TECHNICAL SERVICE REPORT

Kleen-Tex Industries

Client:

Kleen-Tex Industries Gmbh
Münchner Straße 21
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Austria

Test Laboratory:

Technical Services Lab
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1. Objective

To examine an adhesive for microbial contamination

To determine the wet state bacterial, yeast and fungal resistance of the adhesive and its dry film resistance

2. Summary and Conclusions

The Acrylic Adhesive TRM2002A was free of contamination. It had a pH value of 7.9

Wet state challenge testing indicated that the adhesive was protected against bacterial, yeast and mould contamination.

Dry film challenge testing indicated that the adhesive was susceptible to fungal contamination. An addition of 0.3% ACTICIDE® DW protected the adhesive against film fungal contamination.

Film fungal protection was not afforded by the standard blue multi-layered polyethylene film supplied.

3. Samples Examined

1 Adhesive and 2 polyethylene films were received for testing on 5 September and 1 October 2002 respectively and labeled.

1 Adhesive – Acrylic Adhesive TRM 2002A(Blank)
1 blue polyethylene film
1 blue polyethylene film/adhesive multiple layers – Standard

A biocide free polymer dispersion was included in the wet state challenge tests as an inoculum control.

4. Biocide Additions / Preparation

To the adhesive the following biocide was added:
ACTICIDE® DW at 0.3, 0.5, 0.7%
The adhesive was brush applied to the underside of a perish dish and to the blue polyethylene film supplied.
One layer of the standard polyethylene film was peeled away to expose the adhesive.

5. Tests Methods Used

Microbial Screening: 700
PH Measurement: 625
Bacterial Wet State Resistance Test: 720
Yeast Wet State Resistance Test: 730
Fungal Wet State Resistance Test: 730
Dry Film Fungal Resistance Test – Humidity Cabinet: 800.1

6. Results

Results are detailed in the tables below and are described in the summary.

Microbial Screening and pH Measurement **Table 1**

Adhesive Sample	Microbial Growth Rating On			pH Value
	Nutrient Agar		Potato Dextrose Agar	
	25°C	30°C	25°C	
Acrylic Adhesive TRM 2002A	0	0	0	7.9

Growth Key

Bacterial / Yeast growth - 0 = no growth to 6 = dense growth

Fungal Growth - 0 = no growth to XXXX = dense growth

Key to Growth Media:

Nutrient Agar - for the detection and growth of aerobic bacteria.

Potato Dextrose Agar - for the detection and growth of yeasts and moulds.

Bacterial Wet State Resistance Test **Table 2**

Viable Count cfu/ml at 30°C	1st inoculation	2nd inoculation	3rd inoculation
Bacterial challenge	8.8×10^8	8.0×10^8	2.0×10^9

Sample	Bacterial Growth Rating (d = days after inoculation)									
	1st inoculation			2nd inoculation			3rd inoculation			
	1d	2d	6d	1d	2d	4d	1d	2d	6d	13d
Control polymer	5	4	3	5	4	4	5	4	4	4
Acrylic Adhesive TRM 2002A	0	0	0	0	0	0	0	0	0	0

Yeast Wet State Resistance Test **Table 3**

Viable Count cfu/ml at 30°C	1st inoculation	2nd inoculation	3rd inoculation
Yeast challenge	1.3×10^8	1.3×10^8	1.6×10^8

Sample	Yeast Growth Rating (d = days after inoculation)									
	1st inoculation			2nd inoculation			3rd inoculation			
	1d	2d	6d	1d	2d	4d	1d	2d	6d	13d
Control polymer	4	3	2	4	3	3	4	3	3	3
Acrylic Adhesive TRM 2002A	0	0	0	0	0	0	0	0	0	0

Fungal Wet State Resistance Test **Table 4**

Viable Count cfu/ml at 25°C	1 inoculation
Mould challenge	1.2×10^6

Sample	Fungal Growth Rating after 4 weeks incubation	
	Surface Fungal Growth	Growth on Potato Dextrose Agar
Control polymer	XX	+
Acrylic Adhesive TRM 2002A	0	-

Growth Ratings:

Surface Fungal Growth 0 (no growth) to XXXX (dense growth)

On Agar Plates + (growth) – (no growth)

Film Fungal Examination **Table 5**

Viable Count cfu/ml at 25°C	1 spray inoculation
Mould challenge	6.0×10^5

Sample	Fungal Growth Rating %	
	Duplicate I	Duplicate II
Applied to petri-dish		
Blank adhesive	48	53
+0.3% ACTICIDE® DW	0	0
+0.5% ACTICIDE® DW	0	0
+0.7% ACTICIDE® DW	0	0
Applied to polyethylene film		
Blank adhesive	58	60
+0.3% ACTICIDE® DW	0	0
+0.5% ACTICIDE® DW	0	0
+0.7% ACTICIDE® DW	0	0
Standard polyethylene film	27	34

Test Methods Used

Thor Test Method 625 – Measurement of pH

The pH of the samples is measured at ambient temperature using a pH meter with a combination electrode, that was previously calibrated using 3 buffer solutions.

Thor Test Method 700 – Screening for Microbial Contamination

Appropriate growth media are streak inoculated with aliquots of each sample for the detection of aerobic bacteria, moulds and yeasts respectively. After incubation for a minimum of 24 hours at an appropriate temperature any microbial growth is visually assessed using the rating scale detailed in the results table.

Thor Test Method 720 – West State Bacterial Resistance Test

Aliquots of each test sample are prepared and inoculated on a number of occasions at weekly intervals as detailed in the results table. The inoculum is a defined suspension of bacteria relevant in practice. The test samples are incubated under defined conditions. At specified intervals after each inoculation, as indicated in the results table, bacterial growth, where present, is determined by thoroughly mixing the sample and streak inoculating onto appropriate agar plates. These are assessed for growth after incubation under specified conditions according to the rating scale.

Micro-organisms used:

Aeromonas hydrophila	*Proteus vulgaris*
Alcaligenes faecalis	*Providencia rettgeri*
Cellulomonas flavigena	*Pseudomonas aeruginosa*
Corynebacterium ammoniagenes	*Pseudomonas fluorescens*
Enterobacter aerogenes	*Pseudomonas putida*
Escherichia coli	*Pseudomonas stutzeri*
Klebsiella pneumoniae	*Serratia liquefaciens/Grimes II*

Thor Test Method 730 – Wet State Fungal Resistance Test

Aliquots of each test sample were prepared and were surface inoculated with a defined suspension of fungi relevant practice. The surface inoculated samples are incubated under ideal fungal growth conditions and any resulting surface fungal growth is visually assessed according to the rating scale described in the results table. Where no surface growth is visible the presence of viable fungal spores may be determined by thoroughly mixing the sample and streak inoculating onto appropriate agar plates. These are assessed for growth or no growth after incubation under specified conditions.

Micro-organisms used:

Aspergillus oryzae
Cladosporium Cladosporides
Geotrichum candidum
Paecilomyces variotii
Penicillium ochrochloron

Thor Test Method 740 – Wet State Yeast Resistance Test

Aliquots of each test sample are inoculated on a number of occasions at weekly intervals as detailed in the results tables. The inoculum is a suspension of yeasts relevant in practice. The test samples are incubated under appropriate conditions.
At specified intervals after each inoculation, indicated in the results table, yeast growth, where present, is detected by thoroughly mixing of the sample and streak inoculation onto appropriate agar plates. These were assessed for growth after incubation under specified conditions according to the rating scale.

Micro-organisms used:

Candida valida
Rhodotorula rubra
Saccharomyces cerevisiae

Thor Test Method 800.1 – Dry Film Fungal Resistance Test – Humidity Cabinet

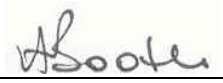
Each sample is painted onto a substrate closely simulating that used in practice. A defined mixed spore suspension prepared from fungi(including yeasts) relevant in practice is spray inoculated onto the dry film surfaces. The 'panels' are allowed to dry before they are suspended in a high humidity cabinet for four weeks under specified conditions favorable for fungal growth. The resultant fungal growth on the surface assessed visually and microscopically.

Micro-organisms used:

Alternaria alternate
Aspergillus versicolor
Aureobasidium pullulans
Cladosporium cladosporoides
Penicillium purpurogenum
Phoma violaceae
Rhodotorula rubra
Sporobolomyces roseus
Stachybotrys chartarum
Ulocladium atrum

7. Report Review

The work detailed in this report has been carried out according to Thor Group Standard Test Methods. All results have been checked by the responsible person and reviewed by the Laboratory Manager.

Signed  Date 13 January 2008

Alison Bootes (Hons)
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Reviewed  Date 13 January 2008

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Please note that unless otherwise stated, the conclusions and any recommendations, either made or implied, are based on information drawn from examination of the samples identified in this report only. Since these may be influenced by, for example, infection level variations in raw materials, stored component solutions and manufacturing equipment, it is recommended that some appropriate monitoring of microbiological properties be carried out.