



## Incident Investigation

### PM3 Breast roll cable failure, 11 December 2008

#### Investigation Team:

Paul Williams (Instro), Craig Ditchburn (electrician), Dean Lawry (fitter), Peter Wilmont (OH&S rep fitter), Trevor Meddis (Site OH&S Manager), Trevor Miller (PM3 Process Engineer), Ross Stride (PM3 RST Manager), Lindsay James (Mech Coord), Matt Boadle (fitter) Simon Hickmott (Manufacturing Manager)

Geoff Gasperotti (site OH&S rep) John Atherton (Blue shift OH&S rep) David Walters (Black shift senior operator) have been involved with the investigation at various stages outside this meeting.

#### Incident Summary

On 11 December 2008 at approx 0130Hrs, whilst PM3 breast roll was being raised into the run position, front cable sheared followed by the rear due to excessive load causing the breast roll to fall from its suspended pivotal arc position. This failure resulted in the breast roll colliding with the machine frame making significant impact which caused damage to the immediate area. Inspections carried out by professional engineers found no structural damage. No personal injuries were sustained. All procedural safety & process checks were performed during the lifting process and subsequent to the incident.

#### Background:

A few hours before the incident, PM3 was shut down to investigate a hole that was appearing in the sheet. The cause was subsequently concluded to be fabric damage with many CD strands broken. The fabric was cut from the machine and samples kept for testing by the manufacturer. As part of the procedure the wet end was cleaned by high pressure hosing and made ready for the installation of the new fabric. The motor/gear box mechanism was operated pre tensioning the cables. The nuts were loosened and the breast roll was lowered ready for the fabric to be installed. The fabric was installed and the breast roll was being raised to its home position. It is as a result of the cables failing that the incident involving PM3 occurred. Work procedures are provided for Fabric changes.

#### Operation

As a result of a similar incident at Maryvale in 2005 which resulted in a fatality we made the following improvements after reviewing our operation; relocating the backside switch improving line of sight, no-go zone identified to eliminate personal from the area.

The breast roll lower/raise is a three man operation. Two manual switches are required to be engaged before the air motor drive can be actuated. One switch is located at the front of the machine and the other at the rear. These switch positions are strategically placed so that the operators can observe the breast roll as it is lowered and raised. A third person is located on the wire section ladder and acts as an observer for the senior operator. The observer watches the top of the breast roll as it is raised to ensure no obstructions are apparent.

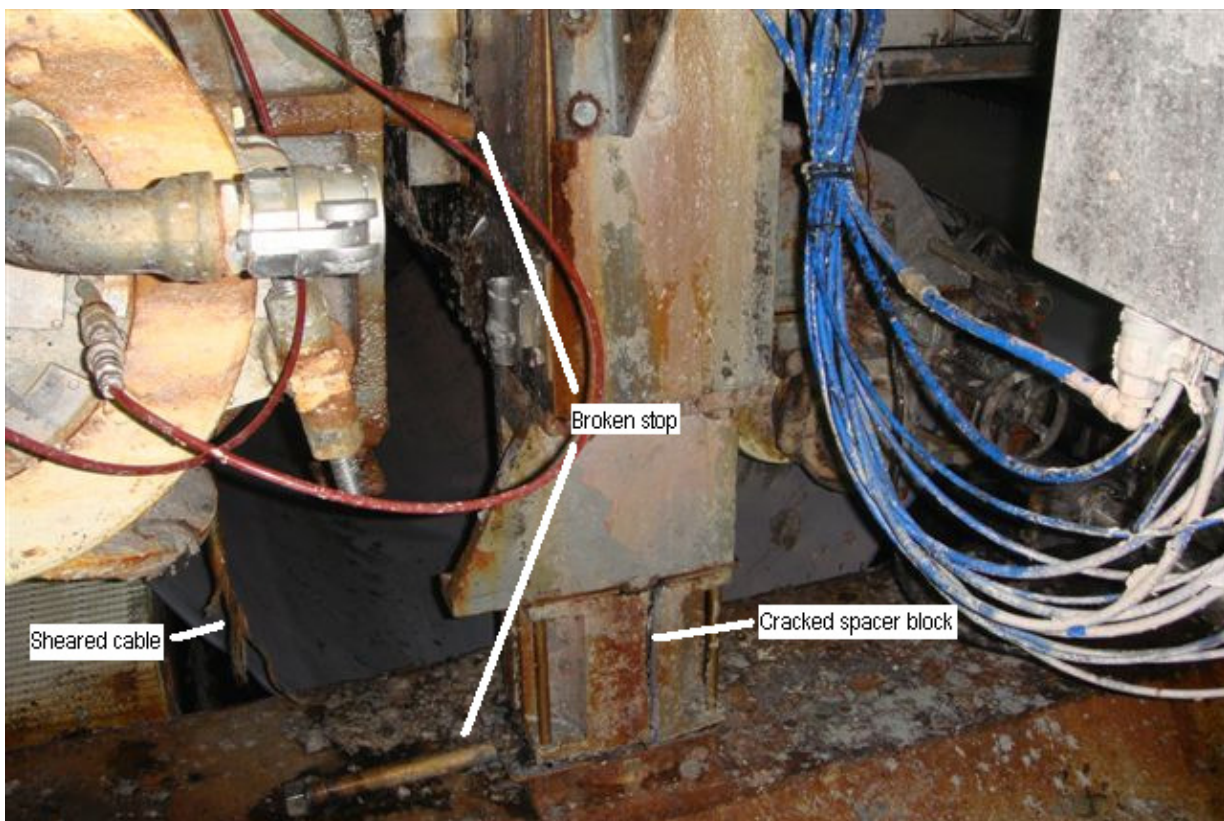
To remove the breast roll pretension of the breast roll cables is required. This allows the operator to undo the locking nuts front and backside. The locking arms are lifted and a locking pin inserted to hold arms clear of the breast roll path. The breast roll is lowered and the cables slackened. The front side cable holding pin is disengaged and the cable removed.

When ready for raising the breast roll the front side cable is re attached to the breast roll is raised.

### Incident Detail

Senior operator had positioned himself at the front of the machine as per standard practice. Machine assistant was instructed to operate the backside switch. Dryerman was instructed to be the observer. Senior operator made all visual checks as per the procedure. Senior operator was satisfied all was ready for safe raising of the breast roll. Senior operator instructed assistant to engage his switch and Senior operator did likewise. The roll was raised to a 45 degree angle where it was stopped. Senior operator then made his visual checks and all cables were sitting in their correct positions. Senior operator instructed Assistant to engage his switch and the breast roll was again raised. When the breast roll was within 40mm of the home position without warning the front side cable sheared followed by the rear due to excessive load causing the breast roll to fall from its suspended pivotal arc position. This failure resulted in the breast roll colliding with the machine frame making significant impact which caused damage to the immediate area. (Fig 1 shows some of the localised damage on the front side)

Fig 1



The breast roll mechanism on PM3 is old technology to what is currently available in today's market it requires extensive human skill involvement which exposes potential human error. An alternative mechanical screw jack mechanism is available which eliminates human error completely. This will be added to the recommendations.

**Fig 2** shows a crack in the floor mount which supports the spacer block. This support took the brunt of the impact.

**Fig 2**



### **Cable history**

As a result of a similar incident at Maryvale in 2005 which resulted in a fatality we made the following improvements after reviewing our operation; the cables are replaced every two years and inspections taken place every six months. These operations are included on our PM schedule.

The cables were replaced in October 2007 and last inspected in June 2008. The next inspection was due in Jan 09. The cables are manufactured for a lifting capacity of 4.5 times the breast roll. The cables are to be examined by independent company to determine their condition at failure and to be tested for shear.

I will refer the findings to the report named *Forensic examination of failed rope for SCA hygiene, Box Hill* page 2 line 7 page 2 *Observations & Preliminary Opinions* Point 2 line 3 and page 3 paragraph 2 line 7

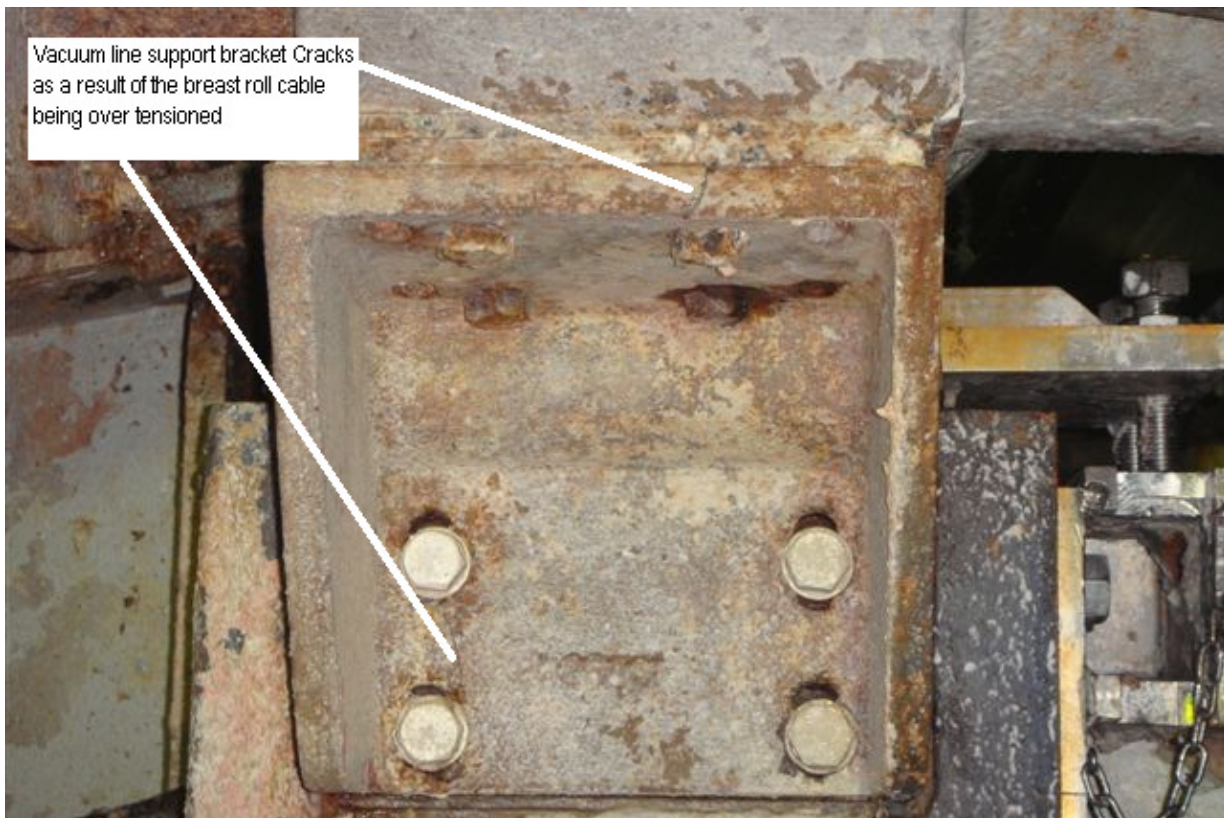
## Findings

The cables appear to be sheared which indicates excessive load has been applied at some stage during raising and lowering this could have happened at any point in history from last change out.

I will refer the findings to the report named *Forensic examination of failed rope for SCA hygiene, Box Hill page 5 first dot point line 9.*

The cracked bracket shown in fig 3 supports the vacuum pipe flange, this is a tell tail sign that excessive force has been applied to the bracket. The only way this could have happened is the breast roll flange has pushed against the fixed flange causing an upward force which has stressed the bracket resulting in the crack.

**Figure 3**



## Incident Response

After failure the immediate area was made safe and flagged off. All senior management were duly notified. A call was made to Work safe and investigators arrived in the morning

## Contributing Factors

The cracked bracket holding the vacuum pipe flange, the bending of the cable pin, and bent stopping block indicates that excessive tension had been applied to the lifting cable.

### ***Evidence of corrosion noticed on the cable.***

The cables were replaced in October 2007, and last inspected in June 08. The next inspection was due in Jan 09. The cables are manufactured for a lifting capacity of 4.5 times the breast roll. The cables are to be examined by independent company to determine their condition at failure and to be tested for shear.

I will refer the findings to the report named *Forensic examination of failed rope for SCA hygiene, Box Hill* page 2 Point 2 *Observations & Preliminary Opinions* line 5 – page 3 line 5. In short corrosion was surface based and easily removed with a light brush.

Over the past 3 years the water system has been closing up, resulting in a raise of water temperature, and conductivity. The stock temperature operates at 45°C.

### ***Cables of differing length***

At the shut in August 2008 the flow box was rebuilt. During the commission phase the breast roll was raised and lowered a number of times. No observation of differing cable length was detected during the time.

### ***Over run of air motor***

There is a lag in the stoppage of the air motor when the lever is disengaged, this will cause additional tension to be applied to the cable than required. I will refer the findings to the report named *Forensic examination of failed rope for SCA hygiene, Box Hill* page 5 – line 11

## Recommendations and Follow Up

	<u>When</u>	<u>Whom By</u>
1. Installation of limit switches on the up movement to prevent the breast roll from raising 5 mm from the striker plate. Solution to be raised with operations.	End Mar	P Williams
2. Check if the cable is against frame bracket	End Jan	M Boadle
3. Provide torque wrench to tighten the locking nuts on the breast roll to a specified torque	End Mar	L James
4. Alter installation procedure to ensure that the cable is continually observed running correctly in the drum	Procedure	T Miller
5. Investigate feasibility of applying a mechanic brake to the air motor	End Feb	L James
6. Investigate coating the cable in corrosion resistant material.	End Feb	L James
7. Investigate changing the lifting switch mechanism to electric.	End Feb	C Ditchburn
8. Repaint the no go area to extend from the breast roll to the north wall	End Mar	L James
9. Install concertina barriers to be used during fabric changes	End Mar	L James
10. Update the work procedure to include above recommendations	Next fabric change	T Miller
11. Review the platform designs to enable better access for the breast roll removal	End Mar	L James
12. Prepare CAPEX for alternative lifting mechanism (screw jack)	Feb 27 <sup>th</sup>	R Stride
13. Change the cables every 12 months commencing.	Jan 20 <sup>th</sup>	L James

## Recommendations and Follow Up

	<u>When</u>	<u>Whom By</u>	<u>Status</u>
1. Installation of limit switches on the up movement to prevent the breast roll from raising 5 mm from the striker plate. Solution to be raised with operations.	End Mar	P Williams	Design stage
2. Check if the cable is against frame bracket	End Jan	M Boadle	Complete
3. Provide torque wrench to tighten the locking nuts on the breast roll to a specified torque	End Mar	L James	
4. Alter installation procedure to ensure that the cable is continually observed running correctly in the drum	Procedure	T Miller	Complete
5. Investigate feasibility of applying a mechanic brake to the air motor	End Feb	L James	Complete
6. Investigate coating the cable in corrosion resistant material.	End Feb	L James	Complete
7. Investigate changing the lifting switch mechanism to electric.	End Feb	C Ditchburn	Refer #1
8. Repaint the no go area to extend from the breast roll to the north wall	End Mar	L James	75% complete
9. Install concertina barriers to be used during fabric changes	End Mar	L James	Identified to be ordered w/e 27th
10. Update the work procedure to include above recommendations	Next fabric change	T Miller	Complete
11. Review the platform designs to enable better access for the breast roll removal	End Mar	L James	
12. Prepare CAPEX for alternative lifting mechanism (screw jack)	Feb 27 <sup>th</sup>	R Stride	
13. Change the cables every 12 months commencing.	Jan 20 <sup>th</sup>	L James	Complete