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Inside:

- AEO Update
- RFID Debate
- Biometrics Review
- ISPS Code
- Conference Diary

SPOTLIGHT ON SCANNING:

Time for a new approach

Raising the bar on container security

Troy Thompson, CEO of Cargotec Port Security, talks to Ian Taylor about the benefits of the new spreader bar radiation verification system

When the **US Congress** passed legislation in 2007 that mandated the 100% screening of US-bound cargo by 2012, there were many people in the maritime industry – including quite a few in the **Department of Homeland Security** (**DHS**) itself – who said it couldn't be done. Others argued that, even if it could be done, it shouldn't, because it would be extremely costly, time-consuming and unnecessary to boot. There were also opportunists who said that perhaps it could be done, and they would love to help; but they would need a great deal of money to fund their research and develop new products.

Fortunately, there was a select band of companies who came forward with a more positive response. They had long-standing links with the cargo-handling industry and had already been developing new technologies which – they maintained – would allow for a cost-effective 100% cargo scanning solution without slowing down the global supply trade. The US Congress mandate was not their starting point, but it was the moment when their journey started to look as if it had a purposeful destination.

One such company was **Cargotec Corp.**, which was created in June 2005 when the giant manufacturing conglomerate **KONE Corp.** demerged. The elevator, escalator and building services businesses stayed put with KONE, while the cargo and load handling operations, **Hiab**, **Kalmar** and **MacGregor**, regrouped under the Cargotec banner. While Cargotec Corp. itself may be a young entity, the businesses within the group have been an integral part of the global cargo handling business for decades. The group employs more than 11,000 people, operates in almost 160 countries and has a wide array of units installed on ships, port terminals and distribution centres.

Through Kalmar, Cargotec's subsidiaries include **Bromma Conquip AB**, the world's leading provider of container spreaders. An estimated 5,000 Bromma spreaders are currently in operation, installed at more than 500 terminals in more than 90 countries. Of the world's top 100 ports, 96 have Bromma spreaders in action.

Bromma is a company for which the term 'market leader' is not just hyperbole. It launched the first telescopic spread, the first twin-twenty spreader, the first 45-foot spread and the first true lightweight spreader line. Given that track record, it is not surprising that the company took an innovative approach to container scanning.

One of the key concerns about 100% container scanning – for both x-ray scanning or radiation monitoring – is that it could slow down the flow of goods. Whether the container is taken out of the system and transported to a fixed scanning unit, or inspectors scour the box with hand-held terminals, the end results will be delays and backed-up cargo. However, if the container can be scanned as it passes through the regular cargo handling process, delays can be kept to a minimum.

Bromma and Cargotec believe that they have a solution: incorporate the scanners in container spreaders. Every box that is brought on or off a container ship will have to be handled by the spreader – which makes 100% scanning far more feasible – so if the scanning can be completed in less time that it takes for the spreader to complete its usual operations, there will be no disruption to the cargo handling process.

There is another major benefit to using spreader-mounted radiation monitors: it overcomes some of the challenges posed by transshipment containers. If containers are being transshipped through a port, they will not pass through the terminal gates, where the traditional radiation portal monitors (RPMs) will usually be sited. However, they will still have to be handled by the spreaders and cranes when they are being loaded or unloaded – so they will be scanned by a spreader-mounted monitor.

Right place, right time

Cargotec and Bromma have been researching the cargo scanning field for several years. The momentum picked up in 2006, when the *US SAFE Port*

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Raising the bar on container security

Act created the **Domestic Nuclear Detection Office** (**DNDO**) within the DHS. Cargotec and Bromma then began to design and develop a spreader bar radiation verification system (SBRVS) solution to meet SAFE Port standards. When Congress passed the 100% scanning legislation in the summer of 2007, the newly-formed **Cargotec Port Security LLC** (**CPS**) had a very productive meeting with the DNDO.

Soon after the DNDO meeting, the CPS arranged for its scanning system to undergo a rigorous testing programme at the **US Department of Energy's** (**DoE**) **Oak Ridge National Laboratory** (**ORNL**) under the supervision of Dr Peter Chiaro.

The ORNL was established in 1943, when the US was racing against the Axis powers to harness the military power of atomic energy. Working as part of the secret *Manhattan Project*, ORNL scientists pioneered a method to produce and separate plutonium. After World War II, ORNL continued as an international centre for nuclear energy studies. When the DoE was set up in the 1970s, the ORNL's role was broadened and it now offers a proving ground for a wide array of new technologies. Today, ORNL has more than 4,000 staff and also plays host to more than 3,000 guest researchers every year.

The SBRVS uses technology developed by CPS's strategic partner, **Innovative American Technology** (**IAT**). IAT uses multiple commercial off the shelf (COTS) radiation and neutron detectors configured as a sensor module. IAT has developed a proprietary isotope identification system and has used the Monte-Carlo nuclear simulation tool for verification of system performance. The Monte-Carlo software has a database capability of 2,200 isotopes. Developed at the **Los Alamos National Laboratory**, Monte-Carlo N-Particle Transport Code (MCNP) can simulate particle interactions of 34 different types of particles at all energy. Essentially, all these technologies should mean that the SBRVS should be able not only to flag up evidence of radioactive material in containers, but identify the precise nature of the material in question. That is the theory, but would it stand up to the scrutiny of the ORNL?

The ORNL staff put the SBRVS through a barrage of 300 tests over eight grueling months. The system had to recognise a variety of radiological materials specified by the **American National Standards Institute** (**ANSI**) N42.38 standard. The system had to perform under pressure – in fact, the ORNL subjected it to a whole range of different pressures and temperatures. The SBRVS returned a perfect score card: 100% accuracy with zero false positives and zero false negatives.

The second round of testing was tougher still. As Troy Thompson, the 20-year Bromma veteran who became President of Cargotec Port Security in May, explained: 'The SBRVS was subjected to over 2,000 cycles of shock and vibration, by dropping the spreader bar onto a container. The spreader bar was then raised and dropped every 20 seconds over a four-hour evaluation period – and this was repeated for three days.' Again, the system passed the evaluation, proving it could handle shock and vibration rates between 180 g-forces and 250 g-forces.

So, the SBRVS was a great lab rat, but how would it do out in the field?

In April 2008, the **US Customs and Border Protection** (**CBP**) – together with the DoE and scientists from **Pacific Northwest Labs** – began a field evaluation on the SBRVS at the port of Charleston, in South Carolina.

According to Thompson, the evaluation at the port of Charleston indicated that the SBRVS not only met but exceeded the ANSI requirements for gamma and neutron sensitivity. In July, the CBP ran a second field evaluation on the SBRVS at the port of Tacoma in the state of Washington.

'This time,' said Thompson, 'they really raised the bar. The tests were extremely thorough and ran for a month.'

The testers concealed a variety of radioactive substances within the containers, and on each occasion the SBRVS provided a positive identification. The Tacoma evaluation also measured how the system could cope with 'background' radiation. The port environment is teeming with cargo and equipment which can confuse radiation

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detection systems. The CBP wanted to be sure that the SBRVS could block out these distractions and focus on scanning the containers.

The CBP and the DNDO have been testing the SBRVS to see if the system can make a major contribution to US homeland security, so it is hardly surprising that they are being fairly cagey about the results. Nevertheless, according to Thompson: 'Detailed results of the gamma sensitivity testing and neutron sensitivity testing in Tacoma are still being awaited, but onsite indications are that the system performance, as in Charleston, was excellent.'

It appears that the SBRVS could be one of the technical solutions to feature in the US CBP and DoE's plans to gear up for the 100% cargo scanning mandate. Over the past few months, we have seen evidence – particularly with the *Secure Freight Initiative* (*SFI*) – that the CBP is still cogitating over how it prepares, and tests its preparations, for 100% cargo scanning (see page 18). Should it concentrate on running 100% scanning tests at major international terminals, or should it focus its initial efforts on 'high risk' corridors? But by 2012, these questions will no longer be relevant. The 100% scanning rule will come into force – in major terminals, high risk corridors and indeed every port where containers are bound for the US. CPS believes that its SBRVS will complement the more traditional RPMs to provide a technological base that will make 100% scanning feasible.

The debate over 100% scanning can often be a very US-centric affair. But, as Thompson pointed out, the US is not alone in its desire to implement a wide container scanning policy. Thompson told *Cargo Security International*: 'We believe technology adoption will begin at terminals with US-bound shipping and then gradually expand to European Union (EU) terminals scanning containers from the Middle East and Asia, with final broader adoption as a global standard.'

The 2012 deadline looms large over the SBRVS business plan, but CPS believes that its product is not a one-trick pony. Isotope identification, according to Thompson, is not restricted to locating radioactive materials. 'We will go beyond looking for cesium, barium and the other bad guys. We can also use this technology to identify a range of substances. We could, for example, use the SBRVS to compare the contents of the container against the cargo manifest.'

So, the SBRVS could help to combat both fraud and smuggling, as well as providing another line of defence against terrorism. These additional applications may not be ready for some time yet, but Thompson believes it is important that CPS explores new possibilities. 'We are port people, our customers are port people,' he explained. 'If I can help customers save millions of dollars from fraud, it is worth pursuing.'

This final point is certainly an interesting one. No one can deny that cargo scanning will bring increased costs to the transport industry. But industry players will be more willing to absorb these costs if they feel that *they* themselves are receiving some commercial benefit from the technology, and they are not just being used as unpaid soldiers in the 'War on Terror'.