Using Dry Ice When Shipping Air Freight

White Paper

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Jan 2013

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Healthcare product manufacturers, transportation providers and distributors have a moral, and in most cases, a regulatory responsibility to help insure the product arrives to the end-user intact. Protection of product efficacy demands use of the latest reliable technologies available. People's lives truly depend on it.

In the history of transporting temperature-sensitive commodities by air, dry ice had at one time offered state of the art cooling capabilities when used in conjunction with specialized transport containers or ULDs (Unit Load Devices). Dry ice-based ULDs utilized dry ice, basic insulation, along with replaceable batteries, fans and thermostats to try to maintain the selected temperature.

There are several drawbacks to the use of dry ice-based ULDs. Most importantly, their temperature management capabilities are directly tied to ambient conditions and the ULD set point required of the cargo. Ambient conditions for proper operation of a dry ice-based ULD need to be a minimum of 5° C above the set point. So, for a 2° to 8° C shipment with a ULD set point of 5° C, the ambient conditions need to be at a minimum of +10° C for proper operation. In addition, the containers had a maximum operating range of about +30° C above the set point.

Ambient conditions and set point temperatures associated with dry ice-based ULDs also directly impact the duration of air circulation fan operation and thus, battery life. The circulation fans are what move the cold air into the cargo hold of the ULD. Since alkaline batteries are mandated for use due to their ability to last longer during high fan use, replacement costs in transit could be quite expensive.

Also, in some countries, dry ice can be difficult to obtain. And when it is available, it is usually found in the pelletized form which sublimates (evaporates) faster due to greater surface area when compared to block or sliced dry ice. Often times, dry ice providers don't operate on weekends making contingency planning difficult. Plus, there are many countries in the world that restrict or forbid access to a ULD while the container is in customs.

Within the airline community, a critical problem with dry ice is that it is classified as Dangerous Goods (DG) by the air carriers. This means additional paperwork, increased handling times, and increased cost. Airline employees, or their contract handlers who come in contact with any type of DG, must meet considerable training requirements before handling the cargo. As a result, there are many airlines who won't allow DG onboard due to the issues it can create.

Airlines are also restricted in the total weight of dry ice allowed on a single aircraft and the maximum weights allowed vary by carrier and aircraft type. Some carriers in the industry have been witness to significant reductions in aircraft dry ice weight limitations due not only to the associated DG problems, but for concerns over carbon dioxide entering onboard crew rest quarters.

Another recent development in the dry ice debate is that some in the scientific, environmental and political communities have come to the conclusion that any additional dispelling of carbon dioxide into the atmosphere is not good for the planet.

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Increased regulatory scrutiny by government entities around the world dictates that greater attention is paid to the temperature conditions during all phases of the supply chain. In addition, there has been proliferation of biologics and bio-similar products that require reliable transport temperatures between 10°C and 25°C under all ambient conditions. Dry ice-based ULDs simply cannot meet these demanding requirements.

Global air traffic patterns and distribution requirements of life science products dictate that temperature-sensitive commodities must be able to transit across hemispheres and around the world. While the current dry ice-based solution offer the opportunity to maintain frozen temperatures and 2°-8° C temperatures in highly restricted ambient conditions, it certainly was not designed to manage today's demanding temperature ranges and transport routings.

In today's world of airline temperature management, the gold standard is fast becoming the compressor-based ULD.

ULDs of these variant use compressors for cooling and heat strips for heating in order to manage transport temperatures to the product's specific parameters. The technology has the ability to operate across a considerably wider ambient temperature range from -30°C to +48°C, provide consistent and specific payload temperatures and offer the opportunity to avoid the pitfalls and challenges inherent in the use of dry ice.

CSafe has created the AcuTemp RKN which can maintain temperatures at any user selectable set point between +4°C to +25°C. This ULD can operate independently in ambient conditions of -30°C to +49°C for up to 100 hours. This container is so well insulated that it can maintain a 4°C internal temperature for 8 hours at +43°C ambient without any power what-so-ever. Convenience of operation is also a key factor. The CSafe AcuTemp RKN can plug into any voltage globally to quickly recharge onboard reuseable batteries eliminating the need for expensive and often frequent alkaline battery replacements seen with dry ice-based ULDs. The ULD offers no-cost shipment data downloading and remains the only compressor-based temperature-controlled ULD with FAA and EASA approvals.

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