



A **CARLISLE** COMPANY

Transportation Owners Manual

Operator's Manual
Introduction

*Walker Stainless Equipment
Company Inc.*

This Operator's Manual has been developed to help guide you in the proper operation and maintenance of your WALKER Transportation Trailer. The manual does not address safe driving habits, commodity knowledge, or State and Federal Law, which may govern transportation of some products. This type of information should be obtained from the sources listed at the beginning of this manual, or from the shipper/motor carrier, or from the tractor manufacturer. Before transporting any commodity, it is in your best interest to know the commodity properties for loading, unloading, and handling any accidents or spills.

Every trailer option available may not be listed in this manual. Consequently, if more information is required, you should contact WALKER STAINLESS EQUIPMENT COMPANY, or the component manufacturer.

Your WALKER trailer has been designed to transport specific liquid commodities within certain densities and temperature ranges. All MC Code trailers are designed and manufactured to meet D.O.T. Regulations. Food Grade Trailers must meet not only certain D.O.T. Regulations, but sanitary standards developed and required by the U.S. Public Department of Health.

Proper operation and maintenance begins when you pick up your trailer at the factory and continues throughout the life of the trailer. Regular service and good preventive maintenance will prolong the useful life of your trailer.

*The
Customer is
King...Quality will
Sell...Integrity
can not be
Compromised"*

Robert Walker,
Founder.

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(608) 562-3151

Or

(800) 356-5734

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New Lisbon, WI 53950

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Website:

[http://
www.walkerstainless.com](http://www.walkerstainless.com)

Reference Sources

This information contains a list of organizations providing information and/or literature for the tank transport industry.

National Tank Truck Carriers, Inc.

703-838-3010

2200 Mill Road
Alexandria, VA 22314

NTTC publishes Cargo Tank Hazardous Material Regulations annually for easy access to those rules governing tank truck operations as promulgated by the U.S. Department of Transportation and the Environmental Protection Agency.

Truck Trailer Manufacturer's Association

703-549-3010

1020 Princess Street
Alexandria, VA 22314

TTMA publishes a catalog of 'Recommended Practices and Technical Bulletins' that are guides to general industry practices. In particular, RP No. 36-84 covers the subject of tank truck nomenclature and contains definitions and diagrams for both chemical and sanitary tank transports plus a thorough listing of governmental, trade, and industrial organizations related to truck trailers.

Manufacturing Chemists Association

202-483-6126

1825 Connecticut Avenue N
Washington, DC 20009

MCA publishes Chemical Safety Data Sheets. Each sheet covers one chemical.

American Petroleum Institute

202-833-5600

1801 K Street, NW
Washington, DC 20006

API is an association whose members are engaged in the petroleum or allied industries. API fosters standardization of equipment and materials, communication and assistance with regulatory authorities, and development procedures for the safe handling of petroleum and its products.

Chemical Manufacturers Association

202-887-1255

2501 M Street, NW
Washington, DC 20037

CMA established the Chemical Transportation Emergency Center (CHEMTREC) to provide the public and emergency response organizations information about chemicals and advice or assistance during emergencies. Should an emergency situation develop when transporting or handling chemicals, assistance may be obtained 24 hours a day by calling: 1-800-424-9300.

SAFETY

Please read this section carefully. It contains important information regarding the safe operation of your tank trailer.

Remember to use good common sense practices and to stress "safety first, last and always".

As owner/operator it is your responsibility to operate your tank trailer in a safe and intelligent manner. In this section and in the information provided by component suppliers (throughout this manual), every effort has been made to assist you in avoiding serious personal injury and/or major damage to your tank trailer. However, the responsibility for safe day-to-day operation and maintenance is yours.

If you have questions or concerns about performing any operation or maintenance procedure, please contact WALKER STAINLESS EQUIPMENT CO., INC. or the component supplier first.

IMPORTANT SAFETY CONSIDERATIONS

WARNING:

Serious hand injury may result from improper operation of pump and/or discharge valve.

CAUTION:

Always open tank discharge valve completely and insert valve stem retainer.

DANGER:

(sanitary valve only) prior to pumping on or tank trailer.

CAUTION:

Never start pump without opening tank trailer valve and customer feed/receiving tank valve.

CAUTION:

Stand clear of discharge area during loading or unloading to avoid accidental injury. Keep hands and clothing away from moving parts.

CAUTION:

Open tank/trailer manhole and supply tank venting prior to loading or unloading.

CAUTION:

Check all product lines for secure connection prior to opening valves or engaging pump.

CAUTION:

Cap all pump and discharge openings after each use and check hose tube doors for security before moving tank trailer.

MINOR INSPECTION

MAKE TRIP SAFETY INSPECTION

LANDING GEAR:

Visually check for broken or worn parts. Visually inspect all mounting bolts and tighten as required.

RUNNING GEAR:

Inspect for broken springs, hangers, torque arm bushing for excessive wear, looseness. Torque "U" bolt nuts.

BRAKES (WHEELS MOUNTED):

Inspect brake mechanism for operation, damage and leaks. Inspect hoses for cuts and/or scuffing.

FRAME:

Inspect subframe and crossmembers for damage or cracks. Inspect upper fifth wheel plate, kingpin for excessive wear or damage. Inspect mounting bolts on upper fifth wheel plate. Inspect fender and brackets and tighten as required. Inspect auxiliary boxes. Inspect piping and flanges for leaks or damage. Inspect wrapper panels for damage (insulated units) or which may be loose indicating a structural problem. Inspect vessel for damage and/or leaks. Test operation of emergency valve remote control.

LUBRICATE:

See lubrication procedures.

MAJOR INSPECTION

MAKE MINOR INSPECTION

AXLES AND BRAKES

(WHEELS REMOVED):

Clean and inspect bearings, wheels and hubs. Repack bearings. For oil seals equipped axles, clean and refill with oil. Align axle(s). Tighten all "U" bolts and/or spring bolts. Inspect all brake parts, linings, drums, etc. for wear and damage.

WIRING SYSTEM:

Check for broken or damaged conduit, loose or frayed wires. Inspect receptacle for excessive wear and damage cover. Inspect terminals on circuit breakers. Inspect main and rear wiring harness for damaged insulation, frayed wires, fractured conduit. Inspect all light sockets for moisture and corrosion; clean as required (do not clean with carbon tetrachloride).

TRAILER MAINTENANCE SERVICE REQUIRED

In addition to the pre-trip safety inspection, the scheduled maintenance services listed in the General Care and Maintenance Section, and the Trailer Maintenance Services in the Suspension and Landing Gear section are required for keeping your trailer in peak operating condition. These suggested service intervals will add operating miles and years of trouble free service to the life of your trailer.

NOTE: All maintenance periods are recommendation based on average operating conditions. Trailers operated principally on gravel or duty roads, or through unusual amounts of water, may require maintenance more frequently and should be serviced as required.

Confined Entry Precautions...

Cleaning and Ventilations

Should the confined area contain sludge or other residue, or if the environment tested positive for combustible and toxic elements or indicated an oxygen deficiency which can be remedied, the area should be purged and positive ventilation provided.

- The residue should be removed.
- Flushing with water or steam should follow to assure proper cleaning unless the vessel carried substances such as carbon disulphide or butadiene (in these instances condensate has a tendency to build up static electricity when it drips).
- A system for positive ventilation should be provided. The most effective method of admitting air is at the bottom of the area with the discharge at the top. Fresh air should be continually circulated while a person is in the area.
- After purging and ventilation procedures have been completed, the environment should be re-tested for hazards.

Confined spaces should be ventilated before and during operations performed in the confined space.

If flammable commodities have ever been transported in the tank, always mechanically sample the air inside to determine if the tank atmosphere is explosive. Never produce sparks or apply an open flame to the tank until the sampling device indicates "SAFE".

Ventilation should provide for internal air circulation throughout the work area and should remove fume generated and avoid re-circulating contaminated air.

Oxygen (sometimes improperly called "air") should not be used to ventilate confined spaces since excess extends the flammable range of gasses and vapors. Excess oxygen also makes combustible materials, just for example, clothing, they ignite easily and burn furiously

Entry Procedures

Authorization of entry into a confined space should be given by a qualified person who:

- Is capable of recognizing and evaluating potential hazards and unsafe conditions related to confined space entry.
- Is capable of specifying the necessary protection and precautions to be taken to ensure the safety of employees while performing confined entry work, and is authorized to designate the type of confined space work to be performed. This is to be shift foreman or leadman in the area where work is being performed.

All personnel working in confined areas should be properly trained in safe entry and rescue procedures. They should have a thorough knowledge and understanding of their equipment and the potential hazards that exist. The employees should be in excellent physical condition and psychologically suited to the job. Periodic updating of methods and training is the responsibility of the owner/operator.

Under no circumstances should a person enter a confined area without at least one other person monitoring the entrance. The observer should be capable of and equipped to remove the worker in an emergency.

Complete information is available from TTMA or NTTCC, which are listed as references in the beginning of this manual.

Vehicle Labels and Decals

The Federal Motor Carrier Safety Regulations and the Federal Motor Vehicle Safety Standards and Regulations both require labels to display specific information. In addition, WALKER STAINLESS EQUIPMENT COMPANY provides labels to identify the transport and to reflect compliance with specific industry standards and codes.

REQUIRED LABELS FOR ALL TRANSPORTS

Wiring circuits: Schematic diagram for the trailer wiring circuit located below the seven conductor electrical connector receptacle.

REQUIRED LABELS FOR SANITARY TRANSPORTS

3A: Small adhesive label which identifies the transport as complying with the "3A" sanitary standards.

Accident prevention decals are displayed on the tank transport for the protection of personnel and property. Three different types of accident prevention decals are used:

Danger Signs: Warn against an immediate hazardous condition that might cause personal injury, death, or property damage. Operating personnel shall be instructed that danger signs indicate IMMEDIATE DANGER and that special precautions are necessary.

Caution Signs: Warn against a potentially hazardous condition or caution against unsafe practices. Operating personnel shall be instructed that caution signs indicate a possible hazard and proper precautions should be taken.

Information Signs: Give instructions or information on the proper operating procedures of certain equipment and where damage to people or property is not the predominant consideration for their display.

NOTE: The following is a list of the location of decals and drawings. All of the decals might not be applicable to your particular tank(s).

Decal Number	Decal Description	Decal Location
SC991-17	Caution:After Cleaning, Keep Manhole Open...	On Manhole Cover
DEC0047	Caution:Air Pressure Inlet Do Not Exceed...	At Vent Area
DEC0037	Caution:Blue Pin On ISO3731 Plug Wired...	At Nose Box
DEC0034	Caution:Wired To Provide Continuous Power...	At Nose Box
HR997-35	Caution:Handrails Become Slippery When...	At Ladder Area
DEC0038	Caution:Blue Pin On SAE J560 Plug...	At Nose Box
DEC0033	Caution:Wired To Provide Continuous Power...	At Nose Box
DEC0036	Caution:Black Pin On SAE J560 Plug...	At Nose Box
HP991-5	Caution:Do Not Pass Steam Or Hot Fluids...	At Steam Inlet
CS991-15	Caution:Know What Product Was Previously...	At Valving Area
RV991-16	Caution:Clean And Check Release Valves...	On Manhole Cover
UR991-20	Caution:Do Not Exceed Maximum Operating...	At Valving Area
ST991-21	Caution:Do Not Exceed Maximum Operating...	At Valving Area
ST991-21A	Caution:Do Not Exceed Maximum Operating...	At Valving Area
UR991-23	Caution:Do Not Exceed Maximum Operating...	At Valving Area
IN991-28	Caution:Do Not Exceed Maximum Operating...	At Valving Area
PV991-6A	Caution:This Tank Is A Pressure Vehicle...	At Valving Area
TC991-7	Caution:Unload Front Compartment First...	At Landing Gear (Crank Side)
RF297-34A	Attention:After 5000 Miles And Periodically...	At Landing Leg Frame
HY195-33	Warning:Do Not Go Near Leaks...	At All Hydraulic Fittings,etc..
HO991-27	Warning:Hot Surface Can Burn Flesh...	At All Hydraulic Fittings,etc..
RP991-29	Warning:Rotating Parts Can Cause ...	At Pump And Motor Locations
ES991-26	Warning:Electrical Shock Hazard Exists...	On Motor
OV991-8	Warning:Outlet Valve Must Be Fully...	At Valving Area
FD991-14	Warning:Remove Fusible Devices Before...	At Top Near Fusible Plugs
SG991-12	Warning:Do Not Operate Motor Without...	Inside Cabinet Near Motor Guard
NPV991-6	Safety Instructions:This Tank Is Not A ...	At Valving Area
MV997-11A	Safety Instructions:Manifold Use For Transit...	At Heating Inlet
SO991-3	Safety Instructions:Brak Off Device To Close...	At Emergency Valve Control
HX994-22A	Safety Instructions:Heat Exchange Inlet...	At Heating Inlet
SV991-25	Safety Instructions:Steam Trap Valve Open...	At Steam Trap
HX991-22	Safety Instructions:Heat Exchange Inlet...	At Heating Inlet

Continued on the Next Page...

TC293-32	Safety Instructions:Lose Of Tire In Transit...	At Tire Carrier
MV991-11	Safety Instructions:Manifold Use For Transit...	At Heating Inlet
FW993-9A	Safety Instructions:Kingpin Plate...	At Kingpin Area
DEC0040	Override Switch For Blue Pin...	In Compartment
DEC0039	Override Switch For Black Pin...	In Compartment
UF991-13	Danger:This Tank Is Insulated In Part...	At Ladder Area
GF991-18	Danger:Confined Spaces May Contain...	On Manhole Cover
MH-293-4A	Danger:Pressure Can Cause Injury Or...	On Manhole Cover
NS293-31	Danger:No Step...	At Top Near Manhole/Walkway Ends
FC991-24	Danger:Be Sure Of Footing...	At Ladder Area
SD-002(D)	Danger:Spoke Wheels, Torque Wheels...	At Suspension Frame
TP-95172	Notice:If The ABS Indicator Lamp Comes...	At ABS Indicator Lamp
CMI 106859 (2/99)	This Vehicle Is Equipped With Pre-Greased...	At Suspension Frame

Pre-Trip Safety Inspection

Before each trip, an inspection is necessary for safe operation and to prevent major maintenance work, serious trip delays and accidents.

AIR BRAKE PRESSURE: Check air brake pressure gauge in tractor cab. This should show a steady pressure when engine is idling. Pressure should not drop excessively when brakes are applied. (Use of 20% of original pressure indicates insufficient air reservoir capacity.)

WHEELS: Check and tighten all loose wheel stud nuts. Look for grease leaks and broken, damaged or missing parts.

TIRES: Check all tires with pressure gauge and inflate to proper pressure. This is important since an inside tire on dual wheels may be low on pressure or even flat, and it is almost impossible to detect by visual inspection. Remove all foreign matter, such as wire, nails, glass, or stones from and between tires. (Always match equally worn dual tires.) Check mudflaps.

BRAKE LINE CONNECTIONS AND LIGHTS: See that the trailer brake hoses are connected properly and do not indicate chafing. Listen for air leaks. See that electrical jumper cable is properly inserted in the coupler socket. All marker lights should burn brightly. If lights are dim, flicker, or fail to light, look for a broken connection or a bad ground. Loose wire connections should be tightened and all broken parts replaced. Clean all light lens and reflectors. (WARNING: Never operate a trailer with defective brakes or lights.)

AIR BRAKE RESEVOIR AND BRAKES: Open drain cock fully to drain condensation from tank. When no water shows in the escaping air, close drain cock tightly and be certain it does not leak. Check gauge on tractor to assure pressure of 100 to 120 pounds before unit is put into operation. Adjust brakes and slack adjusters, if necessary. Inspect system for damage.

TIRE CARRIER: Check the tire carrier structure for possible damage and be sure tire is properly secured.

FASTENERS: Check all trailer components, such as the tire carrier, landing gear, kingpin assembly, suspension, valves, covers, doors, fenders, walkways, bumpers, light boxes, ladders, etc. Loose or missing fasteners should be replaced and tightened, and any damage should be corrected immediately.

MISCELLANEOUS: Before driving away, check the following:

1. Landing legs are raised to maximum height.
2. All hose tubes are closed tightly.
3. All doors and cabinets are closed tightly.
4. Dome cover is closed and secured.

***Be sure fifth wheel is securely locked to trailer. This can be tested by setting hand control valve on tractor to apply trailer brakes only. Put tractor in low speed and test. If tractor is not equipped with hand control valve, remove the "emergency line" which will cause the relay emergency valve to go to "emergency" position and apply the trailer brakes. This feature should be tested each time the tractor is coupled to the trailer.

Transportation Product Group Bulletin

DATE: February 3, 1995
SUBJECT: Ring Clamp Bolts
 (TTT, TBTC, BPC)
TO: All Direct Factory Representatives,
 Distributors and Agents

Recently it has come to our attention that the ring clamp fasteners installed on all frame and cradle construction tanks are in many cases not included in routine inspection and P.M. servicing. These, like any fasteners, require periodic inspection and retorquing where necessary. Attached for your information is a decal we will be installing on all appropriate models effective February 1, 1995

In an effort to simplify maintenance, we are now installing these fasteners with threads and lock nuts to the outside on all models with 3" insulation.

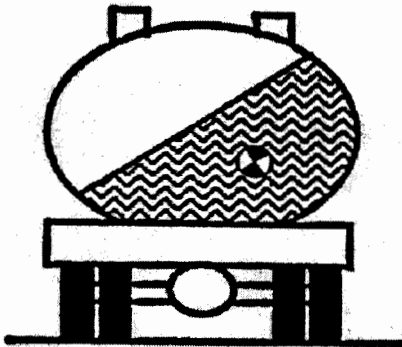
Please enforce with your customers the importance of maintaining the security of these fasteners at 75 ft lbs of torque, preferably with hand tools as over torquing will result in distortion of the frame flange angle and may strip out the threads.

ATTENTION

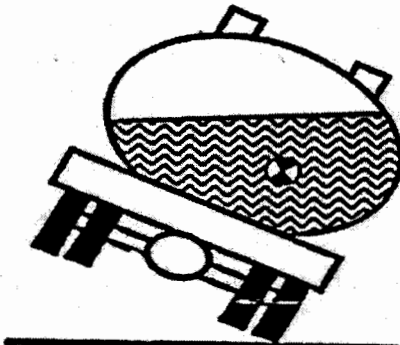
AFTER 5000 MILES AND PERIODICALLY THEREAFTER, CHECK THE EXTERIOR RING FASTENER BOLTS OR LOCKNUTS FOR SECURITY. RETORQUE TO 75 FT. LBS. THIS SETTING MUST BE MAINTAINED AT ALL TIMES. LOOSE BOLTS OR LOCKNUTS MAY CAUSE PREMATURE DAMAGE TO EXTERIOR RINGS.

8795-9A

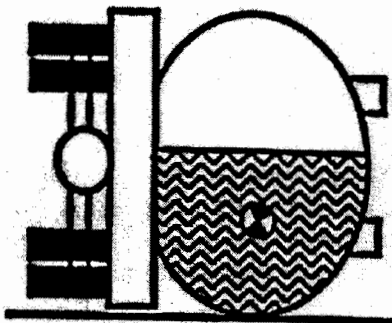
ANYTHING OTHER THAN FULL OR EMPTY,



(a) Initiation of Rollover



(b) Lift-Off Ground



(c) 90 Degree Rollover
& Impact

Center of Gravity

ON GUARD

*US Department of Transportation
Federal Highway Administration*

When partially loaded, cargo tanks can have stability problems. Tank truck drivers need to be constantly aware that they are transporting a partial load. These drivers can be lulled into a false sense of security by driving at freeway speeds for only a few minutes. Then, if it is necessary to make an evasive maneuver, or even merely to slow and turn onto an exit ramp, the resulting unexpected shifting of the liquid cargo can easily overturn the tank truck or produce very long braking distances, causing an accident that could otherwise have been avoided.

A lack of constant awareness of the partial load is likely to result in the driver finding himself or herself in a situation from which there is no escape. By the time the tank truck driver "feels" the load shift unexpectedly, it is usually too late to prevent a serious crash.

Of course, tank truck drivers with partial loads are constantly kept aware of their load whenever they start, stop, or turn. Because they are aware, these professionals take the appropriate counteractions, usually reduced speed, to avoid serious consequences.

But when tank truck drivers are on the open road with a partial load, they must constantly remind themselves of that fact, allow for extra emergency stopping distance and avoid, to the extent possible, situations which might require an evasive maneuver. Tank truck drivers with partial loads should never allow themselves to get caught in a situation where there is no way to avoid a rollover or serious crash.

Cargo tank drivers must be capable of operating and controlling their vehicle in heavy traffic situations at all times. Whether loaded or empty, cargo tanks have visibility and size problems that can create difficult situations for the cargo tank driver and other vehicle operators. When partially loaded, cargo tanks have increased problems because, if allowed to, liquid cargo shifting can cause vehicle instability that even the most experienced driver cannot correct or control. Maintaining proper speeds and being constantly aware of the partial cargo are the best safeguards available against most situations that cargo tanks are likely to encounter.

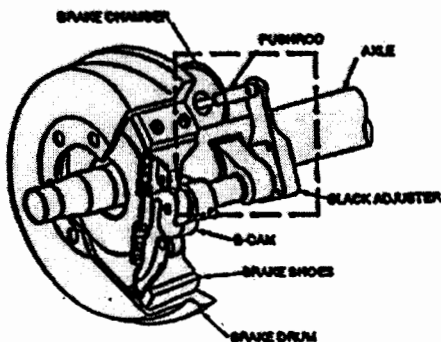
This is how an accident can begin. A tank truck driver is making a right turn off a freeway onto a 25 mph ramp. The driver is watching the congested traffic ahead and behind. The right turn signal is on and the trucker gears down to around 40 mph as the truck enters the off-ramp traffic. The driver brakes slightly and watches the traffic stream while entering the ramp. Traffic is slowing and the trucker drops to a lower gear and starts into the right turn. More braking is applied and then the right side of the rig starts to "float". The driver then remembers the cargo tank is only half full. If the operator steers left to correct, the rig will jump the left curb. If the driver brakes sharply and stays in the ramp traffic, the leftward shifting of the load could be accentuated and overturn the tanker.

There is no textbook solution to this dangerous situation other than to avoid it in the first place. Tank truck drivers must be constantly aware any time their cargo tank is partially loaded.

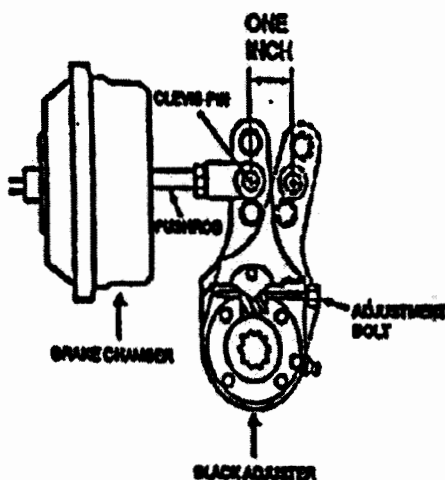
Tank truck drivers say that liquid cargo shifting is a problem whenever the driver makes lane changes, takes evasive action, or applies brakes. A prime location for this condition to develop is at freeway exit ramps because travelling at freeway speeds for even a few minutes may lull the driver into forgetting about the partial load.

Even though full or empty runs occur much more frequently than partial loads, there is and will continue to be an occasional need for partial loads. The special handling required dictates full awareness at all times of the changes in vehicle dynamics that require lower speed and more careful braking and direction changes.

WITHIN AN INCH OF YOUR LIFE



THIS IS THE MOST
IMPORTANT INCH OF YOUR
LIFE



**BRAKES SHOULD BE CHECKED
BEFORE EACH TRIP AND MORE
FREQUENTLY IN HILLY AREAS.**

ON GUARD

*US Department of Transportation
Federal Highway Administration*

TRUCKERS! Poorly adjusted brakes could cost you time and money with out-of-service violations, jeopardize your safety and that of others due to impaired stopping ability, and even cost you your life. The only way to be sure that your vehicle's brakes are properly adjusted is to physically check each wheel on a regular schedule. It is difficult for you to sense, simply from pedal feel, that your brakes are out of adjustment. Under normal braking conditions, your brake may respond satisfactorily, but under a hard or panic stop, you may find that you are unable to stop in time.

HOW TO CHECK:

Before checking or making adjustments, be sure that your vehicle is parked on a level surface with the wheels blocked, spring brakes released, and the engine shut off. The following measurements are for Type 30 air chamber brakes only. For other types, check with your mechanic, supervisor, or manufacturer.

One-person method: (1) Pull the chamber pushrod to its limit by hand or by prying with a short pry bar. (2) Measure from the clevis pin to the chamber face at both full retraction and at full extension. The difference between these measurements is the pushrod travel or slack. One-half inch is correct, and the **MAXIMUM ALLOWABLE TRAVEL IS ONE INCH.** (one-person method).

Two-person method: (1) Make the same measurements described in the one-person method, but with brakes fully applied and with brakes released. Because of the considerable stretching and bending of various parts when using the two-person method, the **MAXIMUM ALLOWABLE TRAVEL IS TWO INCHES** for Type 30 air chamber brakes.

HOW TO ADJUST: Brake adjustment, or "taking up slack" is done by first making sure the brakes are released then turning the adjusting bolt on the slack adjuster arm: (1) Depress the spring locking sleeve with a wrench. (2) Tighten the bolt until solid resistance is met. This indicates that the brake linings are touching the drum.

NOTE: Most adjusting bolts require a normal clockwise turn to "set-up" the brakes, but some require a counter-clockwise turn. Be alert for any outward movement of the chamber pushrod and slack adjuster arm while the adjustment bolt is being turned. This movement means you are turning in the wrong direction.

(3) Restore running clearance by backing off the adjustment between one-quarter and one-half a turn. Re-check the pushrod travel. Proper adjustment leaves one-half inch. (4) Check each brake drum or rotor for excessive heat soon after the brakes have been adjusted. An extra-hot brake drum means that you have adjusted the brakes too tightly.

For both this type and other types of brake systems, always check with the manufacturer for proper maintenance and adjustment procedures. If you are not comfortable with these procedures, ask your mechanic or supervisor.

PROTECTING STAINLESS STEEL DAIRY EQUIPMENT FROM CORROSION

INSTALLATION AND MAINTENANCE CLEANING AND "LIFE GIVING" PRACTICES

Published By:

**NATIONAL ASSOCIATION OF DAIRY AND FOOD
EQUIPMENT MANUFACTURERS
WASHINGTON, DC**

Close observance of the practices and recommendations for installation, maintenance, cleaning, and bactericidal treatment of stainless steel equipment stated herein, will result in longer, corrosion-free life for your equipment and should provide a clean, sanitary surface for milk and milk products. Such practices and recommendations are consistent with the provisions of the United States Public Health Service Recommended Milk Ordinance.

Nickel Bearing Stainless Steel (AISI 300 Series) is resistant to corrosion by milk and other products. That is, under normal operation, the milk and other dairy products that come into contact with the stainless steel will not cause corrosion. However, since the advent of circulation cleaning and C.I.P. procedures, corrosion problems in dairy plants have been aggravated.

Nickel Bearing Stainless Steel is the best material known to dairy equipment manufacturers for the construction of dairy equipment, but the following procedures must be followed in order to insure preservation of the surfaces of stainless steel equipment.

INSTALLATION AND MAINTENANCE OF S. S. DAIRY EQUIPMENT

Instructions

1. The use of dissimilar metal should be minimized in the fabrication of the product contact surfaces, especially if the equipment is to be placed in a C.I.P. type installation. Wherever possible, use only "AISI 300 Series" stainless steel. "White Metal", a copper-nickel alloy, should not be used in fabricating product contact surfaces. If possible, "AISI 400 Series" stainless steel should not be used with "AISI 300 Series" in fabricating a product contact surface, especially if the equipment is to be used in a C.I.P. type installation.

2. Stainless steel tubing should be insulated from metal pipe hangers with non-absorbent insulation.

3. Gaskets should be non-absorbent materials which are free from iron oxide and other corrosive substances.

Reasons

1. The use of dissimilar metals, even two different series stainless steels, or "White Metal" for product contact surfaces in the same system may result in discoloration, pitting, or etching.

2. Failure to insulate may result in galvanic or other types of electrolyte corrosion with serious damage to the piping. Absorbent insulation may accumulate moisture and aid in the corrosion of the piping.

3. Chemically active gasketing material may induce corrosion. Absorbent gaskets may permit a build-up of highly concentrated cleaning and bactericidal compounds which can produce pitting.

Continued on the Next Page...

4. Leaky gaskets and joints should be promptly replaced or repaired. The use of different types of fittings in making pipe connections should be avoided where possible. Properly designed and installed pipe and equipment supports and mountings are necessary to prevent undue mechanical strains and stresses on joints.

5. Welding and polishing should be performed by competent individuals using approved methods and materials. The use of low welding temperatures, appropriate grades of welding rod and parent metal, and iron free polishing wheels and compound is encouraged. Excessive grinding and polishing may also leave the surface in a weakened state.

6. When new equipment, and particularly C.I.P. systems, are installed, all electrical equipment in the area of the installation should be checked for proper connections, grounding, worn or damaged insulation, or other factors which might lead to stray electrical currents. Periodic "preventive maintenance" checks should be made to ensure that this condition does not occur.

7. When installation is complete and prior to use, the equipment and piping should be thoroughly cleaned, drained, and allowed to air dry if possible. It should then be subjected to an approved bactericidal treatment just before product is to be processed.

4. Products and cleaning material leaking through joints may promote corrosion if the corrosive material is allowed to remain in the joint area. C.I.P. installations, where lines are normally dismantled, are especially susceptible to corrosion in the joint area if leaks occur.

5. The corrosion resistance of even the highest grades of stainless steel may be reduced considerably by the use of excessive welding heat; by the use of low grade welding rod or parent metal; by the incorporation of iron particles during polishing; or from failure to remove weld spatter or fluxing agents. Pits or voids remaining in the polished weld area should be completely removed since they form natural areas for corrosion to start.

6. A pitting form of corrosion may result if stray electrical currents come in contact with moist stainless steel. Local electric power companies or electricians should be consulted with regard to detection of such a condition.

7. Thorough cleaning and air drying permits the formation of a protective oxide film, which is the key to placing the systems in its most corrosion resistant (passive) condition.

Cleaning and Bacterial Treatment

Instructions

1. Use only products of reputable and responsible chemical manufacturers who are familiar with dairy processing equipment processes and limitations, and who are able and willing to make specific recommendations for cleaning practices.

2. Use the manufacturers' products in the precise manner in which they are recommended, but only with the concurrence of the equipment manufacturer.

3. Use a suitable water conditioner if the water supply is contaminated with foreign matter which may cause discoloration of the metallic surfaces or undesirable deposits.

4. When product processing has been completed, the equipment should be immediately rinsed with warm water until the rinse water is clear. Complete circulation or manual cleaning should follow as soon as possible.

Reasons

1. Responsible chemical manufacturers continuously check the results obtained with their products on dairy processing equipment, and maintain technically qualified staffs of service personnel.

2. Misuse of normally acceptable cleaning and bactericidal products, in excessive concentrations, temperatures, or exposure times may cause permanent damage to processing equipment.

3. Deposits or discolorations from a contaminated water supply may counteract the best cleaning practices, and may cause corrosion of the best quality stainless steel equipment.

4. Product deposits are most easily removed while still moist, and considerable amounts of soil can be removed by the initial rinse following processing. Particles of moist solid left on the stainless surfaces may cause pitting at a point beneath the particle.

5. Use only soft non-metallic brushes, sponges, or pads when manual cleaning is indicated. An extended period of soaking in the cleaning solution will facilitate removal of stubbornly adhering residues. Extreme care is required when manually brushing to avoid scratching the surface of stainless steel equipment.

5. Metal brushes or sponges will scratch the surface of stainless steel equipment and may promote corrosion over an extended period of time. If improperly used, even non-metallic brushes may scratch the surface. Metallic particles from sponges, if allowed to remain on equipment or in pipelines, may cause corrosion.

6. If alkaline and acid cleaners are used alternately in circulation cleaning, one must be completely rinsed out before the other is introduced into the system. After chemical circulation has been completed, the system must be thoroughly rinsed with warm water, then cool water, before it is shut down. Wherever possible, the system should be completely drained and opened to allow the metallic surfaces to air dry, so that the corrosion resisting passive film (oxide) may form.

6. If alkaline cleaning solutions and milk residues are not completely removed, a "milkstone" buildup may occur. If acid solutions are not completely removed, a highly corrosive atmosphere may form which can cause discoloration or pitting. In addition, most chemical bactericides are considerably more corrosive if they are introduced into an acidic medium. A thorough final rinse is of major importance in the prevention of corrosion.

7. Bactericidal treatment with "live steam" is many times only partially effective, and may cause considerable damage to processing equipment. It is not recommended.

7. Concentrated heat may cause buckling, erosion, or discoloration of the stainless steel, and may reduce corrosion resistance in localized areas.

8. When chemical bactericides are used, extreme caution must be exercised to use them only as prescribed by the chemical manufacturer, in concurrence with the local health authorities and the equipment manufacturer. Specific concentrations, temperature, and exposure times must be followed as recommended. In addition, the chemical bactericide should be applied just before the equipment is to be used, and in no case should the exposure time exceed twenty (20) minutes.

8. Excessive concentrations, exposure times, or temperatures employed during bactericidal treatment with chemicals may cause serious corrosion of the metal surface and premature aging of the sanitary rubber parts in the system.

* It should be noted that even a few degrees increase in the temperature at which the chemical bactericide is applied will greatly increase the chemical activity, and thus the corrosive effect upon the metallic surfaces and the aging effect upon the rubber surfaces. Therefore minimum temperatures

9. If it is impossible to replace "White Metal" and "AISI 400 Series" stainless steel components from processing systems which are to be circulation cleaned, these parts should be removed from the system during the cleaning cycle and manually brushed, if at all possible.

9. "White Metal" and "AISI 400 Series" stainless steels are considerably less resistant to chemical attack than the "AISI 300 Series" stainless steels, and they may be readily corroded when cleaned by circulation methods.

Life Extending Practices For Stainless Steel

1. Use only soft fiber brushes, pads, or sponges for manual cleaning.
2. Use a water conditioner if water is high in undesirable foreign materials.
3. Remove weld spatter, fillings, fittings, wrenches, and rubber parts from wet stainless steel surfaces.
4. Remove all milk residues from stainless steel surfaces.
5. Use chemical cleaners only as directed by the manufacturer, and thoroughly rinse all alkaline and acid cleaners from stainless steel surfaces with clear water.
6. Apply a chemical bactericide only as directed by the chemical manufacturer, and in no case longer than twenty minutes prior to loading.
7. Whenever possible, open equipment and allow to air dry after the final clear water rinse.
8. Install equipment and piping so that all parts are aligned and well supported to prevent undue stress or strain on any component.
9. Use only stainless steel of similar series in systems which are to be cleaned by circulation methods.
10. Allow only qualified personnel, using approved techniques and materials, to weld and polish stainless steel equipment.

CARE AND MAINTENANCE OF METAL PARTS

Stainless Steel Barrels and Fabricated Parts

GENERAL

Many parts of your trailer are fabricated from high quality stainless steel. Stainless is resistant to corrosion in many applications but cannot be considered a cure for corrosion problems. Certain chemicals can cause pitting and stress corrosion cracking. Chlorine, sulfides, bromine iodine and salt compounds are all common offenders. Be sure to follow readily available recommendations contained in TTMA Bulletin #59 and Equipment Data Sheets published by the NTTC.

SANITARY (3A) AND FOOD GRADE

When warm products are hauled, rinse and cool tank immediately after use. Your trailer is made of the finest known material for use in contact with dairy products, however even stainless steel will deteriorate if correct cleaning procedures are not followed.

WHEN HAND BRUSH METHOD IS USED:

1. Rinse with cold water immediately after emptying. Before washing, rinse with water (100-115 ° F.)
2. In a bucket of warm water, dissolve alkaline dairy cleaner (in amounts recommended by manufacturer of cleaner) and brush all product contact surfaces.
3. Rinse with water below 115 ° F. Leave tank open and allow to drain dry.
4. Brush rinse with 100 ppm or spray with 200 ppm chlorine or other bactericide of proper strength. If a chemical bactericide is corrosive, apply just before filling tank.

IMPORTANT: Stainless steel surfaces which will not be completely covered by milk or dairy products within twenty (20) minutes after application must be rinsed free of any chemical bactericide to prevent continuing contact with and possible corrosion of stainless steel surface.

CAUTION: If this tank is refrigerated by direct expansion, do not use water at temperatures higher than 115 ° F. because of the danger of developing high refrigerant pressures. Refer to tank precautions pertaining to the refrigeration system.

METHODS FOR CLEANING STAINLESS STEEL

	Cleaning Agent	Method Of Application	Effects On Finish
Routine Cleaning	Soap, ammonia, or detergent and water.	Sponge with cloth, then rinse with clear water and wipe dry.	Satisfactory for use on all finishes.
Stubborn Spots and Stains, Baked on Splatter and Other Light Discolorations	Revere Ware Cleaner, Twinkle, or Cameo Stainless Steel Cleaner.	Apply with damp sponge or cloth.	Satisfactory for use on all finishes.
	Goddard's Stainless Steel Care, Revere Ware Stainless Steel Cleaner, Soft Scrub, Household Cleaners, such as Old Dutch, BonAmie, Ajax, and Comet.	Rub with a damp cloth. May contain chlorine bleaches. Rinse thoroughly after use.	Satisfactory for use on all finishes if rubbing is light. Use in direction of polish lines.
	Zud	Rub with a damp cloth.	Use in direction of polish lines. May scratch or dull highly polished finishes.
		<i>Continued on the next page...</i>	

Heavy Tint or Heavy Discoloration	Revere Ware Stainless Steel Cleaner, Goddard's Stainless Steel Care.	Apply with a damp sponge or cloth.	
Burnt on Foods and Grease, Fatty Acids, Milkstone (where swabbing or rubbing is not practical.)	Easy-Off Oven Cleaner	Apply generous coating. Allow to stand for 10-15 minutes. Rinse. Repeated application may be necessary.	Excellent removal. Satisfactory for use on all finishes.
Hard Water Spots and Scale.	Vinegar	Swab or wipe with cloth. Rinse with water and dry.	Satisfactory for all finishes.

ATTENTION

- Use of brand names is intended only to indicate a type of cleaner. This does not constitute an endorsement. Nor does the omission of any brand name cleaner imply its inadequacy. Many product names are regional in distribution, and can be found in local supermarkets, department and hardware stores.
- It is emphasized that all products should be used in strict accordance with instructions on package.
- Use the mildest cleaning procedure that will do the job efficiently and effectively.
- Always rub in the direction of polish lines for maximum effectiveness, and to avoid marring the surface.
- Use only soft cloth, sponges, fibrous brushes, or plastic or stainless steel pads for cleaning and scouring.
- Rinse thoroughly with fresh water after every cleaning.

TTMA TECHNICAL BULLETIN

Reprint From Bulletin #59, Dated April 19, 1979

SUBJECT: CORROSION PREVENTION FOR STAINLESS STEEL TANKS
(Original Issue date 8/73)

1.0 PREFACE

1.1 Recommended Practices or Technical Bulletins furnished by TTMA are a guide to general practice and the state of art that exists at the time of their inception. They are not exhaustive. TTMA cannot possibly know, evaluate, or advise the service trade of all conceivable ways which a practice or bulletin might be used or possible consequences of each way. TTMA has not undertaken any such broad evaluation.

1.2 Everyone who uses Practices or Bulletins, either recommended or not recommended by TTMA, must first satisfy himself thoroughly that neither his safety nor the safety of his product will be jeopardized by any method he selects.

2.0 PURPOSE

2.1 The purpose of this technical bulletin is to alert users to certain limitations of the corrosion resistance of commonly used 300 series stainless steels.

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1. CHARACTERISTICS

3.1 Stainless steel is resistant to corrosion in many applications but certain chemicals can cause pitting and stress corrosion. Chlorine compounds are the most common offenders, with bromine, iodine, and fluorine compounds in a similar category.

4.0 PRECAUTIONS

4.1 Any chemical mixture of compound containing chlorine, (chlorides, chlorites, etc.) either as an ingredient or as a contaminant, can cause pitting or corrosion under certain conditions. Some can be hauled if the tank is thoroughly cleaned and dried after such service. Corrosion rates increase drastically as the temperature is increased, so minimum operating temperatures should be used and use of heating systems should be avoided. Also avoid leaving stagnant product or residue in a parked tank (over a weekend for example) as this will greatly accelerate attack.

4.2 Some unexpected sources of chloride pitting can be chlorinated solvents, sanitizing solutions, sugars, corn syrups, and animal or vegetable oil products containing salts. Tanks should be immediately flushed clean and dried after containing chlorinated solvents or the sanitizing solutions which are commonly found around dairy establishments.

4.3 The most important factor in promoting corrosion resistance (passivity) of 300 series stainless steel is to allow a chrome oxide layer to form on the surface of the metal. Therefore, when washing tanks, be certain to remove all small deposits of product or foreign material which will become starting points for pits (sometimes called deposit corrosion) and thoroughly air dry the tank allowing oxygen in the air to rebuild the chrome oxide layer.

TTMA TECHNICAL BULLETIN

Reprint From Bulletin #101, Dated December 5, 1985

SUBJECT: CORROSION IN GENERAL PURPOSE STAINLESS STEEL TANKS

(Original issue date 12/85)

1.0 PREFACE

1.1 Recommended Practices or Technical Bulletins furnished by TTMA are a guide to general practice and the state of the art that exists at the time of their inception. They are not exhaustive. TTMA cannot possibly know, evaluate, or advise the service trade of all conceivable ways which a practice or bulletin may be used or possible consequences of each way. TTMA has not undertaken any such broad evaluation.

1.2 Everyone who uses Practices or Bulletins, either recommended or not recommended by TTMA, must first satisfy himself thoroughly that neither his safety nor the safety of his product will be jeopardized by any method he selects. These publications are reviewed at least every five (5) years and the date so indicated.

1.3 Definitions of specialized terms used in TTMA Recommended Practices or Technical Bulletins may be found in TTMA RP #36 – "Tank Trailer and Tank Container Nomenclature" or TTMA RP #66 – "Trailer Nomenclature".

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1.4 The use of 'shall' or 'should' has no bearing on the voluntary nature of TTMA publications. Inclusion of a TTMA publication in a document, standard, or contract by a company or agency is a voluntary act. When a TTMA publication is so cited, the publication becomes a requirement within the limitations set forth by the document, standard, or contract. The following shall apply to the use of these words:

Shall is to be used wherever the criterion for conformance with the specific recommendation requires that there be no deviation. Its use shall not be avoided on the grounds that compliance with the report is considered voluntary.

Should is to be used wherever noncompliance with the specific recommendation is permissible. 'Should' shall not be substituted for 'shall' on the grounds that compliance with the report is considered voluntary.

2.0 PURPOSE:

2.1 The purpose of this technical bulletin is to point out some known factors which can cause corrosion problems in general purpose stainless steel tanks. This corrosion may show up as staining, pitting, etching, and/or stress corrosion cracking.

3.0 CORROSION CHARACTERISTICS

3.1 Corrosion in stainless steel tanks may be caused by products which are not rated as corrosives by the Office of Hazardous Materials, US Department of Transportation.

3.2 The ability of a stainless steel tank to haul many marginally corrosive products depends upon operating procedures. To optimize the ability of the tank to haul marginally corrosive materials, the tank should be thoroughly cleaned and dried immediately after the product is discharged. Also, the product should be in the tank for transportation only and not for storage. The reason for this is that it is generally accepted that a tightly adherent oxide film enhances the corrosion resistance of stainless steel and this film is allowed to renew itself after a thorough cleaning and drying.

3.3 Any deposits or residue left in the tank will accelerate corrosion by forming a "cell" condition as well as preventing formation of the oxide film.

3.4 The most common cause of staining, pitting, and stress corrosion cracking of stainless steel is exposure to products containing chlorides. Even in concentrations so low as to be expressed in parts per million, chloride containing products can cause corrosion problems, especially at slightly elevated temperatures. Type 316 stainless steel is more resistant to this type of chemical attack than is Type 304 stainless steel, but it is not immune.

4.0 PRODUCT INFORMATION

4.1 It is impossible to list all products that can cause this type of corrosion problems, but some which have been noted over the years are:

- 4.1.1** Detergents, including wash rack solutions
- 4.1.2** Corn syrup products
- 4.1.3** Chlorinated solvents
- 4.1.4** Fertilizers
- 4.1.5** Animal Fats
- 4.1.6** Any product which may contain chlorides as either part of its formulation or as a contaminant

TTMA TECHNICAL BULLETIN

Reprint From Bulletin #60, Dated September 25, 1995

SUBJECT: CORROSION PREVENTION FOR ALUMINUM TANKS

(Originally issued August 1975, Revised January 1980, December 1985, and September 1995.)

1.0 PREFACE

- 1.1 Recommended Practices or Technical Bulletins furnished by the TTMA are a guide to general practice and the state of the art that exists at the time of their inception. They are not exhaustive. TTMA cannot possibly know, evaluate, or advise the service trade of all conceivable ways which a Practice or Bulletin may be used or possible consequence of each way. TTMA has not undertaken any such broad evaluation.
- 1.2. Everyone who uses practices or Bulletins, either recommended or not recommended y TTMA, must first satisfy himself thoroughly that neither his safety nor the safety of his product will be jeopardized by any method he selects. These publications are reviewed every five years and the date so indicated.

2.0 PURPOSE

- 2.1 The purpose of this Technical Bulletin is to advise users of means of corrosion prevention for aluminum tanks.

3.0 CHARACTERISTICS

- 3.1 Aluminum alloys used in trailer tanks are resistant to corrosion by ordinary atmospheric exposure and most fuels, solvents, and dry bulk products.
- 3.2 Tank fabricators can only assure that the tank is fabricated of the materials specified and cannot be responsible for a corrosive attack or other interaction by any product.

4.0 PRECAUTIONS

- 4.1 Precaution shall be taken to avoid any exposure to caustic (sodium hydroxide, et al) materials which are often present in cleaning or washing compounds as aluminum is not resistant to attack by caustic compounds of any kind.
- 4.2 Precaution should be taken to prevent acids and other chemicals that are mixed with the product from coming in contact with the bare aluminum. An example of this would be the chemicals that are used in acidizing well being pumped back up with crude oil.
- 4.3 Mercury and its compounds, even in extremely low concentrations, will also rapidly destroy aluminum tanks.
- 4.4 Care must be exercised when selecting aluminum tanks for hauling many solvents or fertilizer solutions. While the tank itself may be satisfactory, valves and fittings containing steel, brass, or zinc parts may be installed and these parts can cause trouble due to corrosion. Also special gaskets and composition valve discs may be required. A "Clean Oil" or solvent tank is usually equipped with only aluminum, stainless steel, and teflon fittings, discs, and gaskets.

TTMA TECHNICAL BULLETIN

Reprint From Bulletin #80, Dated July 1, 1999

SUBJECT: SPECIFICATION CARGO TANK VEHICLE USAGE

(Original Issue Date – June 1980, Revised July 1997)

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1.0 PREFACE

- 1.1 Recommended Practices or Technical Bulletins furnished by the TTMA are a guide to general practice and the state of the art that exists at the time of their inception. They are not exhaustive. TTMA cannot possibly know, evaluate, or advise the service trade of all conceivable ways which a Practice or Bulletin may be used or possible consequence of each way. TTMA has not undertaken any such broad evaluation.
- 1.2. Everyone who uses practices or Bulletins, either recommended or not recommended by TTMA, must first satisfy himself thoroughly that neither his safety nor the safety of his product will be jeopardized by any method he selects. These publications are reviewed every five years and the date so indicated.

2.0 INTRODUCTION

- 2.1 This bulletin is intended to suggest accepted operating procedures for the proper usage of MC 306, MC 307, MC 312, DOT 406, DOT 407, and DOT 412 cargo tank motor vehicles.
- 2.2 These suggested directions are not exhaustive since tank vehicles are of varying design to meet the requirements of the first purchaser, therefore the user must satisfy himself that his safety, the safety of the public, the integrity of the transport and the load are not jeopardized.
- 2.3 Before opening, become familiar with the message indicated on all information and caution plates on the vehicle. If a plate or label has become illegible or lost, request replacement from the vehicle manufacturer.
- 2.4 Before loading and/or unloading the product, the user must familiarize himself with its operational characteristics, including manholes, vents, gravity discharge valves, pump-off valves, heating procedures, etc.

2.5 KNOW WHAT PRODUCT YOU ARE LOADING AND KNOW WHAT PRODUCT WAS LAST CARRIED ON THE VEHICLE. Avoid loading products into a cargo tank which may become contaminated from the residue of the previous load. Do not mix dissimilar products in a cargo tank or introduce a product into a cargo tank which may react violently with the residue of the previous load. For example, avoid loading gasoline into a cargo tank with fuel oil residue, loading fuel oil into a cargo tank with caustic or water residue, or loading acid into a cargo tank with caustic or water residue, loading acid into a cargo tank with caustic or water residue, or loading caustic into a cargo tank with acid or water residue. Food grade products should never be loaded into cargo tanks which have previously contained a non-food product.

3.0 CAPABILITIES

3.1 MC 306 and DOT 406 cargo tanks.

- 3.1.1 MC 306 and Dot 406 cargo tanks are used primarily for the transportation of flammable such as refined gasoline.
- 3.1.2 They are also commonly used for combustible products such as No. 2 fuel oil and diesel fuel. Other applications include flammable solvents and non-regulated chemicals. Some of these products may be classed "WATER WHITE CLEAR" where contamination could be a problem, and others while they may not be classed as dangerously corrosive, may damage the cargo tank or its accessories. (Refer to TTMA Technical Bulletins No. 59, "Corrosion Prevention for Stainless Steel Tanks", and No. 60, "Corrosion Prevention for Aluminum Tanks.")

3.2 MC 307 and DOT 407 Cargo Tanks

- 3.2.1 MC 307 and DOT 407 cargo tanks are pressure vessels used for the hauling of flammable liquids with vapor pressures in excess of that permitted by MC 306 and DOT 406 cargo tanks. The MC307 and the DOT 407 specification is also used for class B poisons and flammable liquids which are also corrosive or oxidizing.

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3.3 MC 312 and DOT 412 Cargo Tanks

- 3.3.1 MC 307 and DOT 412 cargo tanks are used primarily for the transportation of corrosion liquids such as caustic soda, phosphoric acid, sulfuric acid and hydrochloric acid, etc.
- 3.3.2 In addition, certain oxidizers, organic peroxides, flammable solids and Class B poisons can be shipped in MC 312 and DOT 412 tanks. Examples are Cumine Hydroperoxide (organic peroxide) and Mercuric Iodide Solutions (Class B poisons).

5.0 PRE-LOADING INSTRUCTIONS, GROUND LEVEL

- 5.1 See that all product discharge valves and emergency valves are in operating order and are closed. Emergency mechanical trip or break-away should be functional and the fusible link (s)/plug (s) of the emergency valve operating system should be in place (if outlet valve is self-closing type).
- 5.2 If cargo tank had no bottom valves, check bottom sump for proper gasketing and blind flange bolt tightness.
- 5.3 If cargo tank is equipped with a "downline" from the top of the tank, check that the end of the downline is equipped with a properly operating valve and/or a blind flange or sealing cap properly gasketed and sealed.
- 5.4 If cargo tank is equipped with air unloading piping to the front or rear, check valves and pressure gauges for proper operation and gladhands or connectors for condition and gasketing.
- 5.5 The correct commodity placards shall be in place.

6.0 PRE-LOADING INSTRUCTIONS, TOP SIDE

- 6.1 If the cargo tank is equipped with a blow down valve (usually part of the "vent," "pressurizing," or "christmas tree" assembly), crack open blow down valve to make certain there is no pressure in the cargo tank. Make sure discharge of blow down valve is not directed toward yourself or other personnel. If there is no blow down valve, find out from your supervisor how to make certain pressure in the cargo tank does not exist before proceeding any further.
- 6.2 Check manhole assembly for condition of gaskets and proper functioning of closing mechanism to secure the manhole cover tightly.
- 6.3 Be sure that the cargo tank is equipped with adequate emergency venting. These vents should be checked for proper rating, condition, cleanliness, and function. Sometimes a relief valve is installed on top of a rupture disc. In this case, there should be a pressure gauge or test valve or plug between the two devices so the condition of the rupture disc can be determined. Fusible venting, if so equipped, must not be replaced with caps or plugs.

7.0 LOADING PRECAUTIONS

- 7.1 Always set parking brake before loading, then ground tank to loading rack to avoid static electrical sparks. If loading a specialized product such as JP4, follow product manufacturers' recommendations for the control of static electricity. For further information on the control of static electricity, see API RP 2003 "Recommended Practice for Protection Against Ignitions Arising out of Static, Lightning and Stray Currents."
- 7.2 Do not load a cargo tank with hot product which exceeds cargo tank manufacturers' maximum temperature rating or with a product that will have a corrosive effect on the cargo tank. To do so endangers the structural capacity of the cargo tank to continue trouble-free performance. Aluminum, stainless steel, and carbon steel cargo tanks require close attention to this caution.

DO NOT MIX PRODUCT IN A CARGO TANK.

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Example: Many acids react violently upon addition of water to the cargo tank.

6.3 Do not load the vehicle beyond the maximum product load or maximum product density specified on the metal certification plate or on the vehicle certification label which specifies the Gross Vehicle Weight Rating (GVWR). The GVWR is the maximum allowable total weight of vehicle, payload and equipment on the vehicle.

7.4 Do Not Load a cargo tank semitrailer with an air operated suspension which had been disconnected from the tractor unless the suspension has first been purged of air pressure. **AIR OPERATED SUSPENSIONS HAVE BEEN KNOWN TO SHIFT FORWARD WHEN THE CARGO TANK IS BEING LOADED.**

7.5 Top Loading Through Manhole

7.5.1 The loading pipe should be adequately secured, braced, or restrained to prevent an accidental spill during loading.

7.5.2 Stay away from the vicinity of manhole to avoid being splashed, burned, or exposed to product fumes during loading.

7.5.3 Be sure manhole cover is closed, seated, and securely latched before moving tank. Excessive tightening of manhole covers may damage gaskets.

7.6 Bottom Loading

7.6.1 Make sure that all compartments being loaded are empty.

7.6.2 When the tank vehicle is equipped with vapor recovery piping, connect to the loading rack vapor receiver and make sure valves, if any, are open and there is no restriction in the line. If loading rack is not equipped with a vapor receiver, make sure vapor line on the vehicle is connected to hoses or lines which conduct vapor away from the tank to a safe venting area or the manhole is open.

7.6.3 When the cargo tank vehicle is not equipped with vapor recovery piping, open the manhole before loading.

7.6.4 When the cargo tank vehicle is equipped for vapor recovery, make sure high level shut-off devices are connected from loading rack to trailer.

7.6.4 When the cargo tank vehicle is equipped for vapor recovery, make sure meter on loading rack is set at a quantity equal to or less than the rated capacity of the compartment loaded.

7.6.6 After loading the cargo tank make sure all product hose and vapor hose as well as high level shut-off device connections are disconnected. A means must be provided by the shipper to depressurize hoses before they are disconnected.

8.0 HEATING PRECAUTIONS

CAUTION: THE MAJORITY OF PRODUCTS REQUIRING AN MC 312 OR DOT 412 CARGO TANK MAY BECOME CORROSIVE TO THE TANK AND OR HEATING SYSTEM AT ELEVATED TEMPERATURES AND SHOULD THEREFORE NOT BE HEATED OR LOADED WARM.

8.1 Do not heat an empty cargo tank with on-board heating equipment unless the manufacturer expressly states that the cargo tank is capable of this type of preheating. Otherwise for preheating, see the cautions and recommendations in TTMA Technical Bulletin # 61, "Preheating of General Purpose Chemical Tanks."

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8.2 Do not exceed the working pressure of the steam panel. Be sure correct pressure relief valve is on the steam panel and that it is functioning. Outlets should be directed away from personnel. Pressure gauges should be installed on the steam supply to monitor the heating equipment. Be sure coupling of steam hose is secure before applying steam.

8.3 Handle steam hoses with gloved hands. Connect inlet hose to vehicle heat system inlet, return hose to vehicle heat system return or outlet connections if provided. After both ends of hose are secured, open valve(s) slowly to check for leakage before leaving valve(s).

8.4 If it is necessary to introduce steam into the heating system during the entire product unloading operation, the heating transfer system should be turned off **AT THE HEAT SOURCE** as promptly as possible after the product unloading operation is completed. When cold weather conditions may cause freezing of steam condensate in the vehicle heating system, leave the connections uncovered to allow condensate to drain.

9.0 OVER THE ROAD SAFE HANDLING FOR OPERATING CARGO TANK MOTOR VEHICLES

9.1 Introduction

This section is to provide you with information about the stability of cargo tank motor vehicles as an aid in developing safe handling practices and knowing what situations to avoid that make the vehicle unstable.

9.2 Warning

Like any other vehicle, cargo tank vehicles can tip or slide out of control if turns are not negotiated at too high a speed or when making violent maneuvers such as abrupt lane changes and other evasive actions to avoid obstacles.

9.3 Factors Which Promote Operational Safety

9.3.1 Secure the lower fifth wheel to tractor frame.

9.3.2 Driver familiarity with the characteristics of the particular tank vehicle and the load being transported.

9.3.3 Driver familiarity with the nature of the roads and traffic which may be encountered during the trip.

9.3.4 The ultimate objective of care in these areas is to assure that the vehicle will be operated in a safe and therefore stable manner. Major factors which can adversely affect stability are:

9.3.4.1 Excessive Speed;

9.3.4.2 Violent swerving or turning;

9.3.4.3 Application of brakes or tractor power while turning.

9.3.5 the relatively narrow confines of road laws limiting vehicle weight, together with the characteristics of available tires, suspensions, and other components, there is little that a cargo tank trailer manufacturer can do to affect the inherent stability other than keeping the bottom of the tank as low as practicable considering the requirements of mounting structures and other appurtenances. This means that the major factor affecting operational stability is the knowledge and skill of the driver. Based upon accident reports with which we are familiar, the predominant caused of the rollover accidents (which happen infrequently considering volume of traffic involved) are:

9.3.5.1 Entering curves at too high a speed is probably caused by one of the following factors:

9.3.5.1.1 Traveling at freeway speeds for along periods of time and failing to recognize the high speed of travel and reducing it before entering freeway interchanges and other curves requiring a reduced and controlled speed.

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9.3.5.1.2 Lack of familiarity with the vehicle characteristics to recognize its safe speed with relation to posted speed limits on curves which are usually determined with automobile traffic in mind.

9.3.5.2 Failure to reduce speed sufficiently when approaching congested traffic such as might be found at traffic signals on highways. With the advent of today's more powerful and higher torque engines, the original practice of maintaining momentum to avoid acceleration in traffic is outmoded.

9.4 Cornering Characteristics

High pressure truck tires and suspensions have different characteristics under high speed cornering conditions than do passenger car tires. Truck and trailer suspensions which are designed for carrying high loads have substantially different characteristics than automobiles. Truck and tractor trailer combination lateral stability becomes unpredictable when lateral forces approach 0.4g. This means that tractor-cargo-tank-trailer combination vehicles, trucks with mounted cargo tanks, or other commercial vehicles must be operated in a conservative manner when cornering.

9.5 Braking and Acceleration

Either braking or accelerating while cornering can significantly reduce the stability of the vehicle and should be avoided. The best driving practice is to decelerate to a safe conservative speed before entering a corner or approaching congested traffic, and then to apply only very moderate power until an essentially straight path has been reestablished.

9.6 Handling Partially Loaded Cargo Tanks

It is an accepted fact that liquid cargo tanks filled to their normal capacity (with 5% outage or less) handle essentially the same as a similar vehicle with a solid load. However, as cargo tanks are partially loaded due to product density or legal requirements in the case of compressed gases, the mobility of the load or "sloshing" can be detected and must be taken into account in establishing safe driving practices. In general, a down-loaded cargo tank will be less stable under cornering and braking conditions than an ordinary liquid tank loaded to its normal capacity. This factor must be given full consideration when determining the handling characteristics of the vehicle and establishing knowledge required for safe driving of the vehicle. A specific suggestion is that the driver of a down-loaded cargo tank should learn the characteristics of the load and handle his braking efforts accordingly for smoothest stopping. It is also a good practice to keep the brakes on full for a few moments after coming to a stop to avoid vehicle movement in the event that the braking sequence has developed a wave action in the cargo tank. See enclosed loading recommendations for partial loading of multi-cargo tank motor vehicles.

TTMA TECHNICAL BULLETIN

Reprint from Bulletin #90, Dated June 30, 1993

SUBJECT: IDENTIFICATION, VENTING, AND CLEANING OF VOIDS IN INSULATED TANK TRAILERS.
(Originally Issued October 1980, Revised December 1985, and Reissued June 1993)

1.0 PREFACE

1.0 Recommended Practices or Technical Bulletins furnished by the TTMA are a guide to general practice and the state of the art that exists at the time of their inception. They are not exhaustive. TTMA cannot possibly know, evaluate, or advise the service trade of all conceivable ways which a Practice or Bulletin may be used or pos-

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-sible consequence of each way. TTMA has not undertaken any such broad evaluation.

- 1.2. Everyone who uses practices or Bulletins, either recommended or not recommended by TTMA, must first satisfy himself thoroughly that neither his safety nor the safety of his product will be jeopardized by any method he selects. These publications are reviewed every five years and the date so indicated.

2.0 PURPOSE

- 2.1 The purpose of this Technical Bulletin is to emphasize the importance of properly identifying, venting, and cleaning of voids in insulated tank trailers prior to repair.

3.0 PROBLEMS

- 3.1 All voids shall be vented and drained. Vents and drains shall be open at all times. Unless great care is taken in identifying voids (see 4.0) vent and drain nipples may be mistaken for tank nozzles or steam panel outlets.
- 3.2 Liquids transported at elevated temperatures are often solids at ambient temperatures. When these products are trapped in a void area in solid form, a vapor tester (combustible gas detector), will not show the presence of the product. **FIND OUT WHAT PRODUCT, AND ITS CHARACTERISTICS, HAS BEEN TRANSPORTED IN THE TANK.**
- 3.3 **DO NOT** perform welding or cutting with a torch on any tank trailer until absolutely certain that the void space is clean and vapor free. If hot work is to be performed on or near a void section, the void is to be purged with forced air during such work.

4.0 IDENTIFICATION OF VOIDS

- 4.1 The type of void in a tank trailer can only be identified by entering the tank. **BE SURE THE TANK IS VAPOR FREE BEFORE ENTERING.**
- 4.2 Double Bulkhead – Multicompartment tank. See Fig 1.
 - 4.2.1 To identify a double bulkhead it will be necessary to first check one compartment than the adjacent compartment (s). A double bulkhead will have the concave side of the heads showing in both compartments. Note the approximate distance from the manhole to the head and locate vent openings at the top and the bottom of tank, or some cases both openings at the bottom.
- 4.3 Single bulkhead with back-up angle or double, reversed-dished bulkheads- Multi compartment tanks. See Fig. 2.
 - 4.3.1 To identify a single bulkhead with a back-up angle or double, reversed dished bulkheads it will be necessary to first check one compartment then the adjacent compartment (s). The convex side of a single bulkhead with back-up angle will show the angle welded to the bulkhead and the shell, closing the crevice formed by the knuckle radius. Double reversed bulkheads will have the convex side of the head dished towards the flange of the head and will close off the crevice formed by the knuckle radius of the head in the adjacent compartment. Note the appropriate distance from the manhole to the head and locate vent openings at the top and bottom of tank, or in some cases both openings in bottom.
 - 4.3.2 Some sanitary tanks may have flangeless double bulkheads. In this case it will be necessary to note the distance from the manhole to each side o the bulkhead (s) and the distance between the manholes to determine if the tank had a single or double bulkhead and the location of the vent and drain openings if it has a double bulkhead
- 4.4. Baffle with back-up angle- Multicompartment or single compartment tanks. See fig. 3.

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4.4.1 To identify a baffle with back-up angle, check the convex side of the baffle. An angle will be welded to the shell and baffle closing the crevice formed by the knuckle radius of the baffle. Note the appropriate distance from the manhole to the baffle (s) and locate the two (2) drains at the bottom of the tank.

5.0 CLEANING OF VOIDS

5.1 If the product has solidified in the drain opening, use a wire or rod to open the drain.

5.2 **WARNING: MAKE CERTAIN THAT ONE OF THE VOID OPENINGS IS ALWAYS OPEN TO ATMOSPHERE WHEN CONNECTING HOSE (STEAM OR CLEANING SOLUTION) TO THE OTHER VOID FITTING SO THAT NO PRESSURE CAN BE BUILT UP IN THE VOID AREA CAUSING POSSIBLE DISHED HEAD REVERSAL, SEVERE DAMAGE OR PERSONAL INJURY.**

5.3 Clean out the void with the steam or appropriate cleaning solution. If solid material remains, clean by mechanical means.

5.4 If it is questionable that the void space is clean and vapor free, cut an opening in the void space bottom with proper NON HEAT producing method and remove all foreign material as described in 5.3. DO NOT weld in an area where it

TTMA TECHNICAL BULLETIN

Reprint From Bulletin #96, Dated July 1, 1997

SUBJECT: IDENTIFICATION OF VOIDS PRIOR TO CLEANING MC 306 AND DOT 406 TANK VEHICLES.
(Original Issue Date – May 1983 – Reissued July 1988 & July 1997.)

1.0 PREFACE

1.0 Recommended Practices or Technical Bulletins furnished by the TTMA are a guide to general practice and the state of the art that exists at the time of their inception. They are not exhaustive. TTMA cannot possibly know, evaluate, or advise the service trade of all conceivable ways which a Practice or Bulletin may be used or possible consequence of each way. TTMA has not undertaken any such broad evaluation.

1.2. Everyone who uses practices or Bulletins, either recommended or not recommended by TTMA, must first satisfy himself thoroughly that neither his safety nor the safety of his product will be jeopardized by any method he selects. These publications are reviewed every five years and the date so indicated.

2.0 PURPOSE

2.1 The purpose of this Technical Bulletin is to emphasize the importance of properly identifying voids and vapor return systems prior to cleaning MC 306 and DOT 406 tank vehicles.

3.0 HAZARDS AND PRECAUTIONS

3.1 DO NOT weld or cut any tank until absolutely certain that all void spaces are clean and vapor free and all vapor or liquid containing components have been drained and purged or removed, as necessary, to prevent accumulation of flammable or combustible liquids or recharging of potentially explosive vapors. Assurance that there are no flammable or combustible vapors in a void space may require the insertion of a gas test probe into the void.

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- 3.2 Preparation of the tank (product draining/disposal, component or piping removal, etc.) for purging or gas freeing should be done where potential sources of ignition do not exist.
- 3.3 Tank compartments are confined spaces. Flammable and combustible vapors may displace air inside a cargo tank making such an atmosphere unsuitable for life. All precautions for entrance and working in confined spaces must be followed. This includes, but is not limited to, monitoring procedures and breathing apparatus or forced air ventilation. Follow appropriate procedures for the conditions. Tanks that have been in service are defined by OSHA in 29 CFR 1910.146 as "permit required confined spaces." All work inside tanks must be done in compliance with 29 CFR 1910 and any additional State and Local regulations.
- 3.4 Flammable and combustible liquids should be properly disposed of and vapors or fumes should be exhausted outside away from potential ignition sources, compressor, heating, venting, air conditioning or other fresh air intakes.

4.0 IDENTIFICATION OF TYPICAL VOIDS AND VAPOR SYSTEMS

- 4.1 MC 306 and DOT 406 tanks may be equipped with double heads and/or vapor return systems, either of which may be difficult to identify and which may contain flammable or combustible vapor or liquid.
- 4.2 Refer to Figure 1 for sketches of typical head configurations. Note that most double heads have a vent and drain between them at the top and bottom of the shell. Make sure the vent and drain are both open. When gas freeing between heads, be sure not to build up pressure in a void, otherwise a head will likely be reversed. Further confirmation of the presence of double heads can be made by observing the exterior of the tank shell. Normally the shell will be distorted where the head is welded to it. If the tank is entered to confirm the presence of double heads, make sure it is gas free and use proper breathing apparatus or fresh air system as required.

Note that all double heads look different when viewed from different sides that a double nested flangeless head looks like a single flangeless head welded on both sides.

- 4.3 Many MC 306 and DOT 406 tanks have vapor recovery systems. These are easily identified by looking for vapor collection hoods at the top of each compartment. These hoods are normally connected to one or both of the inverted "V" flashing rails or they may be connected to a separate manifold. Make sure all vapor vent valves are open and all vapor recovery outlets are open when gas freeing the tank. Vapor is conveyed to the ground level by several means (Refer to Figure 2) usually by an external line, sometimes by an internal line where the top connection is through the top shell under the flashing, and sometimes through the void between the two heads. In the latter case there would be an opening (concealed) through the shell between the two heads under the flashing. There would also be a line connected to the bottom shell between the heads. If this is the case, make sure that any other vents or outlets in the bottom tank between the two heads are open.
- 4.4 Tank pads and lap seams are a possible retainer of flammable or combustible liquid or vapor. Check all tank pads and lap seams for weep holes (See Figure 3) to make sure no liquid is retained between them and the tank.
- 4.5 Drain all pipe lines, product valves and bottom loading valves as they may retain flammable or combustible liquid or vapors.
- 4.6 Some tanks may be equipped with "balanced" emergency valves where the balancing liquid is the same as the product being transported. Such valves almost always contain flammable or combustible liquid. Remove them before purging or gas freeing is complete so as to prevent accumulation of flammable or combustible liquids or recharging of the tank with flammable or combustible vapors.
- 4.7 Some tanks may be equipped with air hydraulic emergency valves. These valves may have cylinders or air chambers integral with the valve or they may have internal cylinders or chambers. Such cylinders or air chamber may contain flammable or combustible liquid if valves are faulty. Remove them before gas freeing is complete so as to prevent accumulation of flammable or combustible liquids or recharging of the tank with flammable or combustible vapors.

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TTMA TECHNICAL BULLETIN

Reprint From Bulletin #83. Dated July 1, 1997

SUBJECT **PNEUMATIC TANK VEHICLE USAGE**
(Original Issue – June 1980, Revised April 1987 and July 1997)

1.0 PREFACE

- 1.1 Recommended Practices or Technical Bulletins furnished by the TTMA are a guide to general practice and the state of the art that exists at the time of their inception. They are not exhaustive. TTMA cannot possibly know, evaluate, or advise the service trade of all conceivable ways which a Practice or Bulletin may be used or possible consequence of each way. TTMA has not undertaken any such broad evaluation.
- 1.2. Everyone who uses practices or Bulletins, either recommended or not recommended y TTMA, must first satisfy himself thoroughly that neither his safety nor the safety of his product will be jeopardized by any method he selects. These publications are reviewed every five years and the date so indicated.

2.0 INTRODUCTION

- 2.1 This bulletin is intended to suggest accepted operating procedures for the proper usage of pneumatic tank vehicles.
- 2.2 These suggested directions are not exhaustive since tank vehicles are of varying design to meet the requirements of the first purchaser, therefore, the user must satisfy himself that his safety, the safety of the public, the integrity of the transport, and the load are not jeopardized.
- 2.3 Before operating, become familiar with the message indicated on all information, caution, and danger plates or labels on the vehicle. If a plate or label has become illegible or lost, request replacement form the vehicle manufacturer.
- 2.4 Before loading and/or unloading the product, the user must familiarize himself with the pneumatic tank vehicle's operational characteristics, including manholes, vents, blowdown line, discharge valves, gravity dumps, filters, etc.
- 2.5 KNOW WHAT PRODUCT YOU ARE LOADING AND KNOW WHAT PRODUCT WAS LAST CARRIED IN THE VEHICLE.**

4.0 PRE-LOADING INSTRUCTION

- 4.1 at ground level
 - 4.1.4 See that all product discharge valves are closed.
 - 4.1.2 Open vessel blow down valve. Listen for air escaping.
LEAVE BLOW DOWN VALVE OPEN EXCEPT WHEN UNLOADING.
A safe practice is to always park the pneumatic tank vehicle with the blow down valve open...
 - 4.1.3 See that the pressure gauge(s) are in proper working order and that there is no pressure in the tank.

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CAUTION: *If there is any pressure in the tank when the blow down valve is open, the blow down line may be plugged. This must be corrected at once. Check the blow down line by assuring that there is substantial noise from escaping air when the valve is open with pressure in the tank.*

4.1.4 See that the pressure relief valve is in proper operating condition. Test the relief valve occasionally by carefully increasing the tank pressure to the relief valve setting, but in no case exceed the tank working pressure by more than 5 psi.

4.1 At Top Side

4.1.1 See that the manhole cover gasket is intact and that the closing mechanism functions properly to secure the lid tightly.

4.1.2 Check that the manhole safety latch is in proper operating condition.

4.1.3 Check condition of the vessel interior –

4.2.1.1. If cement service tank: Are air pads free of cement build-up lumps? Are slope sheets and vessel sides free of cement build-up?

4.2.3.2 If chemical or plastics service tank: Is vessel clean and free of moisture? If the product is a powder, are the aeration devices in operating condition?

8.0 SHUT DOWN

8.1 Open the blow down valve to drain the vessel pressure to zero psig and leave open.

8.2 Follow the blower manufacturer's instructions for shut down.

8.3 Carefully check the pressure gauge(s). They should read zero psig. **DO NOT** disconnect the unloading hose until gauge(s) read(s) psig. Double check for pressure by listening for escaping air at the vessel blow down outlet.

8.4 Disconnect the unloading hose and return it to the hose carrier.

9.0 VESSEL AND GENERAL MAINTENANCE

9.1 Every pneumatic tank shall receive an external visual inspection at least once in every two year period and also shall be pneumatically tested at its indicated operating pressure.

9.2 A written report of each inspection shall be retained in carrier's or owner's files for a period of two years after the date of inspection.

9.3 The tank shall be inspected for corroded areas, bad dents, and defects in welds, piping, valves, gaskets, and other conditions including leakage, which indicates weakness in the tank that might render it unsafe for the transportation service.

9.4 Devices for tightening manhole covers must be operative and leakage must be corrected. **NEVER**, under any circumstances, attempt to adjust these devices while any pressure exists in the tank.

9.5 Missing or loose bolts or nuts on any flanged connection must be replaced or tightened. Pneumatic testing is also required after the tank has been involved in an accident in which its shell has been damaged or after the shell has been modified. During the test all joints under pressure must be coated with a soap solution or similar material and checked for the presence or leaks.

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9.6 The month and year of the last test must be marked on the tank in letters not less than 1 ¼ inches high on the right side near the front.

10.0 RELIEF VALVE MAINTENANCE

10.1 Spring loaded safety relief valves shall be removed from the tank and tested to insure proper operation.

10.2 Visually check to see that the manufacturer's lead seal has not been removed or the relief valve has not been tampered with.

10.3 Insure that the relief valve is marked with the correct relief valve setting as per the tank manufacturer's specification.

10.4 Insure that the relief valve outlet port or area is not obstructed.

10.5 TO insure that the relief valve will bypass the full air flow of the blower being used, remove the relief valve and attach it to the test stack per the sketch, "Suggested Relief Valve Tester."

10.6 Relief valves not meeting this requirement should be taken out of service and rebuilt to the original manufacturer's specification and retested as in Section 10.5 and resealed.

11.0 CHECK VALVE MAINTENANCE

11.1 Visually check to see that no wear has occurred to moving parts or the check valve.

11.2 Make sure that check valve opens in the direction of air flow and closes when the air flow source is stopped. This test can be done by pressurizing the empty tank to 2 to 3 psi and then stopping the blower to see if the check valve holds air in the tank.

TTMA TECHNICAL BULLETIN

Revised From Bulletin #75, Dated September 25, 1995.

SUBJECT **HOT PRODUCTS TANK VEHICLES**
(Replace Technical Bulletin No. 66 dated May 1975, Revised October 1979, April 1985 and September 1995.)

1.0 PREFACE

1.1 Recommended Practices or Technical Bulletins furnished by the TTMA are a guide to general practice and the state of the art that exists at the time of their inception. They are not exhaustive. TTMA cannot possibly know, evaluate, or advise the service trade of all conceivable ways which a Practice or Bulletin may be used or possible consequence of each way. TTMA has not undertaken any such broad evaluation.

1.2. Everyone who uses practices or Bulletins, either recommended or not recommended by TTMA, must first satisfy himself thoroughly that neither his safety nor the safety of his product will be jeopardized by any method he selects. These publications are reviewed every five years and the date so indicated.

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1.0 INTRODUCTION

- 1.1 This Technical Bulletin is intended to suggest accepted operating procedures for hot product tank vehicles
- 1.2 These suggested procedures are not exhaustive since tank vehicles are of varying design to meet the requirements of the first purchaser, therefore, the user must satisfy himself that his safety, the safety of the public, the integrity of the transport and the load are not jeopardized.
- 1.3 Before operation, become familiar with the message indicated on all information, caution plates, and labels on the vehicle. If a plate or label has become illegible or lost, request replacement from the vehicle manufacturer.
- 1.4 Before loading and/or unloading the product, the user must familiarize himself with its operational characteristics, including manholes, vents, gravity discharge valves, pump-off valves, heating procedures, etc.
- 1.5 KNOW WHAT PRODUCT YOU ARE LOADING, KNOW WHAT PRODUCT WAS LAST CARRIED IN THE VEHICLE, AND IF THEY ARE COMPATIBLE.**

5.0 REGULATED PRODUCTS, HAZARDOUS MATERIALS

- 5.1 The U. S. Department of Transportation published regulations in 49 CFR Parts 172 and 173 governing the transportation of "elevated temperature materials." These regulations became effective from 1993 through 1995.
- 5.2 Under these regulations products that are transported at temperatures above 100 C (212 F) are called "elevated temperature materials" and products that have flash point above 38 C (100 F), but are transported at temperatures above their flash points, are called "flammable liquid elevated temperature materials."
- 5.3 These regulations require identification numbers, the word "HOT", and hazardous material placards on cargo tanks, and similar marking of bills of lading. They also include requirements for the design and construction of new cargo tanks and cargo tanks already in service. These regulations may require modification of cargo tanks already in service.
- 5.4 The owners and operators of Hot Products Tank Vehicles should become knowledgeable of these regulations to assure their compliance.

10.0 HEATING

10.1 FLUE AND BURNER SYSTEM

- 10.1.1 Do Not Use gasoline instead of the required kerosene or fuel oil in generating or low pressure burners as use of gasoline will result in an extreme fire hazard.
- 10.1.2 Do Not Use the burner(s) to preheat an empty tank.
- 10.1.3 Do Not ignite or use the burner(s) to heat bitumen unless the full length of the flue(s) is covered by a 6 inch minimum depth of bitumen.
- 10.1.4 Position the tank across the wind when operating the burners.
- 10.1.5 Prop the manhole cover partially open during heating of the contents.
- 10.1.6 Do Not Use a burner(s) under these conditions:
 - 10.1.6.1 While loading, unloading or moving
 - 10.1.6.2 In a building, garage, or any other confining area.

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- 10.1.7 Be sure that all fuel lines and connections are free of leaks before igniting the burners.
- 10.1.8 Follow burner operation procedures furnished by the vehicle manufacturer or those of the burner system supplier.
- 10.1.9 For your personal safety, use a torch (not match or lighter) to ignite the burner.
- 10.1.10 Ignite the inside burners first. Do Not reach across a lit burner to reignite and inside burner.
- 10.1.11 Do Not leave a burner(s) in operation unattended and be ready to shut down the burner in an emergency.
- 10.1.12 Do Not heat product beyond the manufacturer's recommended temperature. When burners go out, allow flues to ventilate before reigniting the burners.

11.0 MAINTENANCE, FLUE TYPE TANKS

- 11.1 Every three months during continual usage, inspect and , if required, remove carbon accumulation (coked bitumen) from outside of the flue in the tank. The heaviest deposit occurs at the flame area and should be removed periodically for efficiency of the heating system and for longer flue life.
- 11.2 Roofing bitumens (pitch, steep, flat) will buildup from the bottom under the flues and will sometimes push the flue upward and probably fracture it. Periodic removal of this build up by chipping or "mining" is recommended.
- 11.3 Flue liners which reduce scaling and eventual burn-through in the flame impingement zone are recommended on tanks which routinely carry commodities requiring heating while in the tank. Inspect the tank often and replace as necessary.
- 11.4 Work inside the cargo tank requires entrance into a "confined space" and may be hazardous. Work in this area must be performed in accordance with the regulations of the Occupational Safety and Health Administration found in 29 CFR 1910-146.

VEHICLE LABELS AND DECALS

The Federal Motor Carrier Safety Regulations and the Federal Motor Vehicle Safety Standards and Regulations both require labels to display specific information. In addition, WALKER STAINLESS EQUIPMENT COMPANY provides labels to identify the transport and to reflect compliance with specific industry standards and codes.

REQUIRED LABELS FOR ALL TRANSPORTS

Serial Tag: Metal plate permanently affixed to front left roadside of landing gear frame. The vehicle identification number (VIN) is stamped on this plate along with the specifications of the cargo tank shell.

Certification Label: Metal tag located beside the serial tag and containing information required by the National Highway Traffic Safety Administration.

Registration Box: A moisture proof container provided for storage and easy access to trailer related literature such as licenses, registration, defect and maintenance information.

Note: The following page contains copies of our drawings which show the approximate look of our vehicles certification and serial tags . All of these tags may not be applicable to your tank.

MFD BY: CT-0688 (NEW LISBON, WI) CT-0785 (TAVARES, FL)

WALKER
A CARLISLE COMPANY

V.I.N. _____ SPEC. _____

MAWP _____ PSI, DESIGN TEMP. RANGE: -20°F TO _____ °F

MAX. LADING DENSITY _____ LB/GAL, WELD MAT'L _____ SS

SHELL MAT'L _____ SS, HEAD MAT'L _____ SS

CT NOMINAL CAPACITY _____ U.S. GALLONS

HEATING SYS. DESIGN TEMP. _____ °F @ DESIGN PRESSURE _____ PSIG

SERIAL NO. _____, CT DATE OF MFR. _____

Trailer Serial Tag

MFD BY: WALKER STAINLESS EQUIPMENT CO., INC.
CT-0688 NEW LISBON, WI

WALKER
A CARLISLE COMPANY

DATE OF MANUFACTURE _____

*GWR _____ lb. (_____ b), _____ lb. (_____ b)

CAWR ALL AXLES _____ lb. (_____ b), _____ lb. (_____ b)

WITH _____ TIRES, _____ RIMS

AT _____ lbs. (_____ psi) COLD INFLATION

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE

V.I.N. _____ TYPE: SEM TRAILER

* BASED ON UNIFORM WEIGHT DISTRIBUTION

Trailer Certification Tag

MFD BY: CT-0688 (NEW LISBON, WI)

WALKER
A CARLISLE COMPANY

MAWP _____ PSI, DESIGN TEMP. RANGE: -20°F TO _____ °F

MAX. LADING DENSITY _____ LB/GAL, WELD MAT'L _____ SS

SHELL MAT'L _____ SS, HEAD MAT'L _____ SS

CT NOMINAL CAPACITY _____ U.S. GALLONS

SERIAL NO. _____, CT DATE OF MFR. _____

BPC Serial Tag

MFD BY: CT-0688 (NEW LISBON, WI)

WALKER
A CARLISLE COMPANY

V.I.N. _____ SPEC. _____

MAWP _____ PSI, TEST P _____ PSIG, ORIG. TEST DATE _____

DESIGN TEMP. RANGE: -20°F TO _____ °F, WELD MAT'L _____ SS

MAX. LADING DENSITY _____ LB/GAL, MAX. PAYLOAD _____ LBS.

WATER CAP. _____ U.S. GAL., MFR'S SERIAL NO. _____

SHELL MAT'L _____ SS, HEAD MAT'L _____ SS

MFD. SHELL THK; TOP _____ SIDE _____ BOTTOM _____

MIN. SHELL THK; TOP _____ SIDE _____ BOTTOM _____

MFD. HEAD THK _____ MIN. HEAD THK _____ LINING _____

HEATING SYS. PRESSURE _____ PSIG, HEATING SYS. TEMP. _____ °F

MAX. LOAD RATE _____ GPM @ _____ PSIG, CTMY CERT. DATE _____

MAX. UNLOAD RATE _____ GPM @ _____ PSIG, CT DATE OF MFR. _____

EXPOSED SURFACE AREA _____ SQ. FT.

Trailer "DOT" Tag

DOT

REAR IMPACT GUARD
MANUFACTURED BY:
WALKER STAINLESS
EQUIPMENT CO., INC.
625 STATE STREET
NEW LISBON, WI 53950

BY: _____

PER: FMVSS IN EFFECT
ON DATE OF MFG. _____

MANUFACTURED IN _____
MONTH / YEAR

Underride Bumper Tag

WALKER
A CARLISLE COMPANY

BARREL REPLACED BY: WALKER STAINLESS EQUIP. CO.

ORIGINAL MANUFACTURER: _____

SERIAL NO.: _____ V.I.N.: _____

ORIGINAL DATE OF MFG.: _____

DATE OF BARREL REPLACEMENT: _____

CAPACITY: _____ WORK ORDER NO.: _____

BPC "Rebarrel" Serial Tag

STAINLESS STEEL TANK CORROSION CAN BE PREVENTED THROUGH CARE.

By Manfred E Suess

President

Technimet Corporation

New Berlin, Wisconsin

Corrosion has always been a perplexing and expensive problem in the liquid hauling business. It is an accepted scientific fact that corrosion can't be prevented entirely and that a certain amount of deterioration over time is unavoidable. However, a basic understanding of the scientific principles involved can go a long way in avoiding unexpected problems that put a strain on the "bottom line".

A study by Battelle put the annual cost of corrosion to the motor freight industry at over \$2 billion. This same study estimated that about \$725 million (35%) of that could be saved by proper application of common corrosion control technology. The traditional approach to solving a corrosion problem is to "make it out of stainless steel".

Unfortunately, more than one tank truck hauler has been unpleasantly surprised when his stainless steel trailer suddenly developed pits or leaks after years of service with no prior noticeable deterioration. Even large haulers that have fleets of several hundred trailers face these same problems which often seem to defy explanation. It's one thing to lose a trailer barrel to corrosion, but it is quite another to lose one and not know why it happened and what can be done to prevent the problem in the future. This article covers some of the problems that may be encountered with stainless steel trailers and how to recognize and prevent them.

The most unfortunate thing about stainless steel is its name. After all, if something is stainless, doesn't it imply that it will not corrode, stain, or discolor? Unfortunately, this is far from the truth and stainless steel is subject to a number of corrosion mechanisms that beleaguer the trucking industry.

Stainless Discovery

Stainless steels were discovered by British Metallurgist Harry Brearley in 1913 while he reportedly was trying to develop stronger gun barrel alloys by increasing the chromium content of iron-carbon alloys (steel). Brearley found that at chromium contents above 11%, the metal developed remarkable resistance to etching (staining) with the acids used to define the grain structure and thus named the new material "stainless steel".

Initially, the alloys known as stainless steels lacked ductility and their use was limited to cutlery. Scientists in Germany finally developed the basis for ductile, weldable grades of stainless steel which led British metallurgists in Sheffield to the 18% chromium – 8% nickel alloys known today as the austenitic grades of stainless steel (e.g. Type 304, Type 316, etc). These grades exhibit an excellent combination of corrosion resistance, ductility, and weldability.

Further study refined this alloy system, and today dozens of modifications of the basic 18% Cr – 8% Ni versions exist with each one providing specific advantages (see chart on page 3). For example, by restricting the carbon level, the weldability is increased and by adding molybdenum, pitting resistance can be improved. The chart lists the 18-8 grades used in chemical trailers and other chemical vessels. Of these grades, Type 316L is the most common and often considered the best available alloy, although there are other types which are more corrosion resistant.

Stainless steels can deteriorate due to chemical action (corrosion) in several ways, some of which may be so insidious that they are not discovered until too late. For example, a trailer barrel containing stress corrosion cracks may appear perfectly normal when thoroughly inspected visually, even with a magnifying glass. However, the first time that same trailer is filled with a fluid having a viscosity of water, it will "weep" product at a rate that will attract every highway patrol officer that it passes.

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The corrosion mechanisms in stainless steel trailer barrels we have encountered at Technimet include general attack and severe pitting, galvanic corrosion, stress corrosion cracking, random pitting corrosion, and biological corrosion.

It is noteworthy that sensitization and subsequent inter-granular corrosion are not on the list. These problems are the result of improper welding practice and/or a high enough carbon level in the base steel to promote grain boundary carbide formation in weld heat affected zones which are exposed to the temperature range of 900-1470 ° F. These carbides deplete the chromium content of the material adjacent to the grain boundaries and when the condition is severe, the material is considered "sensitized." In this condition, the steel is subject to rapid corrosive attack along the grain boundaries and individual grains can literally fall out of the structure.

It is my view that this problem is overstated and that nearly all trailer manufacturers and good quality repair facilities are aware of this potential problem, and they will either specify the low carbon grades (e.g. Type 316L) or control welding practices to prevent sensitization. The relatively thin metal used in trailer barrels also helps to prevent localized heat buildup in the weld area, thereby further minimizing the problem.

General attack and severe pitting are relatively uncommon occurrences in stainless steel trailers because those chemicals which severely attack these materials are well known. Hydrochloric acid, even at very dilute concentrations, will dissolve stainless steel Types 304 and 316 at a rate exceeding 1 mil per year, while at concentrations of over 10%, the rate is in excess of 30 mils per year. It should be remembered that pitting rates are often 50 or 100 times greater than average metal loss rates. Nitric acid, on the other hand, does not attack the metal and, in fact, serves to passivate and protect it at all temperatures normally encountered in trailers. While a hot (120 ° F) load of highly concentrated nitric acid could attack a stainless steel trailer, the inherent instability of this acid at elevated temperatures would probably produce far more serious problems.

General attack and severe pitting in trailers are often the result of obvious loading errors or use of the trailer as a storage or reaction vessel. For example, a 316L MC307 trailer that reportedly was used to haul only nitric acid developed pits, but our investigation clearly indicated it was attacked by a reducing, chloride-containing acid. Further investigation revealed the fact that several loads of chlorosulfonic acid had also been hauled, and this product, known to corrode 316L stainless steel, is what caused the damage. In another instance, a stainless steel trailer barrel had to be scrapped because of severe pitting and general attack that developed when the trailer was used to store chloride containing by-products of a chemical plant for several weeks.

Galvanic corrosion is possible when two dissimilar metals which are in intimate contact are exposed to a product that is at least mildly corrosive. In this scenario, one of the two metals becomes sacrificial (anodic) and protects the other by corroding. A good example is the zinc on galvanized steel which forms white zinc hydroxide while protecting the underlying steel from rusting. Trailer barrels are nearly always made from a single grade of steel such as Type 316L, but subtle chemical differences can exist between the head and shell or between the base metal and weld metal that can make one component anodic. As long as the surface area of the anodic member is greater than that of the cathodic member, the problem is usually not noticeable. But when the relative exposed area of anode becomes small, rapid local attack can occur. This phenomenon often explains why the weld areas in a barrel tend to be attacked more than the adjacent base metal. The severe pits at the head side of a section removed from an MC307 barrel were caused when a moderately corrosive product was hauled in this trailer. We found that the molybdenum content of the head was 12% less than in the barrel even though both steels were within the specified Type 316L analysis tolerances. The relatively minor difference in molybdenum content made the steel in the head more chemically active (anodic) so that the corrosion concentrated there.

Stress corrosion cracking of stainless steel trailer barrels is usually confined to the hot wall areas. This condition can't be detected with normal visual inspection and usually manifests itself as "weeping" or extremely slow leaks in a barrel that otherwise appears normal. The cracks are microscopic in size and look like tree roots. Stress corrosion cracking requires a combination of 1) susceptible material (all grades of austenitic steel are susceptible to this phenomenon); 2) residual or applied stress; 3) temperatures above 100 ° F and, 4) a corrodant that usually contains water and at least trace amounts of chlorides. The weld areas of all trailer barrels contain high residual stresses and these are the areas which are the most susceptible. Since an elevated temperature is involved, the hot wall areas usually are most affected. Damage seldom is discovered immediately and a number of hauls may be made before the leaking becomes evident. We have observed this phenomenon caused by seemingly benign products such as used cooking oils.

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Random pitting corrosion is perhaps the most aggravating form of damage to trailer barrels. Isolated pits develop randomly and have to be polished out or welded to bring the trailer back within specifications. Pitting occurs under marginal conditions – in other words, the product being hauled is not particularly corrosive under most conditions, but if the passive film on the stainless steel is locally weak or destroyed, a corrosion pit develops and grows at an ever-increasing rate. Common sources of pitting are products containing trace amount (more than 10-25 parts per million) of chlorides and poor housekeeping practices. Chlorides break down the passive film that protects stainless steel and this usually occurs at areas that are “dirty” because oxygen can’t get there to combine with the chromium in the steel. It is the combination of oxygen and chromium that produces that passive film which provides the corrosion resistance of stainless steel. Any dirt, film, or other contaminant can initiate pits.

Avoiding pitting problems is one of the most difficult challenges facing the industry today. The numerous complications include variations in products being hauled, possible reactions between products and the heel left after washing, instability of product being hauled, improper cleaning between hauls, poor control of product temperature (high temperature promotes pitting), and exposure to mildly aggressive product for extended periods of time (storage).

A comprehensive program of inspections and controls along with laboratory tests on new suspect products is the only way to minimize losses caused by random pitting in Type 316L stainless steel trailers. Under specific conditions, the more noble alloys such as Type 2205 duplex stainless steel may offer an advantage but at a significant initial investment.

CLEANING AND BACTERICIDAL TREATMENT OF 18-8 **S. S. STORAGE AND TRANSPORTATION TANKS**

CAUTION: If this tank is REFRIGERATED by direct expansion, DO NOT use water at temperatures higher than 115 ° F. because of danger of developing high refrigerant pressures. Refer to tank manufacturer’s instructions for specific precautions pertaining to the tank refrigeration system.

When hot products are handled, rinse and cool tank immediately after use. Your tank is made of the finest known material for use in contact with dairy products. However, even 18-8 stainless steel will deteriorate if correct cleaning and bactericidal treatment procedures are not followed:

WHEN HAND BRUSH METHOD IS USED:

1. Rinse with cold water immediately after emptying. Before washing, rinse with warm water (100 ° - 115 ° F.)
2. In a bucket of warm water dissolve alkaline dairy cleaner (in amounts recommended by manufacturer of cleaner), and brush all product contact surfaces.
3. Rinse with water below 115 ° F. Leave tank open and allow to drain dry.
4. Brush rinse with 100 ppm or spray with 200 ppm chlorine or other bactericide of proper strength. If a chemical bactericide is corrosive, apply just before filling tank.

IMPORTANT: Stainless steel surfaces which will not be completely covered by milk or dairy products within 20 minutes after application must be rinsed free of any chemical bactericide to prevent continuing contact with and possible corrosion of stainless steel surfaces.

WHEN SPRAY METHOD IS USED:

1. Rinse with cold water immediately after use. Before washing, rinse with water at 100 – 115 ° F.
2. Attach pump suction to tank outlet and connect spray equipment with pump discharge.
3. Run enough warm water into tank to cover outlet 3 to 4 inches (up to 115 ° F. for direct expansion tanks, 135 ° F. for others), then dissolve cleaner in amount recommended by cleaner before adding to tank.
4. Open tank valve and start pump. Spray surfaces until clean.
5. Pump out cleaning solution and allow tank to drain.
6. Rinse with cold water. Leave tank open and allow to drain dry.
7. Brush rinse with 100 ppm or spray with 200 ppm chlorine or other bactericide of proper strength. If a chemical bactericide is corrosive, apply just before filling tank.

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IMPORTANT: Stainless steel surfaces which will not be completely covered by milk or dairy products within 20 minutes after application, must be rinsed free of any chemical bactericide to prevent continuing contact with and possible corrosion of stainless steel surfaces.

DON'T _____ DON'T _____ DON'T _____

1. DON'T use steel wool as particles may become imbedded in stainless steel and rust develop.
2. DON'T use water high in iron, salt or sulphur.
3. DON'T allow bactericides or cleaners to remain on surfaces over 20 minutes.
4. DON'T allow foreign matter to adhere to tank.
5. DON'T allow rubber or metal parts, wrenches, or fittings to rest on wet stainless steel surfaces as this excludes air and prevents drying.
6. DON'T use chemical bactericides or cleaners in excess of manufacturers instructions as it wastes material and may cause corrosion.
7. DON'T apply pressure in tank unless tank is designed for such services.

Rust, discoloration or pitting can develop from any of the first 6 DON'Ts.

Polish rusty, discolored or pitted areas immediately using sponge or brush and commercial scouring powder. If acid cleaners and milkstone removers are used, follow with alkaline wash and rinse with water at 100-115 ° F.

NOTE: 1. Alkaline dairy cleaners should contain wetting agent and polyphosphate to suit water hardness.

2. Water used for rinsing off chemical bactericides should be water that has been treated with heat or chemicals to assure freedom from harmful organisms.

The above methods of cleaning should provide a surface meeting the requirements of the Milk Ordinance and Code, 1953 Recommendations of the U.S. Public Health Service.

MAINTENANCE OF MILK PICKUP & TRANSPORT TANKS

(Inner Tank of 18-8 Stainless Steel)

A. Tank Proper

<u>DO</u> <i>Instructions</i>	<u>DO</u> <i>Reason</i>
1. DO follow careful cleaning procedures as described in NADEM instruction card "Cleaning & Bactericidal Treatment of 18-8 Stainless Steel Storage and Transportation Tanks" included with your tank.	1. Assure clean tank not damaged by corrosion (See page 4 of these instructions.)
2. DO open manhole before emptying tank.	2. Prevent collapse of tank by vacuum. Vent may be frozen or otherwise inoperable.
3. DO wash, follow with temperature rinsing, then rinse with cool potable water. If mechanical cleaning is used, make certain adequate venting is provided through or around spray attachment cover.	3. To prevent collapsing of tank due to vacuum created by sudden chilling of hot air in tank. The cooling of tank wall is desirable before picking up milk.
4. DO check all mounting bolts (securing tank to truck) once a month.	4. Assure tank fastened securely to truck.

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5. DO snug up jacket to cradle bolts (if floating type of tank) every 3 months.	5. Keep tank tight in cradle.
6. DO clean or sandblast and paint every 12-18 months or whenever tank is mounted on new chassis.	6. Prevent corrosion from road chlorides.
7. DO remount tank on new chassis exactly as mounted on original at factory.	7. Improper mounting may cause undue stresses and shorten life of tank.
8. DO permit only qualified workmen to repair stainless steel portions of tank.	8. Stainless steel fabrication is very special and costly damage may result if workmen are not qualified.
9. DO check all non-stainless parts for scratches and chips on paint. Refinish as required.	9. Prevent rusting.
10. DO replace gaskets and rubber vents periodically.	10. Prevent leaking without over tightening covers.
11. DO maintain lights and wiring.	11. Safety and legality.

 DON'T DON'T DON'T

1. DON'T subject tank to temperatures over 170 ° F. unless so designed.	1. Will destroy insulation.
2. DON'T subject tank to pressure or vacuum unless so designed.	2. Costly damage will result.
3. DON'T drop trailer (loaded or empty) on landing gear when removing trailer.	3. Excessive strain will damage tank and gear.
4. DON'T throw manhole or dust cover back (retain hand hold until in extreme open position).	4. Excessive leverage may damage hinges and covers.
5. DON'T replace manhole vent with other device without checking with tank manufacturer.	5. Factory installed vents designed to relieve minor changes in pressure and vacuum. Insufficient aperture may cause damage to tank.
6. DON'T enter tank without proper footwear.	6. Nails or stones on street shoes will damage tank finish.
7. DON'T transport commodities other than those for which tank designed without checking with manufacturer.	7. May damage tank finish or structure.
8. DON'T overload beyond design carrying capacity.	8. May damage tank structurally.

A. Running Gear (if Trailer)

 DO DO DO

Instructions

*Reason
Continued on the Next Page...*

1. DO realign suspension after 30 days operation and periodically thereafter.	1. Initial use reseats bushings and springs and may cause change from factory alignment. This will cause poor tracking and rapid tire wear.
2. DO lubricate and maintain suspension components, vertical supports, and KP plate per mfg's instructions.	2. Improper maintenance impairs functions and shortens life.
3. DO tighten lug nuts on wheels at 100 and 500 miles.	3. Initial use seats rims, loosens nuts, and causes rim slippage.
4. DO tighten nuts on adjustable KP plate.	4. Prevent slack in plate and excessive wear on bolts.
5. DO grease kingpin and plate.	5. Prevent excessive friction damage.

A. Pickup Equipment (if Pickup Tank)

DO

DO

DO

Instruction

Reason

1. DO service all purchased components (motors, pumps, etc.) per instructions of manufacturer.	1. If instructions not followed, warranty voided.
2. DO remove door gaskets daily and wash in warm water.	2. Must be kept clean and pliable to function properly.
3. DO maintain transfer tubing per manufacturer's instruction card.	3. Insures satisfactory life.
4. DO lubricate valve stem or plug after each cleaning.	4. Assures easy operation and prevents galling.
5. DO refer to Serial number on tank when corresponding with mfg on service or parts.	5. Assures proper compliance with requirements and avoids improper parts shipments.
6. DO check all screws, bolts, etc., on hardware.	6. Required to ensure proper function.

DON'T

DON'T

DON'T

Instruction

Reason

1. DON'T drop sanitary fittings, valve or pump parts.	1. Resulting damage may cause leaking or poor fit on re-assembly.
2. DON'T hammer fittings. Use aluminum wrench provided.	2. Damage to finish and perhaps seat may result.
3. DON'T permit cord reel to snap back full length of cord.	3. Will break spring.
4. DON'T hose down motor compartment.	4. Will damage motor switch and cord reel.
5. DON'T start pump without first opening valve.	5. Will cause belt slippage, motor heating, and may blow a hose.

SCHEDULED MAINTENANCE SERVICES

Each 5,000 miles or once a month (whichever comes first):

- Check kingpin and upper coupler .
- Check electrical & skid control (if applicable for proper operation).
- Check secondary & parking brake systems if applicable for proper operation.
- Check supports for operation and damage.
- Check tires and wheels (torque wheel nuts to proper torque).
- Check axle fluid level, add fluid if required.
- Check wheel seals for leaks.
- Inflate tires to proper pressure.
- Drain air reservoir.
- Check accessories operated with air from brake system.
- Inspect brake system gladhand hoses, tubing, chambers, valves, and reservoirs for leaks or damage.
- Check chamber pushrod travel and adjust brakes.
- Check lining thickness (remove dust shields if necessary). Do not remove wheels.
- Visually check axle alignment.
- Inspect suspension.
- Check body parts for wear or damage .
- Check tire carrier and mounting.
- Inspect all auxiliary equipment for proper function, adjustment, maintenance, cleanliness and lubrication as required.

Each 20,000 miles or 4 months (whichever comes first):

- Inspect brake drums & wheels.
- Inspect brake linkage & shoes.
- Inspect brake lines & hoses for chafing, looseness and deterioration.
- Test brakes for action, side pull and synchronization.
- If equipped with skid control run complete system check.
- Make soap suds test for air leaks in entire air system.
- Drain reservoirs.
- Inspect U-bolts and torque to specifications.
- Check kingpin/axle alignment.
- Check underconstruction components.
- Check springs, air springs, hanger and bushings.
- Inspect kingpin for excess wear, rough edges, looseness, broken out areas and cracks.
- Clean kingpin plate and inspect all welds.
- Check all bolts, nuts and rivets for looseness.
- Inspect frame for wear, breakage and/or damage.
- Lubricate camshafts and slack adjusters.
- Check paint condition of unit.
- Road test unit.
- Lubricate slider locking pins.

NONSCHEDULED MAINTENANCE SERVICE REQUIRED

<i>Maintenance Operation</i>	<i>During Maintenance. Check For:</i>
Replace wheel seals.	Wheel removed, reline, or leaks.
Inspect and clean wheel bearings.	Wheel removed, reline, seal leaks or excessive end play.
Inspect and rotate wheels.	Tires show uneven wear.
Lubricate rollers and anchor pins.	Wheels removed or reline.
Align axles.	Dog tracking or excess tire wear.
Replace gladhand seals.	Annually.
Reline brakes.	¼" thickness or less to be replaced.
Steam clean complete chassis and inspect.	Annually.
Touch up painted surfaces.	As Required.

LANDING GEAR SUPPORTS

The Landing Gear Assembly for Your Walker Trailer is a Full Load Bearing Support With a Two-Speed Operation.

WARNING: If the supports rest on soft ground, cribbing or boards must be placed under the surface of the shoe. This is done to prevent the front of the trailer from sinking into the surface which could cause the tank to tip over and result in major damage.

WARNING: DO NOT uncouple trailer from tractor on a multi-compartmented tank which has only the front compartment(s) loaded. The trailer will be in a very unstable condition and could tip forward resulting in damage to the trailer and/or loss of product.

WARNING!

READ THIS SECTION CAREFULLY PRIOR TO SERVICING SPRING BRAKES. SERVICE SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY UNDER EXPERIENCED SUPERVISION.

SPRING BRAKES CAN KILL!

TROUBLE-SHOOTING

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Grabbing Brakes	*Damaged Brake Chamber or Internal Assembly.	*See your nearest Service Center.
	*Leaky or Broken Hose Between Relay Valve and Brake Chamber.	*Replace or Repair as Required.
	*Out of Adjustment.	*Adjust Brakes.
	*Binding CAM, Anchor Pins or Chamber Rod End Pin.	*Lubricate and Free Up.
	*Damaged Brake Assembly or Brake Drum Out-of-Round.	*Replace. See Your Nearest Service Center.
Underconstruction Pulling Hard	*Spring Center Bolt Broken or Sheared.	*Replace Center Bolt.
	*Loose U-Bolts.	*Tighten or Correct Torque.
	*Broken or Cracked Spring Leaves.	*Replace Spring.
	*Axle Bent or Twisted.	*Replace or Straighten Axle.
Improper Spring Action	*Broken or Cracked Spring Leaves.	*Replace Complete Spring.
	*Uneven Load Distribution.	*Rearrange Load for Proper Distribution.
	*Weak Spring.	*Replace Spring.
	*Springs Out of Alignment in Hangers Due to Loose U-Bolts.	*Align Springs and Tighten U-Bolts to Proper Torque.
Wobbly Tires	*Tires Wobble Due to Uneven Rim Clamping.	*Torque Tighten All Rim Clamps.
	*Worn or Damaged Wheel Bearings.	*Replace Bearings.
	*Bent Wheel or Rim.	*Replace Wheel or Rim.
	*Bent Axle.	*Replace or Straighten Axle.
Scuffed Tires	*Over or Under Inflation.	*Inflate to Proper Pressure.
	*Excess Speed on Turns.	*Reduce Speed.
Dog Tracking	*Leaf Spring Broke.	*Replace Complete.
	*Bent Axle	*Replace or Straighten Axle.
	*Frame or Suspension Out of Alignment.	*Straighten Frame or Realign Axles.
Loss of Tire Air Pressure	*Puncture in Tire.	*Repair or Replace Tire.
	*Faulty Valve or Valve Core.	*Replace Valve Assembly or Core.
	*Wheel or Rim Damage.	*Replace Wheel or Rim.

TROUBLE-SHOOTING, Continued...

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Uneven Tire Wear	*Over or Under Inflation.	*Inflate to Proper Pressure.
	*Loose Wheel Stud Nuts.	*Tighten Wheel Stud Nuts or Clamps.
	*Loose or Tight Wheel.	*Adjust Bearings.
	*Axle Bent or Out of Alignment.	*Straighten, Align, or Replace Axle.
	*Tires Not Properly Matched.	*Match Tires.
	*Improper Acting Brakes.	*Correct Brakes as Required.
	*Rapid Stopping.	*Apply Brakes Slowly When Approaching Stop.
	*High Speed Driving on Turns.	*Reduce Speed.

TIRES AND TIRE CARE

Each tire has its size and maximum inflation pressure (psi) molded on the outer side wall of the tire. Increasing pressures (up to maximum permissible pressures) can improve fuel economy, but will decrease riding comfort and possibly, tread life.

Over and Under Inflation:

Over inflation may result in impact breaks and tread cutting, as both tread and cord body are put under great tension. It also causes a decrease in the road contact area, and the resulting increase in road separation. Over inflated tires also transmit excessive action to the beads.

Under inflation causes fast and irregular tread wear. It increases flexing, and the heat generated leads to flex and crown breaks in the body of the tires.

Do Not "Bleed" Tires:

Letting air out of tires as the heat builds up the air pressure higher than the recommended pressure is known as "bleeding". This increase in air pressure, however, is a normal condition that is taken into consideration at the time of the tire's construction. The increased pressure will take care of itself, so that bleeding a tire is unnecessary. Bleeding tires is costly in that it increases tire failures. When the tire has been bled, the air pressure drops below the recommended pressure after tire temperature returns to normal.

Matching Duals:

Use care in matching dual tires. Tires which differ more than 1/4" in diameter or 3/4" in circumference should not be mounted on the same dual wheel.

Tire Inflation Pressure and Limits:

Enough cannot be said about the proper tire inflation for your new trailer. The life of the tire and the handling characteristics of the tractor and trailer rig are greatly dependent on the correct tire inflation pressures.

Tire Sizes:

When replacing tires or wheels, it is mandatory to use only the standard or optional tire sizes and types that meet or exceed the specification of those recommended on the certification plate attached to the semi-trailer. Wheel rim widths and offsets must be those recommended by the trailer manufacturer for that tire size. Tires and wheels other than those recommended can adversely affect the safety and durability of your semi-trailer. All tires and wheels on the semi-trailer should be of the same size, tube and load carrying capacity. Never mix radial, belted and/or conventional type tires.

WARNING

BASKET TIRE CARRIERS:

Loss of tire in transit can cause bodily injury or property damage. Carry only one spare tire at a time. Do not carry the tire loose in the carrier. Tightly wrap the chain around the tire to eliminate slack and always fasten the end clasp to the chain. Check regularly for bent members and fatigue in welds and rivets. Closely examine chain, chain retainer and chain fastener for wear, corrosion or fatigue. Replace or repair damaged or worn parts promptly.

INSPECTION:

Inspect carriers periodically according to usage. Check for bent member and fatigue in welded or riveted joints. Give close examination to the chain, chain retainer and chain fastener for signs of wear, corrosion or fatigue. Replace or repair bent or damaged members, weld joints or chains. For chain replacement, use chain with 2850# tensile strength.

Observe the day-to-day care recommendations. Watch for the symptoms described under non-scheduled maintenance and have any needed adjustments made promptly. Use only the recommended lubricants and parts.

WALKER parts are designed and built for the best performance and reliability in your trailer. Using these parts for replacements is your assurance that Walker built quality stays in our trailer.

Recommendations For Periodic Inspection Of Frames

Tandem Area:

Visually inspect frame and crossmembers for cracks, corrosion, or accident damage. Pay special attention to the area where spring hangers are welded to the tandem subframe. These are high-stress areas and should be monitored closely.

Landing Gear Area:

Visually inspect frame and crossmembers for cracks, excessive corrosion or accident damage. Check dolly legs, pads and crank for proper operation.

Kingpin Area:

Visually inspect frame above and adjacent to kingpin plate for cracks, excessive corrosion or accident damage. If damage is noted, pull trailer out of service until necessary repairs are completed.

KINGPIN INSPECTION AND GAUGING

Kingpin Assembly:

Although the Kingpin Assembly requires little daily maintenance, other than lubrication and fastener torque check, it is necessary to inspect it periodically.

During normal use, or immediately after any accident to either the trailer or power unit, inspect the kingpin plate for excessive wear, rough edges, looseness, broken or chipped out areas or any cracks to the plate or pin. Also check plate for distortion.

Welds and structural components should be checked regularly for stress cracks. The kingpin should be gauged annually, and should the pin fall below the 1 7/8" minimum, the entire plate assembly must be replaced. Retorque bolts after trailer has been in service 30 days and check every four months thereafter.

Steam clean and degrease periodically to inspect and gauge assembly. Apply liberal coats of high quality grease to the tractor fifth wheel prior to coupling the trailer. Periodically remove the old grease and replace with new. This will significantly extend the life of the plate by removing foreign particles or sale, grit, etc.

CAUTION: For proper and safe operation, worn or damaged kingpin assemblies must be replaced. For safe operation, have all work to this area of the trailer performed at the factory.

WARNING: DO NOT, under any circumstances, weld on the kingpin to compensate for wear or to repair cracks. The metal is heat treated and any welding could change the physical characteristics of the metal and cause failure of the assembly.

Warranty

STANDARD THREE (3) YEAR WARRANTY TO ORIGINAL PURCHASER

WALKER STAINLESS EQUIPMENT CO., INC. warrants to the original purchaser, for a period of three (3) years from date of delivery, each new cargo tank or equipment to be free of defects in material and workmanship under normal use and service, when properly maintained in accordance with operation manuals and service or product bulletins.

The foregoing warranty is made solely to the first purchaser from manufacturer or from authorized dealer or distributor of the manufacturer and is expressly in lieu of all other warranties expressed or implied by law or otherwise. Any warranty of merchantability is expressly excluded.

For breach of warranty of any kind, the measurement of damages to be recoverable from WALKER shall be limited to repair or replacement of the part or equipment which examination discloses to the satisfaction of WALKER to be defective or payment of the price of making such repair or replacement, at the option of Walker, provided such equipment is returned for such repair or replacement to a WALKER manufacturing facility, authorized WALKER service center, or such other place so designated by WALKER within the three (3) years from date the unit was delivered to the first purchaser.

WALKER will not assume any charges for repairs made during warranty by other than WALKER. We neither assume nor authorize any other persons to assume for us, any liability in connection with the sale of our cargo tanks or equipment and no other warranty will be honored unless in writing and signed by an officer of the company.

This warranty shall not apply to any cargo tank, equipment, or part of our manufacture, which has been repaired or altered outside our manufacturing facilities, or which in our opinion, has been subject to misuse, negligence or accident.

WALKER also assumes no liability or responsibility for transportation to and from repair point, nor loss of profit, nor loss of cargo, nor damages or delays. WALKER shall not be obligated to furnish "loaners" or any compensation for rentals, loaned or borrowed equipment while repair is being made under this warranty.

WALKER assumes no responsibility for damage due to the adverse effect on the cargo tanks and equipment caused by the incompatibility of the product being hauled, vacuum damage caused by improper unloading, cleaning agents, any heat induced damage or buckling caused by pre-heating, hot products or other heat sources to include illegal, unevenly distributed loads.

WALKER makes no warranty whatsoever with respect to parts, which are reasonably expected to wear out and have to be replaced including for example, but not limited to, tires, gaskets, brake linings, brake drums, suspension components, seals, upper coupler pin, electrical items, paint and other similar items.

This warranty does not cover parts and components of other manufacturers beyond such warranty as is made by such manufacturer. WALKER will assign to the purchaser of its cargo tanks and equipment, any warranties extended to WALKER by the manufacturer or supplier of parts and components.

WALKER reserves the right to change, modify or improve the design of its cargo tanks and equipment without incurring any obligation to retrofit or modify its cargo tanks sold prior to such changes.

Any action for breach of warranty shall be commenced within three (3) years of said breach, or be forever barred.

Statement of Disclaimer

As a Tank Manufacturer We Can Only Control The Quality And Type Of Material, As Well As The Quality Of The Workmanship With Which This Tank Is Built.

Therefore, **WALKER STAINLESS EQUIPMENT COMPANY, INC.** Assumes **NO** Responsibility For:

1. Weight Or Capacity Of Tractor.
2. Overloads Or Damage Caused By Product Weights Exceeding Those Shown, Or Model Rating.
3. Damage To The Tank Or For Cargo Losses Caused By Products, Cleaning Methods Or Agents, Or Operation Not Compatible With Material Of Construction As Specified..

**** (It Is The Owner/Operator's Sole Responsibility To Transport Commodities That Are Compatible With The Tank Material As Specified.)**

Liability Disclaimer

WALKER STAINLESS EQUIPMENT COMPANY will not assume liability or responsibility for damage caused by:

- Overloads in commodity weights to exceed those shown on the weight distribution and nomenclature plate.
- Damage to tanks attributed to cargo incompatibility or to improper cleaning.
- Liability or responsibility for cargo transported other than those specified as legal and suitable in D.O.T. Hazardous Materials Regulations (Section 172.5) and other existing tariffs.
- Liability or responsibility for matching authorized cargo tanks with chemical commodities.
- Parts supplied by other manufacturers.

Corrosion Disclaimer

WALKER STAINLESS EQUIPMENT COMPANY manufactures various trailer tanks for transporting a wide range of liquid products in both the food and chemical industries. Different types of stainless steels are selected to best resist tank corrosion. Tank corrosion can be accelerated by time, temperature, product density, contaminants, switch loading without proper washing, chemical concentrations, etc.

Because of these variables and because we have no control over the products transported, and their respective chemical analysis, we can only advise product compatibility with the stainless steel tank material. We do not accept any responsibility for tank corrosion, except to the extent of furnishing the tank material as specified on the tank nomenclature plate.

It is the responsibility of the shipper/carrier to determine if a particular tank is suitable for their transporting needs, and to display the proper D.O.T. product code as required by law.



A CARLISLE COMPANY

TRANSPORTATION DIVISION
625 State Street, New Lisbon, WI 53950
Phone: 608-562-3151 or 800-356-5734
Fax: 608-562-3142

WALKER PARTS ORDER FORM

Table with 3 columns: QUANT., PART #, DESCRIPTION. Categories include DOOR GASKETS / DOOR HARDWARE, ELECTRICAL, MANHOLE ASSEMBLY, JABSCO PUMP - 2" 90 GPM, SAMPLE BOX, SANITIZER ASSEMBLY, JABSCO PUMP - 2 1/2" 130 GPM, HOSE AND CLAMPS, THOMSEN VALVES PARTS, and JABSCO PUMP-2 1/2" 180GPM.

IF YOU ARE IN NEED OF SOMETHING THAT IS NOT LISTED ABOVE, DESCRIBE IT IN THE SPACE BELOW OR GIVE US A CALL

Blank lines for describing items not listed above.

IMPORTANT: SERIAL # OF TANK YEAR MAKE OF TANK SIZE
NAME PHONE FAX
ADDRESS CITY STATE
LICENSED CARRIER # (IF IN WISCONSIN) ZIP CODE

MINIMUM ORDER OF \$15.00

IF ORDER IS BELOW \$15.00, QUANTITY WILL BE INCREASED TO REACH \$15.00.


Thank you for this order. We will process it immediately. Should you have any questions about Walker equipment, please call 1-800-356-5734.

Place
Stamp
Here.

.....

*Walker Stainless Equipment Company
A Carlisle Company
Att: Transportation Parts Department
625 State Street
New Lisbon, Wisconsin 53950*

.....





A CARLISLE COMPANY

TRANSPORTATION DIVISION
625 State Street, New Lisbon, WI 53950
Phone: 608-562-3151 or 800-356-5734
Fax: 608-562-3142

WALKER PARTS ORDER FORM

Table with 3 columns: QUANT., PART #, DESCRIPTION. Categories include DOOR GASKETS / DOOR HARDWARE, JABSCO PUMP - 2" 90 GPM, JABSCO PUMP - 2 1/2" 130 GPM, JABSCO PUMP - 2 1/2" 180GPM, ELECTRICAL, SAMPLE BOX, HOSE AND CLAMPS, MANHOLE ASSEMBLY, SANITIZER ASSEMBLY, THOMSEN VALVES PARTS.

IF YOU ARE IN NEED OF SOMETHING THAT IS NOT LISTED ABOVE, DESCRIBE IT IN THE SPACE BELOW OR GIVE US A CALL

Blank lines for describing items not listed above.

IMPORTANT: SERIAL # OF TANK YEAR MAKE OF TANK SIZE
NAME PHONE FAX
ADDRESS CITY STATE
LICENSED CARRIER # (IF IN WISCONSIN) ZIP CODE

MINIMUM ORDER OF \$15.00

IF ORDER IS BELOW \$15.00, QUANTITY WILL BE INCREASED TO REACH \$15.00.


Thank you for this order. We will process it immediately. Should you have any questions about Walker equipment, please call 1-800-356-5734.

Place
Stamp
Here.

.....

*Walker Stainless Equipment Company
A Carlisle Company
Att: Transportation Parts Department
625 State Street
New Lisbon, Wisconsin 53950*

.....





A CARLISLE COMPANY

TRANSPORTATION DIVISION
625 State Street, New Lisbon, WI 53950
Phone: 608-562-3151 or 800-356-5734
Fax: 608-562-3142

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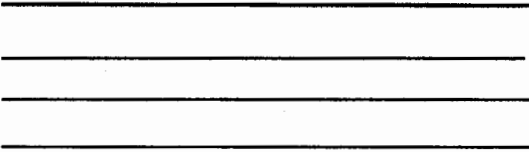
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.....*Index By Subject*.....

Introduction

Introduction.....1

Safety, General Care, and Maintenance

Reference Sources.....2

Safety.....3

Important Safety Considerations.....3

Minor Inspection.....3

Major Inspection.....3

Trailer Maintenance.....3

Confined Entry Precautions.....4

Vehicle Labels and Decals.....5

Label Requirements.....5 and 29

Decal Locations.....5

Decal Descriptions.....5

Pre-Trip Safety Inspection.....6

Transportation Product Group Bulletin.....6

On Guard Anything Other Than Full or Empty.....7

On Guard Within an Inch of Your Life.....8

Protecting Stainless Steel Dairy Equipment From Corrosion.....9-11

Life Extending Practices for Stainless Steel.....11

Care and Maintenance of Metal Parts.....12

Methods for Cleaning Stainless Steel.....12-13

TTMA Technical Bulletin #59.....13-14

TTMA Technical Bulletin #101.....14-15

TTMA Technical Bulletin #60.....16

TTMA Technical Bulletin #80.....16-21

TTMA Technical Bulletin #90.....21-23

TTMA Technical Bulletin #96.....23-24

TTMA Technical Bulletin #83.....25-27

TTMA Technical Bulletin #75.....27-29

Serial and Certification Tag Drawings.....30

Stainless Steel Tank Corrosion Can Be Prevented Through Care.....31-33

Cleaning and Bactericidal Treatment of 18-8 S.S. Storage and Transportation Tanks.....33-34

Maintenance of Milk Pickup and Transport Tanks.....34-36

Scheduled Maintenance Services.....37

Nonscheduled Maintenance Service Required.....37

Landing Gear

Landing Gear Supports.....38

Brakes

Brake Warning.....38

Trouble-Shooting Brakes.....38-39

Continued on the Next Page...

...Index By Subject Continued...

Wheel, Rim and Tire Care

- Tires and Tire Care.....39
- Basket Tire Carrier Warning.....39

Frame Maintenance

- Recommendation for Periodic Inspection of Frames.....40

Kingpin Maintenance

- Kingpin Inspection and Gauging.....40

Parts, Service, and Warranty

- Parts, Service, and Warranty Letter.....41
- Service and Maintenance Contact Numbers.....41
- Instructions For Ordering Parts.....41
- Parts Returned For Credit.....41
- Part Information and Drawings.....42-58
 - Spring Suspension System with ABS.....42-43
 - Intraax Brake/AK219 & 147 with ABS.....44-45
 - Sanitizer Assembly.....46
 - Runovent Assembly.....47
 - 2" Spiralite Hose Assembly for 90 G.P.M. Pump.....48
 - 2-1/2" Spiralite Hose Assembly for 130 & 180 G.P.M. Pumps.....49
 - 2" Spiralite Hose Assembly for 130 & 180 G.P.M. Pumps.....50
 - Thomsen Plunger Valves 304 W S.S.....51
 - Thomsen 3" 60 TTF Valve.....52
 - Walker Manhole Assembly.....54
 - Walker Cabinet Door Assembly.....55
 - Cabinet Door Gasket Installation and Removal.....56
 - Cabinet Door Hinge Assembly.....57
 - Nasco Sample Box.....58
- Jabsco Sanitary Pump 22060-5105.....59-62
- Jabsco Sanitary Pump 23930-5115.....63-66
- Certified Double Acting Olsen Vent.....67

Warranty Information

- Warranty Procedure.....68
- Reporting Defects.....68
- Warranty.....69
- Statement Of Disclosure.....70
- Liability Disclaimer.....70
- Corrosion Disclaimer.....70

Parts Order Forms

- Parts Order Forms.....71-75

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