



PACKSETTER AIR PUMP

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Introduction

This document has been compiled as a risk assessment for the Packsetter Air pump designed and manufactured by ELBROC. This assessment preempts any potential application and trials that will be conducted underground.

The aim of this assessment is to identify the potential hazards associated with the use of the Packsetter Air pump in underground stoping operations and to list control measures to eliminate or reduce that potential.

1. Product Description

The Packsetter Air pump comprises a tank and frame assembly, a mixer assembly, two air chamber assemblies, a pump assembly, control valve assembly and hose assembly.

2. Design Criteria

The Packsetter Air pump is designed to mix the correct volume of water and grout in the tank and then pump the water and grout mix into a packsetter bag which is placed between the pack and hangingwall. As the bag is filled, it acts as blocking between the hangingwall and the pack, as well as pre-stressing the pack to provide active support.

3. Risk Assessment Team

The team that compiled this provisional assessment consisted of:

T Clements	Operations Manager
F Malan	Director
O vd Merwe	Site Manager

4. Objectives

In order to effectively identify the hazards associated with this product, a process as set out below facilitates a logical approach to formulating the risk indices.

1. Utilize a task procedure for installing packsetter bags and grout to pre-stress packs using packsetter air pump to identify probable hazards.
2. Apply a risk rating for each hazard.
3. List preventative measures.

All the above are tabulated in Appendix 1.

5. Hazard Classification

The following definitions are appropriate to this risk assessment and will be referred to in this document:

HAZARD	- something that has potential to cause harm.
RISK	- the likelihood that harm from a particular hazard will occur.
SEVERITY	- extent of the risk associated with the harm that a person might suffer as well as the number of persons likely to be harmed.
PROBABILITY	- the chance that a person or persons will be harmed during the exposure period.
CONSEQUENCE	- the degree of harm; the potential severity of injuries.

*The matrix below has been adopted from the **Anglogold policy and procedure** (QSP 111 Issue 1 – dated 1999-02-15) and appropriately incorporated into the risk rating of this product.*

Allocating a value for the **consequence** and **probability** from the index **column** and **row** does the process of attaching the risk.

		Probability					
		Expected result	Quite possible	Unusual but possible	Remotely possible	Very unlikely	Practically impossible
Consequence	<i>Index</i>	1	2	3	4	5	6
Catastrophic	1	48	47	45	42	38	33
Disaster (few fatalities)	2	46	44	41	37	32	27
Very serious (single fatal)	3	43	40	36	31	26	21
Serious (serious injury)	4	39	35	30	25	20	15
Important (temporary disability)	5	34	29	24	19	14	10
Of concern (minor injury)	6	28	23	18	13	9	6
No incident	7	22	17	12	8	5	3
Near miss	8	16	11	7	4	2	1

FACTOR

INDEX

Consequences	
1. Catastrophic (many fatalities)	1
2. Disaster (a few fatalities).	2
3. Very serious (one fatality).	3
4. Serious (serious injury).	4
5. Important (temporary disability).	5
6. Of concern (minor injury).	6
7. No incident	7
8. Near miss	8
Probability	
1. Is the most likely and expected result if event occurs.	1
2. Quite possible (50/50).	2
3. Unusual but possible.	3
4. Only remotely possible (has happened somewhere).	4
5. Conceivable but very unlikely (hasn't happened yet).	5
6. Practically impossible (one in a million).	6

6. Conclusion

Primary hazards associated with the direct use of these products within the designed specifications and controls will be minimized if the correct installation and transport procedures are applied.

This provisional risk assessment is restricted to the application of these products for underground permanent stope support only.

APPENDIX 1

PAKSETTER AIR PUMP

PROCESS	ACTIVITY	HAZARD	CONS	PROB	RISK	PREVENTATIVE MEASURES
Installation	Making work and support area safe	Falls of ground resulting in injuries to persons	3	2	40	Employ mine standard / procedure for barring down the hangingwall and creating a stable footwall
	Determining and installing the pack in accordance to the mine standard	Decrease in areal coverage - increased area of possible instability (FOGs)	4	3	30	Demarcation of installation pattern
	Pack to be positioned at right angles to the dip of the strata	Uneven load distribution- uneven load distribution on pack and increased risk of being dislodged by blasting or the scraper operations	2	3	41	Installation of pack to mine standard
	Bag placed in middle of pack	Creates a shear plane in the middle of the pack and a very good chance that under rock burst condition, blasting operations and cleaning operations the pack could come out	2	3	41	Place bag on top of pack or as close as possible to the hangingwall
	Placing of bag	Valve facing the wrong direction causing bag not to be pre-stressed to correct pressure, could cause pack to be blasted out	2	3	41	To ensure that bag is placed with valve facing up dip and towards foot wall
Pumping	Air pressure to low	Specified pressure will not be reached in bag and could cause pack to come out	2	3	41	Ensure that air feed to pump is correct before pumping

PACKSETTER AIR PUMP

PROCESS	ACTIVITY	HAZARD	CONS	PROB	RISK	PREVENTATIVE MEASURES
	Incorrect water to grout ratio	More water than grout cause bag to deflate when punctured during blast and could cause pack to come out	2	3	41	Ensure that the correct water to grout ratio is used
	Pumping of grout	Specified pressure will not be reached in bag and could cause pack to come out during blast	2	3	41	Ensure that the pump operator pump until the correct pressure is achieved as indicated when the pump stops stroking.
		Bag not filled after pumping and not properly pressurized could cause pack to come out during blast	2	3	41	Ensure that the bag is filled with grout mix and where necessary a second mix must be pumped into bag with out delay

TRAINING FOR PACKSETTER AIR PUMP OPERATORS

Before using the Air pump:

1. Before using the air pump, the following are required:
 - Two bags of grout for a complete mix.
 - A 25 mm hose connected to a clean water supply.
 - A 25 mm hose connected to a clean air supply.
2. The following pre-start checks must be carried out before operating air pump:
 - Inspect the air pump for signs of damage or missing parts.
 - Rotate the mixer handle to ensure that the mixer shaft turns smoothly.
 - Inspect the delivery hose for cracks or other damage, and check that the grooves at the delivery end of the hose are not damaged.
3. The following pre-start tasks are necessary:
 - Remove the filter plug and clean, if necessary.
 - Flush the inside of the mixer tank to remove fines from the previous mix.
 - Replace the filter plug and fill the mixer tank with water.
 - Turn on the air and turn the mixer handle, to operate the pump, until water is forced out of the delivery hose. This ensures that the pump is free of blockages.
 - Kink the hose and operate the pump against the kinked hose to check for:
 - Rupture diaphragms in the pump assembly
 - Leaks at hose connections
 - Pressure-tightness on the pump (the pump should stop stroking at 400 kPa).

Using the Air pump

WARNING

1. The Air pump operates at high pressure. Safety goggles must be worn at all times when using the Air pump.

Fill the mixer tank with water to the lower indicator pin on mixer paddle, with the mixer paddle in its top position.

NOTE

Because the grout and water mixture sets in a short time, it is important to fill the mixer tank as quickly as possible. Therefore a 25 mm hoses recommended.

2. Two persons are needed to mix the grout in the mixer tank. The mixer handle must be turned smoothly by one person as the second person slowly pours the two bags of grout into the mixer tank.

NOTE

To ensure that the grout is mixed correctly, the mixer tank must first be filled with water and the two bags of grout must be completely used for the mixture. Any attempt to make half a tank of mixture will lead to clogging of the tank.

3. Turning the mixer handle slowly, mix the grout and water for approximately two minutes, regularly changing the direction of rotation on the mixer handle.
4. Operate the pump to force the mixture through the delivery hose back into the tank to extract any air contained in the mixture and to ensure that the grout and water are completely mixed.
5. When the mixture is properly mixed, connect the delivery hose to the packsetter bag and commence pumping.

Cleaning the Air pump

CAUTION

To prevent the pump from becoming permanently clogged, it must be cleaned after procedures are completed.

1. After pumping is complete, remove the filter and flush out any material left in the mixer tank. Turn the filter anticlockwise and pull to remove the filter.
2. Wash the filter, ensuring that all material is removed.
3. Using the outer (woven) part of a clean packsetter bag, clean and rinse the inside of the inlet manifold.
4. Using the outer (woven) part of a clean packsetter bag, clean and rinse the inside of the mixer tank.
5. Install the filter and fill the mixer tank with clean water.
6. Operate the pump to flush the water out of the mixer tank; this procedure will also clean the pump and the delivery hose.
7. Using the outer (woven) part of a clean packsetter bag, clean and rinse the outer surface of the pump and mixer tank.
8. Remove and coil the delivery hose and store the hose inside the mixer tank.
9. Stow the Air pump in a safe area, which must be clean and dry.

Checking and adjusting the pressure setting

Check the pressure setting as follows:

- Connect a pressure gauge, with a range of 0 to 1000 kPa, to the outlet side of the pump and kink the delivery hose downstream of the gauge.
- Turn on the compressed air supply SLOWLY and turn the mixer handle to operate the pump; wait until the pump stops stroking.
- Note the pressure, which should be approximately 400 kPa, on the pressure gauge.

If the outlet pressure is incorrect, the pressure of the compressed air supply to the Air pump is probably too low, due to load demands at the mine. If the pressure of the compressed air supply at the mine is above 400 kPa, the pressure setting must be adjusted at the pressure regulator as follows:

- Loosen the lock nut on the pressure regulator, but do not make any adjustment at this stage.
- Connect the pressure gauge at the pump outlet and kink the delivery hose downstream of the gauge.
- Open the ball valve on the Air pump and turn the mixer handle to operate the pump.
- When the pump stops stroking, note the pressure indicated on the pressure gauge.
- If the incoming air pressure from the mine's compressed air system is above 400 kPa, the adjustment screw on the Air pump's pressure regulator must be turned clockwise to increase the pressure to the pump, or anticlockwise to decrease the pressure to the pump.
- When the pressure setting is correct, tighten the lock nut on the pressure regulator and recheck the pressure output of the pump.

Fault finding

Fault	Possible Cause	Corrective action
Pump not operating smoothly	1. Diaphragm/s ruptured	1. Renew Diaphragm/s
	2. Inlet valve/s blocked	2. Clear valves
	3. Outlet valve/s blocked	3. Clear valves
	4. Delivery hose blocked	4. Clear hose
Little or no water delivered from pump	1. Diaphragm/s caked in grout	1. Clean diaphragm/s
	2. Inlet or outlet valve/s partially blocked	2. Clear valves
	3. Delivery hose partially blocked	3. Clear hose
Pump can be operated against resistance	1. Springs broken	1. Renew spring/s
	2. Joints leaking	2. Tighten joints
	3. Control valve damaged or faulty	3. Renew control valve
Only one air chamber operating	1. Diaphragm ruptured	1. Renew diaphragm
	2. Diaphragm caked in material	2. Clean diaphragm
	3. Air delivery tubes damaged or disconnected	3. Renew or reconnect air delivery tubes
	4. Non-return valves blocked on inlet/outlet manifold	4. Clean non-return valve

Dismantling the pump assembly

Hold the two air chambers together before loosening the strap assemblies to release the pump assembly.

- Loosen the tension nut enough to unhook the long strap assembly from the short strap assembly and swing the two straps clear of the pump assembly.
- Carefully pull the two air chambers clear of the pump body and store the air chambers in a clean safe area.
- Detach the outlet manifold, taking care not to lose the balls or seats.
- Pull the pump body off its seating on the inlet manifold, taking care not to lose the balls and seats.

Dismantling the air chambers

- Select a suitable Allen key from the Operator's toolkit provided and attach the Allen key to the cap screw.
- Taking care not to rupture the diaphragm turn the cap screw anticlockwise to remove the cap screw and the diaphragm disc.
- Carefully prise the diaphragm off the air chamber and detach the diaphragm, the diaphragm washer, the seal and the O-ring.
- Attach a suitable Allen key to the cap screw.

The spring inside the air chamber may be under tension. Exercise caution when removing the spring plate.

- Remove the cap screw and the spring plate.
- Withdraw the spring and the shaft.