

Making sense of test reports done on Field Gear Towels

Anti-bacterial properties in Field Gear towels (Employing FineWel™ technology)

Field Gear Towels employ the use of FineWel™ technology in the manufacture of its towels. This technology uses a proprietary anti-bacterial treatment, 'Dr Bacty™ Protection', which combines both organic and inorganic anti-bacterial compounds. The treatment is sealed into the towel in the dyeing process. The efficacy of the anti-bacterial properties in Field Gear towels have been tested and proven effective with a series of tests conducted by the FITI Testing & Research Institute in Korea.

A summary of the reports of all tests done on Field Gear towels can be viewed at their website at "<http://www.fieldgear.com.sg/certification.html>". The reports relate to the following tests:

- Algal resistance test
- Anti-bacterial test comparing an untreated and treated FineWel™ fabric
- Anti-bacterial test after 10 washes
- Anti-bacterial test after 30 washes

In addition, Field Gear towels have been tested for suitability of use directly on the human skin using the stringent Eco-tex standards. Eco-Tex an organization set up by a consortium of fabric manufacturers and is based in Germany. One of its functions is the setting of standards in the testing of fabrics and textiles. Any fabric that is certified using Eco-Tex standards is guaranteed to be safe for direct use on the human skin and have been manufactured in an environmentally friendly way.

Conduct of Anti-bacterial tests

In any anti-bacterial test, a datum for comparison is needed. The culture of bacteria to be tested on is usually allowed to incubate and proliferate in a normal environment and the rate at which it proliferates measured. This is then compared with the rate of proliferation or destruction of the same bacteria on the material treated with the subject anti-bacterial compound.

To determine the datum, the target bacteria are usually cultured in an agar solution placed in a suitable dish. Once the agar is prepared in the dish, a measured amount of the bacteria culture is introduced to it. The measurement of the bacteria is usually in CFU/ml (Colony Forming Units per milliLitre). CFU is a measurement of viable bacterial numbers and not the number of cells, i.e. the number of colonies formed in the amount of solution. The bacteria are then left to incubate and reproduce and after a determined time period, the number of CFUs is measured again. This then forms the datum. For example, say 1.3×10^5 CFU/ml was the measured amount introduced, after 18 hours the measurement became 7.7×10^6 CFU/ml. This will then be the datum rate at which this particular bacteria culture will proliferate in a normal environment.

To test the effectiveness of an anti-bacterial treatment, the same amount of bacteria is introduced to the treated material and left to stand for the same period. The number of CFU is then measured and the rate at which the bacteria proliferated or are destroyed can then be determined and compared with the datum. A percentage can then be calculated relating to the effectiveness of the anti-bacterial treatment.

Deciphering the test reports done on Field Gear towels

Only relevant portions of the various reports are extracted and explained here. Please go to our website at "<http://www.fieldgear.com.sg/certification.html>" to view the full summary.

1. Algal Resistance Test Report

Extract of report

TEST CONDUCTED	TEST RESULTS
(1) DETERMINING ALGAL RESISTANCE OF PLASTIC FILMS (ASTM G 29-1996) : RATE	0
NOTE) • NONIONIC WETTING AGENT : TWEEN 80 (0.05%) • RATE : 0 = NONE. 1 = TRACE OF GROWTH (LESS THAN 10%). 2 = LIGHT GROWTH (10 TO 30%). 3 = MEDIUM GROWTH (30 TO 60%). 4 = HEAVY GROWTH (60% TO COMPLETE COVERAGE). • SEE ATTACHED PHOTOS.	

This report is straightforward. The rate of algal growth on the tested fabric is "0", indicating no algal growth detected. The rating ranges from 0 through to 4 with each rating explained.

2. Anti-bacterial Test Reports

The explanations below apply to the following test reports:

- Anti-bacterial test comparing an untreated and treated FineWel™ fabric
- Anti-bacterial test after 10 washes
- Anti-bacterial test after 30 washes

Sample Description

Extract of report

SAMPLE DESCRIPTION : TWO(2) PIECES OF FABRIC, SUBMITTED ON 2003-05-02. ITEM : #1 NORMAL FINE-WEL, #2 ANTI-BACTERIAL FINE-WEL

The 'Sample Description' states the item or items tested on. In this example, they are:

- Item #1 – an untreated FineWel™ fabric
- Item #2 – a FineWel™ fabric treated with anti-bacterial properties.

Anti-bacterial test results

Extract of report

TEST CONDUCTED	TEST RESULTS		
(1) ANTIBACTERIAL ACTIVITY TEST (KS K 0693-2001) : CFU/ml, BIOSTATIC REDUCTION RATE %			
	BLANK	#1	#2
BACTERIA-1 : START	1.3 x 10 ⁵	1.3 x 10 ⁵	1.3 x 10 ⁵
AFTER 18HRS.	6.1 x 10 ⁶	4.6 x 10 ⁵	<10
BIOSTATIC REDUCTION RATE	---	25.1	99.9
BACTERIA-2 : START	1.4 x 10 ⁵	1.4 x 10 ⁵	1.4 x 10 ⁵
AFTER 18HRS.	7.1 x 10 ⁶	5.2 x 10 ⁵	<10
BIOSTATIC REDUCTION RATE	---	27.3	99.9
BACTERIA-3 : START	1.6 x 10 ⁵	1.6 x 10 ⁵	1.6 x 10 ⁵
AFTER 18HRS.	7.7 x 10 ⁶	4.9 x 10 ⁵	1.5 x 10 ⁴
BIOSTATIC REDUCTION RATE	---	36.5	99.8
BACTERIA-4 : START	1.2 x 10 ⁵	1.2 x 10 ⁵	1.2 x 10 ⁵
AFTER 18HRS.	5.9 x 10 ⁶	4.9 x 10 ⁵	1.1 x 10 ⁴
BIOSTATIC REDUCTION RATE	---	17.2	99.8
BACTERIA-5 : START	1.5 x 10 ⁵	1.5 x 10 ⁵	1.5 x 10 ⁵
AFTER 18HRS.	7.2 x 10 ⁶	5.7 x 10 ⁵	<10
BIOSTATIC REDUCTION RATE	---	20.9	99.9

The test was conducted using 5 different bacteria cultures (see below for types of culture). These are named Bacteria-1 through 5 as seen on the left most column.

The 'Blank' column represents the datum. In this test, a piece of Cotton fabric was used as will be seen below. Item #1 and #2 are the tested fabrics as described in the 'Sample Description' above.

Let's consider Bacteria-1 for our explanation of the results.

- At the start, all 3 samples were inoculated with 1.3x10⁵ CFU/ml of bacteria-1.
- After 18 hours, the bacteria concentration was measured again for the 3 samples with the following results:
 - Blank = 6.1x10⁶
 - Item #1 = 4.6x10⁵
 - Item #2 = <10 (less than 10 CFU/ml)
- The following can be concluded at this stage:
If 1.3x10⁵ CFU/ml of bacteria-1 is introduced, after a period of 18 hours, the bacteria colonies on a piece of cotton fabric would have multiplied approximately 47 times, on an untreated FineWel™ fabric, the colonies would have approximately multiplied 3.5 times and on a FineWel™ fabric treated with Dr Bacty™, the colonies would have reduced to <10 CFU/ml.

To calculate the Biostatic Reduction Rate, or the rate at which the tested samples are able to reduce the proliferation of the bacteria, the 'Blank' or datum is used as the base for comparison.

- The results on the datum show that bacteria-1 increased from 1.3x10⁵ CFU/ml to 6.1x10⁶ CFU/ml. Let's take this to be a 100% increase.
- For item #1 therefore, it can be said that the percentage increase is:
(4.6x10⁵ divided by 6.1x10⁶) x 100
= 75.4% increase

- Putting it another way, item #1 was able to reduce the rate of increase of bacteria-1 by $100 - 75.4 = 24.6\%$ (25.1% as shown on the report)
Note: The result here differs slightly from that shown on the test reports because of rounding of the figures. The actual figure to arrive at 25.1% as shown in the report is 4.5689×10^6 which was rounded up to 4.6×10^6
- For item #2, the result showed <10 CFU/ml. The entire colony was practically wiped out! The percentage of bacteria-1 remaining after 18 hours therefore is:
 $(10 \text{ divided by } 6.1 \times 10^6) \times 100$
 which is a miniscule 0.000001%
- The biostatic reduction rate for item #2 is therefore:
 $100 - 0.000001\%$
 $= 99.9\%$

Other details

Extract of report

NOTE)	• SAMPLE WEIGHT	: 0.4g
	• AN INCREASING RATE	: BACTERIA-1 : 47 TIMES BACTERIA-2 : 51 TIMES BACTERIA-3 : 48 TIMES BACTERIA-4 : 49 TIMES BACTERIA-5 : 48 TIMES
	• INOCULUM CONCENTRATION	: BACTERIA-1 : $1.3 \pm 0.3 \times 10^5/\text{ml}$ BACTERIA-2 : $1.4 \pm 0.3 \times 10^5/\text{ml}$ BACTERIA-3 : $1.6 \pm 0.3 \times 10^5/\text{ml}$ BACTERIA-4 : $1.2 \pm 0.3 \times 10^5/\text{ml}$ BACTERIA-5 : $1.5 \pm 0.3 \times 10^5/\text{ml}$
	• STANDARD FABRIC(KS K 0905-1996)	: COTTON
	• NONIONIC WETTING AGENT	: TWEEN 80 (0.05%)
	• TEST BACTERIA	: BACTERIA-1 - <i>Escherichia coli</i> ATCC 43895. (0-157) BACTERIA-2 - <i>Salmonella typhimurium</i> KCTC 1925. BACTERIA-3 - <i>Candida albicans</i> ATCC 14053. BACTERIA-4 - <i>Staphylococcus aureus</i> ATCC 6538. BACTERIA-5 - <i>Klebsiella pneumoniae</i> ATCC 4352.

The rest of the report provides details of the test.

- **'Sample Weight'** is the weight of the samples used for the test.
- **'An Increasing Rate'** shows the number of times the bacteria increased in numbers on the 'Blank' sample.
- **'Inoculum Concentration'** shows the measure of bacteria introduced to the samples, complete with the variation tolerance of 0.3×10^5 per millilitre.
- **'Standard Fabric'** states the material used for the 'Blank' sample, cotton in this case.
- **'Nonionic Wetting Agent'** refers to the solution added to the samples to facilitate the culturing of the bacteria.
- **'Test Bacteria'** shows the cultures of bacteria used for the test.

3. OKO (Eco) Tex Test Report

Extract of report

CONDUCTED TESTS	CONCLUSION
(1) pH	PASS
(2) AZO DYE (CLEAVABLE ARYLAMINES)	PASS
(3) CARCINOGENIC DYE CONTENT	PASS
(4) ALLERGENOUS DYE CONTENT	PASS
(5) FORMALDEHYDE CONTENT	PASS
(6) CHLORINATED PHENOLS CONTENT	PASS
(7) CHLORINATED ORGANIC CARRIERS	PASS
(8) EXTRACTABLE HEAVY METAL CONTENT	PASS
(9) ORGANOTIN COMPOUNDS CONTENT	PASS
(10) COLORFASTNESS TO WATER	PASS
(11) COLORFASTNESS TO PERSPIRATION	PASS
(12) DETERMINATION OF ODOUR	PASS

The report shows that the FineWel™ sports towel tested on has passed all 12 test items.