Customer or Patient Innovation of the Year

Pfizer

Deep-Freezing the Supply Chain to Bring the COVID-19 Vaccine to the World

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Pfizer and BioNTech developed an mRNA COVID-19 vaccine. Two big challenges were storing the vaccine postproduction at minus 75 degrees Celsius and getting the doses into patients' arms. Overcoming these challenges required an overhaul of the pharma supply chain.

A new shipper box was developed for shipping the vaccine from ultralow temperature (ULT) freezers to vaccine distribution centers' cold storage worldwide. This required moving the product across multiple supply chain partners in record time with complete, accurate and real-time visibility on location and quality characteristics of every dose, all in an automated way. The sum of these efforts enabled Pfizer to continuously deliver at 99.998% on time to date, significantly affecting the lives of hundreds of millions of people worldwide, and helping to significantly reduce the impact of COVID-19. The supply chain and operational process innovations implemented for the vaccine distribution will be leveraged for global application, lifting Pfizer's performance beyond the vaccine.

Developing the vaccine, scaling up production facilities, ensuring that quality standards are at their highest, performing tests and clinical trials, and getting worldwide approvals for emergency use through regulatory submissions of the highest standard required exhaustive efforts. Pfizer also needed to develop a new deep-frozen supply chain that could deliver the vaccine supply and storage requirements.

Major challenges to overcome were the lack of existing internal and external infrastructure, and the lack of a roadmap to follow.

Pfizer's challenges:

- Scale manufacturing of shippers and loggers to enable tens of thousands of shipper shipments per day.
- Build/implement enough ULT freezers to meet billions of doses of storage in less than eight months.
- Mobilize resources to manage such scale and complexity.

Pfizer's additional barriers and pressures:

- **Dramatic rise in infections globally.** Every minute counted.
- **Scale and magnitude.** Many small points of use (POU) across the globe demanded an agile and flexible distribution model and packaging solution.
- **Temperature-sensitive product.** Cold-temperature storage requirements for the vaccine were especially challenging across product volumes and scale.
- **Multiple supply chain partners.** Moving the product from two manufacturing plants to the rest of the world required multiple handovers.
- **Supply chain visibility.** Total control on this level of volume, all at the same time, required a new level of supply chain visibility.

Shipping a ULT product around the world in short time frames required a solution not yet available on the market. Pfizer worked with one of its packaging partners to develop a new shipper to contain the blue-capped vials that:

- Allows for easy and efficient pick/pack operations
- Keeps the product at a stable temperature for 10 days, allowing shipments to remote destinations
- Serves as a makeshift freezer for the many POUs
- Has reusable packaging to meet global demand through reverse logistics
- Weighs less than 50 pounds for easy handling

A total of 195 vials are packed in a pizza-box-like tray. Up to five trays can be added into each shipper, and dry ice is added to keep the almost 6,000 vials of product at minus 75 degrees Celsius for 10 days. Shipments were traditionally monitored through sensors that store data and need a readout at their destination. This process, which can be cumbersome and reactive, was unlikely to work for COVID-19 vaccine distribution.

Pfizer, with one of its supply chain visibility partners, deployed a new type of data logger with GPRS signal functionality, allowing for real-time tracking of location, temperature and humidity. To enhance the efficiency of the daily shipment process, the loggers come preassembled within the shipper box. Once shipments are complete, the loggers' batteries are loaded again and shipped back for reuse, reducing waste.

Real-time visibility for all COVID-19 shipments was powered by Pfizer's partner's platform to allow for:

- Real-time temperature and location tracking, with alerts and escalations
- Automated quality releases for shipments that meet all control requirements
- Management by exception decision making for flagged shipments
- Real-time metric visibility and data availability, supporting governance, decision making, root-cause analysis and continuous improvement
- Monitoring of shipper integrity during shipment

The control-tower approach connected Pfizer, its partners, the carriers and the different POUs in a real-time collaboration mode. The command center allows for full control on all ongoing shipments, through every node of the supply chain.

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