: Betts Part Number 10268A

Betts Industries, Inc
1800 Pennsylvania Avenue W.
Box 888
Warren, Pa 16365-0888
(814) 723-1250
(814) 723-7030 (fax)
email: betts@penn.com

Fusible Links

Re-Circulation Tube Spray Nozzles

Spraying Systems Co Veejet 65 degree H ¾ U-65400 (Used 4 Places)

Spraying Systems Co VeeJet 95 degree H ¾ U-95400 (Used Nearest Tank Inlet)

Spraying Systems Co.
P.O. Box 7900
Wheaton, Il 60189-7900
(708) 665-5000
(708) 260-0842 (fax)

Hose from Directional Valve to Hose Reel

Hose: Unisource Series 2215 1-1/2" 150 psi hose, 3 feet long

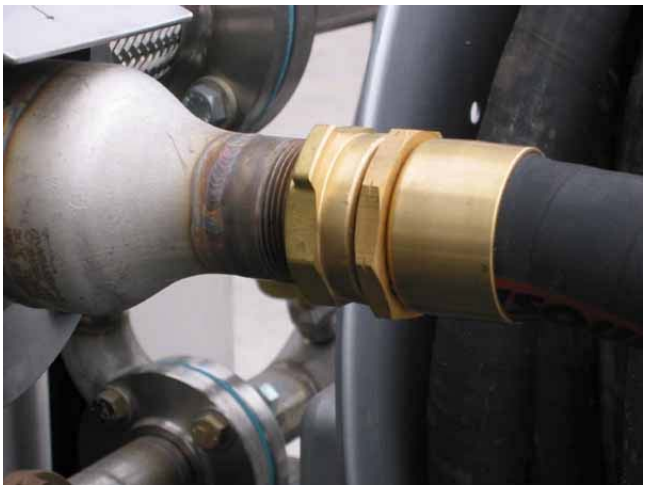
Unisource Manufacturing Inc
8040 NE 33rd Drive
Portland Or 97211
(800) 234-2566
web site: www.unisource-mfg.com
email: info@unisource-mfg.com

Directional Valve End Fitting: Dixon Part Number H5231-A-BU Female Coupling and R15AS-A Ferrule

Hose Reel End Fitting: Dixon Part Number H5232-A Male Coupling and R15AS-A Ferrule

Dixon Valve & Coupling Company
800 High Street
Chestertown, Md 21620
(800) 355-1991
(800) 283-4966 (fax)
web site: www.dixonvalve.com

Note: Make hose conductive



Directional Valve Hose Connection

Hose Reel End Fitting

Helitorch Fueling Hose

Hose: Unisource Series 2215 1-1/2" 150 psi hose, 90 feet long

Unisource Manufacturing Inc
8040 NE 33rd Drive
Portland Or 97211
(800) 234-2566
web site: www.unisource-mfg.com
email: info@unisource-mfg.com

End Fittings: Dixon Part Number H5232-A Male Coupling and R15AS-A Ferrule

Dixon Valve & Coupling Company
800 High Street
Chestertown, Md 21620
(800) 355-1991
(800) 283-4966 (fax)
web site: www.dixonvalve.com

Note: Make hose conductive

Dry Breaks

Adapter (In Main Piping) Emco Wheaton J72A-AVNO-A

Coupler (On end of hose) Emco Wheaton J72C-AVNO-A

Emco Wheaton Corp
2480 Bristol Circle
Oakville, Ontario, Canada L6H 5S1
(905) 829-8619
(905) 829-8620 (fax)
web site: www.emcowheatoncanada.com

Hose With Dry Break Coupler

Flange Gaskets

2” Kevlar Flange Gasket With Nitrile Binder
McMaster Carr Part Number 9472K45

3” Kevlar Flange Gasket With Nitrile Binder
McMaster Carr Part Number 9472K47

McMaster Carr Supply Company
9630 Norwalk Blvd
Santa Fe Springs, Ca 90670-2932
(562) 692-5911
(562) 695-2323 (fax)
web site: www.mcmaster.com
email: la.sales@mcmaster.com

Metal Hoses (Main Piping)

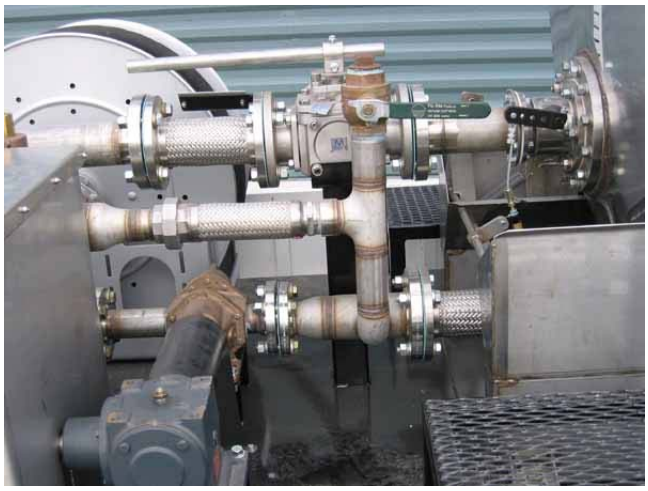
Pump Connector, McMaster Carr Part Number 5468K73

McMaster Carr Supply Company
9630 Norwalk Blvd
Santa Fe Springs, Ca 90670-2932
(562) 692-5911
(562) 695-2323 (fax)
web site: www.mcmaster.com
email: la.sales@mcmaster.com

Relief System Metal Hose

Stainless Steel Hose Assembly 2” Hex Male NPT X Female Union, McMaster Carr Part Number 5680K761

McMaster Carr Supply Company
9630 Norwalk Blvd
Santa Fe Springs, Ca 90670-2932
(562) 692-5911
(562) 695-2323 (fax)
web site: www.mcmaster.com
email: la.sales@mcmaster.com



Relief System Metal Hose
(Middle Hose Assembly)