LAKOS
FILTRATION SOLUTIONS

INSTALLATION OPERATIONS AND MAINTENANCE

FRYSAFE COOKING OIL FILTRATION I&O MANUAL

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LS-899C (Rev. 10/18)

Table of Contents

Please read the entire manual carefully prior to installing, operating or servicing this product. Failure to comply with these instructions may cause personal injury and/or property damage, and may void the warranty of the unit. Always retain this manual for future reference.

Repairing this equipment while under warranty without prior permission of LAKOS/Claude Laval Corp. or the direction of an approved LAKOS service location may void warranty.

The shipping container has been specifically designed to prevent damage while in transit. Please check the unit thoroughly upon receipt and note any damage on the delivery receipt. If damage is found, you must then file a claim promptly with the carrier.

Introduction

Centrifugal solids-from-liquid separation by LAKOS Separators is efficiently achieved through centrifugal action created by fluid velocity changes in the LAKOS Separator. LAKOS Separators employ centrifugal action for the purpose of removing heavier-than-liquid fines and crumb particulates. The LAKOS separator has no moving parts to wear out and no backwashing requirements. In addition, LAKOS separators have a low and steady pressure loss; continuous operation capabilities; and the capacity for little or no system liquid loss.

This Installation, Operation and Maintenance Manual will provide operators, maintenance personnel and plant engineers with complete and comprehensive information regarding the safe operation of the LAKOS Cooking Oil FrySafe Filtration System.

Warning!
This manual must be read and understood before attempting to install or operate the system. Incorrect operation of the system may void any warranties on the system and may endanger the operator and/or coworkers.

Please forward any comments, suggestions or issues regarding this manual or the LAKOS Cooking Oil FrySafe Filtration System to:

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Basic Operations

The ***LAKOS Cooking Oil FrySafe Filtration System*** consists of the following components:

- One LAKOS CSX Separator specially designed for cooking oil filtration
- Two LAKOS Cooking Oil Filtration System Collection Vessels with removable screened baskets
- Blow-down connection, vessel gauges, vessel temperature gauges

The ***LAKOS Cooking Oil FrySafe System*** uniquely provides filtration of hot cooking oil by continuously removing fines, crumbs and other related solids produced during the frying of the product, utilizing the flow created by the fryer's existing cooking oil pump. The system continuously filters the entire flow of cooking oil leaving the fryer's cooking oil pump before the oil enters the fryer's heat exchanger. Unlike most other filtration systems, this system provides continuous filtration of the oil with a low, steady/uniform pressure loss, independent of the build-up of the fines and crumbs within the collection vessels.

Upon removal from the main oil flow, the fines and crumbs are deposited into one of two collection vessels. These vessels contain one, three, or four removable screened baskets. These baskets retain the fines and crumbs until that vessel is full, at which time the operator switches the fines and crumbs flow to the other vessel.

The operator is allowed to remove the full fines baskets from the collection vessel only after it is "cool to the touch" and under "zero" static pressure (see Start-Up Procedures and Operation). During the removal of the fines and crumbs from the collection vessel, the filtration process of the main flow continues.

This system has been designed to minimize the potential exposure of the operator to hot and/or pressurized oil. Blow-down valves, isolation valves, pressure gauges, and temperature gauges are supplied for safety and safe entry into the collection vessels.

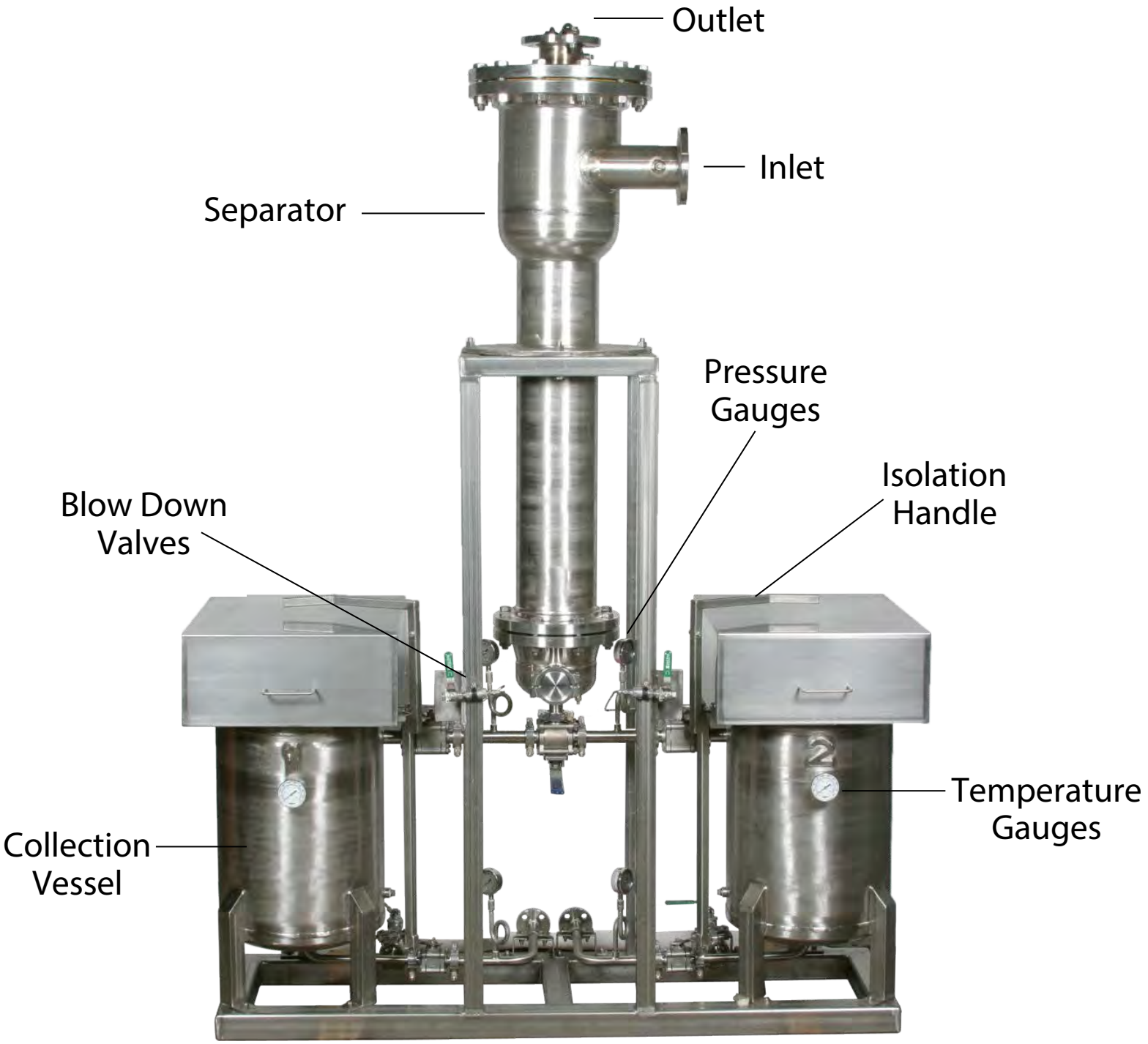
Basics Operation *continued…*

To ensure that the oil is removed from the fines and returned to the fryer, the system is designed with an air "blow-down." Before the fines and crumbs are removed from the collection vessel, air pushes all of the entrained oil in the fines and crumbs back to the fryer, providing very "dry" fines and crumbs.

Because the fines and crumbs are kept in a closed vessel environment and within a closed–looped system until cool, the potential for the fines and crumbs to ignite and cause a fire is almost completely removed.

In addition, with the three-way valve diverting flow from the full vessel to the empty vessel, there is little possibility for the filtration process to entrain air into the oil.

Key Separator Components



Technical Specifications

General	
Process Fluid	Cooking oil
Type of solids to be removed	Fines, crumbs and related solids produced by the frying of corn, potato chips and other foods
Design pressure loss range	3 to 12 psig (.20 - .83 bars)
Maximum operating pressure	100 psig (6.8 bars)
Maximum operating temperature	400°F (204°C)
Collection vessel basket volume	683 inches^3 (11.2 liters) per basket
Fines and crumb retention	100 US mesh (149 micron)
Materials of Construction	
CSX Separator	304L stainless steel
Collection vessels	304L stainless steel
Collection baskets	316 stainless steel
Sealing members	Fluoroelastomer rubber
Gaskets	sealant tape
Support/mounting structure	304 stainless steel
System Requirements	
Electrical requirements	N/A
Air requirements	60 psig, minimum
Nitrogen requirements	N/A
System Service Interval	
Approximately every 6-8 hours to remove fines and crumbs from collection vessels. Service interval will vary by application and size of fryer.	

Technical Specifications *continued...*

Safety Features
Collection Vessels: Hinged shrouds are installed over the collection vessels, covering the seal of the lid of the collection vessel, to prevent accidental splashes and spraying of an operator. *Redundant system to the collection vessel lid seal*
Non-return valve (check valve) is installed between the discharge of the collection vessel and the fryer to prevent oil from returning from the fryer into the vessels.
Two manual isolation ball valves, one on the inlet to collection vessel and one on the discharge or return of the vessel, to completely shut-off the flow of oil to the vessel. One set of valves on each vessel. *Redundant system to the three-way valve and non-return valves*
A mechanical lever system to tie together the operation (opening and closing) of the two manual isolation ball valves. When the valves are open, the position of the handle of the lever system prevents the shroud from being opened. One lever system on each vessel.
An analog temperature gauge (thermometers) installed on the outside of the fines collection vessel for visual inspection by the operator prior to opening vessel. One gauge on each vessel.
Pipe System/Manifold: All piping connections, other than to the separator, are made with sanitary clamps

Safety Features

Hinged shrouds are installed over the collection vessels, covering the seal of the lid, to prevent accidental splashes and spraying of an operator.

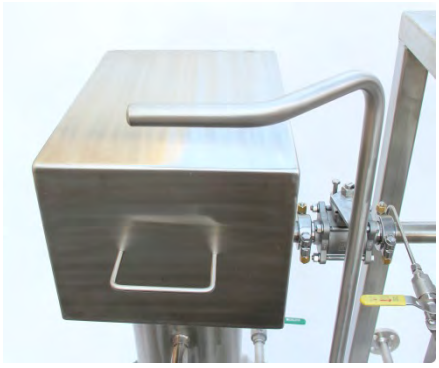
Redundant system to the collection vessel lid seal

Two manual isolation ball valves, one on the inlet to the collection vessel and one on the discharge or return of the collection vessel, to completely shut-off the flow of oil to the vessel. One set of valves on each vessel.

Redundant system to the three-way valve

Safety Features continued…

A mechanical lever system that ties together the operation (opening and closing) of the two manual isolation ball valves. When the valves are open, the position of the handle of the lever system prevents the shroud from being opened. One lever system is located on each collection vessel.



An analog temperature gauge (thermometers) installed on the outside of the collection vessel for visual inspection by the operator prior to opening it. One gauge is located on each collection vessel.

Analog pressure gauges installed on the collection vessel for visual inspection by the operator prior to opening it. Two gauges on each collection vessel.

Pre-Installation System and Installation Area Check List

System

1. Inspect entire system for shipping damage.
2. Inspect the system's frame and structural supports for damage incurred during shipping, loading & unloading.
3. Inspect ancillary equipment (e.g. valves, shrouds) for operational deficiency.
4. Valves must open fully and close tightly.
5. Inspect the internal chambers of the separator and connecting pipes for foreign objects or blockage.
6. Inspect tubing and fittings for tightness. Tighten if necessary.

Installation Area

1. Inspect soundness and levelness of the concrete foundation and surrounding installation area
2. Inspect installation area for overhead electrical wires or piping that might interfere with the installation of the system.

System Installation

Assemble the system into place and level using the leveling devices on the underside of the support structure. The system does not need to be anchored to a concrete floor or foundation.

A piping by-pass, as diagramed on the LAKOS system installation drawing on page 14, is good practice, in case the LAKOS Cooking Oil FrySafe System needs to be removed from service.

If necessary, disassemble the mated flanges at the collection chamber and barrel of the separator and the nuts on the separator support ring to position the inlet in the required orientation.

If necessary, disassemble the mated flanges at the top of the separator to position the separator's discharge to the required orientation.

Plumb the inlet pipe to the provided ANSI flange on the separator, to the discharge of the fryer pump. Refer to the LAKOS system drawing in this section.

Plumb the discharge pipe to the provided ANSI flange on the separator returning to the heat exchanger or fryer. Refer to LAKOS system drawing in this section.

Warning: The inlet pipe of the separator is the horizontal pipe at the top of the separator and the discharge pipe of the separator is the vertical pipe at the top of the separator. Misplumbing the separator will prevent the separator from operating correctly.

Warning: Inlet and outlet piping to and from the separator must be supported to avoid any possible strain to the unit's flanged connections. The use of pipe supports, clamps, and hangers is required.

System Installation *continued…*

Plumb the return lines from the collection vessels to a point on the take-out end of the fryer at a position above the oil level line in the fryer.

Important: Each collection vessel must have its own return line to the fryer.

Plumb the drain lines to the shut-off valves provided. Refer to LAKOS system drawing in this section. Plumb the air supply lines to the ¼" ball valves provided for blow-down.

Warning: Air supply must be provided with a pressure regulator and filter.

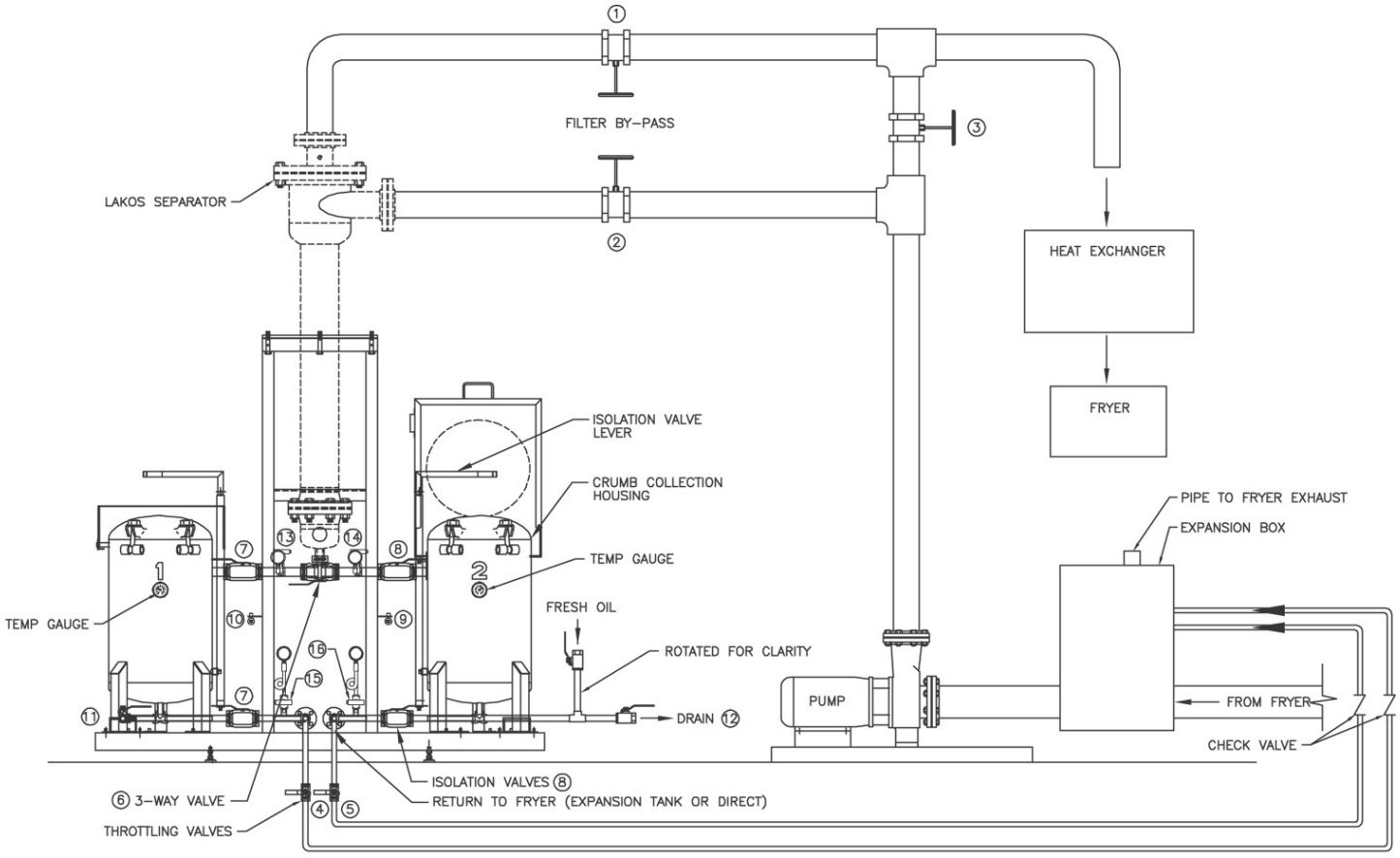
Pressure gauges should be installed on the inlet and outlet of the separator. The gauges will be used to verify separator performance **(supplied by customer)**.

Tag Valves with following numbers. Refer to LAKOS system drawing.

1. Bypass valve
2. Bypass valve
3. Bypass valve
4. Throttling valve
5. Throttling valve
6. 3-Way directional valve
7. Isolation valves
8. Isolation valves
9. Blow-down valve
10. Blow-down valve
11. Drain valve
12. Drain valve
13. Hand valve
14. Hand valve
15. Hand valve
16. Hand valve

Tagged valve will correspond with operation procedures

System Installation *continued…*



Pre-Start Up Check List

(After Installation)

Fill the fryer, separator, and collection vessels with hot water, start circulation to check for major leaks. Tighten connections as necessary.

Make sure valves seat properly, including system bypass valves, if installed. (Performance of the separator is affected when bypass valve is not properly closed).

Verify pressure readings indicated on inlet/outlet gauges on collection vessels.

Verify the temperature gauge reading on the collection vessels.

See sanitation instructions to continue.

Start-Up Procedures and Operation

Initial Start-up Procedure or After a System Shut-Down

1. When the system start-up for the first time or after a system shut-down, the procedure below should be followed:
2. Verify that both collection vessels have their fines basket(s) installed.
3. Verify that the fines baskets are securely retained by the fines basket retainer device (not applicable to single basket).
4. Inspect the sealing area of the collection vessel lid to ensure it is clean and free of dirt or fines.
5. Inspect the O-ring, on the collection vessel lid, to ensure that it is clean, in the proper position, and not nicked or cut.
6. Lower the collection vessel's lid
7. Tighten the cross-handle bolts in a crossing (diagonal) pattern. Tighten all of the cross-handle bolts slowly and evenly. Hand tight is sufficient and a small gap between the Fines Vessel and the Fines Vessel Lid is expected.
8. Lower the collection vessel shroud.
9. Open the isolation valves (7, 8) by moving the handle over the collection vessel shroud.
10. Inspect and close drain valves (11, 12).
11. Verify that the hand valves are fully opened (requires several turns to fully open or close the valve. Clockwise to close and counter-clockwise to open). (13, 14, 15, 16).
12. The frying system can now be safely started and operated.

Start-Up Procedures and Operation

continued…

Clean/Servicing a Collection Vessel

During the normal operation of the system, the fines are being continuously separated from the oil and transferred to one of the two fines vessels. Each fines vessel is equipped with one, three, or four removable fines baskets, which capture and retain the fines, internal to each fines vessel. The fines baskets will require periodic removal and cleaning. To clean the fines vessel, the operator will be required to open one of the fines collection vessels. To prevent the operator from being exposed to hot pressurized oil, the system employs several gauges and isolation levers to enter the vessel safely. During this operation a blow-down will be conducted to relieve the vessel of oil left in from filter mode. Switching of the tanks is required during this process as well. The following procedures are suggested by LAKOS for switching vessels and cleaning vessels.

Switch Collection Vessel to Tank 1

Fines vessels are to be switched on differential pressure read from the fines vessel gauges. The differential pressure used to indicate the change should be logged on a check sheet for future reference (Sample Located in this Section). The indicator for which vessel is in use is the pressure and temperature gauge on a fines vessel. The vessel in use will be pressurize and to temperature.

1. **Vessel 1, t-bolt closure securely closed**
2. **Splash guard lowered**
3. **Valves #11 and #10 are closed**
4. **Valve #7 is open**
5. **Switch valve #6 position to change vessels**

Start-Up Procedures and Operation

continued…

The above sequence will switch from vessel #2 to vessel #1. To switch back to vessel #2, use the same order with the appropriate valves.

Clean Collection Vessel

Collection vessel cleaning is to be done after Switch Fines Vessel Procedures have been followed.

1. **Check vessel temperature (100°F is Safe).**
2. **Blow-down valve opened for 1 minute at 60psi (blow-down can occur before vessel has cooled).**
3. **Blow-down valve closed.**
4. **Check vessel gauges (0 psi is safe).**
5. **Close isolation handle when temperature and pressure is safe.**
6. **Raise splash guard.**
7. **Open t-bolt closure slowly.**
8. **Remove and clean baskets (hot water only no scraping).**
9. **Reinstall clean baskets, close t-bolt closure.**
10. **Lower splash guard.**
11. **Open isolation valve (vessel ready for service).**

The above procedure will ready vessel for next switch of the vessels. The above instructions are to be used with the appropriate valves illustrated on the manual system on page 14.

Sanitation Procedures

Clean/Sanitation of System

Sanitation of the system is recommended prior to normal operation of the system in conjunction with the fryer. Sanitation itself is done in conjunction with the fryers sanitation procedures. Proper sanitation is important to the functionality of the systems overall performance. Caustic boil-out of the system should be increased by 1 hour for the first 3 sanitations. The sanitations that follow can be decreased by ½ hour. The increased sanitation will help keep the buildup in the heat exchanger down and prevent blinding of the fines vessel baskets. **Please note sanitation is required after initial installation of system.**

Sanitation Procedures

SYSTEM SANITATION WILL BE AS FOLLOWS AFTER PRODUCTION HAS ENDED.

1. **BLOW-DOWN VESSEL IN OPERATION TO RECOVER OIL FOLLOW CLEANING INSTRUCTIONS FOR BOTH TANKS (LEAVE BASKETS OUT).**
2. **CLOSE VALVES #13, 14, 15, AND 16. 3.**
3. **READY FOR SANITATION.**
4. **CHANGE POSITION OF VALVE #6 EVERY 15 MINUTES DURING SANITATION.**
5. **OPEN VALVES #11 AND 12 TO DRAIN AFTER SANITATION.**
6. **CLOSE VALVES #11 AND 12 AFTER DRAINING SYSTEM.**
7. **FOLLOW VESSEL CLEANING INSTRUCTIONS (REINSTALL BASKETS).**
8. **OPEN VALVES #13, 14, 15, AND 16.**
9. **SYSTEM READY FOR USE.**

SANITATION BOIL-OUT SHOULD BE CONDUCTED FOR 30-60 MINUTES LONGER WITH THIS SYSTEM. LONGER BOIL-OUT HELPS CLEAN HEAT EXCHANGER AND PREVENTS PREMATURE BLINDING OF VESSELS. MAKE SURE ALL WATER IS REMOVED FROM SYSTEM AFTER SANITATION!

NOTE: Certain caustic washing may degrade the integrity of carbon steel tanks, pumps and centrifugal separators. We recommend only stainless steel products in these applications.

System Bypass

A System bypass is recommended for the ease of maintenance during normal operation of the system. The bypass allows for maintenance during operation without shutting the fryer down. Reference Manual System drawing on page 14 for valve reference. Procedure as follows:

BYPASS SYSTEM

1. Bypass Valve #3 is opened
2. Bypass Valve #2 is closed
3. Bypass Valve #1 is closed

TO BRING THE SYSTEM BACK ON LINE FOLLOW THE REVERSE SEQUENCE OF OPERATION TO BYPASS.

Trouble-Shooting

Problem	Check Point	Remedy
No system flow or pressure	- Check for loose electrical connections.	-Tighten connection as necessary
	- Check blown fuses or tripped circuit breakers	- Replace or reset as necessary
Decreasing flow and pressure during normal operation	- Check for closed by-pass valves	- Open as necessary
	- Check for blocked strainers or filters up-stream of the LAKOS Cooking Oil FrySafe System	- Clean strainers or filters as necessary
System has low flow and low pressure	- Check electrical hook-up on the pump fryer motor for incorrect rotation. Proper pump rotation is normally indicated on its volute casing of the pump. (3 phase pumps only)	- Interchange any two of the motor's conductors and see if performance improves. If not, change back
	- Check for blockages in the piping	- Clean as necessary
No discharge flow from the system with maximum pump pressure	- Check the by-pass valves on discharge of the separator	- Open as necessary
	- Check the separator inlet chamber for blockage	- Clean as necessary
No transfer of fines to the Fines Collection Vessel	- Check for a blockage in the collection chamber of the separator	- Clean as necessary
	-Check for a blockage in the tubing from the separator to the fines collection vessel	
Fines basket blinding off	- Check throttling valves for proper adjustment	- Adjust valve as necessary

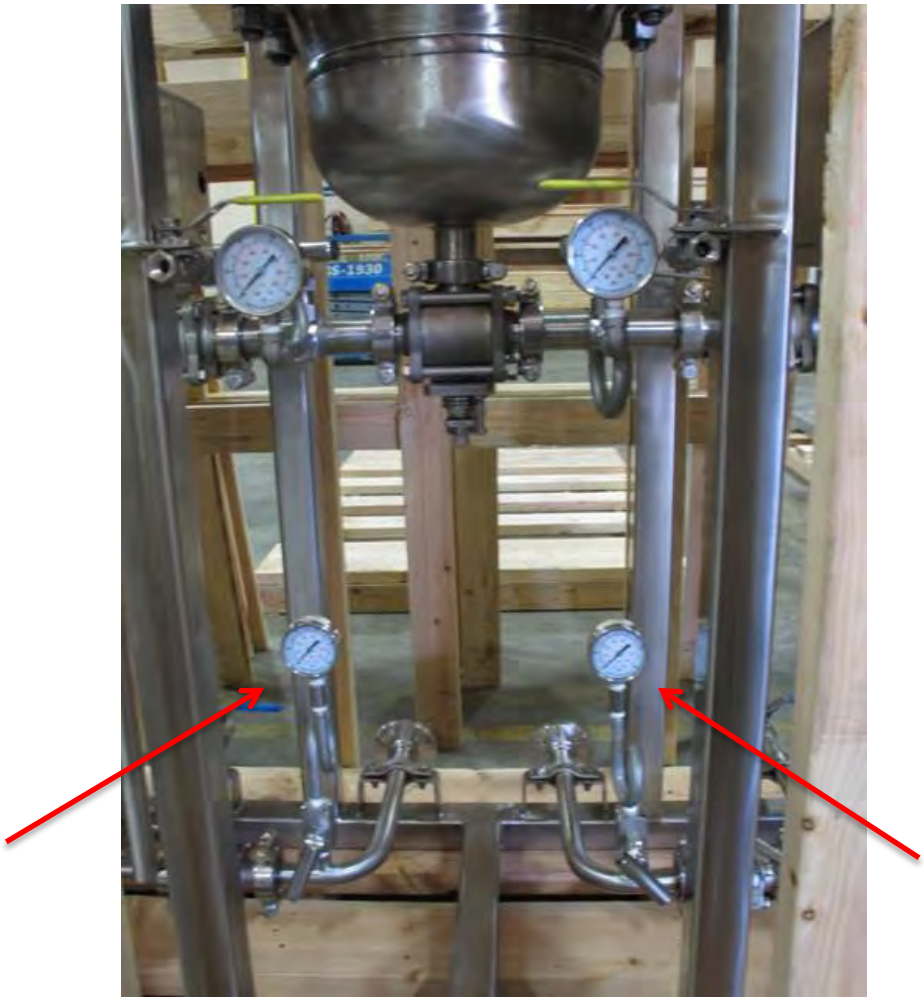
Important Issues:
Before Opening A Vessel

- Confirm that the fines collection vessel being opened is the correct one.
- Each fines collection vessel has a number welded on the front.
  - "1" is on the left side
  - "2" is on the right side

- Confirm that the temperature inside of the fines collection vessel is at or below the release temperature before attempting to open vessel.
- The temperature gauge is located on the front of the fines collection vessel.
- Gauge should read less than 100°F before opening
  - Due to the location of the temperature gauge, it will read lower than the inside of the fines collection vessel

Important Issues:
Before Opening A Vessel

- Confirm that the pressure inside of the fines collection vessel is at or below the release pressure before attempting to open the vessel.
- Read the lower (on the outlet side of the vessel) gauge.
- Gauge should read “zero” before opening.



Important Issues:
When Opening A Vessel

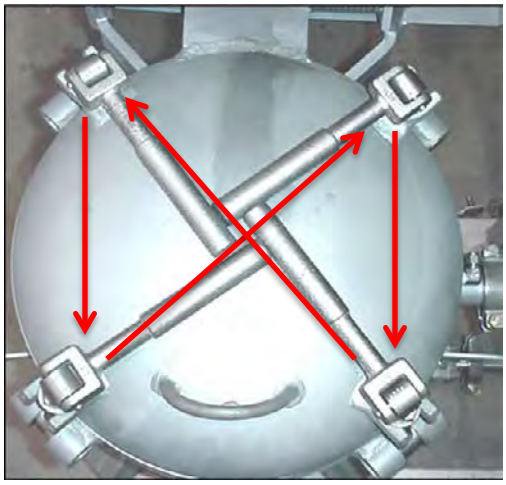
- When opening a fines collection vessel, remove the back two (towards the shroud) cross-handle bolts and only one front cross-handle bolts, first. The single basket vessel will only have three cross-handle bolts.
- Keep one of the front cross-handle bolts tightened until all of the others have been loosened and removed.
- Loosen the last cross-handle bolt slowly, listening for any pressure bleed off.

Important Issues:
Before Closing A Vessel

- Make sure the fines basket retaining device is locked in place before closing the fines collection vessel (only for three or four baskets vessel).
- Inspect the sealing area of the fines collection vessel lid to ensure it is clean and free of fines before closing the lid.
- Inspect the O-ring on the fines collection vessel's lid to make sure it is clean, in the proper position, and not nicked or cut before closing.

Important Issues:
Before Closing A Vessel

- Tighten the cross-handle bolts in a crossing (diagonal pattern.
- Tighten all of the cross-handle bolts slowly and evenly.



- Do not over tighten the cross-handle bolts.
- Hand tight is sufficient to make the O-ring seal.
- A small gap between the lid and body of the fines collection vessel is to be expected.
- Over-tightening may damage the O-ring and cause a leak

Spare Parts- Fines Baskets

Description: Fines Basket, 100 Mesh Screen

Material: Stainless Steel

LAKOS Part Number: 136771

Location in the System: Inside the Collection Vessel

Spare Parts- Collection Vessel Retaining Device

Description: Plate, Screen Retainer

Material: Stainless Steel

LAKOS Part Number: 136884 (for three baskets vessel)

LAKOS Part Number: 124043 (for four baskets vessel)

Location within System: Inside the Collection Vessel

Spare Parts- Separator Head Gasket & Collection Chamber Gasket

Model	Flow Range (U.S. gpm)	Inlet/Outlet Size Flange	[1] Separator Head Gasket Part#	[2] Separator Collection Chamber Gasket Part#
FrySafe-0075	75-125	2-inch	119060 (8"-150#)	119060 (8"-150#)
FrySafe-0110	110-180	2-1/2-inch	119060 (8"-150#)	119060 (8"-150#)
FrySafe-0165	165-280	3-inch	119060 (8"-150#)	119060 (8"-150#)
FrySafe-0250	250-400	4-inch	119972 (10"-150#)	119972 (10"-150#)
FrySafe-0360	360-670	4-inch	119066 (12"-150#)	119060 (8"-150#)
FrySafe-0565	565-1030	6-inch	120383 (14"-150#)	119972 (10"-150#)
FrySafe-0815	815-1500	6-inch	118733 (16"-150#)	119066 (12"-150#)
FrySafe-1450	1450-2700	8-inch	118734 (20"-150#)	118733 (16"-150#)
FrySafe-2300	2300-4250	10-inch	118765 (24"-150#)	118763 (18"-150#)

Material: Spiral wound, 304L/sealant tape.

Notes:

1. Location within the System: Between the main and discharge of the separator.
2. Location within the System: Between the collection chamber and the main barrel of the separator.

Spare Parts- Gaskets

Sanitary, 3″

Model	Flow Range (U.S. gpm)	Inlet/Outlet Size Flange	Gasket Sanitary Part#
FrySafe-0075	75-125	2-inch	N/A
FrySafe-0110	110-180	2-1/2-inch	N/A
FrySafe-0165	165-280	3-inch	N/A
FrySafe-0250	250-400	4-inch	113827 (3″)
FrySafe-0360	360-670	4-inch	113827 (3″)
FrySafe-0565	565-1030	6-inch	113827 (3″)
FrySafe-0815	815-1500	6-inch	113827 (3″)
FrySafe-1450	1450-2700	8-inch	113827 (3″)
FrySafe-2300	2300-4250	10-inch	113827 (3″)

Description: Sanitary gasket, Type 1
Material: Sealant tape
Location within the System: Access port at collection chamber of the separator.

Sanitary, 1″

Description: 1″ Sanitary, Type 1, gasket

Material: Sealant tape **LAKOS Part Number:** 113652
Location within the System: Sanitary fittings at the outlet side of the collection vessels.

Sanitary, 1-1/2″

Description: 1-1/2″, Sanitary, Type 1, gasket

Material: Sealant tape

LAKOS Part Number: 106257
Location within the System: Sanitary fittings at the inlet side of the collection vessels.

Spare Parts- Pressure Gauges and O-Rings

Description: Pressure gauge, 2-1/2” dial, 1/4” bottom connection, stainless steel, glycerin filled
LAKOS Part Number: 123740 (0-100 psi)
LAKOS Part Number: 134595 (0-30 psi)

Collection Vessel Lids

Description: Collection Vessel Lid O-ring
Material: Fluoroelastomer rubber
LAKOS Part Number: 140302 (for single basket vessel)
LAKOS Part Number: 139900 (for three baskets vessel)
LAKOS Part Number: 140303 (for four baskets vessel)
Location within the System: Lid of collection vessel

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