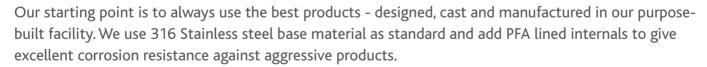




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Van den Bosch has unveiled a new growth strategy with 'The Supply Changer in Bulk', through which the logistics service provider wants to ensure sustainable change in the sector. According to Van den Bosch, data analysis, digitisation, innovations and a more wide-ranging approach to the supply chain all contribute to a smarter kind of bulk logistics.

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### Front Cover Interview

TCS Natal shares with Tankcontainer Magazine its journey from start-up to its position as the leading South African tank container depot and cleaning station



### **OPERATOR**

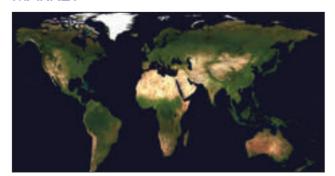
HOYER has initiated innovative research into the temperature behaviour of liquid cargoes in tank containers

### **REGIONAL**



ICA Bulk Logistics MD Renée Smith has her sights firmly set on expanding the firm's footprint in Africa

### **MARKET**



Independent market expert Leslie McCune believes the low point has passed, with a strong recovery to come

### **SERVICES**



Cleaning stations are part of the essential infrastructure needed to service the global tank container fleet 27



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### Past the low point

Oscar Wilde, the Irish poet, said that the optimist sees the doughnut while the pessimist sees the hole in the middle. In today's tank container market, the hole seems to be Europe, the Middle East and India while the doughnut is China. (US tank container demand remains fairly robust, with the product portfolio moving away from fracking chemicals towards sanitising products such as ethanol and IPA.) Overall, from a global perspective, the industry is weathering the coronavirus pandemic relatively well.

Negative sentiment is driven by the fall off in economic activity in some regions from pre-COVID levels; general economic uncertainty; the dramatic increase in ocean freight rates caused by the restricted availability of ocean carrier space on some trade lanes; and weakening utilisation rates for both operators and lessors.

The positives at the macro level include booming demand for tank containers for domestic and export trade in China, the world's major economic growth engine at the moment; the deployment of huge economic stimulus programmes in many regions; rock bottom finance rates; signs of returning strength in Europe (despite a second wave of coronavirus) and an accelerating strategic commitment to intermodal transport in general and tank containers in particular.

At our micro level, the tank container sector has adapted well to the challenges of 2020 and its attractive medium-to-long term secular trends have, if anything, been reinforced.

The industry is well-regulated; has an excellent safety record; returns are reasonably stable across cycles and its yields relatively high compared to many other asset classes; specialty chemical demand in China - the world's largest specialty chemical market - is growing at a rate above the country's GDP; supply chain disruptions have highlighted the value of using tank containers for temporary liquid storage and have generated substantial demurrage revenues; food grade movements have been very resilient; global chemical production is expected to return to pre-COVID levels by the end of 2021; new pockets of hygiene-based demand have sprung up to partially off-set the downturn in conventional shipments; the corporate scrutiny of cash flow has intensified, often mandating the movement of smaller bulk lot sizes more often (benefiting tank containers); bad debt in the industry is negligible; the risk of credit defaults by

customers is low (with the highest risk being inexperienced, small-scale operators using leased-in equipment); the risk of technical obsolescence is low; today's dramatically higher ocean freight rates will eventually be recovered from customers; utilisation weakness in the deep sea tank container fleet is being helped by blank sailings, restricted ocean carrier space, delayed berthing and customs clearances, port restrictions, and a slower return of equipment; bulk liquid terminals in several locations are full, leaving tank containers as the only alternative for temporary bulk liquid storage; lease rates are stable (albeit low) and off-hires have been less than expected; some European tank container operators have resumed reordering newbuilds, as have lessors such as CS Leasing; and weaker tank container players will fail.

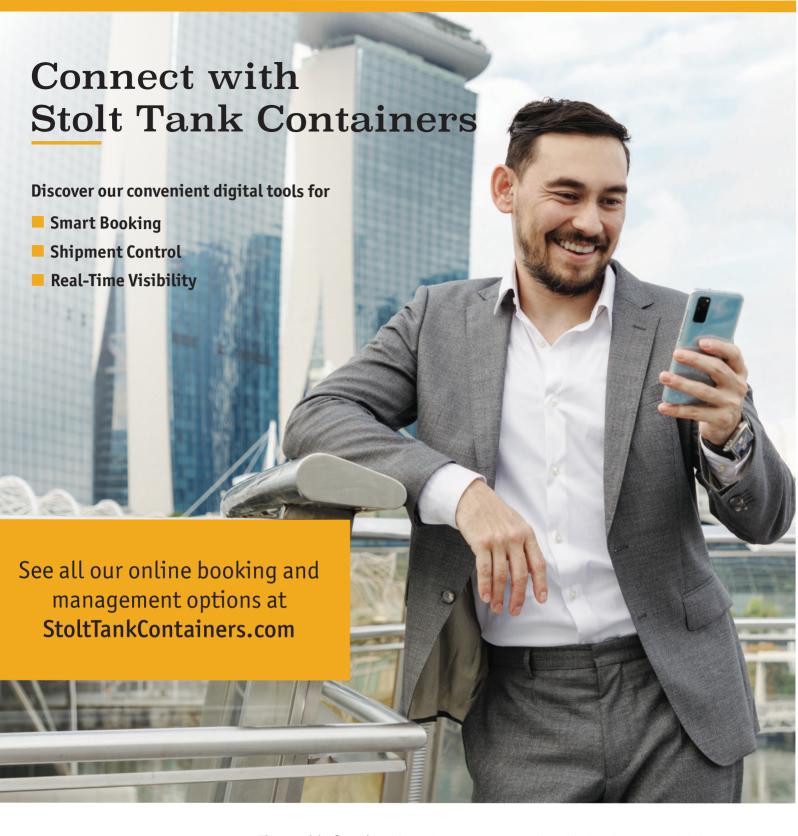
Changing customer preferences, and new working practices resulting from coronavirus, have highlighted the impressive digital capabilities of some companies but exposed the fundamental weakness of others.

These market characteristics and competitive undercurrents are explored in greater detail on Page 22. Elsewhere, we consider the numerous difficulties posed when cleaning tank containers and, in the next issue, we analyse the 65 million tonnes of chemicals that are moved in tank containers each year, segmenting the volumes into inter-regional trade lanes and product categories.

The tank container sector reached its peak in terms of financial returns in 2018 but was downgraded in 2019, before any awareness of COVID-19, because of expected market weakness (See 'Goldilocks has left the room', *Tankcontainer Magazine* Vol 6, Issue 3, December 2019). This weakness has come to pass and has, of course, been magnified by the coronavirus crisis.

However - unlikely as it may seem to many - a personal belief is that the tank container sector has just passed its low point and is set for a strong recovery. Despite the economic damage wreaked by the global coronavirus pandemic, the positive long term outlook for the tank container business has not changed and, as investment guru Warren Buffet - the owner of top tank container lessor Exsif Worldwide - said, investors should think long term.

Leslie McCune, Editor



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### Van den Bosch aims for more impact via smart bulk logistics

Van den Bosch has unveiled a new growth strategy with 'The Supply Changer in Bulk', through which the logistics service provider wants to ensure sustainable change in the sector.

According to Van den Bosch, data analysis, digitisation, innovations and a more wideranging approach to the supply chain all contribute to smarter kind of bulk logistics. An extensive intermodal network remains essential in this respect. In fact, the logistics service provider wants to expand its network even more in the coming years by investing in smart equipment, an ambitious sustainability approach and a knowledge lab for open innovation.

Van den Bosch combines logistics knowledge and experience with the possibilities that data, technology and automation offer. The insights obtained in this way provide Van den Bosch with much more control over the logistics chain.

That means higher delivery reliability, more transparency in the supply chain, fewer empty kilometres and a lower CO2 footprint for its clients.

So, for example, customers can receive integrated CO2 advice based on an emissions calculator. New insights like these also offer far-reaching possibilities for developing new concepts and evaluating scenarios for optimising supply chains.

The change that Van den Bosch wants to realise in the bulk sector goes hand in hand with a repositioning of the brand. Van den Bosch is introducing a new communication style, removing the word 'Transport' from the company name and marking the next step in



its evolution with the new promise: 'The Supply Changer in Bulk'.

### Changing market demand

Van den Bosch CEO Rico Daandels explains: "Market demand is changing and we are responding to that. We want to further strengthen our leading position in order to make smart bulk logistics and more efficient supply chains a reality together with customers. Intermodal transport is of course an essential part of this, but fundamentally it's about accumulating fewer kilometres. Bulk logistics is about more than just quantity. Quality through insights, knowledge and data is essential to perform as optimally and sustainably as possible."

In line with its digital revolution, Van den Bosch is also a forerunner in the field of Smart Load Units: smart tank and silo containers that are not only tracked in real time, but which provide clear temperature, weight, seal status and cleaning quality indicators using smart sensors. Combining all the data available along with specific customer requirements using advanced planning software, the most appropriate equipment and optimal intermodal route can be selected. Based on this, the customer then receives comprehensive information enabling them to make a wellconsidered choice balancing the impacts on costs, time, CO2 emissions and performance.

Van den Bosch wants to be the industry leader in sustainability by 2025. The sustainable transition has been set in motion over the past decades. Eighty percent of transport is now carried out intermodally. What's more, payloads have increased which means that the number of transport movements has decreased. This results in significant CO2 savings. Van den Bosch's ambition is to further reduce emissions for both customers and within its own organisation. Consequently, all locations will be completely climate neutral by 2025.

Van den Bosch has built up a reliable and proven network in Europe, the Middle East and Africa. In addition to the traditional aspects of the network, Van den Bosch wants to further develop through innovative, sustainable and future-oriented networks and partnerships. In light of this, its knowledge lab will become available from 2021, where students, researchers, knowledge institutions, customers, partners and its own organisation will come together. This hotbed for open innovation aims to boost meaningful change within the supply chain of bulk.



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### Kerry-ITS in merger deal with service provider Cotac Group

Kerry-ITS has entered into a merger agreement with the Cotac Group.

COTAC stands for Complete Tank Care and is a leading service provider in the tank container industry with a strong global network and own facilities in Europe, North America and China.

The company told customers: "For the past 30 years, our corporate mission has always been to become the leading depot service provider in Asia. By joining forces with the Cotac Group, we can further expand our horizons and pursue a global vision with a strong focus on Asia.

"Leveraging Cotac's depotexpertise we will further strengthen our position in the



Asian market. We will be able to provide you with the outstanding customer service you are used to, the latest technology available in depot related activities, larger capacities and a global network at our hands that will even better fulfil your needs.

"The new Kerry-ITS will be Cotac ITS (Asia) Pte Ltd.

"As with all important business decisions, we work closely together with our customers, partners and employees to make the integration process as smooth as possible. You can be assured

that we will continue to uphold the level of quality and service you are used to during this transition period.

"In addition, we would like to inform you that Kerry-ITS Shanghai Tank Depot ceased its operations since 1st April 2020.

"We would also like to take this opportunity to inform you that Mr William Loh, will be stepping down from the daily operation and will stay on in an advisory role for the next 4 years.

"We are also pleased to announce that Mr Sebastian Loh will be taking over the position as Managing Director of Cotac ITS (Asia) Pte. Ltd, supported by Cotac's Global Managing Director, situated in Germany.

### New GPCA initiative for members in Arabian Gulf

The Gulf Petrochemicals and Chemicals Association (GPCA), has adopted a new initiative for members on the occasion of World Cleanup Day 2020, aimed at improving sustainability and best environmental practices at plastic manufacturing and logistics operations in the GCC.

Practised in over 60 countries and thousands of plants around the world, Operation Clean Sweep (OCS) arrives in the region to enable good housekeeping and pellet containment practices at plastic resin handling operations.

The global initiative is aimed at ultimately achieving zero pellet, flake, and powder loss and contributing to global efforts by plastic producers today to protect the environment and minimize their environmental footprint.

The initiative is of great significance for the region, as Arabian Gulf plastic producers manufacture 32.3m tonnes of polymers annually. Pellet, flake, and powder loss is a growing problem, which can have an economic and business cost in \$U1.5bn every year, excluding environmental and reputational damage among local communities.

OCS is a product stewardship program of the American Chemistry Council's Plastics Division and Plastics Industry Association in the US. It is aligned with GPCA's commitment to the Declaration of the Global Plastics Associations for Solutions on Marine Litter, specifically focusing on area #6 – "to address marine litter at the source through plastic pellet containment".

Dr. Abdulwahab Al-Sadoun.

Secretary General, GPCA, said: "GPCA is steadfast in its resolve to champion this important initiative in the Arabian Gulf and empower both our member companies and their employees to drive change from the ground up. As demonstrated in our recent Responsible Care Performance Metrics report, the regional chemical industry is in the leadership position in environment, health, safety, and security performance, and its commitment to sustainability will only be strengthened by Operation Clean Sweep.

"When compared to alternative materials, plastics reduce environmental costs nearly four times, and adopting more robust pellet containment will help improve the industry's sustainability impact further."

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## KEEP TRACK OF Y@UR ASSETS

A STRATEGIC TREND-SETTING PARTNERSHIP



### IMT wins Telematik Award 2020 with its solar-powered CLT20-Ex

The strength of the solar-powered Communication and Location Terminal CLT20-Ex, the latest innovation from Intermodal Telematics BV (IMT), has been internationally recognized with the Telematik Award 2020.

In the jubilee year of the Telematik Award, IMT received this international prize during a digital ceremony.

'IMT won in the category "Container Logistics". The Telematik Award is presented every two years to telematics companies and honours outstanding development achievements and solutions in the field of telematics.

The organizer, Mediengruppe Telematik-Markt.de, aims to present the telematics industry in a more transparent and understandable way for the user and to showcase future trends using best practice examples by honouring the top providers in their sector. , said:

Dethmer Drenth, MD IMT: "It is great that what our dedicated team of hardware and software engineers jointly achieved in creating the CLT20-Ex has now been recognized with this award. It gives us an extra incentive to continue developing fully-fledged telematics solutions that offer added value for our customers in the tank container and rail wagon market."

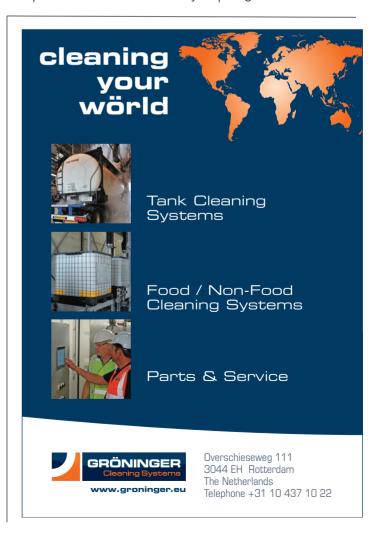
The quality of the internationally renowned Telematics Award is guaranteed by the expertise of the organizer and its partners as well as the expertise of the prominent expert jury. The winners of the Telematics Awards are decided by an independent, highly competent specialist jury with eminent members from business, science, specialist journalists, users and experts.

Mr Drenth added: "We hear from our customers that they really appreciate the CLT20-Ex because of the unlimited data transfer that this device offers thanks to solar energy. Also, the very accurate information that the CLT20-Ex provides about their tank containers or rail wagons and the cargo itself is helping our customers to optimize their fleet management, increase safety and monitor minutely the quality of the cargo.

"More and more companies need continuous and accurate monitoring of their fleet. The CLT20-Ex, which offers a near real-time and worldwide overview of the fleet and its cargo, perfectly meets these needs.



"The fact that the possibilities and functionalities of our latest innovation have now been recognized by an independent jury of experts is therefore of great importance and above all very inspiring to us."





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### 'Crowning glory' for Den Hartogh

His Majesty King Willem-Alexander of the Netherlands has granted Den Hartogh Logistics the 'Royal' predicate.

This honourable designation is the reward for Den Hartogh's work as a leading logistics service provider for the chemical, gas, polymer and food industry and marks our 100th Anniversary.

Group Managing Director Pieter den Hartogh said: "On behalf of all Den Hartogh employees I can say we are extremely proud to now use the designation 'Royal'. It is both literally and figuratively the crowning glory for the work of our employees all around the world after 100 years.

"People were then and still are the backbone of our company. We have been able to evolve the past century because of our culture of entrepreneurship, facing the future and adapting ourselves accordingly. And because of our constant focus on improvement and solving challenges by coming up with answers and new logistics solutions."

The royal family in the Netherlands has always been close to the development of the country and in particular of the economic development. For that reason the Dutch king rewards companies that are a 100 years of



age or more with a special predicate giving the company the possibility to title themselves as 'Royal'.

This predicate is not being awarded in all cases; only 45% of the companies get it since the reputation of the company and its management and shareholders

must be impeccable.

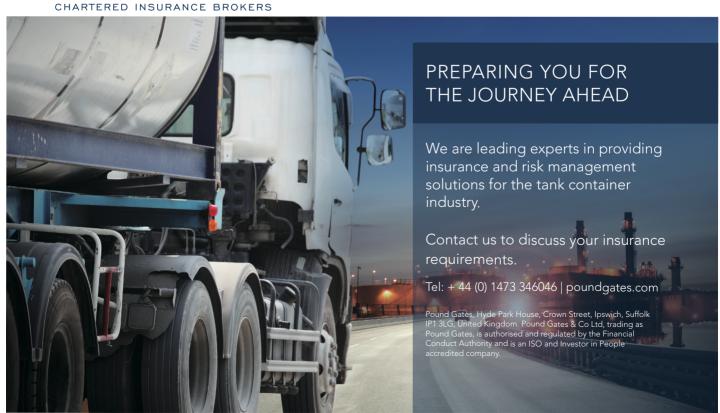
The predicate 'Royal' was introduced in the year 1807 by the first king of the Netherlands, Louis Napoleon Bonaparte.

The king can award any company, association or institution the right to use 'Royal' in their name.





### POUND GATES



### Albatross expands fleet and opens representative office in Gujarat

Availability of equipment is essential to respond to customer requests flexibly.

For this reason, Albatross Tank Leasing is constantly expanding the leasing fleet. Even short-term and more specific customer enquiries can be served by us at any time.

As the newest addition to the fleet, our 26cbm Iso tanks have arrived. With the  $2 \times 3$ ",  $1 \times 2$ " and the  $1 \times 1,5$ " connections in the rear compartment, we offer our customer a tank which is suitable for all kinds of applications. The safety of the tank is playing an increasingly important role in the use of equipment.

To meet this challenge, our containers are equipped with a full walkway and a collapsible handrail (optionally on both sides).

Both long-term and short-term rental periods can be offered and make no difference to our service promise to the customer.

With our know-how and our full service fleet management, we not only act as a leasing company, but as a partner who will support you in your projects.



Our local teams in Germany, Russia, China and India/Middle East are grateful to provide further information.

Meanwhile, Albatross Tank-Leasing has set up a representative office in Gujarat, India to cover south Asia and the Middle East, regions that Albatross believes will offer long-term opportunities for special tanks, including T50 gas tank containers.

Albatross can offer tank containers ex depot in India on short notice, with sufficient flexibility to help its customers handle rapidly changing market conditions. The company is developing a domestic leasing platform, due online in second quarter 2021.

"Our local presence is giving customer full access to our service structure and will ensure timeliness response to any technical, commercial or operational inquiries," the company says.

"Apart from leasing of the tank containers, customer can chose between a variety of service elements which can be added to provide technical and operational support if and when required to ensure an efficient and cost effective fleet management."

### OPW acquires liquid tank container line from Girard

OPW, a Dover company and a global leader in fluid-handling solutions, has acquired the ISO Liquid Tank Container product line from Girard Equipment, Inc., of Vero Beach, FL.

Going forward, OPW will manufacture the ISO Liquid Tank Container product line at OPW's facility in Lianyungang City, Jiangsu Province, China, with emphasis on increasing OPW's presence and product portfolio in the Asia-Pacific, Latin American and Europe.

"We have great respect for the Girard brand and believe that it represents a great opportunity for us to grow our presence in the ISO market," said Azam Owaisi, VP & GM of OPW Fluid Transfer Solutions.

"This new product range also fits seamlessly into our ongoing efforts to improve the range of products we can offer our customers."

Specifically, the new product family will include manlids, pressure/vacuum relief vents, airline ball valves, composite footvalves and top discharge butterfly valves.

# South Africa's premier depot

TCS Natal shares with Tankcontainer Magazine its journey from start-up to its position as the leading South African tank container depot and cleaning station

**TCM:** What is Tanker Cleaning Services (TCS) Natal's background and ownership?

TCS: TCS Natal started in 1998 with a single owner, Henk Grove, and five employees. He had two young sons and wanted to provide an opportunity for them in the future. TCS began with road tankers and started storing and washing a small number of tank containers in 2003. By 2012, we were servicing 450 tank containers a month.

In 2015 Henk's two sons, Franscious and Nickolaai, decided it was time to expand what their father had bestowed upon them and grew TCS Natal's servicing to over 1,000 tank containers a month.

**TCM:** What are TCS's service capabilities?

TCS: We wash chemical and food grade tank containers, undertake cosmetic and major refurbishments, import and export tank preps, wash road tankers and undertake pitting repairs and mandatory 2½-year and 5-year periodic testing. Our work includes repairs to cladding, walkways, frames, barrels, work on bursting disks and dipstick fitments.



TCM: Can you provide a full M&R (Maintenance & Repair) off-hire service for leased tank containers? TCS: A full leased service includes washing, a minimum 1 bar pressure test, and seal and gasket replacement. Once completed, a full off-hire inspection report is needed to record if the last cargo caused stains, pitting or scorching. The exterior is then inspected and compared with

the on-hire condition.

TCM: Who are your typical tank container customers?
TCS: TCS services the major chemical and food grade tank container operators and lessors, including Hoyer, Stolt, Bertschi, Suttons, Bulktainer, Daelim, Van den Bosch, Bulkhaul, Seaco, Eurotainer, Eagletainer, Braid, ICA, M&S Logistics, E-way, Multistar,

Almar, PalTank and ATI Freight.

TCM: Are you a formally registered and approved logistics provider for any companies? TCS: TCS has been the only approved Sasol, BASF and ISOGENE facility for over a decade and is now NCP's preferred food grade depot, for whom we dispatched 887 tank containers in 2019. NCP's approval was a huge success as it has the most stringent loading site conditions. We are also an approved provider for Illovo, Royal Swazi and USA Distillers.

**TCM:** Which chemicals do you clean most often?

TCS: We accommodate a large variety of products, from Acronal acrylic resins, nitric acids, acrylic acids, glacial acrylic acid and dimethylacetamide, to heavy sludge and food grades. This year, there has been a large increase in hydrocarbon solvents and synthetic lube oils from Asia, and a wide variety of wax grades from Europe. The most surprising trend has been the exponential growth of tank containers carrying ethanol in Africa, not doubt related to COVID-19,

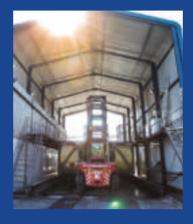
**TCM:** What are the most difficult products to clean?

**TCS:** The worst are BASF's Acronal acrylic resin binders, which are water-based acrylic and styreneacrylic emulsion polymers used in the construction and coatings industries. Dow's epoxy resins are also difficult to wash.

TCM: Can you clean products like isocyanates, chlorides and latex?
TCS: Yes. We are very fortunate to have worked closely with a chemical engineer for over 15 years. He adapts and manufactures the detergents needed to break down the multiple viscosities of the cargoes we receive.

Our cleaning process includes the

### TCS: the history



TCS is a family owned business - Nickolaai Grove, the eldest brother, is an experienced tank container M&R expert and his experience began in the UK's tank container depots. Franscious Grove oversees the wash cleaning division. His expertise is in Dangerous Goods and the chemical industry for both road tankers and tank containers. Courtney Grove, the Chief Operating Officer, co-ordinates the finances, the day-to-day operations and the personnel.

use of ultra-high pressure 500 bar equipment.

**TCM:** What does your range of repair services include?

TCS: They include seal and gasket replacements, and we have a dedicated refurbishment team focused on major repairs and tank container appearance - appearance promotes brand image and ensures customers' tank containers are distinctive.

**TCM:** How many tank container cleaning depots are there in South Africa?

**TCS:** TCS was the first privatelyowned tank container depot in South Africa but the market has become saturated with at least four other smaller depots now operating. We continue to service the lion's share of South Africa's container market.

**TCM:** What distinguishes one depot from another?

TCS: Quality and commitment. We turnaround tank containers within 5 days and have a young, dynamic team - the company is operated by three 30-year-old owners and the team is made up of five managers, all of whom are aged under 30. We are very proud to run a successful depot with a turnover of \$3 million, servicing 1,000 tank containers a month with 55 dedicated players on the team.

**TCM:** What are the general trends in the South African tank cleaning market?

TCS: In 2003, the tank container industry in South Africa was dominated by three operators, with smaller numbers of 100-200 units. Since 2015, the market has grown to include multiple tank operators bringing their tank containers into South Africa for export trade.

For many years, there was a misconception that South Africa was a troublesome area for tank container operators as imported laden tank containers had to be repositioned empty clean due to the lack of back haul opportunities. Since 2018, the tide has changed and now very few tanks leave our depots without an export cargo.

There is currently a shortage of tank containers to meet export demand so there is pressure to have tank containers washed and made available as soon as possible.

Despite the pandemic, tank container imports into South Africa increased. We received over 5,800 tank containers for washing this year, up 31% year on year.

**TCM:** Is the proximity of Welfit

### Cover Interview

Oddy in Port Elizabeth an advantage?

**TCS:** Not really. Welfit Oddy manufactured 9% of the world's tank containers in 2019 but supplies newbuild units which require no work from depot facilities. Instead, we focus on the tank containers being imported into South Africa.

Welfit Oddy, as a spares supplier, is not feasible either as the turnaround times are too slow for our quick pace. We prefer to stock large quantities of parts from Perolo, Pelican and Fort Vale.

**TCM:** What are the typical costs for the 2½ and 5-year periodic inspections and tests? **TCS:** We charge approximately \$62 for a 2½-year periodic test

\$62 for a 2½-year periodic test and \$94 for a 5-year periodic test, excluding BV/DNV certification.

**TCM:** Tank containers are increasingly fitted with externally attached telemetry control boxes. Do these make cleaning more difficult?

TCS: We work around them but, unfortunately, they require special attention which can slow down the cleaning time. Tracking telemetry units are becoming common fitting on tank containers, most notable on Hoyer and M&S Logistics equipment. Some are discreetly within the cladding.

**TCM:** Is there a personal development programme for TCS employees?

TCS: Most definitely. The core of our company is our personnel and developing our human assets has kept TCS operating for 22 years.

TCM: Now that there are global members, would EFTCO (European Federation of Tank Cleaning Organisations) membership be appropriate for South African tank container cleaning companies?
TCS: Absolutely. TCS is currently



being assessed, although the process has been delayed by the coronavirus situation. Being a global member of EFTCO will underwrite our service quality and keep us aligned to the development of universal benchmarks in the industry.

TCM: In these troubled times, TCS's 'Jerusalema challenge' music/dance video clip on YouTube (https://www.youtube.com/watch?v=UqpD3OMr-mA&feature=emb\_title) is an inspiration and a 'must-see' for everyone. How did it come about? TCS: During lockdown, TCS was blessed to remain open but working under difficult constraints put a lot of pressure on our teams. What better way to welcome the return of the teams than working

together as a single unit to celebrate our industry. Being a niche market, we wanted to educate fellow South Africans about our industry and the video is a celebration of our working environment.

TCM: What are TCS's future plans? TCS: We will remain focused on providing superior quality and client satisfaction. TCS hopes to align with other industry parties and build South Africa's tank container import/export industry. We hope to build our brand and expand to further depots around the country.

We also hope to increase our 'Go Green' initiative and develop our awareness for safe cargo disposal, water waste conversion and recycling.

### Taking the temperature

Tankcontainer Magazine reports on an innovative programme of research into the temperature behaviour of liquid cargoes in tank containers, initiated by HOYER

The incidences of catastrophic rupture and explosion are mercifully few in the half-century history of the tank container industry. This generally excellent record is a key driver behind the continued adoption of tank containers as a safe, reliable, convenient and flexible means of moving often hazardous liquid chemicals around the globe.

The behaviour of the liquids carried by tank containers is obviously an integral part of the overall safety characteristic of any laden tank container. Research into the in-situ fluid dynamics of cargoes within tank containers has led to a greater understanding of, for instance, cargo surge. This has resulted in better insights into baffle design and loading limits, leading to uprated guidance for those involved in the transportation of tank containers.

How liquid cargoes react under different temperature regimes is another essential area to understand for tank container players, and an intimate knowledge of this becomes critically important when handling hazardous liquids.

Safety Data Sheets (or Material Safety Data Sheets) map out the mandatory, or advised, requirements for the movement of a particular product but some chemicals are more temperature sensitive than others - isocyanates, for example, are one of the most common chemicals moved in tank containers but have very specific temperature-related requirements. Guidance from ISOPA, the

isocyanates producers' association, advises that TDI and MDI isocyanates are shipped in insulated tanks and that loading takes place between 25°C and 45°C. It points out that, despite these precautions, there may be substantial heat loss before the tank container reaches its final destination and that, if the temperature is less than 17 °C for TDI (or less than 15°C for MDI), the tank container should be heated before unloading. The product should be heated to 25-45 °C until all frozen product has thawed. It also advises that the temperature should never be allowed to exceed 45°C as dimerisation may take place, potentially leading to off-spec product.

### Severe consequences

High temperatures can, however, lead to far more severe consequences than off-spec product. Divinylbenzene, for example, is a reactive monomer that polymerises at elevated temperatures. In a closed container, this can (and has) lead to violent rupture. In another example, styrene - a highly flammable, toxic, reactive liquid is stable at ambient temperature but at higher temperatures, or when in contact with peroxides, an exothermic polymerisation process may be initiated.

At temperatures above 65°C, this may cause 'runaway' polymerisation, potentially leading to the over-pressurisation and ultimate rupture of storage tanks.

Temperature, then, is a crucial safety factor. Understanding the temperature behaviour of dangerous liquids when being carried in tank containers is therefore a key to building even higher levels of safety and we report below on a concerted programme of research being initiated by one of the most widely-respected tank container operators, HOYER.

HOYER is one of the leading specialist chemical logistics experts and is intensely focused on hazard prevention when transporting highly-sensitive dangerous goods. Allowing the temperature of many of these products to fall below, or exceed, certain parameters can lead to significant risks and hazardous situations for both people and the local environment.

In a two-stage project, its team of engineers and chemists is researching the temperature distribution in tank containers, and the reaction process of highlysensitive chemical products. The initial results from the first stage - examining the temperature behaviour of products in a tank container during the complete use cycle - are now available.

### Deviations can pose risk

There are a few dangerous substances that have very specific handling requirements and transporting these products can present special challenges. Tank containers and their cargoes are inevitably exposed to a variety of external influences. If not carefully

controlled, temperature deviations may initiate vigorous reactions that not only harm the product's quality but also pose a risk to people and the environment. This can happen when the temperature of a product exceeds the temperature range within which it is chemically stable. Polymerisation may result, which can involve a powerfully exothermic reaction.

The use of tank containers with heating and cooling systems is one method of maintaining a constant product temperature. An even higher level of safety is achieved by using modern telematics. Telematics use sensors that are mounted directly onto the heating and cooling system of tank containers. These sensors, together with temperature probes inside the tank and on the tank wall, record and process various influences affecting the product and its temperature progression. A temperature controller regulates the heating and cooling actively and intervenes if there are any changes. The proper functioning of the heating and cooling systems, and of the sensors, is also continuously monitored.

### **Temperature loss**

In a multi-step analysis, HOYER is now working towards achieving a hitherto unprecedented level of safety for polymerizable products by developing a profound understanding of the product's temperature-related behaviour.

Comprehensive analyses of the temperature behaviour of liquid cargoes in stationary, loaded tank containers were carried out in collaboration with a well-known, independent inspection and certification company. This was supplemented by another study on the behaviour of the product temperature during transport. The tank container wall and tank interior were equipped with numerous digital thermometers to carry out measurements in parallel

and the size of the temperature deviations within the tank container were observed, together with the thermal fields that were formed during the heating and cooling phases.

The product temperature presented a homogeneous distribution during the heating phase but rather large deviations were apparent in the cooling phase, with the bottom area in particular showing a big temperature loss. The product cooled on the tank container's stainless steel walls, while the heat rose upwards.

In addition to the stationary tests, during which more than 150,000 sets of data were evaluated, HOYER analysed the product's behavioural dynamics during transport in tank container types of different sizes, fitted with various attachments, over a 12month period. The tank containers were equipped with additional temperature sensors analogous to the static test series. Route layouts along several climatic zones were taken into account using a variety of means of transport and with loads consisting of different products. Various dynamics were apparent, depending on the product's viscosity, thermal conductivity and specific heat capacity. However, a critical common denominator was the temperature loss in the tank container's bottom region, irrespective of the tank container type or nature of the product.

### Heat loss can be counteracted

The base cools down relatively quickly due to the heat rising in the product, the output of heat on the stainless steel, and the lack of temperature flow and/or turbulence in the tank container. The tank container's bottom region is therefore the critical factor in relation to heat loss but various means can be used to counteract the heat loss.

Preheating, for example, can

reduce the risk when handling temperature-sensitive products. In the tests, almost no discrepancies were detected between the core and base temperatures during temperature-controlled transport movements. Tank containers with optimised insulation, and various heating and cooling systems, have been used for many years to provide the ideal transport conditions for temperature-sensitive products.

The use of carefully coordinated heating and cooling system types can help minimise any temperature gradient in the cargo, as can the use of reinforced insulation, which reduces temperature losses. High-quality insulation systems also reduce other influencing factors, such as large fluctuations in the external temperature acting on the tank container and product.

### Smart data improves safety

The analyses and results substantiate the fact that safety and security go hand-in-hand with the quality of the equipment and technical accessories such as telemetry. Based on the results, HOYER re-examined its equipment in this respect and is working hard to equip its entire tank container fleet with telematics solutions. This will enable the data measured by the sensor systems to be displayed on HOYER's Smart Portal. The identified critical factors were used to verify the ideal positions for the sensors.

In a second stage, in collaboration with a research institute, HOYER is analysing the dynamic behaviour of polymerizable products, a product group requiring special attention. Based on big data logic, HOYER will build on the linkage between the two studies. In this way, HOYER aims to recognise the inherent dangers and risks of sensitive tank container products before they become critical.

### Inroads into Africa

After more than two decades of successful operation in South Africa, ICA Bulk Logistics MD Renée Smith has her sights firmly set on expanding the firm's footprint

Africa has shown consistent growth over the last 35 years and the continent's tank container volumes are on the rise as the market increasingly awakens to their multimodal and cost benefits.

"We see Africa as a market of remarkable opportunity. Undoubtedly, poor roads, infrastructure and port congestion are amongst the challenges, but we believe many of these can be overcome and remain confident that ICA Bulk Logistics can, and will, make significant inroads into this vibrant market."

Smith, a shareholder since 2011 and at the helm of ICA Bulk Logistics for 15 years, is determined to focus on Africa's "pockets of potential" and views the chemicals industry as one of those pockets.

"Despite uncertain politics, unstable energy supplies and volatile currency exchange rates, the chemicals industry in Africa is booming. Demand for hazardous chemicals is also on the rise and a 10% growth is projected for 2021."

Africa's chemicals industry is vast and an important component of South Africa's industrial base, covering a range of sectors from fuels and plastic fabrication to pharmaceuticals. Smith believes that South Africa, as a world leader in synthetic coal-based and natural gas-based liquid fuels and petrochemicals, has the potential to play an even more important role in growing these industries on the continent.

Concrete steps have already been taken for ICA Bulk Logistics



to gain a stronger foothold in Africa. In addition to its offices in major shipping ports in South Africa, it has also appointed agents in West and East Africa. "We are well placed to serve the chemical, gas and food sectors in these markets and have ensured that we have the expertise and versatility needed to offer our customers a complete, and tailormade, logistical solution."

According to Smith, ICA Bulk Logistics' expertise and experience lies in the global transportation of liquids, chemicals and gases and in adding further value by offering leasing, static storage, a supervised, door-to-door logistics solution and equipment management as part of the package.

As a small dynamic team, the company's service and approach to business is highly personalised, a feature Smith regards as essential.

"There is no doubt this is a

business where strong, positive relationships and effective communication make the difference."

These attributes have also played a key role in helping ICA Bulk Logistics manage the impact of the COVID-19 pandemic on its business. Smith has nothing but praise for her highly motivated team of five - and the support of majority shareholder, Unipalm Investment Holdings.

"My team has risen to every challenge and we have emerged, stronger and more motivated.

"As a small team, we found it fairly easy to adapt to the new way of working remotely.
Collaboration has increased and we have made a point of not only meeting online daily, but also of supporting one another in both work-related and personal matters."

A temporary setback on the financial front - when the transportation of certain key products was prohibited during

### Tankcontainer Directory

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### The four editorial sections are:

- Tank Container Operators
- Tank Container Lessors
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Each section has a geographic listing at the front followed by a comprehensive alphabetical listing. Level 5 lockdown - was used as an opportunity to invest in training and staff development and the early renewal of international Dangerous Goods certifications.

Staying abreast of regulations is a priority for Smith and her team. "While the transportation of dangerous goods by sea is highly governed by the UN IMDG Code, greater harmonisation of regulations for road transportation in Africa, in particular, is required for greater compliance, consistency, safety and maintaining a smooth supply chain."

Smith says supply chains have become increasingly complex because of the increase in both the volumes and types of dangerous goods being transported and stored, and every effort needs to be made to reduce risks to an absolute minimum whilst optimising transit times.

Looking ahead

All indications point to an expanding global tank container fleet in the years ahead as shippers recognise the benefits of transporting their cargoes in tank containers (in favour of drums or parcel tankers).

ICA Bulk Logistics is well placed to be part of this growth trend and Smith says its focus will centre around three main areas - safety, the environment and efficiency.

"With this in mind, we are currently working on two exciting new projects, due for launch in 2021 and which are confidential for now. They will involve cryogenic gases and providing a tailor-made solution for fuel emissions."

Smith believes Unipalm Investment Holdings' decision to purchase a 70% in ICA Bulk Logistics in 2015, has given the company the platform - and the capital - it needs to pursue and realise its growth ambitions.

Unipalm – which describes itself as a South African company focused on South African



ICA Bulk Logistics' Managing Director, Renée Smith

opportunities for South African people - was founded in 2001.

The company, which represents more than 30,000 shareholders, has stakes in several blue-chip South African companies, including technology, media and telecoms giants Telkom, Vodacom and MTN, in construction giant Civils2000 as well as Growthpoint Properties. Its sole investment in the supply chain and logistics sector is in ICA Bulk.

Unipalm's vision of creating more opportunities for South Africans is one which resonates strongly with Smith, who joined ICA Bulk Logistics two years after the company was founded in 1999 after several years in commercial ships agency and in the clearing and forwarding sectors.

°And while Smith may have logistics as her key business focus, her real passion is people and her unwavering commitment to supporting her staff and providing opportunities for them strongly defines her leadership.

She is excited about the company's growth prospects as a member of the Unipalm group and believes the shareholder's financial acumen and strategic focus will continue play a key role in ICA Bulk Logistics' growth.

"Ebrahim Khan, a director of ICA Bulk Logistics and of Unipalm's Executive and Investment Committee, is a strong believer in the potential of the logistics sector and his strategic vision and support will continue to open up doors for ICA Bulk Logistics to get involved in larger projects, not only in Africa but across the globe.

"We are particularly keen on increasing our involvement in projects in the wine and spirit, chemical, compressed and cryogenic bulk markets."

Smith says ICA Bulk Logistics has had a long standing and successful association with Paltank UK to export and import large volumes of wine and other alcoholic beverages globally.

"Utilising newbuild tank containers from South Africa is a double win for the South African industry because both the tank container, and its contents, are high value exports."

ICA Bulk Logistics may have global and African aspirations, but the company is equally committed to growing its business on home soil. In 2019, the company opened a new office in Durban and appointed Dinesh Balgobind as Operations Manager. Smith says "Dinesh has been such an exciting addition to our team. His extensive technical experience in the tank container market and his strong operational knowledge and customer relationships have been a huge asset."

South Africa-born and bred Smith is also decidedly 'proudly South African' when speaking about the quality of locally manufactured tank containers. "Despite strong competition from China, South Africa continues to produce about 10% of the world's tank containers and the units are held in high regard by those looking for a high quality, robust unit. The South African tank container market may be small in comparison to other parts of the world, but we have flown, and will continue to fly, the South African flag high."

ICA Bulk Logistics is keen to partner with like-minded companies who wish to play a key role in increasing trade into and out of the continent.

# Tank container market has passed the lowest point of virus crisis

Independent market expert Leslie McCune assesses the tank container market's undercurrents and believes the low point has passed, with a strong recovery to come

In an article in *Tankcontainer Magazine* last year, a subjective 'Buy' rating for the overall tank container sector was downgraded because of the expectation of short term market weakness following the peak in the sector's financial performance in 2018.

That weakness has come to pass, although the anticipated weakening of the market was exacerbated by the unpredictable and devasting impact of the COVID-19 pandemic. Unlikely as it may be in these seemingly dark times, the tank container sector could have just passed its low point and, maintaining the stock market parlance, is now a 'Buy'.

### Why is the sector a 'Buy'?

The return to a positive outlook for the global tank container sector is driven by several factors, including the relative resilience of tank container demand during the pandemic; the strong recovery of economic growth and manufacturing in China; booming demand for box containers to meet Chinese exports; and a change in the dynamics of the tank container market.

The encouraging industryspecific signals, which we explore later, are set within the context of a cautious uptick in investor sentiment - the acid rain of falling interest rates may have withered the returns on personal savings but they have squeezed debt costs down to around 2% for some tank container players. Interest rates are now so low that even companies that have no requirement for capital have issued fund-raising bonds, often to reduce their blended effective interest rate or weighted average cost of capital.

### Investor sentiment: higher yields, less volatility

Depressed global interest rates have forced many investors to seek out decent yields in a spectrum of riskier asset classes that pay higher returns. Tank containers lie on that spectrum - one reason why Apollo Global Management, China Cinda Asset Management, I-Squared and SMFG were said to be interested in buying third ranking tank lessor Seaco from debt-crippled HNA, which has effectively been taken over by Hainan's provincial government.

Size matters, not least because banks have been retreating from funding smaller players in the tank container sector, making it difficult for them to fund the purchase of non-standard units which, if managed well, can generate higher margins than generic 24,000-26,000 litre T11s.

For investors, real infrastructure and property assets can offer enhanced yields compared with publicly listed securities and, because the assets have a tangible value, they typically exhibit much lower volatility.

### Tank container market resilience

The chemical industry is the third largest in the world, after agrochemicals and energy, but the relentless decline in global chemical production since December 2017 has led to significantly reduced earnings for most producers with the past two years littered with profit warnings. The sector-wide underperformance led, in turn, to widescale cost-reduction initiatives, many of which were focused on the supply chain, which accounts for 10-15% of a specialty chemical's price.

To a degree, tank containers as a transport mode have benefitted from this increased scrutiny - bulk liquid chemical producers ('shippers') have sought to improve their management of working capital by more accurately matching supply to demand, often resulting in the more frequent movement of smaller bulk lots in tank containers rather than in larger lot size chemical parcel tankers. In addition, the use of tank containers for intermediate bulk storage, and the convenience of door-to-door delivery instead of the pier-to-pier model of chemical parcel tankers, is more widely recognised as an effective way to mitigate some of the inherent risks in supply chains.

The IMF's World Economic Outlook estimates that this year's global economic contraction of 4.4% will be less severe than the 4.9% downturn forecasted in June but will rebound strongly in 2021 by 5.2%. How does this read through into the tank container segment? Business development activity, which might include converting chemical producers into new users of tank containers, may have stalled but manufacturers will inevitably emerge from the pandemic with a revised view of how best to meet their supply chain needs. Most will have re-evaluated the strategic options available to their supply chain, which could result in a changed appetite for outsourcing and a reconsideration of their preferences for using tank container operators instead of leasing equipment (or vice versa, depending on their specific needs).

Chemical production is expected to return to pre-COVID levels by the end of 2021 but the pandemic exposed the lack of resilience of many chemical-dependent supply chains and revealed the extent to which many chemical producers, and their customers, had depleted

their buffer stocks. The dislocation of supply chains by coronavirus-driven closures, and the restricted access to some distribution hubs, has fuelled demand for space at bulk liquid terminals, with several now full. Often, temporary storage in tank containers has been the only viable alternative.

In the tank container market, poor economic conditions and low demand visibility can put pressure on lease lengths but, while lessors are seeing softer demand from operators for leased-in equipment, there has been a dramatic uplift in demand from shippers of IPA and ethanol for sanitising products.

Most importantly, the level of offhires is lower than lessors expected and lease lengths are not shortening. Long term leases for standard equipment are still typically structured around a 3-5 year commitment; those for newbuild 'special' tank containers often stretch to 7 years to reflect their higher price. Freely-available depot units may have shorter lease terms.

Regional equipment imbalances, the use of blank sailings by ocean carriers to control capacity, and liner service disruptions should ease the gradual erosion in utilisation rates that several operators and lessors are experiencing.

In summary, global tank container demand has inevitably weakened this year, with some regions particularly inactive, but structural changes in the industry and the limited availability of some equipment is keeping rates firm, albeit at a low level.

### China's booming demand

Any talk of weak demand is incomprehensible to those operating in Asia. Demand for tank containers for both domestic and export use is exceptionally high in China with newbuilds being ordered by lessors and operators. Exports are booming, fuelling demand for newbuild reefers and

40' general purpose box containers, especially high cubes.

China's economy grew by 4.9% in Q3, up from the 3.2% growth in Q2 which followed the 6.8% contraction in Q1 (the first official contraction since the end of the Cultural Revolution in 1976). China is currently the world's only major growth engine with August's industrial production growth rate of 6.9% above the country's overall GDP growth rate. Manufacturing output - the biggest component within the industrial production sector - rose 7.6% in September compared with the same period last year.

Growth in China is a leading driver of tank container demand as it is now the largest global market for specialty chemicals, the primary user segment for tank containers. Within China, the largest specialty chemical market is polyurethane, made by reacting hazardous MDI or TDI isocyanates with non-hazardous polyols (construction chemicals make up the second largest specialty chemical segment).

### Tank container demand returning

Tank container operators have seen activity levels stall in Europe, the Middle East and India but fleet utilisation appears to have steadied, albeit at a lower level than seasonal norms. More positively, some European operators have resumed newbuild purchases from manufacturers in China.

Shipments for global operators were 5-10% lower in Q3 than in Q3 2019 and margin pressure will increase in the remainder of the year, and into 2021, as higher ocean freight rates become a feature of the market (a result of ocean carriers restricting capacity and imposing new fuel surcharges).

Liner service disruptions will continue, boosting tank container demurrage revenues. In a very SPECIAL EDITION

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strong market, Asia-west coast US container spot rates (including space guarantees and equipment priority fees) hit nearly \$4,000 per 40' container in September - a record high and nearly three times the rate of a year ago. In Week 44, the Shanghai Containerized Freight Index was up 92% year-on-year, reflecting the major escalations in spot rates across several trade lanes.

Trans-Pacific routes tend to have proportionately more standard T11 tank containers that the trans-Atlantic trade route into New York/New Jersey from Europe, with its large specialty chemical production base. (A curiosity of the tank container market is that operators usually make more profit on tank containers moving east, than west).

The dramatic rate increases have been due to ocean shipping companies reducing the number of voyages with, for example, May's level being 80% of prepandemic levels.

Contentious General Rate Increases (GRI) were announced for mid-September, with the Federal Maritime Commission warning it may seek an injunction for a 'collusion' breach of the Shipping Act. Some GRIs remained, some were pared down and some were cancelled. To ease the upward rate pressure, Chinese authorities effectively forced COSCO and OOCL to add capacity by reinstating six blanked Trans-Pacific sailings in October.

Space has been 'sold out' from most Asian ports to the US and, unlike tank containers, the availability at depots of dry box containers has been very tight, with shippers obliged to pay additional fees of \$500-\$2,000-a-box for equipment and space priority. Shortage of equipment has been a major problem.

### **Signs of leasing strength?**Although demand from operators has been anaemic, lessors have

seen a welcome increase in demand from chemical producer 'shippers', especially for the more specialised types of equipment that several lessors have focused on in recent months. Off-hires have been less than anticipated, a tell-tale sign of confidence in real, or anticipated, future demand while long-term leases have conferred a relative immunity to a fall-off in utilisation as the global trade environment worsened. Those lessors with a portfolio of longer leases have seen only a slight decrease in utilisation.

Another comfort for both lessors and operators is that collections from chemical producers remain strong and bad debt for the sector is negligible. Small regional tank container players with less expertise, and those that are highly leveraged, are the most at risk of failure.

This has not been lost on shippers, who have accepted higher rates from larger, more established tank container players to ensure continuity of supply while minimising the risk of their cargoes being impounded in the event of their financially-weak operator becoming insolvent.

Demand for tank container heating and refrigeration units has also picked up and is steadily increasing.

Several lessors have been expanding their fleets in 2020 but the Pavlovian urge to take advantage of historically low tank container prices has abated, not least because low demand from the operators has depressed the fleet utilisation rates of lessors.

Additions to the size of lessor fleets will therefore be modest in 2020 with CS Leasing standing out as having one of the more aggressive expansions, with a potential fleet size increase of 16% to 18,000 tank containers by year end. Despite only being formed in 2015, this would make CS Leasing the fourth largest lessor, assuming no growth by Trifleet (although,

unlike Trifleet, CS Leasing is not a 'pure play' tank container lessor as it leases dry freight units such as half heights, bulkers and pallet wide units).

### impact on Chinese manufacturers

Hong Kong-based Singamas produced 6% of global tank container production in 2019 but saw revenue from tank container manufacturing collapse by nearly 70% in the first half of 2020. Somewhat surprisingly for those focused exclusively on the tank container sector, Chinese general purpose dry box manufacturers are now working flat out and are effectively 'sold-out' for the following four months. This is driven partly by the shortage of 40' high cubes and reefers in Asia, according to Peacock Container. Textainer and Triton are said to have placed large orders.

Several box manufacturers also produce tank containers, where activity was low for a few months earlier this year. Tank container production usually lags behind box production and, consistent with this market characteristic, tank production has suddenly picked up - CIMC, which produced nearly half of all tank containers manufactured in the world in 2019, may be 25-30% down in 2020 with global production possibly creeping over 40,000 units, a 25% fall on 2019.

### Conclusion

It is said that the darkest hour is just before the dawn. To many, that is where we seem to be, but medium-to-long term secular trends continue to support the tank container market, China's domestic and export demand for equipment is now exceptionally strong, tank container ordering is returning and this tough year is creating many new opportunities. The tank container market has just passed its low point and is on the turn.



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- Produced quarterly 'Middle East Tank Container Market Review'
- Founding Editor, Tankcontainer Magazine

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### Cleaning up

Cleaning stations are part of the essential infrastructure needed to service the global tank container fleet and rely on an intimate knowledge of a tank's cleaning requirements, reports Tankcontainer Magazine

Tank container depots are the oil in the machine that is the global tank container industry. Without them, all tank container activity will, eventually and quite literally, grind to halt. As in nature, where the cleaner wrasse provides 'cleaning stations' for reef fish, so too do depots and cleaning stations for our industry's tank container fleet.

Today's tank container depot and cleaning station sector is highly fragmented but is brought together in Europe by the European Federation of Tank Cleaning Organisations, which this year welcomed its first global member. In Asia, the @TCO organisation began the process of formalising tank container depot standards before merging with ITCO, the International Tank Container Organisation, in 2018.

The most acquisitive tank cleaning company has been USbased Boasso Global, which has 21 cleaning depots in North America and Europe. Acquired by Quality Distribution Inc (QDI) in 2007, Boasso America expanded before QDI was itself acquired by funds advised by Apex Partners in 2015. The following year, Boasso America acquired the Isotank Group in the UK, with its six locations and 64,000 cleans-a year capability, before acquiring Den Hartogh's tank cleaning and depot business in 2017.

In the US, Florida-based Quala has the largest national network of cleaning facilities, with a capacity of over 600,000 cleans-a-year.

Some global tank container operators are also invested in depots and tank cleaning facilities, often via joint ventures with local partners. Market leader Stolt Tank Containers has a global network of 22 owned and joint venture depots and hubs, providing direct control over the handling and maintenance of its tank container fleet, which is the largest in the industry.

Cotac, a 100% subsidiary of the family-owned Hoyer Group, has seven locations in France, Benelux and Germany. It services Hoyer's operator fleet and, most probably, those of TWS, the independently managed tank container lessor that is not owned by the Hoyer Group but by the Hoyer family.

### Cleaning stations vary

The difficulties presented to tank container cleaners are caused by a product's dangerous nature and/or its physical state.

In general terms, tank container cleaning stations can be categorised as either 'high tech' or 'low tech'. This is based on several criteria, including whether or not they have low or high pressure systems, the ease with which cleaning solvents or other cleaning materials are introduced, the waste disposal capability and throughput rate.

High pressure 800 bar systems from suppliers such as Gröninger are necessary for cleaning tank containers used for transporting chemicals like Class 6.1 toxic MDI isocyanate. MDI and TDI

isocyanates, with non-hazardous polyols, are the main reactants to produce polyurethane, the largest specialty chemical consumed in China, the largest specialty chemical market in the world.

MDI is not miscible in water and reacts with water in a polymerisation reaction to form a hard crust in the tank container. High pressure cleaning units need their own generator and have a specialised cleaning head. The equipment requires a substantial investment - \$225,000-\$280,000 - so there has to be sufficient demand.

Lower tech cleaning stations can easily clean toxic, flammable and corrosive products but can face difficulties with inert products like latex or some resins.

The elapsed time since a tank container's discharge is an important cleaning consideration. There is, for example, a major difference between the cleaning requirements for latex if presented for cleaning immediately after discharge, and the cleaning needs of a tank container that has been left in storage for a few weeks after discharging latex.

### Tank condition matters

The condition of the shell of a tank container is also important. A very smooth internal surface is much easier to clean than one with grinding marks and/or pitting. Higher molybdenum content stainless steel increases the corrosion and pitting resistance of tank containers, including, it is

said, some in the fleet of Bulkhaul, which had the highest pre-tax return on sales of any tank container operator in 2019 (18%, or £47.9 million EBIT on turnover of £270.7 million). Market leader Stolt Tank Containers' 2019 return on sales was 11% (\$56.1 million EBIT on turnover of \$528.6 million).

### Stainless steel modifications

Modifying the composition of the stainless steel used for tank containers enables a wider range of chemicals to be carried, increasing the commercial opportunities available to a tank container and its residual value. However, higher molybdenum content can add up to \$1,000 to a tank container's price.

Nickel is among the primary drivers of the cost of the austenitic 316L stainless steel used in tank container manufacturing, but it is a volatile commodity and has doubled in value since May 2016. Excessive increases in nickel or molybdenum prices stimulate the search for alternative grades (nickel-free 444-grade ferritic stainless steel has limited width and thickness availability, and toughness and weldability issues).

### Last cargo categories

There are three broad last cargo product categories to be considered when tank cleaning. For simplicity, let us call them: 'The Good, The Bad and The Ugly'.

### The Good

These are 'straightforward' products that, due to their properties, are easy to clean, have no smell and only require a simple, short cleaning process. The process begins with a cold rinse to flush out residue, followed by a hot water spin. The cold rinse cools flammable residues to well below their boiling points and prevents discoloration of the internal shell. A simple detergent

is used. 'Straightforward' chemicals include glycols, benzene, ethanol, toluene, methanol, sodium hydroxide and most other non-smelly solvents.

### The Bad

These are more complex - and therefore 'not straightforward' chemicals - which may be smelly, not miscible with water, exothermic and/or reactive.

Cleaning these products requires a longer wash cycle which often generates more effluent and waste disposal issues. The cleaning process involves detergents, solvents such as toluene or MEK, and steaming.

Some of these products may stain the inside of the tank container shell but staining can be removed, at a cost, by using proprietary 3M<sup>TM</sup> products and polishing.

Propylene oxide is an example of a 'not straightforward' chemical. It is highly flammable and polymerises, depending on the time between discharge and cleaning. If not cleaned promptly, discharge residues easily polymerise. An accepted method to move propylene oxide is to use a T50 gas tank container (which has a much higher pressure rating than a standard T11) with suitably modified valves to accommodate the pressure build-up.

Dedicated tank containers can be used when there are extensive prior cargo restrictions, or when there are no contamination issues - chemicals such as hydrogen peroxide tend to be carried in dedicated tank containers because the product reacts violently with organic matter, generating heat and gas. The gas generation quickly leads to a build-up of pressure in the tank container, explaining the need for a 350mm bursting disc.

Other 'Not straightforward' chemicals include ammonia (smelly but water soluble),

acrylates, mercaptons, phenol, furfuryl, furfural alcohol, pyridine, lube oils and styrene.

Styrene is a highly flammable, toxic, reactive, oily liquid with a flash point of 32°C. Although stable at ambient temperature, higher temperatures - or contact with peroxides - can lead to an exothermic polymerisation process. At temperatures above 65°C, this may cause 'runaway' polymerisation, potentially leading to the over-pressurisation and ultimate rupture of storage tanks. Inhibitors such as 4-tertbutylcatechol (TBC) reduce the danger of self-polymerisation but deplete over time. Divinylbenzene, a reactive monomer, also polymerises at elevated temperatures which, in a closed container, can lead to violent rupture. The TBC inhibitor concentration, as shipped, is typically 900-1,100 ppm with a minimum transit concentration of 400-600 ppm.

### The Ugly

These are 'difficult' products that can only be cleaned by 'high tech' cleaning facilities. There will probably be waste disposal issues that must be rigorously addressed. Difficult chemicals include toxic MDI isocyanate, which is not miscible in water and reacts with water to polymerise to form a hard crust. Dimethyl sulphate is also a 'difficult' chemical to clean and is extremely toxic.

Corrosive products also tend to be difficult chemicals to clean. Chlorides, for example, react with water to form hydrochloric acid although tank containers moving hydrochloric acid are rarely washed as dedicated rubber and FRP-lined units are used. These lining materials can be heatsensitive so only cold water rinses are used.

Food movements in tank containers should never have chemicals as a last cargo.





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