Cold Chain
Global Forum
SPRING . 19
Temperature Controlled
Life Science Supply Chains

Supply Chain Efficiency

And

New Technologies

Expert insight from
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Supply Chain Efficiency And New Technology

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Retroactive Logistics: A Thing of the Past...

- IoT and blockchain will enable **proactive shipment management**. No longer will practitioners be restricted to post-shipment for analysis and excursion management, increasing the sector's ability to mitigate risk to the product and the patient.

- The future of the sector will be characterised by solutions that are **software driven rather than hardware driven**. The benefit of this is that logistics services and shippers will no longer be tied down to a single device, or group of devices that have restricted connectivity.

- A **device-agnostic software system** that can switch to the latest technology, which will put the shipper in a much more flexible position in terms of their purchasing ability. It will also ensure that the sector can maintain fluidity and adapt to newer technologies far easier than ever before.

Pharma 4.0, Internet of Things

For many years, the temperature controlled logistics sector suffered from technology stagnation. Is this still the case?

"Clients can now see where their product is in real time."

What does innovation look like?
Just on the horizon is a wide array of software solutions that will mark a shift from retrospective intervention to real-time intervention.

"The benefit of these new technologies is that it's going to be real-time and predictive. When excursions occur, or a process doesn't occur as it should, you have the opportunity to fix the issue in real-time, as opposed to retrospective analysis," says Shortman.

"A big part of these new solutions is how the data speaks to all involved parties." The data can be pulled from devices and sent to individuals and organisations within the supply chain to prevent incidents. This can be anything from damage reports, to theft, and temperature excursions.

"The sector is now at the stage where we're beginning to move away from hardware solutions into software solutions," says Shortman.

Indeed, the logistics sector does run a risk to patients if software is sluggish in adapting to meet the industry's changes. However, Shortman highlights that innovation is around the corner. There are now products comprised of independent software that can connect to any device type - and this kind of technology is available across the full range of transport solutions.

Better stakeholder collaboration
"The sector has come a long way," Shortman says. While it still isn't perfect, implementing a new type of software transportation management system is significantly faster and more efficient than it was a decade ago. "What is available on the market now is almost like plug and play, with API links to bring in relevant data, this technology is hugely beneficial from a push-pull point of view. We're seeing that that these solutions can be set up incredibly quickly, and once it's up and running, it's all about ensuring that the work flows correctly."

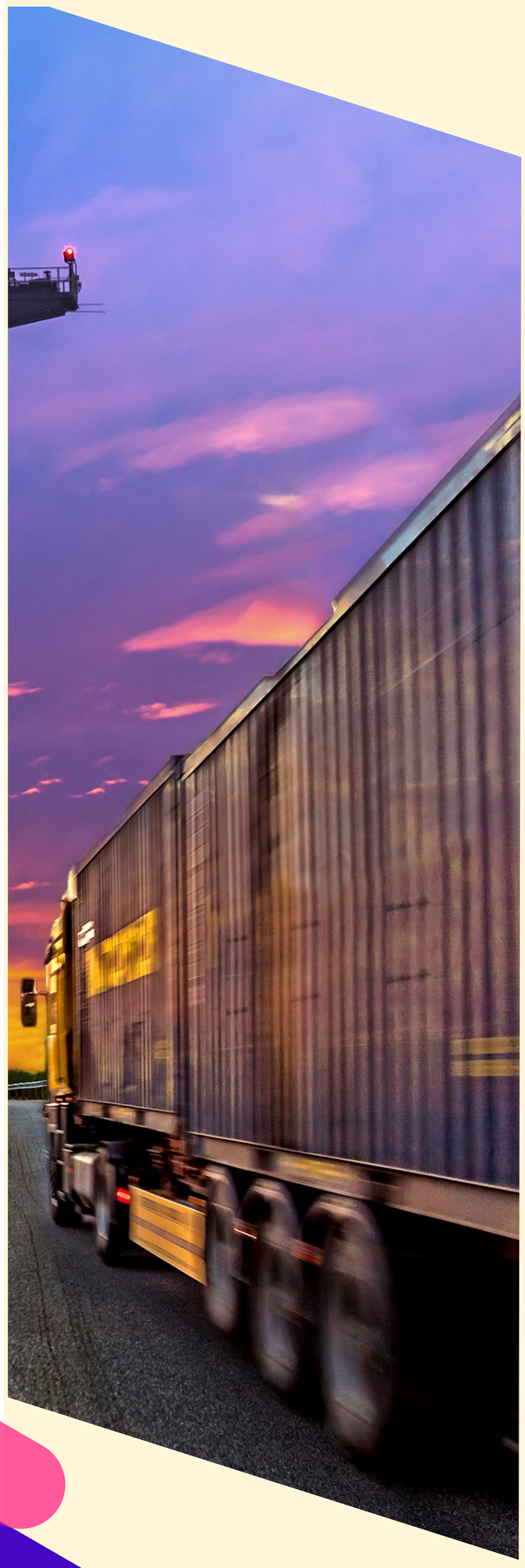
Indeed, new technologies will bridge communication between all parties and stakeholders. In a TCL scenario, a pharmaceutical company can send a text message to a driver, the driver can download an app, and then take photographs of the seal of a temperature readout while collecting the shipment. This information can be uploaded in real time and can be shared with everyone on the system, according to Shortman.

"If an airline was using similar technology we can give them a tablet or they can have a tablet device where they can also upload any relevant checklists, again in real time, so that we're capturing that audit trail of what's happening, when it's happening, who it's happening by."

Pharma 4.0, Internet of Things

Is the temperature controlled logistics sector adapting with new technology?

"In TCL, the Solutions of the future will be software driven"



Real-time and predictive temperature management
If there is GPS tracking or temperature monitoring on a vehicle, or Bluetooth tags on pallets, the data on each disparate piece of hardware can be shared any a unified software system giving all stakeholders a full-spectrum perspective. By being able to bring transfer data from any source, companies can increase their agility and the validity of temperature readouts.

First and foremost, one of the greatest disruptions in the temperature controlled logistics sector will be solutions that offer real-time and predictive data. This will signal a move away from the current methodology where temperature excursion management is based around retroactively assessing the situation. So, why are some companies operating with legacy systems and paper based solutions?

Shortman says that, "most large companies still follow a procedure where the temperature profile is assessed after the shipment arrives. They use hardware devices to assess the temperature profile, and If is stays in the profile the product is released to the market. This can be very time consuming."

A changing outlook
The temperature controlled logistics workforce just hasn't reacted to disruptive technology as fast as other industries, such as finance, explains Shortman.

"We started with fax machines and data loggers that you'd plug into a laptop to discern a temperature excursion. Some of us still stick with these legacy solutions. The new wave of employees and companies are digital natives. They've grown up with IT cloud technologies and innovative software solutions, and that's bringing a real kind of excitement to temperature controlled logistics."

Are companies adopting software transport management systems?
In the past, implementing a transport management software system was very cumbersome and labor intensive.

"Systems which can operate with smart device technology are now available. What we're finding is that actually through technology that's no longer a black hole and that clients can actually see where their product is and be alerted if anything is amiss. In terms of the chain of custody, it was previously handed over to the airline or the shipping company, that was where deviations happened."

Pharma 4.0, Internet of Things

Like many other industries, the temperature controlled logistics sector is comprised of IT immigrants. Without the benefit of a workforce who grew up using innovativetechnology, will the sector stagnate?

"Clients can now see where there product is in real time"

"Everyone will have access to the same information. Here what we have is that we can actually update clients, customers. And while the shipper may not want to know every detail of a delivery, the third party logistics provider does.

Through bespoke algorithms and processes, the shipper will only be alerted if there are any deviations from that process, substantially streamlining the flow of information. "

Reducing risk

This is also of great interest to the insurance industry, explains Shortman. " The maritime insurance industry often questions 'How are you reducing the risk?' Nobody wants these massive claims on temperature and product. Now, we're able to demonstrate that through using this technology, and that can reduce their Premium. So it has a positive knock-on effect throughout the supply chain."

Risk reduction is also a large element of software-based solutions. Algorithms and work flows are established, and if they don't occur the system will alert the involved parties. While active monitoring can be achieved until the shipment gets on the flight, road freight and ocean freight active monitoring is possible. In maritime scenarios you can see where your inventory is and it can ping from certain points whilst it’s in transit from the ocean.

Software Solutions

Data loggers vs bluetooth temperature sensors vs IoT for cold chain monitoring

"Blockchain offers unrivaled accountability "

Equipment selection
Temperature data loggers have been around for decades, however the problem with data loggers is that they provide post-shipment information.

Bluetooth temperature sensors form the second generation of data logging. Improvements over traditional data logger include touchless and cableless functionality. But, they still cannot provide real-time shipment insights. However, with increasing IoT solutions, the functionality of Bluetooth sensors can be greatly enhanced.

"We're seeing that through the use of Bluetooth temperature monitors, multiple temperature recording devices can communicate with each other and the pulled data can be uploaded in real-time," according to Shortman.

Blockchain = better lane security and reduced losses
With IoT and Blockchain solutions, you can run an "always connected", touchless, wireless, and secure logistics operation. IoT and blockchain communicate in real-time and the fact it can speak, store data and be transmitted to the Cloud is vital for this sector, explains Shortman. The benefits are substantial. This technology turns the sector on its head in particular with regards to last mile shipments, as shippers can now irrefutably demonstrate that a particular pack has maintained within its temperature profile.

"Blockchain is really exciting. For me, It's going to offer an immutable level of traceability for products, so we will have not only that audit trail that cannot be tampered with, but also in scenarios like temperature recordings where we require more security. If a shipment has said it's maintained between two and eight degrees, you know for sure its actually has. And that that then forms part of that blockchain and can't be tampered with."

There's huge natural synergies between block chain and the logistics industry. SOPs and work flow can be turned into an algorithm, with rules and process. In terms of the transactions between stakeholders within the supply chain, the that accountability of shipments, it has the potential to be revolutionary.

Software Solutions

With blockchain, you can make smart decisions about re-shipping damaged products, dispatching emergency crews, changing thermostat settings and prevent millions of pounds worth of product from spoiling

"it's about offering the consumer an extra level of surety "

"DHL are looking at it, IBM are looking at it, and so are Intel. There are a lot of companies out there at the moment that are thinking: How can we incorporate this?"

Indeed it makes perfect sense for the controlled logistics sector to think like this. With a lot of stakeholders and a lot of supply chain partners, and the outsourcing of activities that happens within the industry being particularly huge. And at the moment that's being done primarily in a very paper based manual environment, "In terms of quality contracts and commercial agreements.

And to actually have all of that put up into an immutable system which offers that level of security is only a good thing, explains Shortman.

"At the moment a lot of companies that I'm speaking to are starting to explore how it's going to be used. It will take one or two companies to come out with a really good product that incorporates block chain, and the people won't even know that they're using blockchain. It's going to be a very large leap with regards to technology."

"Some retrospective temperature monitoring devices are still very basic in terms of the readouts that companies are receiving. Some of them are still pretty antiquated in terms of the graphs that you are seeing. It might show that your product has gone just a little bit above eight degrees, but is this the case?"

Blockchain adds that other layer of security. It is particularly useful in terms of the transactions between parties and making sure that variables such as quality agreements are kept in an audit-able trail and that you can see the provenance of a particular shipment. where it's gone through the chain and more.

Software Solutions

With the ever-growing volume of data, it can be virtually impossible to find the necessary information to make informed decisions.

"There's natural synergies between block chain and the logistics industry"

AI can process and analyze big data, offer advice and take proactive intelligent actions.

"For all of the information that is captured I think it is massively exciting. We are at a very interesting precipice in terms of the industry, because we've all heard a little bit about blockchain and artificial intelligence. There are uses and there are applications within other industries for it. And at the moment a lot of the big companies are seeing it as a potential solution to some of those perceived risks in terms of security, tampering with data, all of those things"

Artificial intelligence

The industry is already using artificial intelligence and automated intelligence in various ways. There are automated warehouses, some airports are already platooning - which refers to the linking of two or more trucks in a convoy. One vehicle may have a driver but the others are equipped with sensors and caravan behind the manned vehicle, substantially reducing manpower costs.

Data management is key

Each company is different. Data consumption means something different to individual organisations, so the capabilities that AI brings to a logistics will be substantial.

"We're only starting to see in some areas things like e-airway bills being the norm rather than the old-fashioned ones that are typed. And that's amazing because you'd have thought that would have happened a long, long time ago. But we're still catching up."

"And I don't know why this is the case, because the logistics industry should be very tech driven. Many other industries, the high-tech industry in particular, they've had a lot of these cutting edge processes in place for a long time. It's about time that we do start to move forward, and hopefully the more younger people coming into the logistics industry, being digital natives, will be able to speed that process up. And so, yes, that's pretty exciting, especially for us oldies."

Mean Kinetic Temperature Monitoring

Regulator bodies, drug manufacturers and distributors have been working to create a standard for temperature monitoring that ensures the integrity of medicines.

"Without robust support information and methodology, MKT should be discouraged"

Mean Kinetic Temperature Monitoring (MKT) is one tool used to evaluate the impact of temperature control .

MKT is a single derived average temperature that the product can maintain. This calculated temperature is a non-weighted average that shows the affects of temperature excursions over time.

Going forward, how much can logicians rely on MKT?

First and foremost, within a wholesale environment and without robust supporting information and methodology, the MHRA states that MKT should be discouraged, explains Shortman.

Historically, MKT has been a solution for storage rather than the distribution element of temperature controlled logistics. This is because relying on a single temperature range is easier in a static environment. As a result, MKT, is not necessarily safer that the accepted advice, which entails a path of validation and a risk based approach.

The best use for MKT

As Shortman explains, predominantly, MKT is best used for storage. "Of course it's easy to keep the temperature in a warehouse at a constant, and you can pack the product to meet those challenges because you're going to face fewer excursion variables. In an air freight environment the challenges are greater."

MKT is not suitable for incubators, stability chambers, refrigerated and cold storage units and long-term storage. A weighted, but non-linear average over time is best used when short excursions are less likely to cause serious damage. In addition, it should not be used as a crutch to compensate for temperature excursions. As a general rule of thumb, MKT should be avoided in situations where the temperature is difficult to control.

As a result, there is still no consensus as to whether MKT is suitable for use in evaluating excursions during the transportation process.

"Most companies in the packaging industry and the pharma professionals would say they go above and beyond that in terms of making sure excursions don't occur. The other downside to consider course is that they could over engineer packaging and therefore they're adding on expense. While it is good to have MKT in some cases, a risk based approach is still the most accepted."

Mean Kinetic Temperature Monitoring

Temperature profiling becomes more effective with increased data

"MKT has a use in countries where the focus is storage, wholesaling and warehouse side"

Looking towards the future

Companies are compiling, monitoring and sharing more data than ever before. As a result, data can be inputted into software which suggests the right type of packaging for certain lanes, explains Shortman. One day, there will no longer be a need for manual data monitoring.

Shortman says that as data becomes more ubiquitous, MKT will come to the fore. "I think it's something that will evolve as we know what to do with the data that we're actually getting from shipments."

Temperature profiling

MKT has a more obvious use in countries where the focus is storage, wholesaling and warehouse side. It is discouraged for the transportation sector because it is a variable environment that the product is in so a risk based approach is far more desirable.

The shipper needs to demonstrate to the relevant authorities that all of the variables have been taken into account, and that goes further than MKT.

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