Growth in a New Green Landscape

A buoyant, evolving pharmaceutical market, new sustainability goals, and technological advances are driving passive temperature-controlled packaging systems down the road towards full recyclability

Matt Tomkinson at Softbox Systems, by CSafe Global

For suppliers of temperature-sensitive goods, there have always been two critical transportation criteria that are non-negotiable: meeting stated product temperature-range requirements, and withstanding damage from origin to destination. Today, however, much more is being asked of temperature control packaging (TCP) organisations.

Fresh customer demand for pharmaceuticals, the ascent of biologics, ambitious decarbonisation targets, shipping over great distances across extreme temperature ranges, more stringent regulatory requirements, and new technology, are all changing the face of TCP logistics. Throw a pandemic into the mix, and innovation is being forced at almost every turn.

In the world of passive systems – or specially conceived, temperature-controlled shipping systems – a migration from single-use to reusable and fully recyclable solutions is now under way. More comprehensive product portfolios offering greater reliability and performance across temperature ranges, lighter weights, and lower costs, have been impossible for consignors to ignore.

The Influence of Biologics and Biosimilars

The global TCP solutions market was valued at $12.4 billion in 2022, and is set to witness a staggering compound annual growth rate (CAGR) of 8.1% between 2022 and 2030, reaching an estimated $23.2 billion (1). Where the influence of life sciences is concerned, the reasons for growth are primarily twofold: newly approved drugs and biologics are hitting the market that require high-performance TCP solutions, and much stricter regulations are governing the manner in which temperature-controlled goods are moved through the cold chain.

More specifically, potential high-growth areas in oncology, immunosuppressants, blood and plasma products, cell and gene therapy, and biosimilars have

all emerged. This is driving the deployment of chilled and ambient TCP solutions, with the latter being utilised as greater investment in oral solid and liquid drugs materialises. Guaranteeing the integrity in transit of temperature-sensitive biologic-based products composed of sugars, proteins, nucleic acids, or live entities such as cells and tissues is projected to contribute a CAGR of 7% for 2020-24, surpassing the sub-sector's historical growth of 4% (2).

The global upturn can be mainly attributed to an increased demand for innovative and effective therapies, stronger 'pharmerging', and higher pharma utilisation. Acceleration in niche segments with specialised requirements or considerations – blood and plasma products, cell and gene therapy, and biosimilars all qualify – has been particularly aggressive across all geographies. Biosimilars are bringing affordability and competition to the biologics table. Launches in oncology, immunology, and diabetes, are being swiftly followed by expansion into other therapeutic areas including respiratory agents, anticoagulants, immunosuppressants, and growth hormones.

It is not inconceivable that more than 80% of the US biologics market could eventually be targeted by these comparable alternatives. According to IQVIA's Forecast Link, biosimilar value grew at a CAGR of 78% between 2015 and 2020, reaching approximately $17.9 billion, and is expected to continue growing at a CAGR of 15% between 2020 and 2030, reaching an estimated $75 billion within the next decade (3).

Fit-for-purpose TCP packaging that fulfils the minimum low-temperature transportation requirements, can reduce cost of ownership for these highly temperature-sensitive goods.

The Forecast for Frozen, Chilled, and Ambient TCP

Nearly all biologics require transportation at between 2-8°C. As a result, this chilled temperature range represents around three-quarters of the commercial biopharma market, with growth being almost twice as fast as ambient. The origin of COVID-19 vaccines has obviously played its part, albeit a quite modest one in the bigger scheme of things; with booster phases being implemented, around $400 million per year is expected in TCP revenue between now and 2025 (2). As shipping requirements vary for different vaccines, huge pressure has been placed on TCP market leaders. The sheer hike in volume has had to be managed alongside the development, testing, and production of the ultra-low temperature shipping system that has enabled certain vaccines to ship at -60° to -90°C throughout the pandemic. Together with cryogenic transit (below -90°C) for cord-blood stem cell products and other cellular therapies, growth in all sub-zero transit is expected. In the US alone, there are now 23 cell and gene therapies that have been approved, and a large pipeline exists (4).

Other increases in demand are happening across all the temperature brackets. R&D spending has galvanised a clinical trial segment which utilises ambient, chilled, and frozen TCP solutions. Greater investment in non-injectable drugs has been a springboard for growth in ambient transportation, as shipping at controlled room temperatures of 15°C-25°C is required. The booming blood and plasma segment with its bulk pallet-sized shipments has also boosted chilled transportation.

Reduce, Reuse, Recycle, Recover

Such a buoyant and diverse pharma market has been the catalyst for a TCP evolution. Historically, temperature-sensitive pharmaceuticals have been shipped in single-use packages, manufactured from cost-effective expanded polystyrene and polyurethane foams. However, with disposal difficulties often inherited by the end customer, the last decade has witnessed the emergence of more robust, thermally capable, reusable cold chain packaging as the gold standard in temperature-controlled transport. Leveraging progressive, environmentally friendly insulation materials, like vacuum insulated panels and phase change materials, these high-performance, reusable TCP systems offer autonomies of 120+ hours for chilled, ambient, and frozen temperature ranges. With secondary or tertiary deployments, they are particularly cost-effective.

That said, this is a market segment that can rarely rest on its laurels. In a

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recent Temperature Control Sustainability Report, industry leaders regarded the implementation of sustainability in TCP as a key aspect of their future plans. In fact, almost 90% of the managers polled stressed its importance, while 70% already had it on their radar (5). With many pharma, diagnostic, and medtech companies prioritising decarbonisation and setting targets designed to reduce emissions, TCP manufacturers have rallied, expanding their portfolios by incorporating sustainable systems that offer a good end-of-life story. The evolution to 100% curbside-recyclable solutions is already gathering pace. These next-generation shippers utilise specially configured, engineered, and corrugated cardboard to produce incredibly effective, plastic-free insulation with high shock-absorption capabilities. When combined with temperature-regulated cool packs, they provide a thermal fortress that can be effective for several days.

The New Differentiators

In the process of keeping pace with change, a mindful eye has been cast across a host of TCP differentiators. A competitive total cost to deliver a package that includes labour, transportation, storage, and material costs, tops many a consideration list. Then, there is the preference for using widely available, pre-qualified packages, with the importance of volume and weight key to filling out transportation and storage holds, minimising dead space. There's an obvious preference towards simplicity too, with investments more likely to be made in systems that are easy to assemble, load, transport, store, and open at the destination site. But in this day and age, little moves without accounting for sustainability. For many consignors, a high environmental sustainability index score matters, whether from reusability, recyclability, or the use of bio-friendly materials. Packaging disposal also needs to be as convenient as possible.

TCP companies have also had to negotiate a more complex regulatory environment. Designed to ensure the quality of cold chain drugs, this has added a layer of protection where patient safety is concerned, and been a precursor for reduced excursions. In the unrelenting pursuit to eliminate losses, increased visibility and traceability through IoT has emerged as a useful asset for shippers. Real-time monitoring with high-tech data loggers has enabled consignors to track packaging performance and respond to real-time data governing location, temperature, humidity, air pressure, light, and shocks. In some quarters, predictive analytics powered by AI is helping the supply chain actually become proactive. Advanced shipment predictions can add yet another layer of product protection in support of an unbroken cold chain.

Protecting People, The Planet, and Bottom Lines

TCP market leaders have been immersed in meeting new performance, cost, compliance, and sustainability benchmarks to help pharma companies protect people, the planet, and budgets. Yet, conversations around expansion and pushing new boundaries are unyielding. There seems to be a plethora of possible areas that warrant further investigation. Data and AI tool development, sustainable thermal protection, online storage qualification, recycling collection stations, rental containers that alleviate hospital storage space, collaboration and training around storage and handling, deep-frozen shipping, and warehousing, all have potential to add value to the temperature-controlled shipping process. Today, the importance of total cost of ownership for reusable TCP systems along with a move to greener, more sustainable solutions, looks likely to shape much of the landscape in the not-too-distant future.

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Matt Tomkinson is Technical Solutions Specialist at **Softbox Systems, by CSafe Global**. Matt helps customers solve the complexity of the cold chain industry and applies best practices and processes to achieve the desired results. Previously, Matt spent 18 years at Pfizer as their cold chain and network solutions specialist, becoming a Temperature Controlled Logistics Subject Matter Expert (TCL SME), where he helped establish a world class temperature-controlled distribution network. He quickly became a trusted advisor on best-in-class temperature control logistics solutions. Matt's ethos is 'ship right first time, every time'.