

SUSTAINABLE SOLUTIONS IN COLD LOGISTICS

About the **AUTHOR**



Mr. Samit Jain, MD at PLUSS, is passionate about the environment and drives Pluss with the purpose of all products being not only people centric but environment centric. He leads the strategy and overall business development of thermal energy storage solutions to enable sustainable temperature control. He holds an M.Sc. in Physics and BE in Electrical and Electronics from BITS, Pilani (1994) and an M.S in Electrical from Univ of Hawaii (1997).

India is amongst the largest food producers in the world. While this being true, more than 12% of India's population goes hungry every day.

Although there is an abundance of food in the country, disorganized supply chains fail to transport, store, and distribute produce effectively. There is an immediate need of effective cold logistics which is reliable, energy efficient, robust and more sustainable as a practice.

Government Support

Meat and seafood, groceries and fresh produce, dairy products, fresh-cut flowers etc. have one thing in common: they all require thermal control transport solutions to enable the end consumer to get the products in intact or usable condition. This is where the concept of cold-chain management comes in. Failure to keep cold-chain products cold will render them unusable, which leads to a wastage of the products. When cold products go bad, both the shipper and their client lose money.

With respect to the dairy industry, India is the biggest milk producer in the world. The Government of India in association with the Department of Animal Husbandry and Dairying in June 2020 announced a US\$ 2.1 Bn infrastructure development fund with an interest subsidy scheme to promote investment by private players and MSMEs in dairy, meat processing and animal feed plants which in return is expected to create 3.5 million jobs. The food processing ministry is actively promoting development of integrated cold-chain and value addition infrastructure, food safety and quality assurance infrastructure, infrastructure for agro-processing clusters, creation / expansion of food processing and preservation capacities and operation greens through schemes like 'Pradhan Mantri Kisan Sampada Yojana (PMKSY)' with budgets of over INR 4600 crores allotted to these focus areas.

Globally, India is the second biggest aquaculture and fish producer. The country is the fourth biggest seafood exporter in the world, with exports of marine

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products worth close to USD 7 billion. The country currently exports to over 115 countries, and the government has prioritized the goal of making India the world's top seafood exporter. India accounts for approximately 6.3% of the global fish production. The fisheries sector sustains close to 14.5 million fishermen and is growing at 7% per annum.



fun FACT

Running in the mornings, wherever I am, is my stress buster!

In all these various sectors, conventional diesel run solutions or ice (amounting to millions of tons) is used to maintain temperature and is run without the overall objective of sustainability. The wastage of massive amounts of water and increase of emissions coupled with old practices is a cause of concern.

India needs an adequate cold-chain network and sustainable technology

Even as India suffers from a serious level of hunger, here's something that's even more worrying: the country wastes a significant portion of its farm produce due to a weak cold-chain infrastructure, with 16% of fruits and vegetables being lost every year. Up to 10 per cent oilseeds, pulses and cereals grown in India are also completely wasted. Rameswar Teli, Minister of State for Food Processing Industries, provided this data in the Lok Sabha, attributing it to the study "Assessment of Quantitative Harvest and Post-Harvest Losses of Major Crops and Commodities in India". A successful cold-chain ensures temperature-sensitive products are kept

within optimal temperature ranges and maintain the desired states from start to finish.

For example, ice cream must be kept frozen to preserve its shelf life. If temperatures go above the sub-zero ranges, the product will lose its solid state and it'll no longer be considered to be usable. Suppliers of food and pharmaceutical products heavily rely on the cold chain to ensure shipment doesn't become compromised before they reach the market. Demand to provide the optimal customer satisfaction when it comes to product experience continues to escalate, and companies must continually seek out better ways and new technologies to deliver customer satisfaction. Many companies find that value-added logistics services help give their supply chain a competitive edge. Once limited to basic transport services, the industry has now evolved to configuring kits including marketing material for e-commerce to adding new technologies to maintain the product at its best quality.

Awareness, poor warehousing provisions and old infrastructure result need to be improved for us as a nation to overcome this challenge. Major side effects of this food wastage are poor health conditions, threatening the well-being of hundreds of millions of Indians, grave economic damage in lost crops alone and leading to substantial loss of resources like water, fuel, and land. To avoid such heavy hits to the nation, we need an adequate cold-chain network and sustainable technology/applications which drive the cold-chain network for agricultural practices towards better food safety and quality.



Conventional reefer trucks operate on diesel as the primary source of fuel and the refrigeration unit consumes around 40% of the fuel. Thermal battery using PCMs enables semi-electric reefer vehicles by decoupling the refrigeration unit from the diesel engine. The electric refrigeration unit is plugged onto an electric source when the truck is docked. During this time the refrigeration unit charges/ cools down the thermal batteries which caters to the cooling required during movement of the trucks. Another technological advancement has been the use of PCMs in chest freezer/coolers. PCMs have been incorporated into traditional chest freezers and coolers. These provide backup during power failures and also reduce energy consumption, by the virtue of having thermal mass to address sudden ingress of hot air. Till date these PCMs have enabled over 18 gigawatt hours of energy saving per year (through about 50,000 PCM based chest freezers and coolers).

Phase change materials – Energy Efficient and Sustainable

Advanced materials like Phase change materials or 'PCM' is one such solution that can provide energy efficient and more sustainable solutions for cold-chain in India. The market for PCM and its integration has huge potential in India and abroad and the acceptability for PCMs will only increase in the years to come from available conventional methods used today.

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are switching to more energy efficient solutions in the market and reducing their carbon footprint in the market. Most companies have specific teams that cater to their brand's sustainability targets and are always on the lookout to find new opportunities to incorporate new technologies to make their operation more sustainable and efficient. PCMs will enable this, as they can store energy when available or reduce the energy requirements. They also provide thermal mass during transport, thereby maintaining desired temperatures.

India is in dire need to upgrade its cold-chain capacity in agriculture sector. According to the Director of the National Horticulture Board, there is a 90% deficit of cold storage facilities in India. This is creating a huge gap in the cold chain which is resulting in 20 to 30% of produce being lost to wastage due to lack of temperature control. We need to learn how to store and use the cold energy for longer durations using reliable and inexpensive solutions. PCMs are an answer to address this problem.

Not all temperature-sensitive products are created equal. Every product is unique and requires specialised handling and storage temperatures to maintain its integrity along the cold-chain. A variety of different PCMs enable this. These PCMs have found applications in reefer trucks:

A lot more can be done through innovation. We as a nation must actively focus on developing this segment to make a significant leap forward and secure our future for generations to come!

