

Disposable Type 6 coveralls with Flame Retardency

In recent years some manufacturers have launched low cost disposable coveralls that claim both approval to Type 6 for repellency against liquid chemicals *and* feature Flame Retardent properties sufficient to achieve conformance to the requirements of the old Flame retardency standard EN533 (1993) Index 1. This combination of properties has obvious potential importance in any application where chemical splash protection is required but contact with flame or flash fire is a risk. Of particular reference is in the petrochemical industry where Type 5 and 6 disposable splash coveralls are commonly worn over Thermal Protective Garments (TPG's) such as Nomex®. In such cases a standard coverall, being manufactured of polypropylene or polyethylene and therefor being flammable, in contact with a flame may ignite, burn and thereby reduce the Thermal Protection offered by the TPG – perhaps critically. This has been shown by Thermal Mannequin Testing. A disposable coverall that meets the minimum flame propogation requirements of EN 533 Index 1 however may be worn in such a case without compromising thermal protection and in fact in some cases overall thermal protection may be improved.

Most such disposable garments combining these properties are based on multi-layer meltblown polypropylene – commonly known as “SMS”, SMMS or several similar variants, the FR properties being achieved through the use of a chemical FR treatment applied to the fabric topically, normally through a spray or dipping system. However, recent testing has indicated a potential serious problem with such garments. It appears that in some cases manufacturers may have made an assumption that the application of an FR treatment has no effect on the fabric's repellency and have used repellency test results from untreated fabric in order to gain approval to Type 6 (EN13034). Independent repellency testing on garments drawn from the market have indicated that the actual repellency properties of the FR treated fabrics are considerably lower than those of the untreated versions, to the extent that in all garments tested the fabric failed to meet the minimum repellency requirements defined for Type 6 coveralls. *In other words these garments should not be approved to Type 6 as they do not meet the minimum repellency requirements.*

Chemical Repellency results from independent testing (SATRA) against 2 samples from the market-place for two tested chemicals according to the required EN 368 repellency test is given below:

	Sample 1		Sample 2	
	R	P	R	P
10% Sodium Hydroxide				
Repellency claimed in user instructions	98.4%	0%	98.4%	0%
Actual repellency result in independant testing	91.7%	0.7%	94.7%	0.5%
30% Sulphuric Acid				
Repellency claimed in user instructions	98.4%	0%	98.4%	0%
Actual repellency result in independant testing	95.0%	0.5%	93.6%	0.2%
<ul style="list-style-type: none"> • R = Repellency % / P = Penetration % • Two of four chemicals required by Type 6 • Minimum Type 6 requirement is >95% (Class 3) 				

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The testing indicates the actual tested repellency results are not only substantially lower than the results published in the products' accompanying user information, but more importantly in each case the repellency is lower than the minimum requirement for Type 6 garments, ie >95%.

It is further noticeable that whereas in most cases this test on SMS /SMMS fabrics results in a penetration of 0%, in these tests the fabrics suffered some penetration.

That some manufacturers have assumed the repellency properties of FR treated fabric from the untreated fabric tests is further indicated by the fact that in some cases *the same* repellency figures are quoted in user instructions both for the untreated AND treated versions of the coveralls. Such results are extremely unlikely because there is always inevitably some variation in EN 368 repellency test results and it is almost unfeasible that two tests on the same fabric would result in exactly the same results, much less two tests on fabrics with different treatments (i.e. one with FR treatment and one without).

The reason that a topical FR treatment has a negative effect on the repellency properties of an SMS or SMMS fabric are still unclear and are being further investigated. However it seems likely that the difficulty stems from the fact that detergents must be used as a whetting agent in order to ensure the solids in the FR mix adhere to the fibres in the fabric – otherwise they simply will not attach. The problem is that to remove these detergents the drying temperature must be raised to at least 145°C – higher than the temperature at which the polypropylene would be damaged. A lower temperature must therefore be used in the drying process (to avoid damaging the polypropylene) with the result that the whetting agent is not removed properly. As the agent is essentially a detergent it will interact with the repellency agent and reduce the fabrics repellency properties. This, it seems is simple chemistry AND IT IS UNLIKELY THAT THIS PROBLEM CAN BE SOLVED WITH CURRENT TECHNOLOGY OR AT A COST REALISTIC FOR DISPOSABLE GARMENTS.

Further confirmation comes from the response of fabric manufacturers themselves. Of those approached all stated they would be unable to supply an SMS type fabric that met BOTH the FR and the repellency requirements of the Type 6 standard. Clearly fabric manufacturers are already acquainted with this problem. Manufacturers of existing such garments on the market may not have asked the question as to whether an FR treatment will adversely affect the repellency properties.

The obvious solution to this for garments claiming Type 6 AND flame retardency to EN 533 is that such FR treated fabric must undergo repellency *and* FR testing at the same time, ensuring that the same fabric samples are used for both tests, thus confirming that the fabric does indeed meet both. Note that we have tested several different SMS type fabrics with FR treatments and ALL have failed to meet the required minimum repellency standards for Type 6 garments. Further, it would seem sensible that notified bodies ensure that ALL testing of a garment should be done on the same sample as provided by the manufacturer. This will ensure subsequent treatments applied to achieve specific properties does not have a detrimental effect on already tested properties.

This matter has been reported to the BSIF and HSE in the UK and is under consideration. However, ***it would seem advisable that any users of disposable garments that claim approval to both EN13034***

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Type 6 and flame retardency to EN 533 should be aware that the fabric may not actually meet the minimum repellency requirements and should require confirmation or proof that the garment has been properly tested, including a single report on a single fabric or garment sample that shows pass results on both the FR and repellency tests.

Also note that Lakeland's own Type 6 / Flame Retardent coverall Pyrolon XT is based on entirely different technology to FR SMS and does not suffer this problem. Pyrolon garments are designed specifically to be flame retardant and use an entirely different type of fibre. Pyrolon garments are also certified to the latest FR standard EN/ISO 14116:2008 which supercedes the earlier EN533 standard.

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For more information about this issue please do not hesitate to contact Lakeland at sales-europe@lakeland.com. We will be pleased to answer any of your questions.