CONVEYING SYSTEM TROUBLESHOOTING GUIDE

To troubleshoot the vacuum conveying system, the use of a vacuum gauge that can be sealed to the convey piping (material line) will help when trying to identify and localize various problems.

When examining a conveying system, first check the vacuum gauge on the power pack when the system is operating. The gauge should not exceed the full vacuum rating for the pump. If the gauge is suspect, replace it with a known good gauge to verify condition.

The next thing to check is the air inlet suction at the material pickup point. It may be necessary to disconnect the material line at the vacuum takeoff adapter with hard piped systems. If the test gauge can be applied to the end of the conveying line, the reading should be close to the gauge installed on the pump. There should be a substantial air inflow at the open material pickup tube. If these conditions are not indicated, then detailed trouble shooting will be necessary.

To use the chart below, click on a symptom for suggested solutions:

Fails to Convey	*Motor Does Not Run*	*Not Loading Material, Motor Running*	*Not Loading Material, Motor NOT Running*	*Typical Vacuum Relief Valve Settings vs. Hi Vac Switch Settings*	*Equivalent Feet*

Fails to Convey | Back to Selection Chart

Power Pack gauge Reads High Vacuum or Test gauge Reads Low Vacuum:

If the pump gauge is above the expected reading, and not conveying material, there will usually be a line plug or an obstruction such as a plugged filter - a coupling gasket sucked into the pipe.

When the test gauge starts low and then increases this suggests an obstruction or leak in the system. Check for leaks and see instructions for 'Tee' valve/poppet valve diagnostics and clearing line plugs.

Power Pack Gauge Reads Low Vacuum or Test Gauge Reads No Vacuum:

When operating the convey system without trying to convey material (empty system), there should be between 2-3" hg vacuum, and up to one half of the power pack rated vacuum indicated on the power pack gage. *See chart.*

When there is very little vacuum at the power pack, and no detectable suction at the material inlet, the system has a leak or open connection in the piping system. There may be multiple sequence valves open at the same time.

Remove material inlet lines from chamber, check for vacuum at chambers.

Also check the power pack protective filter for missing or loose hardware or clamps or other open/leaking condition. If the system has an vacuum breaker valve, the operation and proper sealing of the valve should be verified.

The vacuum relief on the power pack should be checked for proper relief vacuum, which is just above the rated vacuum of the pump. ***See "Typical Vacuum Relief Valve Settings vs. Hi Vac Switch Settings" chart.***

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Material Conveys, But Does Not Make Required Throughput Rate:

When the system will convey material, but at a rate well below the required rate, there are three possible reasons.

1. *The material pickup VTA or suction lance is not properly adjusted for proper airflow/material ratio. Increase material in-feed to get the piping to surge from material overloading, and then reduce loading slightly to reduce surging for proper adjustment.*

2. *A mechanical problem with the system- Possible vacuum chamber dump throat not sealing, material inlet check valves not sealing on common material line systems, vacuum breaker or relief not sealing properly, excessive leaks in piping system, sequence valves leaking, etc.*

3. *The system is undersized for the application- By incorrect sizing, or addition of more stations and/or material throughput than originally designed to handle. Check actual rate compared to power pack sizing charts.*

Control Operation Not Sequencing Properly:

Control issues for proper operation may involve incorrect level switch sense (normally open or normally closed), incorrect station wiring identification to terminal connections, incorrect station to power pack assignments, and lack of wiring continuity or shorts to ground. When any wiring errors are made the chance of damage to the printed circuit input or output cards is likely. By observing the LED indicators on the PC cards, and comparing the voltage meter readings at the terminal strips, the bad card can be diagnosed.

The setup and initial configuration of the control is critical to the proper operation of the conveying system. If the control does not have the proper station to pump assignments, load times set, and appropriate optional features enabled, the operation of the conveying system will not be possible until the controller is configured properly.

The FACS system has specific wiring and connector requirements. The wiring has length limitations for the main twisted pair without the use of an additional power supply. Also note FACS is sensitive to excessive static electricity generated by the material conveying in the lines and electromechanical interference (EMI) generated by high voltage wiring. The proper grounding of the piping system is import in the successful installation of the FACS control system.

Sequence Valve Diagnosis:

The 'Tee' sequence valves and poppet valves located on the chamber lid are designed to be closed without compressed air or when no control signal is present. When an individual vacuum chamber shows high vacuum, but not any other stations on the power pack, the sequence valve may not have the proper electrical signal when it should, or no plant compressed air applied to the solenoid valve. If there are several chambers on the power pack that will not operate properly, the station that appears to work "properly" could have its sequence valve stuck open.

Locating And Fixing Conveying Line Plugs:

When the conveying system has symptoms of a plugged line, the best approach is to isolate the system until the pipe containing the plug can be identified. Begin by removing the material line from the vacuum chamber (or as close to the chamber as possible), and check the power pack gauge for empty system operation. The high vacuum should be gone if the plug is in the material line, and if not, the problem is in the vacuum manifold or sequence valve, a coupling gasket that is sucked into the a pipe joint, or possibly the protective filter. When the vacuum is OK at the vacuum chamber, reconnect the material line, and go away from the chamber toward the material source to break the material line open again. Typically this point should be near the beginning of the last long straight run, or approximately half way back to the material source. Again, if the vacuum is good, continue toward the source, or if not OK, break the line half way back to the vacuum chamber. When the plug is located, it may be necessary to remove the blocked pipe, and clear it with a probe.

Vacuum Relief Valve and Vacuum Switch Operation:

All positive displacement power packs have a spring loaded relief valve to protect the blower if the air inlet is obstructed. The relief valve should begin to open above the rated vacuum of the power pack, and not before reaching the rated vacuum. Should the relief open at lesser vacuum, the system capacity will be impaired. The relief can be adjusted by changing the tension on the spring with the nuts on the spring retaining bolt. When checking the relief, make certain the gasket on the seal plate is in good condition, and not leaking when closed. There should be no detectable leakage at the relief when under the rated vacuum of the power pack.

The vacuum switch can be checked by using an ohm meter on the switch contacts of the switch while closing off the inlet to raise the pump vacuum to the reach the rated vacuum of the unit. The switch should show a change of state of it's contacts when it reaches the rated vacuum. If the switch does not trip at the specified point, it may be adjusted with a screwdriver to increase or decrease the vacuum level of the trip point.

Vacuum Breaker Operation:

The optional vacuum breaker is used to keep the blower motor running when the system is sequencing through the stations. This avoids starting and stopping the motor more frequently than necessary. The normal condition of the vacuum breaker at rest (compressed air applied, no electric control signal present) is closed to atmosphere. This is the ‘Convey’ position. When the system is to convey material, the vacuum breaker is de-energized, and will be energized to stop conveying material and allow the changing of the system valves/dump time for the stations. Note the air pressure of the compressed air service- it should be between 80 and 100 psi for proper operation.

Power Pack Blower Rotation:

The positive displacement blower used in the power packs must rotate in the proper direction to produce a vacuum on the conveying system. There is a rotation arrow on the pump belt guard indicating the proper direction of blower rotation. With the vacuum inlet piping disconnected from the power pack there should be suction at the blower inlet. You can also feel the airflow coming from the muffler air diffuser outlet when the blower rotation is correct.

The regenerative type blowers will also have a direction arrow, and will also exhibit the same air direction/rotation relation as the positive displacement blower.

When the blower is not rotating in the correct direction, the three phase drive motors can have the direction of rotation reversed by exchanging two of the phase wires. Note that any electrical work should only be performed by qualified electrical personnel.

Power Pack Drive Belt Replacement:

The power pack uses a set of two or three ‘V’ belts to drive the positive displacement blower at the correct speed. The sheave/pulley selections are made for the proper speed of the drive motor to get the necessary blower RPM. When servicing the pump or motor, be certain the sheaves are replaced in the original positions. Also note the RPM of the motor if replacing the motor to be certain that it is the same as the original. Always replace all of the drive belts as a matched set at the same time.

When installing the belts, the motor is moved closer to the blower to relieve the belt tension so the new belts can be placed on the sheaves. Do not attempt to pry the new belts over the sheaves without moving the motor over. It will damage the belts to force them over the sheaves. When tightening the belts use a straight edge to insure the sheaves are directly in-line, and are not offset. The belts should have approximately ½ to 1” of deflection when pressure is applied with the thumb in the middle of the belt. Do not over tighten the belts as this will reduce their life and cause excessive pressure on the motor and pump shaft bearings. Securely tighten the motor mounting bolts to lock the assembly in place. Check belt tension and condition regularly.

Compressed Air Service:

The compressed air service must be between 80 and 100 (unlubricated) psi for the correct operation of the convey system components. The FACS control solenoids are easily damaged by excessive compressed air pressure. It will be necessary to use a supply regulator for the air supply to all devices if the air pressure is higher.

Control Operation Not Sequencing Properly:

Control issues for proper operation may involve incorrect level switch sense (normally open or normally closed), incorrect station wiring identification to terminal connections, incorrect station to power pack assignments, and lack of wiring continuity or shorts to ground. When any wiring errors are made the chance of damage to the printed circuit input or output cards is likely. By observing the LED indicators on the PC cards, and comparing the voltage meter readings at the terminal strips, the bad card can be diagnosed.

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Not Loading Material, Motor Running | Back to Selection Chart

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Not Loading Material, Motor NOT Running | Back to Selection Chart

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Typical Vacuum Relief Valve Settings versus Hi Vac Switch Settings | Back to Selection Chart
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Typical Vacuum Relief Valve Settings vs Hi Vac Switch Settings

Unit HP	Relief Setting	Hi Vac Switch Setting
1.0	3.5” hg	3.0” hg
3.0	7.0” hg	6.5” hg
5.0	10.0” hg	9.5” hg
7.5	12.0” hg	11.5” hg
10.0	12.0” hg	11.5” hg
15.0	14.0” - 15.0” hg	13.5” - 14.5” hg
25.0	14.0” - 15.0” hg	13.5” - 14.5” hg

Figuring Equivalent Feet | Back to Selection Chart

TO COMPUTE EQUIVALENT FEET

(the equivalent distance the material will move from source to destination)

- Each foot of horizontal transfer run x 1
- Each foot of vertical transfer run x 2
- Each foot of flexible hose run x 3
- Each 90º elbow in the system x 15

If further assistance is needed or to schedule a service call, please contact:

Technical Support

703-490-7009
703-490-7008 (Fax)
Email: technical.support@unadyn.com