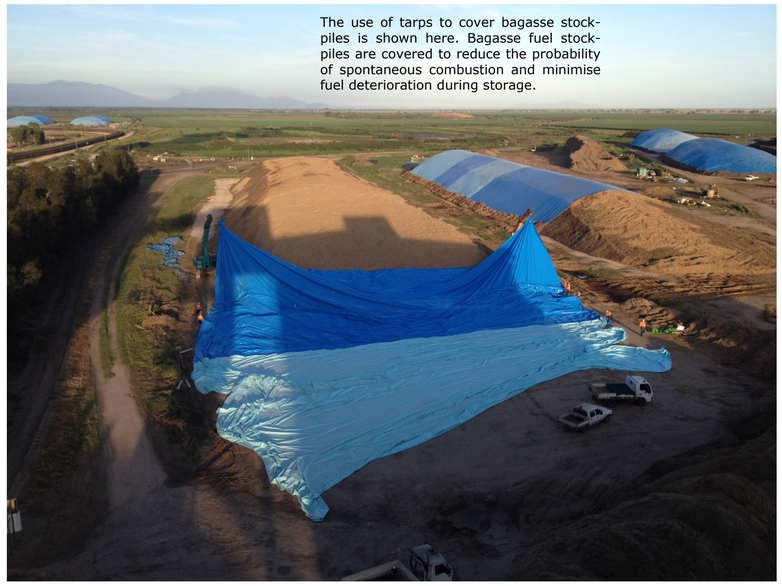
Permeability testing for bagasse tarpaulins

Synopsis

Bagasse is becoming an increasingly valuable resource with the advent of cogeneration. Fuel quality needs to be maintained in storage to minimise the financial impacts of prematurely degraded bagasse because of deteriorating bagasse tarpaulins.

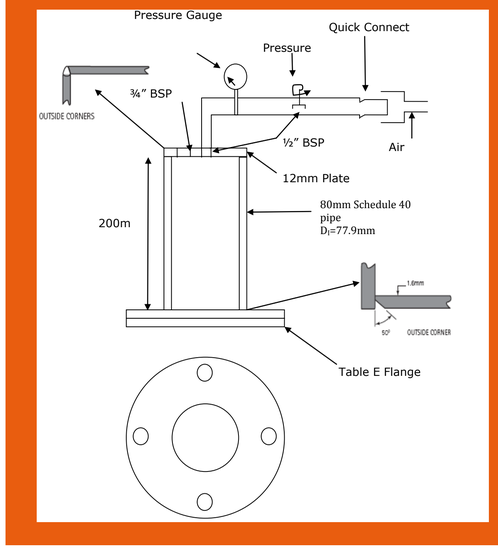
A standard procedure was developed to determine the resistance to water penetration of the tarpaulins being considered for covering bagasse stockpiles. The testing procedure complied with Australian Standard AS2001.2.17. A test rig was designed for performing the permeability measurements (Figure 1). The poster shows the design of the test rig and the procedure for typical permeability measurements for tarpaulins of varying ages.

The re-use of tarpaulins for several seasons is currently a discretionary practice. The test rig and procedure can be used to quickly and effectively reduce the risk of using tarpaulins with poor permeability properties.



The use of tarps to cover bagasse stockpiles is shown here. Bagasse fuel stockpiles are covered to reduce the probability of spontaneous combustion and minimise fuel deterioration during storage.

Figure 1—Permeability Test Apparatus



No galvanised fittings are permitted to be used on this apparatus

Figure 2—5000E Product profile

Canvacon™ 5000E — GALE PACIFIC

Product Profile — **Polyfabrics Range**

Rev. 1 10/03

Product Description
Canvacon is a high quality polyfabric designed for a wide range of medium to heavy-duty applications. Canvacon has excellent weld strength and a superior strength/weight ratio. Ideal for tarpaulins, covers, liners etc.

Material

Base scrim	UV stabilised HDPE
Construction	3.9 x 3.9 yarns/cm
Yarn size	1600 denier
Coating	UV stabilised LDPE
Coating thickness	60 µm
Finish top side	Natural
Finish bottom side	Natural
Temperature range	-30°C to +70°C

Features
UV stabilised coating AND UV stabilised base cloth for long service life.
3 year UV warranty and a 3 year delamination warranty on the fabric.
High levels of coating adhesion for improved weld strength and ease of welding.
Dirt repellent LDPE coating.

Properties

Fabric Mass (AS2001.2.12)	260 gsm
Nominal thickness	~ 0.55 mm

Performance

Tensile Strength - Warp (AS2001.2.3)	1250 N/50mm
Tensile Strength - Weft (AS2001.2.3)	1250 N/50mm
Elongation at break – Warp (AS2001.2.3)	25%
Elongation at break – Weft (AS2001.2.3)	25%
Wing Tear - Warp (AS2001.2.10)	200 N
Wing Tear - Weft (AS2001.2.10)	200 N
Hydrostatic Pressure (AS2001.2.17)	250 kPa

Usage Instructions
Suitable for hot air and hot wedge welding.
Do not use against flames.
Contact with organic solvents, halogens or highly acidic substances may reduce the service life of the fabric and void the warranty.
Not suitable for applications where excessive flexing or 'wind flap' is present.

2.05m x 50m Rolls	
Colour	Code
Beige	416225
Blue	416065
Green	416201
Ice Blue	416102
Blue/Ice Blue	410025
Royal Blue	416089
Silver/Green	416287
Silver/White	416300
White	416249
Yellow	416263
Blue	409432
Approx. roll weight	28kg
Approx. roll diameter	0.16m
Core diameter	35mm

2.05m x Jumbo Rolls	
Colour	Code
Beige	416232
Blue	416072
Green	416218
Ice Blue	416119
Blue/Ice Blue	410049
Royal Blue	416096
Silver/Green	416294
Silver/White	416317
White	416256
Yellow	416270
Approx. roll weight	748kg
Approx. roll diameter	0.85m
Core diameter	150mm
Approx. length of Jumbo rolls	1200 to 1400m

2.50m x Jumbo Rolls	
Colour	Code
Beige	416577
Blue	416591
Green	416584
Approx. roll weight:	900kg
Approx. roll diameter	0.85m
Core diameter	150mm
Approx. length of Jumbo rolls	1200 to 1400m

FOR MORE INFORMATION – PLEASE CONTACT:

Australia	Gale Pacific Ltd. PO Box 145, Braeside, Victoria, 3195	Phone +61 3 9518 3333	Fax +61 3 9518 3398
UAE	Gale Pacific FZE. PO Box 17696, Jebel Ali, Dubai	Phone +971 4 881 7114	Fax +971 4 881 7167
USA	Gale Pacific Inc. Suite 105 2400 Maitland Center Parkway, Maitland, Florida, 32751	Phone +1 407 667 9135	Fax +1 407 838 0250

Standard procedure (summarised from AS2001.2.17)

1. Cut a sample of the test material to the dimensions 200x200mm
2. Ensure sample is dust free and free of contaminants such as lubricant, grease, paint etc.
3. Unbolt the flange and clean both faces
4. Apply "Silastic" (or similar) to both flange faces. Do not contaminate test sample with adhesive.
5. Clamp the specimen on the testing head with the face side of a water-repellent specimen in contact with the water. A coated specimen is clamped on the testing head with the coated or uncoated side in contact with the water according to specification requirements.
6. Fill the testing head with 500mL of water via the 20nb "water hole". (Use fresh water for each test)
7. Plug the water hole with a 20mm BSP plug.
8. Raise the pressure in the testing head at a rate of 25±4 kPa per minute, or at a constant rate to produce a result within 10±2 minutes.
9. Observe the specimen continuously for evidence of water penetration. (Don't include fine drops that don't enlarge after being formed.
10. Record the pressure when water penetrates at the third location, to the nearest 10kPa. (Don't count subsequent drops forming through the same place in the fabric)

Actual procedure—replaces steps 8-10 above

Since the pressure could not be constantly increased at a steady rate of 25kPa/min, the following procedure was used when testing the sample:

1. Increase the pressure by 25kPa using the air hose.
2. Constantly observe the tarp sample for one minute for evidence of leaks, as described in the Standard Procedure.
   a. If no leak has appeared, increase the pressure by 25kPa and repeat step 2.
   b. If one (1) or two (2) leaks have appeared, increase the pressure by the smallest amount possible with the air hose, and observe the tarp for one minute for evidence of a third leak.

Results

New Tarps

Sample	Test	Description and Colour (Top/Bottom)	Date	Pressure of first leak (kPa)	Pressure with 3+ leaks (kPa)
1	A	300g 14x14 Clear	15/7/10	130	130
	B		15/7/10	170	170
	C		15/7/10	125	170
3	A	270g 12x12 White/White	15/7/10	200	250
	B		19/7/10	250	250
	C		19/7/10	250	250
4	A	200g 12x12 Clear	19/7/10	150	150
	B		19/7/10	100	125
	C		19/7/10	100	100

7000E Tarps

Sample	Test	Description and Colour (Top/Bottom)	Date	Pressure of first leak (kPa)	Pressure with 3+ leaks (kPa)
2	A	7000E, 2009 Tie Down Blue/Blue	19/7/10	75	100
	B		19/7/10	70	70
	C		19/7/10	100	100
6	A	7000E?, 2009 Blue/Blue	19/7/10	80	100
	B		19/7/10	70	100
	C		19/7/10	70	100
7	A	7000E?, 2009 Paddock 8 Ice Blue/Ice Blue	19/7/10	150	150
	B		19/7/10	150	150
	C		19/7/10	150	150
10	A	7000E, 2009 Paddock 8 Blue/Ice Blue	19/7/10	25	50
	B		19/7/10	25	25
	C		19/7/10	25	25
11	A	7000E, 2009 Paddock 8 Blue/Blue	19/7/10	75	100
	B		19/7/10	75	100
	C		19/7/10	80	100

5000E Tarps

Sample	Test	Description and Colour (Top/Bottom)	Date	Pressure of first leak (kPa)	Pressure with 3+ leaks (kPa)
5	A	5000E, 2008 Paddock 8, used for 1 yr Green/Ice Blue	19/7/10	0	0
	B		19/7/10	25	25
	C		19/7/10	25	25
8	A	5000E?, 2009 Ice Blue/Ice Blue	19/7/10	100	125
	B		19/7/10	75	75
	C		19/7/10	75	75
9	A	5000E, 2008 Paddock 8, used for 1 yr Green/Ice Blue	19/7/10	0	0
	B		19/7/10	0	0
	C		19/7/10	0	0

Discussion

The tests showed new tarps were much better, as they generally reached around 150kPa before failing. Sample 3 was the best performer, as it did not start to leak until it reached 250kPa (the maximum pressure for the test).

Of the 7000E tarps, Sample 7 was the best performer. However, it's possible it had been used less than the others, resulting in less wear.

The 5000E tarps were the worst performers but they were also the oldest tarps. The two samples (5 and 9) that leaked without any added pressure had been used for one year, but were two years old. The fact that they leaked immediately indicates that they are at the end of their useful life and should be replaced. Sample 8 gave a better indication of how the 5000E tarps should perform, being newer. Since there is a large difference between the tarps purchased in 2008 and those purchased in 2009, this indicates that these tarps experience wear and fatigue and deteriorate quickly. See Figure 2 for the claimed permeability performance of the 5000E tarp. The claimed value is 250kPa.

It was difficult to increase the pressure of the Test Apparatus by small increments once a leaked had been established. An increase of approximately 15-20kPa was the smallest that could be achieved.

Conclusion

A practical portable instrument for measuring bagasse tarp permeability was designed and tested to be satisfactory in operation.

A standard procedure was developed which replicated the intent of AS2001.2.17—1988.

Sugar Mills can use this instrument and procedure to be more confident that the bagasse that is stored can be reclaimed with the expected level of deterioration so as not to compromise Co-Generation revenue or sugar milling operations.

Prepared by:
LG SANTAROSSA
Sucrogen - Cane Products, Townsville, Qld
lsantarossa@sucrogen.com