PJ Tech

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Air Cannons

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AIR CANNON
OPERATING AND MAINTENANCE MANUAL

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IMPORTANT

PJ TECH hereby disclaims any liability for injuries or damage resulting from use or application of this product contrary to instructions and specifications contained herein. PJ TECH's liability shall be limited to repair or replacement of product shown to be defective. Observe all safety rules given herein along with owner and Government standards and regulations. Know and understand lockout/tagout procedures as defined by Government standards and regulations Safety warnings.

1. SAFETY WARNINGS

1.1 General

- All standard safety procedures should be observed when working on electrically powered equipment.
- Proper care should be taken when connecting or disconnecting the power source.
- When connected to a power source, un-insulated, dangerous voltage is present within the Control Panel's enclosure which may constitute a risk of electric shock.
- Do not allow moisture to collect in the Control Panel's enclosure or near the power connections. Always close the enclosure after working with Control Panel.
- **ENTIRE SYSTEM MUST BE ISOLATED AND AIR BLOWN OUT OF ALL THE AIR CANNONS & AIR PIPES PRIOR TO ANY WORK COMMENCEMENT.**
- The user should not attempt to service the Flow Enhancement System. **All servicing should be referred to certified service personnel qualified to work on electrical equipment and system's "know how".**

1.2 Air Cannons

- During the installation, all safety regulations must be adhered to.
- Operation with maximum permissible pressure is allowed only within the temperature limits of –40°C up to +80°C.
- According to present regulations, inspections must be carried out every 36 months.
- The air cannon may not to be transported or installed in a charged state.
- The air cannon may only be installed in such a way that the air will be discharged into an enclosed and unoccupied area.
- All access doors into the bunkers especially those lying down with in the range of the air stream of the air cannons have to be secured to prevent accidents or unauthorized entrance all access doors have to be marked with a safety installation sign.

1.3 Control Panel

- Do not install the Control Panel near heat sources such as radiators or air ducts.
- Place the Control Panel in a location with adequate air circulation to prevent internal heat buildup.

1.4 Electrical Connections

- The Control Panel is built for connection to 115Vac, 220Vac or 24Vdc. If specifically requested, the Control Panel must be connected only as supplied.

- The power and signal cables should be routed so that they are not likely to be walked on or pinched by items placed upon or against it, paying particular attention to the point where it exists from the Control Panel.

1.5 PPE

- Always wear eye protection and necessary PPE while working on **PJ TECH** flow enhancement systems.

2. OPERATING PRINCIPLE

- Compressed air of up to 10bar is fed through ½" pipe via 3/2way normally open solenoid valve, quick exhaust valve and pressure discharge valve into the pressure vessel.
- The compressed air flows through a hole in the piston until air cannon's (vessel's) pressure and line pressure are equalized. The blaster is then charged.
- The 3/2way solenoid valve is energized (one second pulse is sufficient). The diaphragm in the quick exhaust valve moves back de-aerates the space behind the aluminum piston abruptly.
- The compressed air in the pressure vessel is released explosively out of the blow pipe or deflector. When this operation is completed, the air supply forces the piston back into the charging position.

3. OPERATING INSTRUCTIONS

- In general, air cannon flow enhancement system is actuated automatically (selector switch on the control panel must be turned into Remote Mode) on a timed cycle, which is set in such a way that clogging problems do not occur. Attention must be paid to ensure that the discharge controls are interlocked and that actuation cannot take place when no material flow is required. The air cannons should always be charged and ready for operation. This will prevent the air cannon from being filed out accidentally with bulk material. Usually, process operator is able to set the frequency of the discharge cycle by entering the required frequency time on a SCADA screen.
- Air cannons can also be discharged manually (selector switch on the control panel must be turned into Local Mode) by depressing a Start button on the control panel for at least 1 second.
- Air filter – PJ TECH systems are equipped with self-flushing filters. The frequency of the flushing action is controlled and may be altered via settings on the timing device in the control panel.
- Pressure regulator with gauge – air cannon's charge pressure can be regulated via pressure regulating valve.
- Lubricators – lubricating oil MUST always be present in the drip feed lubricator's reservoir. The oil lubricator must always be installed with the reservoir pointing down. The maximum filling level mark on the reservoir should be observed. Oil grade: oil obtained from all petroleum companies corresponding to HLD25 DIN51524 - ISO VG 32 quality may be used. The quantity of oil added to the compressed air is set with the metering screw. Turning clockwise means fewer drops; turning anti-clockwise means more drops. The flow rate can be observed through the sight glass. Guideline for oil metering: the optimum is one drop per discharge of the air cannon.

CAUTION

BEFORE REMOVING THE RESERVOIR, REMOVE THE OIL FILLER SCREW TO BLEED THE RESERVOIR.

- Pressure relief valve – each air cannon is equipped with a pressure relieve valve (PRV). Each PRV is set to 8bar.
- Exhaust valve - each air cannon is equipped with an exhaust valve mounted at the inlet port on the discharge valve. The exhaust valve releases the air between the 3/2way solenoid valve and the discharge valve.
- Pressure isolation valve – main air supply line can be isolated and locked out by closing and locking the hand ball isolating valve by means of a padlock.

4. MAINTENANCE INSTRUCTIONS

4.1 Inspections

- **PRESSURE TESTS - EACH AIR CANNON MUST BE TESTED HYDRAULICALLY AND INSPECTED EVERY 36 MONTHS.**
- **DAMAGES** – there maybe no external damages and only damages caused by rust should be repaired.
- **FASTENING** – all parts must have their original fittings. Particular attention should be paid to the following:
  - Wall supports
  - Quick exhaust valve
  - Air supply piping, tubing and fittings
  - Any welding
- **PISTON** – remove bolts and cover, pull out piston. Check piston's sealing disc and o-rings. The air filling port at the piston side must not be blocked. It must be possible to move the piston in the cylinder by hand. The piston should not show any perishing or cracking.
- **COMPRESSED AIR SYSTEM** – check for leaks in the compressed air piping from the compressed air supply to the solenoid or manual valves and the control pipes and tubing. The air service devices (air filter, pressure regulator and lubricator) must be checked as follows:
  - **Filter strainer** to be inspected and cleaned periodically. Frequency to be determined by maintenance personnel depending on usage and air quality. To check functionality of the flush solenoid valve switch the circuit breaker Off and On in the control panel (water should be flushed out the filter for time set on the timer in control panel).
  - **Pressure regulator** to be tested via knob turning while observing pressure changes on the pressure gauge. Recommended frequency – once a month.
  - **Oil level** in the lubricator has to be checked monthly or after every 2000 blasts. Maintenance is possible during operation. Wait for hissing noise when opening the upper filter plug. Unscrew lower bowl and fill with oil either directly into the bowl or via the filling plug, the later is preferable. Recommended lubricant is vg-32 Caltex.
- **PRESSURE RELIEF VALVE (PRV)** - manufacture's seal placed on the PRV must be intact. Functionality of each PRV should be tested periodically.
- **3/2WAY SOLENOID VALVE** – under normal conditions solenoid valves are maintenance free. Check connections, operating pressure, electrical connections and voltage. Alternating currents in an over tightened core to body produces over-heating. For this reason, the coil has to be unscrewed and hand tightened to the body, and the spring has to be checked. This is a "Normally Open" valve. Ports: 11 - inlet, 2 - outlet, 33 – exhaust.

4.2 Troubleshooting

AIR CANNON DOESN'T OPERATE (NO DISCHARGE)	:	Check power supply to the control panel. Refer to the circuit diagram drawing in the control panel or in the Operating Manual.
	:	Check air supply pressure (hand isolation valve must be open)
	:	Check fuse of the 3/2way solenoid valve (located in the terminals). Refer to the circuit diagram drawing in the control panel or in the Operating Manual.
	:	Check oil level in the lubricator (if an air cannon operates without proper lubrication the piston can seize). In such case refer to 4.1.1 section 4.
	:	Check operation of 3/2way N/O valve. Turn the selector switch to Local Mode on the control panel and press Start button for at least 1 second. **CAUTION! THIS WILL DISCHARGE THE AIR CANNON.**
	:	If the above discharges the air cannon turn the selector switch to Remote Mode on the control panel and simulate PLC signal to discharge the air cannon. **CAUTION! THIS WILL DISCHARGE THE AIR CANNON.** Refer to the circuit diagram drawing in the control panel or in the Operating Manual.
HISSING SOUND AT THE END OF NORMAL FILLING TIME	:	Check for air leaks from air supply right up to the air inlet into the air cannon.
	:	If a hissing noise remains at the end of the normal filling time, the sealing disk on the piston is leaking and has to be replaced.
AIR CANNON TO WEAK – DOESN'T REMOVE CLOGGING/BLOCKAGE	:	Check if sufficient air pressure (operating range 4 to 8 bar).
	:	Check pressure regulator and adjust pressure if necessary.
	:	Deflector (discharge) pipe might be blocked.
	:	Air supply pipe from the 3/2way solenoid valve is too long. This pipe should not exceed 10m.
	:	Check if the deflector (discharge) pipe is mounted high enough. Relocate it or add another air cannon.
	:	**WALLS OF ALL SILOS TO BE CLEARED OF ANY BUILD UP PRIOR TO USAGE OF PJ TECH'S AIR CANNON FLOW ENHANCEMENT SYSTEM.**
FILTER – NO AUTOMATIC FLUSHING	:	Automatic flushing of the air filter is initiated via electronic timing device in the control panel. The frequency can be set depending on air quality and usage (to set different flush interval time refer to the operating manual in the control panel). To check if it operates turn the selector switch on the control panel from Remote to Manual and back to Remote Mode. The filter should flush. If not, check if hand valve is open.
	:	Check fuse of the 2/2way solenoid valve (located in the terminals). Refer to the circuit diagram drawing in the control panel or in the Operating Manual.

CONTROL PANEL – INDICATION LIGHTS	:	Check power supply to the control panel. Refer to the circuit diagram drawing in the control panel or in the Operating Manual.
	:	Check globes.

5. DRAWINGS & DOCUMENTS

5.1 Control Panel – Circuit Diagram

Refer to the appropriate drawing.

5.2 Air Cannon – installation diagram

Supplied with each installation.

5.3 Air Cannons – pressure certificates

Supplied with each pressure vessel.