Technical Report

Anti-Microbial Testing

For

Forbo Flooring BV

Final Report

Work Carried Out By

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Global Surface Coatings Covered

Final Report

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Client	Forbo Flooring BV Industriegweg 12 NL-1566 JP Assendelft PO Box 13 NL 1560 AA Krommenie The Netherlands FAO: Jose Jak
Work Requested	Anti-Microbial Testing
Samples Submitted	Samples of Linoleum

Work Carried out by ..... T. J. Glazier

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Approved by pp.....

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Authorised Signatory

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1 Materials Submitted For Testing

Linoleum flooring samples

Printed linoleum

Marmoleum Real (Reference)

2 Test Procedure

Antibacterial activity was determined using the method described in ISO 22196 : 2011. An aliquot (225µl) of a log phase cell suspension of either *Staphylococcus aureus* (5.2 x 10^5 cells ml^{-1};ATCC 8625) or MRSA(5.5 x 10^5 cells ml^{-1};NCTC11939) prepared using the method described in ISO 22196 was held in intimate contact with each of 3 replicates of the test surfaces supplied using a 30 x 30 mm polyethylene film (cut from a sterile Stomacher bag) for 24 hours at 35°C. The size of the surviving population was determined using the method described in ISO 22196. The viable cells in the suspension were enumerated by spiral dilution on to Trypcase Soya Agar and by the pour plate method described in ISO 22196. These plates were incubated at 35°C for 24 hours and then counted. An additional 3 replicate unfortified surfaces were also inoculated in the manner described above but were then analysed immediately for the size of microbial population present to provide 0-time control data. The method is described schematically in Figure 1 below.

All data were converted to colony forming units (CFU) cm^{-2} and then transformed (Log10) to provide a data set that conformed to a Gaussian distribution. Potential outliers were tested using Dixon's *Q*-test (P = 0.05).

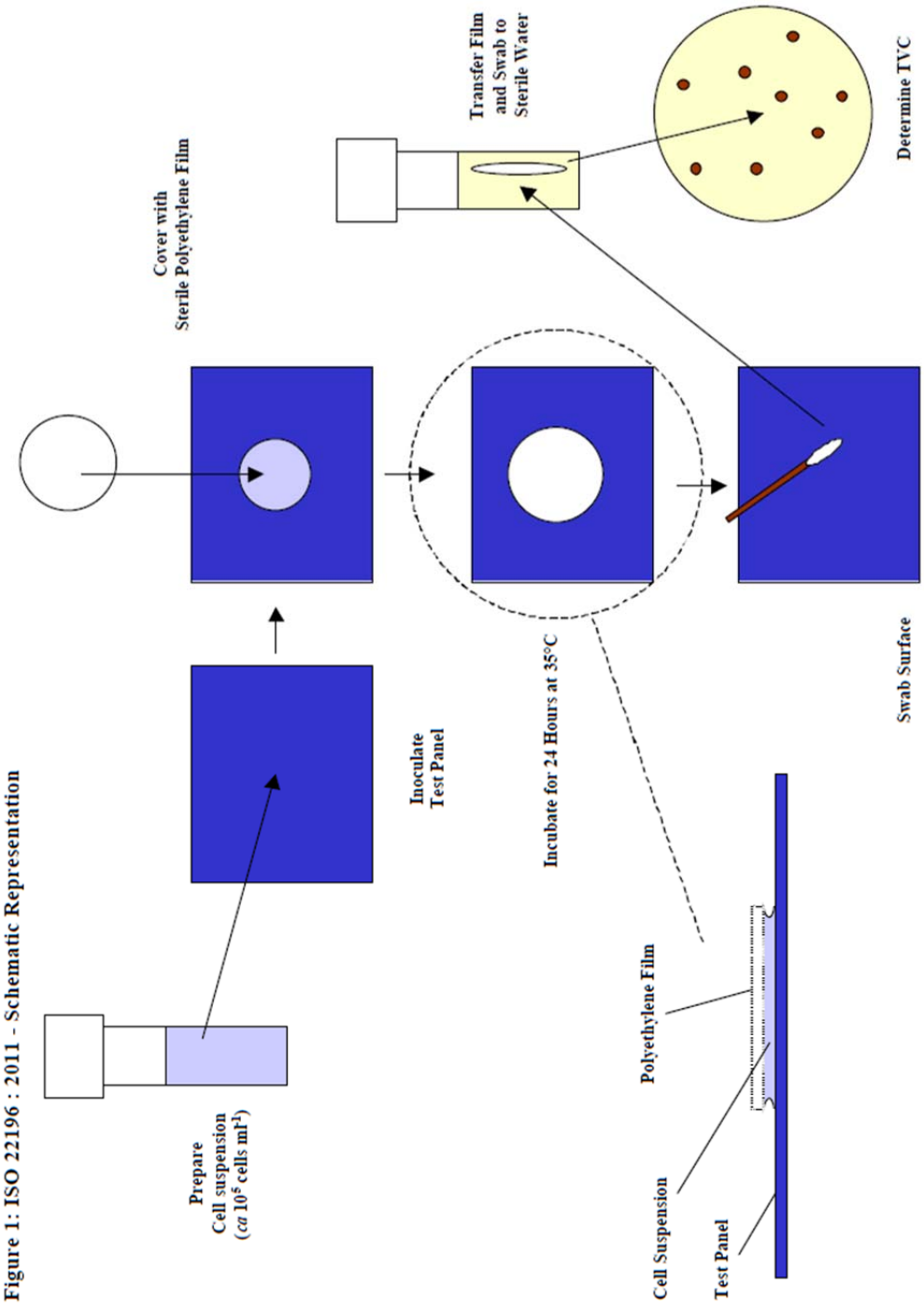


Figure 1: ISO 22196 : 2011 - Schematic Representation

3 Results and Observations

The results are shown in Tables 1 - 2 and Figure 2 below.

Table 1: Activity of coatings against Staphylococcus aureus
(Geometric mean of 3 replicates as Colony Forming Units cm^{-2})

Sample	Contact Time		Reduction from Initial	
	0 Hours	24 Hours	%	Log_{10}
Polypropylene	$2.1x\ 10^4$	$1.3\ x10^4$	39.43	0.2
Printed Linoleum	$2.1\ x10^4$	≤1.00	≥99.99	≥4.3
Marmoleum Real (reference)	$2.1\ x10^4$	≤1.00	≥99.99	≥4.3

‡ The theoretical limit of detection is 1 CFU cm^{-2}

The data in Table 2 shows that the population of Staphylococcus aureus held in contact with the IMSL Polypropylene surface declined by 39.43%. This is considered a normal response for this species on an inert surface under the conditions imposed by ISO 22196. In contrast, the population of Staphylococcus aureus exposed to the surface of the Printed Linoleum and Marmoleum Real (Reference) declined by ≥ 99.99% to below the limit of detection after 24 hours compared to the initial population.

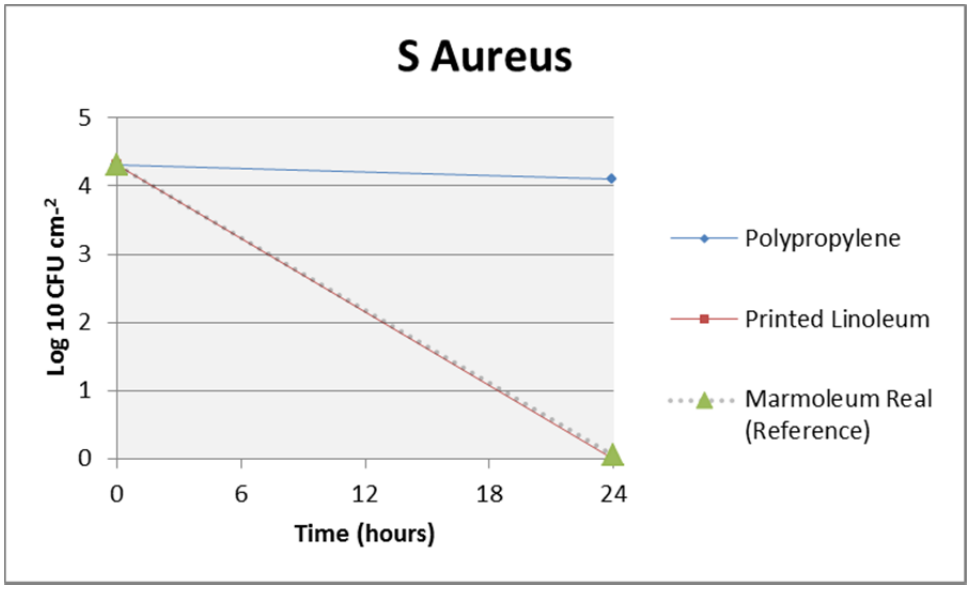
Table 2: Activity of coatings against MRSA
(Geometric mean of 3 replicates as Colony Forming Units cm^{-2})

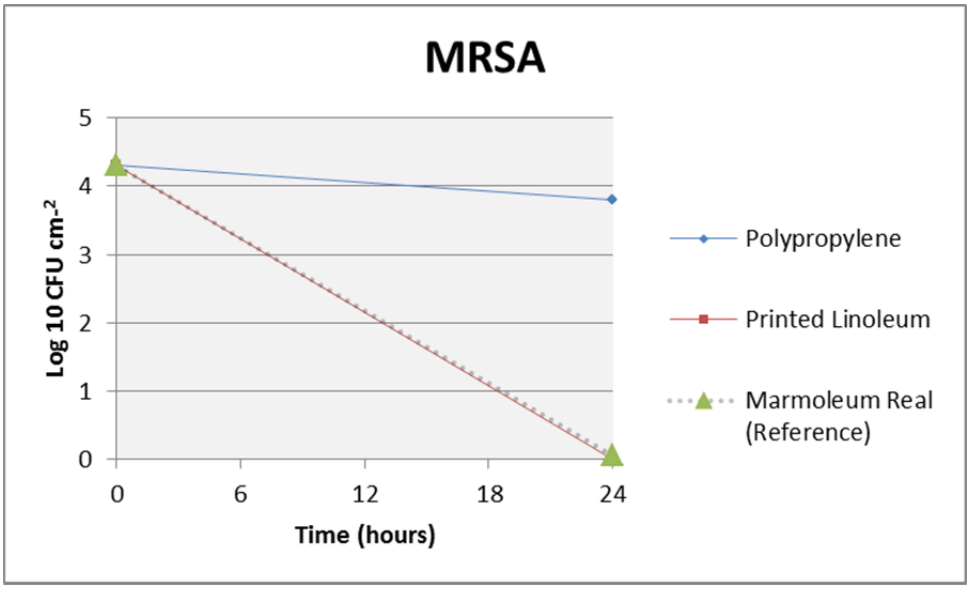
Sample	Contact Time		Reduction from Initial	
	0 Hours	24 Hours	%	Log10
Polypropylene	$2.0\ x10^4$	$6.8\ x10^3$	68.78	0.5
Printed Linoleum	$2.0\ x10^4$	1.1	99.99	4.3
Marmoleum Real (reference)	$2.0\ x10^4$	≤1.00	≥99.99	≥4.3

‡ The theoretical limit of detection is 1 CFU cm^{-2}

The data in Table 2 shows that the population of MRSA held in contact with the IMSL polypropylene surface declined by 66.78%. This is again considered a normal response for this species on an inert surface under the conditions imposed by ISO 22196. In contrast, the populations of MRSA held in contact with the surfaces of Printed Linoleum and Marmoleum Real (Reference) declined by 99.99% or greater after 24 hours compared to the initial population.

Figure 2: Results as Log10 CFU cm^{-2}





End of Report

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