TROUBLESHOOTING GUIDELINES

PROBLEM: ***Performance***

1. The most common problem in this area comes from inadequate flow to the LAKOS Separator(s**)**. All LAKOS Separators operate within a prescribed flow range (see appropriate product brochure for flow data for any specific model). Pipe size is not a factor in model selection. Be cautious when using pump flow curves. Experience tells us that these curves may vary as much as 10% from published data. This information is particularly difficult to use when multiple pumps are installed in a parallel configuration. Consider, also, that the pump(s) may also suffer flow and efficiency loss due to the solids present in the system flow.

   Do not plumb two separators from two independent pumps into the same outlet header without installing balancing valves on the discharge of each separator. The balancing valves must be set to achieve a pressure loss across each separator that indicates a flow rate (according to that LAKOS model's published chart) equal to the flow rate anticipated through the pump that feeds each separator.

   The use of finer filtration downstream from a separator is a common application. Be aware, however, that barrier filters cause an increasing pressure loss, which may cause the flow rate of the system to be reduced… sometimes below the recommended flow rate of the separator. This situation will often reveal itself when typically separable particles begin to show up regularly on the downstream barrier filter (leading the customer to believe that the separator does not work). Always check for variations in the flow rate when downstream conditions change.

   There are several ways to verify the flow rate of a system:

   - Read the pressure differential between the inlet and the outlet of the separator. LAKOS Separators operate effectively at a minimum pressure loss of 3 psi (0.2 bar) to a maximum of 12 psi (0.8 bar). Slightly higher pressure losses are acceptable. Be sure that the pressure gauges are not clogged with solids, which could affect their accuracy. Proper installation includes petcock valves between the separator and the gauges to facilitate servicing/replacing gauges.

If pressure gauges are not installed on the LAKOS Separator, the system's flow rate can be determined using the following formula:

$$\frac{\text{Pump Horsepower} \times \text{Pump Efficiency} \times 1715}{\text{System psi}} = \text{Max. US gpm}$$

Pump horsepower is typically found directly on the system pump. Pump efficiency, unless subjected to extreme abrasive wear, typically varies between 60% (for smaller pumps) to 75% (for larger pumps). System pressure requires a gauge reading at or near the LAKOS Separator. This technique also requires a common sense consideration of the system piping size. If the formula above reveals a flow rate that is excessive for a given pipe size (use your LAKOS product sheet data for acceptable flow rates for a given pipe size), the actual flow rate may be less than the formula indicates.

- An accurate-reading flow meter may also be used to verify actual flow rate. Do not install a flow meter downstream from a LAKOS Separator without the proper means for "straightening" the flow (given that the flow directly from the outlet of a separator will be somewhat turbulent). Consult the maker of your flow meter for specific details.

2. Purging of all separated solids is important on a routine basis. Failure to evacuate the separated solids will result in over-filling of the LAKOS Separator's temporary collection chamber, allowing any further particles which enter the separator to pass through the separator.

3. Inlet pressure to a LAKOS Separator must be at least equal to or greater than the anticipated pressure loss through that separator (see appropriate pressure loss chart for any given model) *plus* 15 psi (1.0 bar) *plus* whatever downstream pressure is required.

4. If a LAKOS Separator operates with an open discharge, a valve should be installed to create a back pressure of at least 5 psi (0.3 bar).

5. Verify that the solids are potentially separable. A simple rule is that solids but be settable in 3 minutes or less. Particles which remain n suspension beyond that time may be removed via a separator only to a lesser degree. Other factors which limit separability are particle shape (flake-like particles with a low specific gravity can be difficult to remove) and changeability (due to factors like temperature, pressure, dissolvability, etc.).

PROBLEM: *Excessive Pressure Loss*

1. All LAKOS Separators operate within a prescribed flow range (see appropriate product brochure for flow data for any specific model). If undersized, the separator will experience higher pressure loss. Check for changing conditions of the system pump(s).

2. If particles larger than the recommended maximum size enter the separator, they may block the internal acceleration slots of a separator. A proper installation uses a coarse strainer prior to the pump to keep such larger particles out of the system. If, however, such particles do get into the separator:

    - *Accessible-Style Separators* – See product brochure for details on internal access for the removal of troublesome solids.
    - *Non-Accessible Separators* – Consult factory for specific suggestions.

PROBLEM: *Solids Purging*

1. Proper operation of a LAKOS Separator includes routine purging of the separated solids from the separator's temporary solids collection chamber. Never collect solids to the specified capacity of the collection chamber as noted in the product brochure. At least a minimum volume of fluid is necessary to flush the solids via the purge outlet and to the desired solids-handling destination.

    If solids are allowed to compact in the separator (either by over-filling or over a period of time), it may become difficult to discharge the solids from the separator. It may then be necessary to interrupt flow through the separator and gain internal access for removal of the solids.

2. Be a aware that vertical profile separators at the higher flow rates maintain some space in the collection chamber below the purge outlet, where separated solids may accumulate and may not discharge during regular purging. There is typically no harm in this accumulation. Once the solids accumulation reaches the level of the purge outlet, solids will discharge when the purge vale is opened.

3. Never purge a separator into the fluid source that is being pumped into the LAKOS Separator. This will only result in accelerated concentration of solids.

4. When purging, remember that you are trying to move solids via a fluid handling process (pipes & valves). Consider the following:

    - Avoid uphill purging.
    - Do not reduce the purge line pipe size.
    - Be sure that the purge duration allows for complete evacuation of solids from the purge line piping to the desired solids-handling destination.

5. Do not connect two of more separators to one LAKOS SRV or CRS Solids Collection System, unless the separators are supplied by the same pump and the separators are of the same identical models and sizes.

6. Two-stage separators must be purged individually. Do not join the purge lines together.

7. Proper installation should always include a manual isolation valve at the separator's purge outlet prior to any automatic purge system. This allows for the closure of the valve to enable removal of the automatic equipment for servicing if necessary.

8. If your LAKOS automatic purge valve malfunctions, check the following:

    - *LR Series Motorized Ball Valves* – Be sure that proper power is being delivered to the controller and valve. Check purge frequency and duration settings (valve must be set for a minimum of 10-second duration to allow actuator to open and close the valve). A leaking valve may require replacement of the ball and seat bushing.
    - *LJ Series Fail Safe Pneumatic Ball Valves* – Be sure that proper power and compressed air supply is being delivered to the controller and valve. Check solenoid for clogged ports. Confirm that air pressure line is properly connected to the correct solenoid and valve ports. Check purge frequency and duration settings. A leaking valve may require replacement of the ball and seat bushing.
    - *LA Series Pneumatic Pinch Valves* – Be sure that proper power and compressed air supply is being delivered to the controller and valve. Adjust air pressure regulator to provide sufficient pressure to overcome separator/system pressure in order to close the pinch valve liner (at least 30 psi or 2.0 bar greater than the inlet pressure to the separator). Check purge frequency and duration settings. Check solenoid for clogged ports. Confirm that air pressure line is

properly connected to the correct solenoid and valve ports. A leaking valve may require replacement of the pinch valve liner.

9. Consult your instructions for specific automatic valves or solids-handling equipment for details on proper installation and maintenance.

PROBLEM: *Vibration*

1. Mild vibration is possible in some installations and should be considered normal. Excessive vibration is typically due to entrained air, improper piping or overall system vibration (amplified at the separator).

2. Entrained air is typically removed from the upper acceptance chamber of the separator via the normal operation of the internal vortex action. Air in the upper extended collection chamber area is expelled via the Vortube. If the separator is subject to routine draining of fluid or frequent entrainment of air, install permanent air relief ports – consult factory for details.

3. Check installation piping and inlet/outlet connection configurations. Certain arrangements of piping to and from the separator will allow fluid flow to create significant vibration. Consult your LAKOS product brochure for specific recommendations for vertical profile separators.

4. Larger models should be secured properly to the floor, using the bolt holes provided. Foundation must be sturdy enough to handle the weight of the product, including liquid (see data in product brochure for approximate weights).

5. Smaller models should be properly bracketed or secured beyond hanging from the system piping.

6. The use of expansion joints is advisable with all separator installations. It is particularly recommended that these devices be employed when the piping arrangements cannot comply with the configurations suggested in the product brochure.

7. Pump cavitation can also transfer vibration to the separator. Be sure that the pump suction is flooded and that conditions for cavitation are avoided.

PROBLEM: *Miscellaneous Issues*

1. Be sure that no source of vacuum/suction exists in the piping arrangement. Such conditions as downward piping immediately after the separator outlet, pump suction installation and/or the use of a booster pump require a valve between the separator and the suction source. Throttle the valve until the
pressure loss across the separator indicates the published flow rate that most closely resembles the anticipated flow rate through the separator.

2, Separators that feature an internally accessible upper chamber should be installed with a spool in order to provide the space necessary for removing the upper section from the separator. See product sheet for details.

3. All piping connections and internal access ports/connections should have proper seals or gaskets to ensure a leakproof installation.

4. If separator develops leaks in the body (not gaskets, seals or purge valve), chemical corrosion may be responsible. Check system fluid for corrosive qualities and modify/replace separator to accommodate this condition. Consult LAKOS for coatings and alternative materials of construction. Excessive solids loading may also be responsible. Consult LAKOS for options.

LAKOS

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LS-638 (rev 10/06)