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Using Waste Cold from LNG Conversion to Enhance Cold Food Supply Chains in India

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Abstract

The post-harvest losses of agricultural produce in India are as high as 40% compared to about 2 % in the UK. Fresh perishable crops contain 65 to 95 % water when harvested and are at risk of spoilage due to microbial activity, water loss, and higher respiration and sprouting under ambient conditions for a long time. Hence there is a need to preserve agricultural produce by maintaining it below ambient temperatures. Presently, huge amounts of agricultural produce are being wasted due to a lack of proper storage techniques and an integrated cold supply chain in India. The cold chain denotes the series of actions and equipment required to maintain a product within a specified low-temperature range from harvest to retail and consumption. A temperature-controlled supply chain network with storage and distribution involves the transportation of temperature-sensitive perishable products through thermal and refrigerated packaging methods
Natural gas is liquefied by cooling it (at 112K) to reduce its volume for shipping. LNG receiving terminals, also called regasification facilities, receive LNG ships, store the LNG until required, and send out gaseous methane into the local pipeline grid. At the receiving terminal, the Liquefied Natural Gas (LNG) undergoes a regasification (reheating) process before being supplied to customers, and in the process, vast amounts of cold are lost to the environment. There is a great opportunity to harness the wasted/ stranded cold at the LNG terminals to produce liquid air and provide zero-emission cooling and power in a wide range of applications, static as well as mobile. This energy recycling at LNG terminals can develop dedicated gateways for perishable foods in the region and could be a potential and viable alternative source of refrigeration for cold storage /cold chain with zero CO2 emission

Presently 90% of India's cooling capacity and annual refrigeration and air-conditioning is based on hydrofluorocarbons whilst about 10% is based on ammonia. India's cold chain investment is rapidly increasing which will dominate other refrigeration units and it is expected to be based on conventional refrigeration systems. There is a pressing need to develop sustainable and low carbon dioxide emission cold chains. Part of the solution may be to use the huge untapped resource of cold associated with LNG production.

Currently, India has four regasification plants in Petronet's Dahej, Kochi LNG terminals, Shell's Hazira plant, and the Dabhol terminal, with a total capacity of 25 million tonnes per annum (MMTPA) where approximately 500-640 Megawatts of waste cold energy can be recovered. India is in the process of enhancing its LNG import many fold in the next few years
In this context, the paper explains the concept of the cold chain and the importance of temperature control for increasing the shelf life of produce. It summarizes the current status of cold storage in India and highlights, in an Indian context, the prospect of an agri-food cold supply chain using LNG
Key Words-Cold Chain, Liquefied Natural Gas, Refrigeration, Perishable crops

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