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Nonwoven cotton to the rescue in Gulf spill?

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A platform technology from Texas Tech could be the perfect sponge

By Greening of Oil

The same nonwoven cotton technology that keeps soldiers safe from chemical and biological warfare agents may also serve as the perfect sponge for sopping up the oil that is leaking from the Macondo well into the Gulf of Mexico.

That's the message about a technology created at Texas Tech University that was sent to members of the press May 17 by the university's communications office.

Unlike the synthetic material, polypropylene, used to soak up oil with most conventional oil containment booms, an expert in nonwoven cotton technology from The Institute of Environmental and Human Health at Texas Tech says raw cotton can soak up at least three times what synthetic materials can—and break down more easily when it is disposed of.

"Already, several million feet of the oil containment booms have been used to capture the oil spilling into the Gulf," said Seshadri Ramkumar, associate professor of nonwoven materials at the institute. "They are made of synthetic materials, don't biodegrade and absorb only a third of what raw cotton can do. The properties of raw cotton allow it to soak up 40 times its weight. With chemical modifications ... such as acetic anhydride ... it can soak up to as much as 70 times its weight. And it won't just stay in a landfill forever."

Knowledge gap and cost

Why aren't manufacturers of oil containment booms already using nonwoven cotton?

Ramkumar said it's mainly because very few in the industry understand the superiority of raw cotton.

That knowledge gap and cost issues may have been barriers to market penetration, he told Greening of Oil on May 17.

Ramkumar's research focuses on developing value-added materials using nonwoven materials and nanotechnology. He supervises the Nonwoven and Advanced Materials Laboratory at the institute.

He and a small group of his graduate students are researching ways to use lower-quality cottons that can't be used for apparel, but which could help overcome the higher cost of nonwoven cotton.

"We have not done any testing in the coast yet," Ramkumar said. "What we are proposing is to use discounted raw cotton to develop oil absorbent pads that can soak up oil due to its oil attraction capabilities. Our contribution is to use discounted—the lay term is poor quality—cotton for oil absorbency. And ... Fibertect, which can absorb oil and hold abnoxious (volatile) gases" released by the crude.

Ramkumar developed Fibertect

Ramkumar is the creator of several nonwoven cotton

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As oil continues to leak from the Macodo well in the Gulf of Mexico, a Texas Tech University expert in nonwoven cotton technology says the fabric of our lives may do a better job to absorb the crude oil than conventional containment booms made of synthetic material.
Photo: Clare Bloomfield

technologies including Fibertect, which is used in the U.S. military's decontamination kits and marketed by a company called First Line Technology.

Nonwoven fabric is different from regular woven fabrics, he said, "due to its high porosity and hence they are used as absorbent materials and filters. In April 2009, we obtained a US Patent for the process to make a decontamination wipe called Fibertect. This wipe was tested using Mustard chemical warfare agent and it was found to absorb the gases from mustard."

According to First Line's website, Fibertect is a "three layer, inert, flexible, droppable, nonwoven composite substrate for absorbing and adsorbing chemical warfare agents, toxic industrial chemicals and pesticides. Fibertect is self-contained and packaged for easy use, storage, and transport. Materials used in the outside layers may vary to provide both absorption and adsorption properties and multiple functional uses."

The "three layers of material consist of a top and bottom fabric with a center layer of fibrous activated carbon that is needle punched into a composite fabric. The top and bottom layers provide structural coherence, improving mechanical strength and abrasion resistance," the company said. Its current users? The military, first responders/receivers, hospitals, hazmat and fire fighters.

A platform technology

According to Ramkumar, "the Fibertect wipe is a platform technology," which are technologies that can be used to facilitate a broad range of application based activities.

"The wipe can be made using raw cotton on the top and bottom to absorb oil and the middle layer will have activated carbon which can hold volatile compounds," he said. "So, when the oil is soaked up by the pad, toxic volatile gases can be held by the carbon."

What are the challenges of this concept in oil spill cleanup applications? Aside from unfamiliarity with the benefits of nonwoven cotton, its containment qualities and its cost.

"Cotton nonwovens will work well as absorbents," but "hybrid structures" may have to be developed "to have both containment and absorbent capabilities," Ramkumar said.

And, pound for pound, nonwoven cotton is more expensive than synthetic materials.

But Ramkumar said performance also has to be considered, so a straight pound for pound comparison isn't fair when cotton can pick up three times as much oil as synthetics and—using the Fibertect technology—also offer the advantage of absorbing volatile gases.

"We have to take into account the price and performance," he said. "Of course, polypropylene based materials will be relatively cheaper. But, for absorbing oils, raw cotton performs three times better. What we are proposing is to use discounted cotton," which is 2-9 cents less per pound compared to regular apparel grade cotton.

"In addition, soaked up cotton pads are biodegradable, whereas synthetic pads are not. Overall, natural

fiber based booms will be better," he said.

Getting the word out

So, do any of the oil containment boom manufacturers use nonwoven cotton?

"There are a few" who use it, Ramkumar said, but ... to my knowledge, a "concept like the Fibertect has not been tried."

But First Line has begun contacting oil companies about Fibertect, he said.

How long will it take to manufacture Fibertect booms and get them to the Gulf of Mexico?

"We have licensed the technology to a Texas-based nonwoven manufacturer," Ramkumar said, adding that First Line President Amit Kapoor is working directly with the manufacturer.

"The products can be developed quickly and so time of production will not be an issue," Ramkumar said, with emphasis on the word "not."

Links of interest

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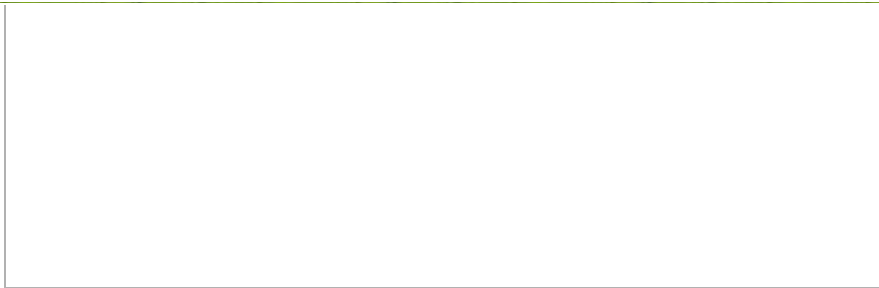
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