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Immersion suits are meant to be fire-retardant, but evidence has emerged of suits being made from flammable material. SASI investigates whether seafarers' lives are being put at risk

► **Picture the scene:** a chemical tanker is involved in a collision with another vessel, sustaining damage amidships that leads to a fire on board so severe that the master has no choice but to give the order to abandon ship. A crew member dons an immersion suit and makes for a lifeboat, but high winds and rough seas mean that the evacuation doesn't go according to plan and he ends up in the water. By this point, fires are burning not only on board the vessel but also on the surface of the sea, putting the floating crew member in danger of sustaining burns. Thankfully, his immersion suit meets the recommended fire-testing requirements outlined in Section

3.1.15 of IMO Resolution MSC 81(70) 'Testing and evaluation of life-saving appliances'. This states that after being enveloped in flames, the suit "should not sustain burning for more than 6 seconds or continue melting after being removed from the flames".

That is, if the immersion suit *is* capable of passing that test. If it isn't and the fabric is not made from the correct fire-extinguishing chemical components, then the suit will continue to burn, and the seafarer's chances of survival will rapidly decrease as he contends not only with being overboard in dangerous sea conditions but also with the nightmare of a burning immersion suit. It is a harsh

eventuality to consider, but it may be one that some seafarers will have to face. One maker of immersion suits believes it has evidence of other manufacturers producing such products made of non-compliant flammable material, and SASI has uncovered evidence that these suits may already be on board ships.

Dr Wolfgang Dressler, managing director of Aquata, explained that in mid-May the company received an example of some material apparently used to make immersion suits. The company was shocked to discover the material was flammable. Dressler demonstrated the problem to SASI by holding a cigarette lighter against a sample (which was cut into the shape of an immersion suit glove) and then against sample material from one of the company's own suits. The flames on the Aquata material extinguished quickly, whereas the other material continued to burn.

Body of evidence

The recommended fire test referred to in paragraph 3.1.15 of Part 1 (Prototype tests for life-saving appliances) of the Revised recommendation on testing of life-saving appliances (Resolution MSC 81(70)) requires a specific regimen involving the ignition of a pan of petrol and water in a draught-free area and the suspension of the suit over the flames, which must "ensure the whole immersion suit or anti-exposure suit is enveloped in flames". Using a lighter to ignite a sample of material does not therefore conclusively indicate that a suit made of the fabric fails to comply with such standards. Nevertheless, it provides a strong indication that the material is not of a sufficient standard to meet with such regulations.

When a fire burns through an immersion suit's nylon covering and reaches the material beneath, chemical components in the fabric should produce CO₂ gas, which extinguishes the flames. Aquata suits are manufactured from neoprene, a synthetic rubber, while the suspect fabric was apparently made from either pure styrene-butadiene rubber (SBR) – a lower grade of synthetic rubber that is some 30–40% cheaper than neoprene, according to Dressler – or a blend of neoprene and SBR. Including the requisite fire-extinguishing chemical components in an SBR suit would be possible in principle, but the material lacks the flexibility of neoprene. The SBR sample was also covered by double-knit nylon, which is thicker and less flexible than the single-knit nylon commonly used by immersion suit manufacturers in the European market.

The flammable material came to Aquata by an indirect route. The manufacturer that produces neoprene for Aquata was contacted by a trading agent, who asked if the manufacturer was able to make a cheaper version of a particular material. He passed on the SBR as a sample for analysis. According to

the trading agent, the sampled material came from a company that did not usually operate in the maritime safety sector. Dressler said that the originating company had certainly been manufacturing immersion suits, not just exploring the possibility of doing so: the smooth curves around the finger areas on the sample indicated that the material was a 'punch-out' that could only have been produced using a mould with a view to mass production, he explained. The company was trading in both China and Korea, leaving Aquata unable to pinpoint exactly which notified body or flag state to contact with its concerns.

Dressler told SASI he would contact MarED, the co-ordination group for the notified bodies assigned by EU member states to conduct conformity assessment procedures set out in the Maritime Equipment Directive about the issue. The directive covers the safety and certification of equipment on ships flagged to EU countries.

SASI made further enquiries, prompting one ship service company to carry out similarly rudimentary fire tests on immersion suits. It reported that it had found evidence in two manufacturers' suits supporting Aquata's finding that some manufacturers appear to be using non-fire-retardant material. The fire test in Sec 3.1.15 of IMO Resolution MSC 81(70) is not carried out as part of immersion suit servicing and is used only when suits are approved by administrations. However, SOLAS regulations do leave room for tests that are "substantially equivalent to those specified in the recommendations". Three major immersion suit manufacturers contacted by SASI had not heard of substandard suits appearing on the market.

Passing the test

Dressler believes the recommended fire test is not fit for purpose. "The fire test is a joke," he remarked, noting that the usual brevity of the test and the way in which a suit is exposed to the fire is not representative of conditions in an emergency. The test is usually only sufficient to burn the nylon off a suit rather than testing the fireproofing of the synthetic rubber beneath, he said. The same sentiment was expressed to SASI independently by another equipment servicing company during our investigations.

The International Lifesaving Appliances Manufacturers Association (ILAMA) takes the view that the test *is* fit for purpose, however. "The existing test is adequate, as it checks that a suit does not continue to burn after exposure to a flame," a spokesman told SASI. "The issue with this particular example appears to be that the immersion suit in question does continue to burn when it should not." The spokesman pointed out that on board fire-fighting suits were subject to a more stringent test, whereas "people wearing such an immersion suit are expected to run away from a fire and not go towards it, to try and intervene or fight it".

Dressler's view is that a more robust test of immersion suit fabric is needed, and that there should be type-specific immersion suits for vessels with a greater inherent fire risk, such as oil tankers. Aquata previously produced suits in which nylon is replaced by heat-resistant Aramid fibres, as used in Formula 1 driving suits, but found no market for the product.

The price of safety

Dressler has been involved in the manufacture of immersion suits for more than three decades, and is Germany's expert on standards for diving suits at the European Committee for Standardization (CEN). The market for substandard suits is determined by price, he maintained. "Shipowners buy on price – they ask whether a product is certificated and then how much it costs," he said. Recent investigations by SASI (November 2009 and March 2010 issues) found that some LSA manufacturers are facing competition from a growing number of Chinese producers that apparently prioritise aggressive pricing over quality and even counterfeit existing designs. Dressler shares such concerns, having seen immersion suits offered for as little as \$100: "I see such prices and I wonder what kind of material they use," he commented.

He also told SASI that companies that had attended Aquata's product-servicing training sessions related how they had serviced suits sourced from China that soon became damaged, some of them exhibiting dangerous failings such as open seams. Many of the companies behind such products seem to



have little pedigree in producing lifesaving appliances. "Yesterday they made underwear, today they make immersion suits," Dressler complained. "There is something stinking on the market, that's for sure."

Poor-quality products are reaching the market for two reasons, it seems. The first is a sentiment that lifesaving appliances, because they exist only for use in an emergency, do not have to be treated with the same degree of care accorded to ship equipment that is in use every day. The danger is that managers and crews believe that investing in quality LSAs or in rigorous maintenance is a waste of money because such products are unlikely to ever be used 'in anger'.

With immersion suits the issue is more acute: unwary buyers are unlikely to know about a dangerous failure in quality until it is too late, because no ship manager or crew member is likely to take an open flame to an immersion suit to test whether it is truly fire-retardant.

The second issue is a concern, voiced to SASI in previous investigations and shared by Dressler, that the European regulatory set-up might not be best equipped to react to quality concerns such as inappropriate fabrics being incorporated in immersion suits. "MarED is too big, with too many different interests," Dressler suggested, adding that he believes that the organisation will only react to comprehensive findings rather than partial evidence.

Article 13 of the MED covers substandard wheelmarked equipment. It directs EU member states to "prohibit or restrict [the product] being placed on the market or being used on board a ship for which it issues the safety

Photo: iStockphoto

An unpredictable flare for danger

A recent incident involving incorrect disposal of safety flares has sparked a warning from the UK's Maritime and Coastguard Agency (MCA). In June, air traffic control in Stornoway, Scotland, received a report of green flares alight near Brevig harbour. Upon investigating, the local coastguard team discovered a small onshore bonfire containing the debris of flares well past their use-by date.

"This is not the way to dispose of out-of-date flares," emphasised Stornoway Coastguard duty watch manager Maggie Mackay. "Besides being highly dangerous to the individual attempting to build the bonfire, it can alert the authorities to what they might believe is an unfolding emergency incident. We have tried and tested ways of disposing of out-of-date flares."

An astonishing 33,000 to 35,000 old flares are handed into the MCA each year. "It's a lot of explosive – much of it very old and

unstable and often stored [by the owner] in a ramshackle arrangement," agency spokesman Mark Clark told SASI.

Recent amendments to the legislation affecting such pyrotechnics have led to the MCA reducing the number of the locations where old flares can be handed in to its 18 maritime rescue co-ordination centres (MRCCs) around the UK. While the changes make the system far safer, it does mean that mariners in some areas without a nearby MRCC will have to travel farther to surrender their out-of-date flares, and an MRCC can only hold a limited quantity of the material.

Since December, MCA has had a three-year deal with specialist Portsmouth company Ramora UK to dispose of the flares safely. "We're not in the business of disposal, and nor is the Ministry of Defence," Clark pointed out to SASI. Under the agreement all unwanted signal flares are now transported

to Ramora for disposal. The company has found that some people have attempted to dispose of unwanted flares in bonfires and in other unsafe ways. "The flares become more unpredictable after the shelf-life has expired," the company's sales and marketing administrator Beau Cavell indicated. He advised holding the items securely inside some form of robust container.

Ramora was reluctant to divulge the precise details of how it renders flares safe, although it is believed to involve a dissolving process. For commercial shipping worldwide, pyrotechnic distributors and liferaft service stations often include disposal as part of their service package, and have local arrangements with companies that specialise in the disposal of hazardous waste.

There is, however, no international standard on flare disposal. It varies by country and sometimes by state within a country.

certificates" and informs member states and the European Commission of the measure and the reasons behind it. Consultation with the parties concerned should follow and can involve the Committee on Safe Seas and the Prevention of Pollution from Ships (COSS) if a product's substandard nature is attributed to poor testing standards. If a non-compliant piece of equipment is wheelmarked, "the appropriate measures shall be taken by the Member State which has authority over whomsoever affixed the mark". The role of member states in policing standards is crucial, therefore, but Dressler believes that beyond this there is a need for a "main international group that checks if national flags are controlling things".

Who watches the wheelmarks?

In ILAMA's view the procedures for dealing with substandard products are clear enough, but it conceded that policing the market is problematic. "The monitoring of any such products being supplied so widely and from so far afield is always going to be very difficult, simply because the relevant authorities who can monitor this cannot be spread so widely to effectively monitor every product coming on to the market. Then it is down to the people in the field to recognise that a product is perhaps not conforming to the standard, but for end-users this is very difficult for them to do," the spokesman told SASI. "Often the only way something like this is picked up is by another manufacturer of a similar product who has the technical knowledge to question such a product – as appears to be the case in the example here." ILAMA agreed with Dressler's suggestion, however: "It would be the ideal and very welcome situation to have such an independent body for both manufacturers' and end-users' benefit and protection."

When contacted by SASI to discuss the issue, the secretariat of MarED directed us to the European Maritime Safety Agency (EMSA); the lobby group the European Maritime Equipment Council gave the same response. EMSA participates in MarED's work as an observer, updating annexes of the MED and assisting the Commission with technical advice regarding non-compliant products. The organisation was at pains to remind SASI that "EMSA is not the organisation overseeing MarED."

"Until now, no information has been provided to EMSA on this alleged case," said a spokesman. "This notwithstanding, it is clear that no system is absolutely foolproof and mistakes do occasionally happen." The spokesman said that experience had shown that the system is able to detect and correct via co-operative working between national authorities, notified bodies and manufacturers, although "unfortunately, from time to time counterfeits also appear in the market".

Regarding the rigour of the recommended

fire test, EMSA replied that "no complaint was transmitted to EMSA concerning this particular standard". The spokesman added: "If some serious concerns should be raised at European level" about the test, EMSA would provide technical support as the issue was dealt with at national, European and international levels.

SASI asked whether there was a need for an independent body to address concerns about non-conforming products. EMSA reiterated that the responsibility to investigate cases of suspect risk or non-conformity with the MED requirements lay entirely with the member states and noted that "in fact, there is no specified source from which a member state necessarily becomes aware of the potential manufacture/marketing of a substandard product. The member states obtain this information from their own inspections of items in the market, or, more frequently, from information gathered during flag and port state control inspections on board ships and information provided by the industry itself."

For the foreseeable future, self-regulation and collaboration remain the preferred strategies of those tasked with ensuring the safety of marine equipment. Observant manufacturers clearly contribute, but perhaps seafarers will also need to play a role in spotting dangerous products – after all, their safety depends on it. ◀



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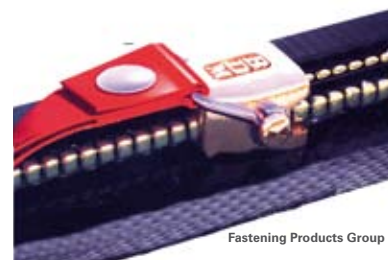
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