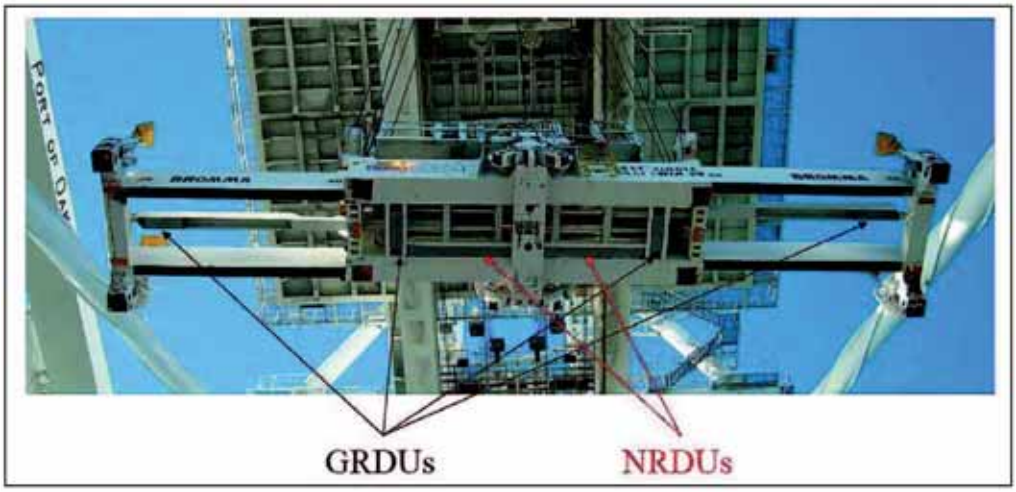
Container scanning from a crane

US company Veritainer has developed a system which can scan box containers while they are being moved on a crane, so there are no disruptions or delays.
We interviewed CEO John Alioto

US COMPANY VERITAINER has developed a container scanning system which it believes may provide commercial as well as security benefits to the shipping industry.
The company is currently working with the US National Nuclear Security Administration (NNSA) Megaports programme, and with local governments to select equipment and install it in Ports of Origin for ships heading for America.
"The vast majority of shipping containers move in and out of the nations of the world without any inspection of any kind," said John Alioto, CEO of the VeriTainer Corporation. "It is a major vulnerability to nuclear terrorism."
"But the port state authorities told the NNSA that they don't want to have drive through scanning, they wanted to have a crane-mounted system."
Having a crane mounted system can help to eliminate the need for extra time for security inspections, and, as the saying goes, time is most definitely money in the shipping business "There is a tension between security, on the one hand, and economic efficiency, on the other," said Mr Alioto. "Greater security means less economic efficiency. Additional security threatens just-in-time manufacturing. We're trying to change that so that full inspections can be carried out, but not a second is lost."
VeriTainer has developed a crane mounted scanning system that it calls the VeriSpreader (see photo).
The equipment is then able to scan containers as they are loaded or unloaded from the vessel, meaning that no extra time or movement is required for the security inspection process.
"By using a combination of nuclear detection techniques with sophisticated software, we think that adequate security can be achieved without sacrificing global economic efficiency," said Mr Alioto.
The system consists of a GRDU (gamma ray detection unit) and an NRDU (neutron ray detection unit), mounted on a container loading crane (see diagram).



The crane is fitted with gamma ray detection units (GRDUs) and neutron ray detector units (NRDUs) which scan the container while it is being moved

The gamma ray system uses a sodium iodide probe. The probe has the sodium iodide crystal at the front of the device, which is extremely sensitive to gamma rays. When such rays are encountered a photon flash is created and then counted.
"There are 3 data points: the gamma count, the gamma energy, and the neutron count," said Mr Alioto. "The gamma count and the gamma energy are recorded by the probe, as the gamma rays maintain energy, which is integrated with a multi-channel analyser and a digital pulse processor."
The NRDU is filled with He-3 gas. Neutrons hit the gas, and the wire in the middle senses this and counts them (but not the energy level, as with the gamma detector).
This piece of equipment is one metre long and 50mm wide.
"It has a helium tube surrounded by hydrogen," Mr Alioto told us.
"The neutrons need to be slowed down to be counted – a high level of hydrogen can slow it down." Polyethylene is used as part of this process. The equipment is also surrounded by polyurethane plastic, as a shock absorber.
"It's a lot like an ABS braking system," he said. "It will give a bit, hold, give a bit, hold. There is some wiggle room. Shock absorbers could suck up 60 per cent of the vibration."

Testing programme

The NRDU technology was developed as part of a testing programme which the company named the Oakland Pilot Project 1 (OPP1), in the summer of 2005.

Scanning the container while it is being moved on a crane

"The VeriSpreader was completed at the end of this project," said Mr Alioto. "It proved that we could put this technology in a marine environment. It's robust enough, it's sensitive enough, and it's cost effective."

"There are about 2,500 container cranes in the world. The cranes in Europe do about 70,000 to 75,000 lifts per annum, and about 100,000 to 125,000 lifts in Asia. At $20 per box it's a good bit of economic business. The US government is doing scanning and charging significantly more."

The company has now moved on to a second Oakland Pilot Project, and has developed the technology further, utilising other innovations in digital electronics.

"The OPP2 equipment is smaller, about 2 inches long, with better electronics," Mr Alioto told us. "It's also much lighter. It's important for us that the digital industry is working towards us."

"We've done 6,529 lifts, and had zero breakdowns. One time a screw came loose and shorted the electrics, but the shock absorber has been a complete success, it's completely robust." "The Oakland Pilot Project proved that you can do Spreader Bar Scanning (SBS)," he continued. "SBS is right in the workflow, so nobody lost one second of time going through the screening process."

The company even found that the equipment was able to detect traces of dangerous materials without it having to be directly beneath the scanning equipment.

"The VeriSpreader can actually measure radiation in the terminal itself," said Mr Alioto. "When you see the neutron count going up, you know you have some bad stuff in the terminal. All of the bad stuff, dirty bomb capable stuff or an atomic bomb, will emit neutrons."

"In September of 2005 the (US) Department of Energy was shipping yellowcake (UF6) through the port, and we could check the reading on it just from it being in the terminal."

Data analysis

Once the data is collected it can be automatically fed into the security system and analysed to detect possible threats.

"The data is fed up a fibre optic line to the machinery room at the top of the crane, where it's connected to a WiFi PC," said Mr Alioto.

"The PC communicates with the terminal operations system, and communicates with the Navis system."

"The data is accessible from afar, and is analysed as it comes off. This was part of OPP2. With the original OPP (Oakland Pilot Project) we just had data spilling out on the floor. We're now connecting the software, looking at data collection, transmission and analysis. OPP2 has more sensors, which has given us a better quality of data, so more can be detected."

The analysis software does isotope identifying, using the energy of the item in question. Once the company knows the signature of a particular substance or material the technology can identify what it is without the container having to be opened.

This would apply to legitimate materials as well as dangerous ones. While the security benefits of this are obvious, it would also allow people to check that what is in the containers is as was claimed on the bill of lading. Commercially this would mean that cheating on freight rates could become impossible.

"With each lift you take a picture (reading) and add the data to the database," said Mr Alioto. "Starting with the weapons detection, that will allow for the population of the database with other normal stuff."

"We're working on a type of manifest fingerprint databases, for manifest comparisons.

There are 4 different types of databases that need to be populated, from dangerous weapons-type materials right down to regular cargo."

"If they say it's bamboo, and it looks like bamboo, we'll give a certificate to confirm it," Mr Alioto continued. "It might also be a legitimate cargo, but have a different measure to what it's supposed to, and some people do cheat on what they carry, as freight rates are done by type of cargo. Cheating on freight rates, we'll be able to stop that." "The software for isotope identification will be ready this year, and shielding determination software will be ready next year."

Source: Digital Ship October 2006

R&D bij Rolls Royce

Rolls Royce legt zich vooral toe op het onderzoek van de verbranding in de vliegtuig-motor en de vorm van de turbine schoepen. De studie-projecten voor de verbranding hebben twee doelstellingen: minder verbruik en minder uitstoot van schadelijke gassen zoals CO2 of NOx. Het onderzoek gaat dan over verschillende brandstof-mengsels en experimenten met het aantal brandstofinjectoren.

De turbinebladen blijken een onuitputtelijke bron van onderzoek te zijn. In zijn streven naar een kleiner gewicht van de motoren heeft Rolls Royce al verschillende oplossingen gevonden. Het komt er op neer dat de schoepen in principe volledig hol zijn, op enkele verstevigingen na. Eerst bestond die versterking uit een honingraatstructuur, maar nu werkt men ook al met verschillende materialen en een versterking die eerder lijkt op het binnenste van golfkarton.

De turbines blijken ook de sleutel te zijn voor stillere motoren en Rolls Royce werkt aan mogelijkheden voor bijkomende akoestische isolatie van de motoren.

Hoe het bedrijf de temperatuur beheert in de turbines?

Dat blijkt supergeheim te zijn. Het hoofd van de afdeling wil enkel kwijt dat het brandende gas in de turbine ongeveer 500 graden warmer is dan de smelttemperatuur van het metaal van de schoepen. Die worden daarom luchtgekoeld met een ingenieus systeem van interne luchtkanalen.

De vorm van de turbinebladen zorgt voor minder lawaai en beter aërodynamica.

Source: INDUSTRIE TECHNISCH MANAGEMENT februari 2006