A Global Protect coatings engineer applies Spongejet in Global's test facility

**They're soft, spiky and bouncy. They absorb dust and help protect the environment. And now sponge media are starting to put the squeeze on traditional blasting agents, as *Sean McManus* reports**

# Dust busting sponge

GRIT and garnet are cheap and powerful blasting agents, but environmental clampdowns are undermining their appeal. Coatings engineers must dress like spacemen and work in clouds of dust in expensive enclosures designed to seal the pollutants from the outside world. Single use blasting materials must be collected and dumped and leaks to the environment are inevitable. When removing lead-based paints, the dust clouds are potentially harmful. Even in some countries where the capture of lead pollutants is strictly regulated, there are accusations that the law is widely flouted because of the expense of enclosure.

An emerging solution is the use of sponge blasting media. Prickly but squashy to the touch, these spongy agents are produced by two companies whose combined market share is a tiny portion of the world market for blasting media. But the material's properties make it often ideal for use on bridges. Its light weight means it can be confidently used on half-complete structures and the reduced dust makes it suitable for river-spanning structures.

One of the companies making the material is Spongejet, which filed its patents in 1993 and brought the product to market the following year. Spongejet has an annual turnover of between US$5 million and US$6 million worldwide. As a proportion of the world blast media market this is "so small it's not even worth mentioning. Infinitesimal," says Spongejet's European manager Len Matson.

But the blast agent has been used on the Storebælt East Bridge, former record holder for the biggest suspension bridge and still one of the greatest European infrastructure achievements in recent years.

Global Protect used Spongejet Silver to prepare the weld seams of the steel roadway girders. The bridge sections were coated offsite, but Spongejet was also used to prepare the surface where spot repairs were necessary. The paint used was a three part epoxy system. Global Protect's operations director Bill Ross admits that they were originally intending to use grit, but were forced to switch to Spongejet for environmental reasons. "The Scandanavians are very aware of the environment and this bridge spans clean water and a shipping lane," he says. "Containing 100% of dust is very difficult."

Because the bridge structure was not yet complete, engineers were also influenced to use Spongejet by its light weight. Traditional blast media would have weighed between 40kg and 60kg for each square metre of steel blasted to the Swedish Corrosion Institute's Sa 2.5 standard ('near white metal blast'). Spongejet only weighs 4kg for each square metre blasted, and can be recycled at least six times.

Spongejet Silver particles are polyurethane foam matrices embedded with aluminium oxide abrasive particles. A range of other sponges is available, including red sponge containing steel abrasive and sponges without abrasive for surface cleaning. Fired at 150m/s, the foam flattens against the surface and the heavier abrasive particles have the inertia to jump forward to connect more efficiently with the surface. The resulting dust is captured within the contracting sponge as it falls away, absorbing the energy so that the bouncing media presents no risk to the operator or surrounding coatings surfaces. Operators only need to protect their eyes and ears and could safely work in short sleeved clothes. Spongejet claims the surface can be prepared to Sa 2.5 or Sa 3 standard with profiles from 25 to 100 microns, supporting a coating life of between 10 and 20 years.

At Storebælt, steel shelters with trellis work floors were hooked

Spongejet's 240L feed unit

Storebaelt's East Bridge: environmental concerns meant a switch in blasting techniques

around the sides and bottom of the bridge and hauled beneath the joints using Tirfors. Because they could not be moved around the columns, as many as four or five were used on different sections of the bridge at once. Within the shelters the environment was controlled using dehumidifiers and heaters to ensure the coatings would cure. Global Protect's coatings operation took 12 months.

Ross estimates that about 5% was lost to the environment when blasting near to the containment seals. The sponge material was recovered using a vacuum unit on the deck before any coatings were applied. Recovered sponge is fed through a sifter to filter out the larger particles for reuse. Trapped dust and small particles are filtered out for disposal. At Storebælt the material could be reused between six and eight times, which Ross says is the maximum practical. Spongejet's Matson claims that ten reuses is feasible. "Traditional abrasives use a pressure of 7.5 to 8 bar," he says. "Spongejet can go to ten reuses if a pressure of 3 to 3.5 bar is used, but this takes longer. It depends on the type of surface, but you can end up trading speed and reuse for productivity".

Ross estimates that the work rate achieved with sponge media is between 50% and 60% of that achieved with open grit blasting. Spongejet's own estimate pitches the speed of blasting at 8m²/hr, compared with 11m²/hr for coal slag. This estimate overlooks the problem of dust clouds. Matson explains: "Field evidence over the last year shows that when you have teams of workers, you never achieve multiples of 11m²/hr. The dust builds up so rapidly that you have to wait for the dust to settle, unless the area is wide open for the dust to blow away".

Spongejet's cost comparison of coal slag against use of silver sponge prices coal slag as cheaper by about US$8/m² once the cost of disposal is taken into account. Silver sponge costs around US$3.50/kg, over three times coal slag's US$0.97/kg price. But using coal slag carries significant consequential expenses in containing the structure, transporting the single use blast media, protecting the operator and filtering the air. These costs are enough, the company claims, to tip the balance the other way.

Spongejet Silver has also been approved by the Georgia Department of Transportation in the USA. It has already been used on interstate and overpass bridges on I-95 and I-985 by contractor Peregrine Group. The challenge was removing a 5mm to 14mm three coat lead paint system including overcoats of patch repair. Luke James is branch chief of independent assurance at the DoT's Office of Materials & Research; he witnessed removal at Pine Barren Road overpass over I-95. "The airborne dust particulate was well below what I expected to see," he says, "but was not completely eliminated." Sponge media was recycled between six and eight times, adding new media at each recycle to reduce waste. James says: "I considered the process to be a very good non-polluting procedure. One thing that impressed me was not having to blow down as much dust off the beams as you have with other abrasives, the sponge seemed to grab the dust on impact and hold on to it without dispersing it into the contained area. The sponge media removed all grease and oils from the beams with less rebound that other blasting media the Department has used."

The drawback, James notes, is that it is a slower process. But this did not affect the DoT because its contracts are let on a lump sum basis and contractors are allowed a year to complete work.

Environmental protection during blasting has been a hot topic for some time, especially where lead paint is being removed. As budgets are forced to catch up with environmental legislation, sponge media could prove to be the engineer's new flexible friend.