

COMPILATION OF

DISCUSSIONS AT THE NCCD

CONCLAVE ON REFRIGERATED

TRANSPORTATION

7th March, 2013

Ihc, Delhi

INAUGURATION SESSION

Mr. Shailender Kumar, Secy J&K and Ex Director NCCD

The produce moves from farm to wholesale to retail and finally to the consumer but the chain is not integrated. There exists a static infrastructure but absence of transport facilities defeats the purpose.

Transportation sector is not given importance and hasn't flourished. He urged the stakeholders to come up with the bottlenecks and advice NCCD on the probable course of action and recommend what Ministry of Agriculture should put into action.

He made the audience aware that there exists Extensive highways; rural roads and Agriculture produce available in all parts of the country but they need to be transported to the consumer. According to a study by ICAR the perishable losses amount to 1 lakh Crores. There are twin losses happening- one in terms of monetary loss and the other is the actual loss of produce which a could have helped to bring about nutritional security in the country and promoted exports of fruits and vegetables.

There are 7000 refer trucks for transporting 20 million MT of produce manned by unskilled workforce which leads to deterioration of the quality of the produce handled. The condition of air and ship cargo is even worst. There are a number of issues like lack of protocol and standards, taxation, traffic police and interstate issues. The government has offered a number of incentives like Schemes of NHM, subsidies, 100% FDI, external commercial borrowing allowed and excise exemption, no service tax applicable and zero custom duty. But the industry is still not utilizing these perks available.

He also emphasized that while studying the industry we should also keep in mind the number of refrigerators available in each household which is truly the last mile.

Mr. Bandhpadhya, Joint Secy, Ministry of Transport & Highways

He elaborated on the state of affairs of the roads in the country where he highlighted that there exists 5 million Kms of road network in country and 85000 kms of National Highways alone. A number of technological and infrastructural advancements have been made in the last 7-8 years. Routes with high traffic movement have been taken up to facilitate easy movement of cargo and people. National Permit Vehicles have been introduced where tax payment is online. RFID enabled vehicles is the next major step taken by the ministry to address the issue of long queues on toll plazas.

He also told that a system for common taxes is under process and would be made available by April end with all the payments made online.

He requested the stakeholders to come up with a wishlist which can be taken up by the Ministry to resolve the bottlenecks.

Mr. Sanjeev Chopra, Joint Secy, Ministry of Agriculture

Referring to the representatives from Ministry of Agriculture, Food Processing and transport, he said that no ministry can individually handled the bottlenecks faced by the refrigerated transport sector. He stated that 7000 refer trucks is like a small minidrop in the ocean. He suggested that the aim of the conference is to determine the reasons for the sector not catching up despite the support from the government.

He told that the atmosphere is very positive as now we have moved from the basic grains to the exotic fruits and vegetables. We are close to attaining the level of food security so we are now looking ahead to high value produce like fruits vegetables and exotics. Also there are two ways of looking at the situation which states that there is 50% capacity available: one that the sector is slow and the other possible way is that this 50% capacity has been built in the last 7-8 years which is a very positive indicator.

He stated that the refrigerated transport is not only related to fruits and vegetables but there are sectors like dairy, ice-cream, poultry and pharma. So he requested the stakeholders from all these sectors to come up with their issues. NCCD having a modern approach is a body which is in a position to address these issues at a much faster pace.

Mr. J. S. Meena, Joint Secy, Ministry of Food Processing & Industries

Mr Meena highlighted that the transportation sector is very vital in controlling the wastage of fruits and vegetables. New mega food parks are being set by the Ministry of Food Processing and Industries, abattoirs are being modernized, new infrastructure has been put in place but the most important connecting link is the transportation sector.

He informed that 63 projects of integrated cold chain with an investment of 1200 crores are in the pipeline and 75 projects of integrated cold chain with an investment of 1500 crores are planned in next two years.

He stated that all these investments would be meaningless if the transport sector is undeveloped. According to him the key challenge is the lack of skilled manpower.

SESSION 1: PLENARY SESSION

Mr R S Bedi, Chairman, Task Force on Logistics, PHDCCI

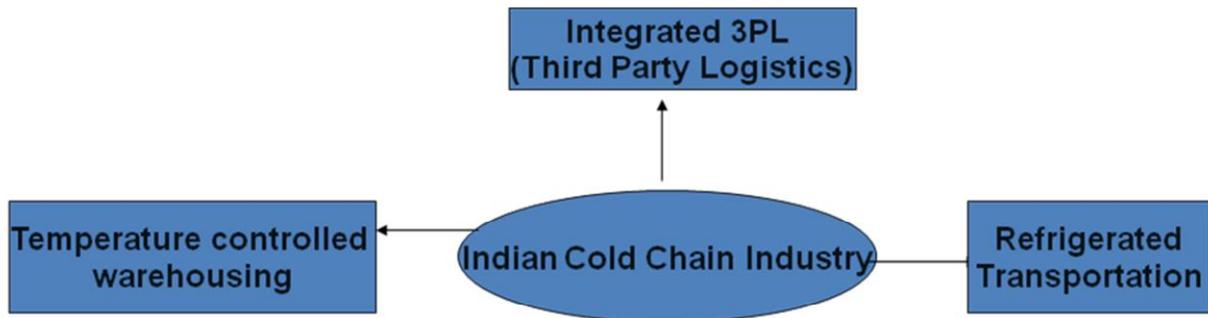
Indian Cold Chain Industry

- Majority of the cold chain infrastructure in India was developed in 1960s which majorly supports the storage of potatoes and potato seeds.
- About 75% of the total capacity of cold storages is suitable only for potatoes.
- Cold chain Infrastructure for other temperature sensitive goods is at abysmal state right now.
- On an average, about 30-40% of horticultural produce gets wasted annually in India.
- Even though India is the second largest producer of vegetables worldwide but its share in global export of vegetables is around 1.3% only. This is mainly caused by the lack of cold chain infrastructure which includes both storage and transportation facilities.
- According to recently published report by TechSci Research “India Cold Chain Market Forecast & Opportunities-2017” the cold chain market of India is anticipated to grow at the **compounded annual growth rate (CAGR) of 28% during 2012-2017, which will make it a whopping US\$ 11.6 Billion (Rs. 6,400 Crore) market.**
- The Indian cold chain market is highly fragmented in which about 3500+ players are present and most of them are from unorganized sector.
- India has nearly 23 million MT of cold storage facilities where as it currently needs at least 10 million MT of capacity over and above the existing one. Uttar Pradesh, West Bengal and Punjab account for around 70% of the total capacity.
- In the present scenario, India is able to store only 2% of its farm produce in temperature controlled environment as against 8% for the Asia-Pacific and 85% for Europe and North America.

Global Cold Chain Sector

- The total capacity for refrigerated warehouses is estimated at 458 million cbm worldwide, of which 310 million cbm are public warehouses (for hire).
- During the last two years approximately 192 million cbm of additional refrigerated warehouse capacity has been created.
- USA, India and China account for the largest share in cold storage industries worldwide.

3 main segments of Cold Chain Industry



Refrigerated Transportation In India

Present Status

- In India, unlike Western Europe or the USA, cold chain distribution or refrigerated transport is still at a nascent stage.
- When compared with the world standards for cargo movement through cold chain, India is way behind.
- The percentage of movement of fruits and vegetables through cold chain in U.S. is around 80 to 85%, Thailand is 30 to 40% while it is negligible in India.
- According to industry estimates, approximately 104 million MT of perishable produce is transported between cities in India each year. Of this, about 100 million MT moves via non-reefer mode and only 4 million MT is transported by reefer.
- Currently, most of the refrigerated transport segment is fragmented with large number of small, non integrated private players focusing on select commodities or regions.
- Their key assets comprise of modified trucks with additional insulated fixed containers and air conditioning units.
- India has about 250 reefer transport operators (mainly private firms) that transport perishable products. Of the estimated 25,000 vehicles in use, 80% transport dairy products, thus leaving only about a fleet of 5000 Vehicles for refrigerated transportation.
- Market studies have revealed that about 40% of the vehicles are for long haul movement while 60% vehicles are for short haul movement.
- Presently, the reefer transportation business in India (Both organised and unorganised segment) is estimated at about Rs 10-12 billion which includes reefer transportation demand for both exports and domestic.
- With regards to volume, the current reefer transportation business for exports is about 2.5 million MTS and for domestic consumption is about 1.5 million MTS.
- Based on the existing production and consumption pattern, the market can be stretched to a potential of 14 million MTs in the next 5 years.
- Major problems that cold chain logistics industry has been facing are power outages, fragmented market, high costs because of long transit time etc.

- Most of the cold chain providers are private players. There are few players that can offer an end-to-end cold chain solutions leading to limited choices for outsourcing by the manufacturers.
- Multi modal transport network for cold chain is lacking. Road transportation accounts for more than 60% movement. Leads to environmental issues.

Opportunities ahead

- Indian Logistics sector has evolved during the past two decades from being a pure transportation service to provision of value added offerings as customs clearance, freight forwarding, cross-docking, reverse logistics, warehousing of modern standards etc. however, it is still characterized by dominance of unorganized market.
- Logistics market represents about 6.2% of the country's GDP with transportation segment being the largest component of the market as most of the industries spend more than half of their logistics cost on this function.
- India is viewed as Asia's most attractive logistics market and ranks at No.4, whereby there is moderate logistics infrastructure in place and companies are starting to adopt integrated logistics practices thus offering more opportunity for growth as compared to an already developed logistics market like Singapore, which ranks at 13(as per SSKI research)
- Pharmaceutical Cold Chain Logistics represents an emerging opportunity in India despite several local challenges...
- Ø **New Drugs:** In addition to the 130 biotechnology drugs and vaccines approved by the US FDA, there are more than 350 biotechnology drug products and vaccines currently in clinical trials. Many of these biotechnology drugs are temperature- sensitive that require cold chain network.
- Ø **Focus on Vaccines:** major shift in the product portfolio of leading pharma companies, with focus on products developed through advanced technology like vaccines, which require maintenance of a proper cold chain right from the manufacturer's premises till it reaches the patients.
- Ø **India's growth as an outsourcing hub** is making MNC's being particular about strict regulatory compliance and costs, thereby increasing the demand for cold chain transport infrastructure

What needs to be Done

Export Logistics

- Special emphasis needs to be laid on development of reefer related infrastructure in view of India's export thrust and potential. Much time has already been lost in this direction. Addl infrastructure could be developed at ICDs at Delhi, Bangalore, Pune, Hyderabad, Guwahati, and ports at JNPT, Madras, Cochin. It is felt that the above mentioned ports and ICDs, and their hinterlands are most suited to exploit the exports of perishable cargo.
- Currently in India there are bottlenecks at most of the Indian Airports that include authorities not being able to assure cold room space despite getting advance notices from the companies about possible unloading of large consignments of temperature sensitive products.

- Cold chain dollies need to be provided at all international airports for movement of temperature sensitive cargo from airport warehouses to the tarmac where aircraft is parked.
- Some of the other gaps include improper training and refresher courses for some of the handling staff who handles such products at the Airport. Storage of Pharmaceutical products along with the meat and food products is against the GMP norms
- There should be emphasis on standardization and procurement to top-of-the-line technology. This should include:
 - Ø A perspective plan to introduce handling and storage systems over a period of time and it should be responsive to the needs like changes in refrigerated containers, etc.
 - Ø Planning of adequate numbers of reefer receptacles to be done in such a way that the ports are able to cater to the large variety of electrical supply variables like voltages, connector types, and interfaces. This would not involve much investment and help in making the refrigerated container service effective and attractive at Indian ports.

Road Transportation and Others

- Main arteries of roads and bridges along the way or which are important for container movement need special attention. There needs to be greater emphasis on design, specifications, quality of construction and maintenance of these roads. This aspect is more important since the refrigerated containers are larger and heavier. Multi-axle trucks (with suitable facilities for under slung diesel generating units) should be planned and encouraged.
- Domestic manufacturing should be encouraged. The domestic reefer market is large and could prove as a catalyst in growth of transport of fruits, vegetables, fish and other horticultural products. The required equipment and technology for insulation, cooling and the basic reefer technology should be obtained from leaders abroad. Import duties on components and equipment should be reduced.
- India's domestic market for refrigerated container services is yet unexploited. Aggressive marketing and making container services available for domestic perishable cargo would help in improving cargo transportation culture in India; also there is an ardent need to spread container culture among the shippers.
- Refrigerated containers need special facilities for testing, calibration, checking, cleaning and servicing. This is a relatively labor intensive service with considerable value added. Moreover, it goes a long way in ensuring long life and high value to the product being transported; hence such facilities should be introduced at the ports and ICDs.
- Greater thrust needs to be provided for development of suitable refrigeration systems including temperature controllers (with vast range and fine tolerances). End-users should also be involved in coordinating with the refrigeration industry of their special requirements.

- Need of Capital investment in Rail support equipment to move reefer containers.
- Provision of fast, scheduled, refrigerated container block-trains, etc should be there.
- The transport industry, shippers and government should create a task force to decide on strategic locations where inland pre-cooling and cold storage facilities could be developed, which are woefully inadequate.
- Promote organized Retailing in India; this would help in encouraging investment in the cold chain sector (Including Reefer Transport).
- A key gap in cold chain space is lack of adequate & relevant human capital to manage and operate the cold chain systems. So focus should be on opening more and more specialized institutes for cold chain technicians where they can avail on job training.
- Technical Standards are not suitable for Indian Transits; Poor cargo handling knowledge or dissemination; No intelligent support mechanism; Irregular parameters across regions; Standard refrigerated systems are inefficient & poorly designed and Lack of connectivity & distribution centres , such issues need to be addressed seriously and in detail to improve the existing scenario of Reefer transportation in India.
- Power shortage in the country (approx.10%, with a peak deficit of17%) could lead to significant impacts on cold chain sector, which is dependent on electricity for refrigeration. This needs to be addressed.
- Lack of Concrete regulations in Pharma Logistics: Though there are Good manufacturing Practices for the manufactures, packaging and storage of active pharmaceutical ingredients (APIs) and medicinal products, similar principles are not yet established for pharmaceutical logistics segment. These should be put in place
- Despite cold storages having been given infrastructure status and allowed the benefits of Project Imports, ECB funding, Viability Gap funding, tax holidays etc, large investments in the sector are still lacking. Govt needs to look into this. GST implementation needs to be pushed harder : a major factor which would impact the storage locations
- The cold chain sector demands an immediate investment exceeding USD 5 billion for creating additional storage capacity of 30 million tons and improving availability of refrigerated transport. In 5 years we will be needing investments exceeding USD 10 billion per year in this sector.

Dr R K Sharma, Director, NHB

Dr Sharma talked about the reefer transport support initiatives by National Horticulture Board.

Govt. initiatives - Milestones

- High Power Committee Study (1997-99)
- Lunch of first scheme (25% subsidy) in 2000
- NHB, NABARD, Commercial Banks, State Govt. involved

- Cold Chain Task Force constituted (3.5.2007)
- Task Force Report (14.8.2008) - Implementation
- Technical Standard Committee constituted (16.6.2009)
- Implementation of Technical Standards starts 1.4.2010
- Creation of National Centre for Cold Chain Development (27.1.2011)

Financial Assistance

- Reefer Van, Trucks, Containers and Specialized Transport Vehicle are eligible as PHM component alone or integrated cold chain projects
- Cost norm Rs 24 lakh/unit of 6 MT capacity; subsidy 40% (Rs. 50 lakh/project) in general area and 55% (Rs 60 lakh/project) in Hilly and Scheduled areas
- Procedure: DPR, LoI, Inspection, Release
- **12th plan proposal:** Cost norm revised Rs 24 to 26 lakh/unit of 6 MT Capacity @ 35% subsidy for general areas and 50% for hilly & scheduled areas
- Refer Van - NHB Subsidy

Year	Subsidy (Rs. in Lakh)	Van (Nos.)	Project (Nos.)
2011-12	Released: 149.67	23	7
	LOI: 418.70	13	2
2012-13	Released: 109.90	17	2
	LOI: 101.15	14	12

Trends

- Shift towards integrated cold chain. MFPI 94 ICC projects have essential components of reefer van linking farm level infrastructure with retail distribution hubs.
- Modern multi-commodities cold storage (for imported produce) or CA stores have reefer van as desired components.
- Frozen produce stores also linked with reefer van for distribution part.
- Stand above bulk store, basically in general areas, still alone.

Reefer Training- Course items

- Skill Development of Cold Storage Operators
- Training Content approved-Standing Committee (29.06.2011)
- Course Modules: Basics of perishable transport, Refrigerated Transport Practices, Specifications of various components, Pre & Post trip inspections, Field Visit for hands-on-training, Standard operating practices for machinery, Reefer Cargo Losses and how to control them, Carriage Guidelines, Documentation for quality maintenance of produce and Feedback, Safe and Fuel efficient driving – Green Driving and Contingency Management & Feedback and certificate distribution Session.
- Khalasi and driver both to be trained. Crisis management practices also to be part of training

He also depicted the experiments conducted by NHB where the protocols for transporting mangoes were developed to successfully transport mangos from Malihabad, UP to Dubai.

Technical Standards and Protocol for Transportation of Perishable Food Stuff in India (NHB-CS-Type 05-2011)

Basis of Standards

European Standards : (ATP Agreement) Agreement on the international carriage of perishable foodstuffs and on the special equipment to be used for such carriage.

- Prescribed by UNECE United Nations Economic Commission for Europe & Inland Transport Committee of Economic Commission for Europe.
- Established at Geneva on 1Sept.1970 entered into force on 21 Nov.1976. The Agreement and its annexes have been regularly updated.
- Presently there are 41 contracting parties including Europe, the Russian Federation, United States of America and Uzbekistan.

Standard – Contents

- Definitions of Various Equipment
- Testing Procedure
- Measurement & Definitions
- Measurement for Bodybuilder
- Guidelines For Operators
- Transport Temperatures
- Good Loading Practices
- Airflow

 National Horticulture Board		
Refrigerated Van No.	:	NHB –Class/FRA/FRB/FRC
Temperature Range	:	Plus 20°C to Minus 20°C
Refrigerant Type	:	<input style="width: 100%;" type="text"/>
Cladding Type	:	Food Grade
Air Ventilation	:	Yes/No
ACU	:	Watt
External Power	:	V (3 Phase) etc.
Chasis No.	:	<input style="width: 100%;" type="text"/>
Manufacturing MM/YY	:	<input style="width: 100%;" type="text"/>

Test Facilities – Required

- Government to assists setting test lab(s)
- Government/Industry to appoint authorities for certification/testing
- Body builders and refrigerator manufactures shall make type tests of their products in an ATP test station approved by the competent authority

- Transport equipment owners need ATP certificates “conformity with tested sample” (type test)

Mr. Anupam Srivastava, Invest India

Talked about his organisation’s offerings and asked the stakeholders to invest in the transportation sector. He informed of the interest by Ministry of commerce and Industry and DIPP in the cold-chain sector.

Mr. Pawanexh Kohli, Chief Advisor, NCCD

He referred to the eminent players of the industry telling them to together make the industry exciting and initiate interest. According to him change can be brought only if there is participation from all bodies and stakeholders. He urged them to come up with the bottlenecks and recommend NCCD on the possible plan of action as NCCD is a body of the people.

He further introduced NCCD, explaining to the audience that NCCD was formed as an autonomous body:

1. To Provide an enabling environment for cold chain sector to gain prominence and to enroll private sector involvement.
2. To establish standards & protocols for supply chain & equipment in harmony with international standards.
3. To undertake and coordinate R&D work in this sector.
4. Similarly, to undertake and coordinate HRD and capacity building.
5. To provide appropriate policy framework as well as launch publicity campaigns.
6. He added that cold chain is best applied holistically across all segments and NCCD will not focus only for agriculture products (though this segment is known to be main driver worldwide).

Benefits to nation accrue in terms of varied benefits like reduced **wastage**, improved **quality**, improved **value sharing** across total value chain.

To fulfill the objectives, NCCD has been mandated to function as **the Umbrella body**, as a **national nodal agency** for all cold chain development initiatives.

- There are by-laws that sanction the NCCD to progress with certain activities.
- These by-laws are open to review by the governing council and we will welcome suggestions to amend and improve upon these declarations.
- It includes research & evaluation, promotions, commercial exploitation of technologies, evolve strategies, etc.
- At the start the committees with industry participation, were established.
- The Focus areas span across supply chain, skill development, Energy, Standards, Logistics, Specifications and R&D.

- Each Committee could set up additional task forces comprising of experts.
- As per the recent Dr Saumitra Chaudhari's report, our financial incentives are more capital investment friendly, as opposed to how they can catalyse business that are more revenue expense intensive.
- NCCD shall take lead to explore innovative incentive options to catalyse the flow of business through cold chain.
- In July, a participative think tank conclave was held to include inputs for a Road Map.
- Expectations from NCCD were high and need for umbrella body was reinforced by members.
- Suitable amendments to the membership rules have been made.

Even in its initiation, some **milestone steps** have already been undertaken:

- CEMAFRIOD is **the 'NCCD' of France** and a partnership arrangement is initiated with them. Cemafroid was set up similarly by French Ministry of Agriculture in 1956. The protocols developed by them have led to the inputs & the signing of ATP at United nations- this is the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be Used for such carriage.
- IIR is well referred to by the refrigeration experts here. They will be glad to know, India has category 6 membership, which means voting rights as well and NCCD will be appointing delegates on their panel.

The steps taken are collaborative & partnership based, besides those which were only interactive, such as this conference.

- In other steps, NCCD has already commenced processes and hopes to obtain support from GoI and World Bank for funding certain specific cold chain related activities.
- These will include support for participation of IITs in this elite and critical profession. This will add greater credibility to India's cold chain engineers.
- NCCD would also promote specific and specialised trainings through the IITs for vocational training courses.

Other participation in developing domain knowledge & cargo handling skills for managing cold chain will also to be undertaken.

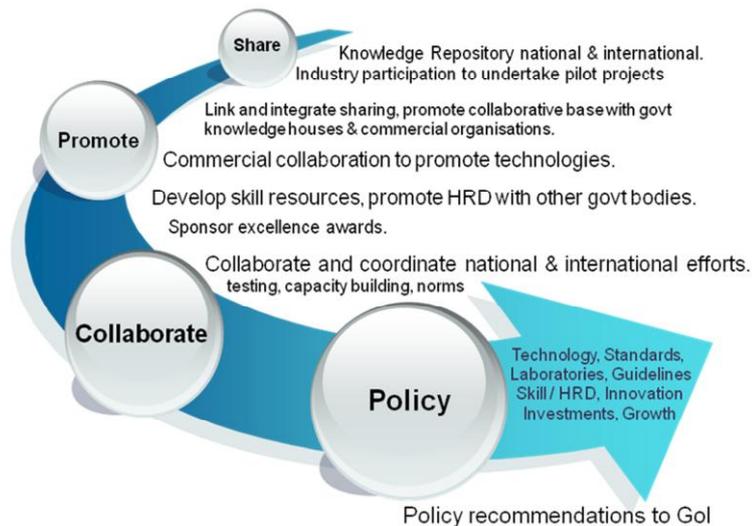
In the road map conclave, there was strong demand for a knowledge repository-

- NCCD will arrange and organise access to established knowledge base worldwide and locally,
- We understand that technology application in India may require indigenization to suit our working and infrastructural requirements.

Towards this NCCD will apply its collaboration with IITs, Agricultural universities and the other cold chain sectors like pharma, seafood, meats, etc.



- This slide displays the next steps that will build a platform that creates an enabling environment under NCCD.
- The steps include diligent mapping of current asset base, communication mechanism and case studies or market studies.



- The follow up actions would include:
 - Pilot projects.
 - A knowledge repository.
 - Collaboration with technology providers.
 - Capacity building.
 - Excellence awards.
 - Testing, validating and setting standards.
- The aim is to provide a forward catalyst to the cold supply chain.

Industry, PSUs, Government, Investors, Entrepreneurs, Farming Associations & Knowledge Houses - All Working Together!



- A nodal agency set up by the government on recommendation from the Industry. Its members are industry and government participants.

It may be noted NCCD is not only for agriculture produce but will for synergy across all cold chain sectors is aimed at.

In summarising:

- NCCD will participate as nodal agency in policy formulation for cold chain sector with various ministries and autonomous bodies of the government (such as planning commission, finance, HRD, Transport, technology, etc).
- These activities would be best served with direct inputs from industry.
- NCCD would seek to sponsor R&D activities with public and private R&D units.
- NCCD will bring India's cold chain into universities and international arena.
- NCCD will promote businesses and market studies that will can serve as examples for others.
- NCCD aims to promote commerce through India's cold chain.
- The cold chain is said to be fragmented and disorganised. The industry has also stated as much about the government initiatives. That it has too many arms promoting varied schemes & policies.
- NCCD is the government's forward step to address these concerns. NCCD shall be the one stop agency to forward the industry needs and relate them to national agenda. This will be done through internal and external collaborations.

- It is also recognised that Cold chain is not solely about building infrastructure but actually is a supply line that serves to link perishables from production point to buying market.
- NCCD will bring focus on this aspect of cold chain as well as packaging and other cold chain specific processes.

In ending he welcomed the continuous inputs and intelligent revisions to road map and invited members to take advantage of and to support NCCD in taking India's cold chain forward.

SESSION II: User & Industry Perspective

Mr Alok Dubey, DGM, Fieldfresh Foods

He highlighted the issues faced by the transport sector as following:

- § **Mis-Match** between availability & provision of vehicles.
- § **No standardization in sizes** of vehicles between various service provider.
- § **Limited number Quality service providers** (Less number of reefer vehicles vs. requirement).
- § **Bad Road Conditions**, resulting in High wear & tear & asset depreciation.
- § **Poor Network**, No Single Service Provider is able to give Pan India service.

Market & Concentration

- § **Fragmented** Cold chain operational presence (Extreme North-Apple, South & South west-Pharmaceutical).
- § **Reverse Logistics:** Major movement of cold chain is from North-West-South-west routes, and very limited towards East. Any deviation from this main route is expensive affair for growth.
- § **Design:** Only few refrigerated van have AC plug-in facility to ensure back-up in case of generators breaks down. Almost none for part load uses.
- § **Development:** Limited number of Fabricators (Available Reefer Truck Manufactures).

Knowledge / Awareness

- § **Domain:** Cold chain operators have limited knowledge of industry requirements.
- § **Drivers:** Lack of knowledge amongst driver makes them immune to cold chain criticality.
- § **Management:** Lack of skilled staff at Service Provider's end with no skill upgradation or cargo specific training.
- § **Stoppage:** Frequent delay and stoppage at highways & toll points, harsh for perishables.

Wish List

- To have **plug-in Power Points** available at petrol Pump in case of emergencies.
- **Separate lane** for reefer vehicle at Toll gates.
- Approved **Standard Sizes** of refrigerated vehicles for different pay loads.
- Vehicle **designed for Part Load** requirements.
- **Cargo handling training** for operational staff.
- Better facility should be available at Airports for Export Cargo.

- Thermal Blanket should be used during transit of cargo from the Perishable center to the Aircraft.
- Mumbai Airport Perishable cargo center needed an immediate upgradation.
- No Permanent Perishable center at Bangalore Airport
- Cargo to be taken out from Perishable center D-1

He stated that the demand is huge but no service providers are available to meet that demand and emphasized on manufacturing standard containers.

Mr Ashok Mirchandani, MD (Asia Pacific), Carrier

Stating the importance of transportation sector he stated that Carrier has been in the field of manufacturing trucks and the major challenges include:

1. Indian Cold Chain Development
2. Seasonal / Fragmented Loads
3. Capital Cost- duty structure - financing options
4. Sales Tax structure-check posts
5. Lack of reverse loads
6. Undefined end usage of components imported in the country due to which there are huge duties to be paid

What will change

1. Demographics
2. Ministry initiatives : all the ministries are putting in efforts to control the losses and the developemnt of the sector
3. Organised retail : FDI in multi brand retail is a big incentive
4. Streamlined logistics
5. Integrated solutions : there should be manufacturers and service providers who take up the role of providing integrated products so that

He also stated that as a general belief all the developed countries should have 1500 refer trucks per million of population and according to the study the figures for the countries as follows :

- Middle East : 300
- Latin America : 100-150
- China : 20
- India : 5

Which implies that we have a lot of scope to develop.

Dr. Devendra Jain, Director and Innovator, Pluss Polymers

Technology Innovation for Reefer Trucks and Last mile distribution Bottlenecks in cold chain. The bottlenecks can be listed as under:

1. **Energy:** Energy expenses constitute 30% of the total expenses

2. Product Temperature

Different Products require different temperature conditions and the Capacity utilization in Indian cold chain sector 30 – 75 %

3. Last Mile Distribution

- Limitations in last mile distribution
 - Roads
 - fragmented cold storage
 - Small volumes
 - Vaccines, cold foods less in tier 3-4 regions (30% unpenetrated market)

4. Technology

- Technologies Available, But dissemination and adoption limited.
- Limiting Pollution: Noise and emissions.
- Freeing Capacity: improving payload.
- Timed redundancy: Thermal Inertia.
- Risk Minimised: Chill injury mitigated.

Mr Aman Rekhi, Baxter India

Bottlenecks to Pharma Cold Chain

Cold Chain Logistics consist of :

- Cold Storages
- Refrigerated Carriers
- Cold Chain Packaging
- Warehousing processes
- MIS (tracking and tractability)

Major Focus is towards:

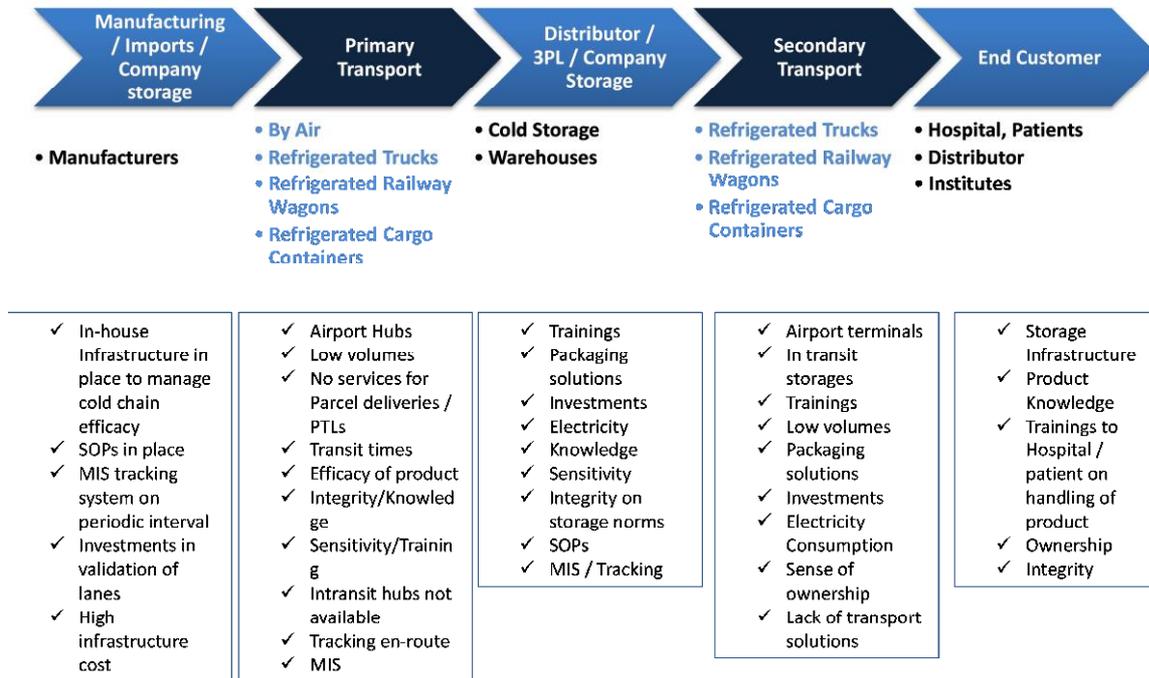
- Fruit and Vegetables
- Chocolates
- Ice Cream
- Dairy Products
- Meat, Poultry & Fish
- Limited Space for Pharmaceuticals

Key Bottlenecks

- Cold chain logistics infrastructure

Key Bottlenecks

Cold chain logistics infrastructure



Approach to Collaborative Partnership

- Innovate new Packaging solutions
 - Re-useable
 - Load efficiency
 - Cost effective
- Develop new logistics solutions
 - To manage small loads by road
 - Improvement of services by Train
 - Movement of parcel through air
 - Cut down transit lead time
- Product Sensitivity (Knowledge)
 - Change management : Compliance / integrity
 - Product Sensitivity
- Training
 - Partner with Transporters / Storage warehouses
 - Develop training manuals
 - Handling of products
 - Dedicated skill set

Value Parameters

- Reach (Geographical coverage)
- Temperature Range Availability (Product Ranges Covered)

- End to End Solutions (Integrated approach)
- Temperature & Humidity Control (During Transit)
- Transport Modes
- Product Security
- Cost effective solution
- Competence of service provider
- Regulatory Compliances
- Carbon Footprint

Mr Howard Scott, MD, Big Bear Supply Chain Management

He emphasized that the major constraint or bottleneck apart from all the ones mentioned is the availability of manpower. He told that the current salary per month of the drivers range in the following categories:

- Low end Drivers: 6500 INR per month
- Mid way Driver: 8000 INR per month
- High end Driver: 12-15000 INR per month

Calculating the total worth of a single truck on the road with all the contents is somewhere around 1 Crore and can in no way compared to the 6500 INR being paid to the person who carries it from say Delhi to Mumbai. According to him focus should be on

- Driver training
- Driver best practices
- Driver Health

The industry has somewhere around 33 million drivers at present and would require 51 million drivers by the end of 2015.

He also told that the rate of efficacy of transporting vaccines from Hyderabad to Guwahati is 30% where as for the same values and distances it is 100% in Europe. According to him the best technology is present in the west but it cannot be simply picked and dripped in India, it has to adopted and acclimatized to the Indian conditions.

Mr. V P Vargheese, MD, Surakhsha Transport Systems

Refrigerated Trucks: Industry Overview

- Refrigerated Trucks for transportation of perishables in India has been in use since early 80's.
- The Refrigerated Trucks manufacturing activities are mostly in the un-organized sector and centered in the metros.
- The First Refrigerated Container built on a Truck Chassis was exhibited in the Telco Pavilion at Auto Expo 1989.

- The growth of Indian Refrigerated Industry has been very sluggish in the past 20 years.
- Although reliable data on the average annual production is not available, it could be presumed that this volume would not have been more than 3000Nos. per annum.
- Insulated Trucks (without Reefer Plants) are mostly used for transportation of Fresh fish with crushed ice and Milk & Milk Products.
- The building of Insulated Trucks are mostly concentrated near the coastal towns and nearer to the traditional fishing harbours.
- Traditionally GI Sheets/Aluminium/Wood/Mild Steel are the materials used for Body Construction.
- The Insulation materials used are Expanded Polystyrene (Thermocole) , Glass wool, Cork and Wood and Plywood.
- Refrigerated Truck Industry has seen rapid growth in the recent years with more volumes being built.
- The estimated volume of heavy & medium size Reefer Trucks built over the past few years has doubled or even trebled and quality Reefer Trucks are in demand.
- The financial benefits offered by the Govt. in the form of concessional excise duty , is yet to reach the actual users.

Constraints & Bottlenecks in Reefer Truck building

Central Motor Vehicles Rules 1989 - Related

- Refrigerated Trucks have a peculiar requirement of accommodating the Reefer Units above the cabin. Traditionally Cabins are of fixed type and locally fabricated and hence flexibility existed.
- Now all the Chassis manufacturers have launched factory built tilting cabins and it needs more vertical space for cabin tilting.
- The Overall height specified in the CMVR 1989 is based on the types of commercial vehicles available at that point of time. The technology changes taken place in the past 25years needs to be factored and rules amended suitably.
- Multi Axle rigid body trucks replaced the single rear axle trucks as the popular transport vehicle for the long & medium haulage requirements
- The height of the Chassis longitudinal frame from the ground in unladen condition in Single rear axle and Multi Rear axle trucks are shown in the table below:-

Chassis	Frame Height from GL
LPT 1613 (TATA)	945mm
LPT 2518 (TATA)	1070mm

- Additionally the multi rear axle vehicles has a bell crank mechanism at the rear and as such the Reefer Container needs to be mounted above this mechanism. (Height of the Mechanism -150mm)

- The Overall height of various types commercial vehicles would have been decided based on the Height of ISO series 1 Freight Containers and the Chassis height of Rigid body trucks and trailers.
- The Table below gives the External Dimensions of ISO series 1 Freight Containers used in the International Trade.

Container Size	External Width	External Height
20ft x 8ft x 8.5ft	2438mm	2591mm
40ft x 8ft x8.5ft	2438mm	2591mm
40ft x8ft x 9.5ft (Hi Cube)	2438mm	2896mm

- The Table below gives the maximum height permitted for motor vehicles as per Rule 93, Clause No.4 of the CMVR 1989.

Description	Max. Height
Motor vehicles other than double decked vehicles	3.80 M
ii. Double Decked Motor Vehicles	4.75 M
Laden Trailers Carrying ISO series 1 Freight Containers	4.20 M

- n Considering the peculiar construction of Reefer Containers on Multi Axle trucks and also the height of ISO Containers, the CMVR Rules require amendment as under

Description	Max. Height
Single Rear Axle Motor vehicles other than double decked vehicles	3.80 M
ii. Multi Rear Axle Motor vehicles other than double decked vehicles	4.00 M
ii. Double Decked Motor Vehicles	4.75 M
Laden Trailers Carrying ISO series 1 Freight Containers	4.20 M

Insulated Trucks

- Insulated Trucks are also part of the Cold Chain in India and these trucks are used for transportation of Chilled Products.
- These trucks are mostly used for transportation of Fresh fish with Ice (2 to3 °C) & Chilled Milk & Milk Products (3to 4 °C) and similar products.
- The volume of Insulated Trucks built in India per annum is quite substantial and even more than the Refrigerated Trucks
- Since insulated trucks play a vital role in the cold chain, these trucks also to be treated at par with Refrigerated trucks.
- “Refrigerated Motor Vehicles” and “Insulated Motor Vehicles” to be brought under the same tariff head and treated equally.

SESSION III: Provider Perspective

Ms P Alli Rani, CEO, FHEL

She talked about the achievements of Concor stating that CONCOR operates 63 terminals; is coming up with 10 logistic parks; runs 2 full trains in a week and is equipped to handle any demand from the point of view of the service provider and does not face any challenge. The major business comes from the EXIM sector, meat, pharma and only limited amount of Fruits and vegetables.

Coming to the constraints from the point of view of the customer there exists a number of issues which can be divided as follows:

- **Demand side constraints**
- Single direction of traffic with no balanced movement
- Issues of scale where small size of consignments cant be shipped and are not cost effective
- **Supply side constraints**
- Lack of availability of adaptable technology which can be adopted to the nature of the produce to be transported
- Lack of Presence of single window service provider offering a package of services

Also the aim should be to benefit the farmers at large.

Mr. K.K. Mitra, VP, Lloyd Insulations

Bottle Necks

- Lack of customer understanding / knowledge
- Lack of Specification knowledge
- No technical Standard Specifications like NHB Technical Standard for Cold Store Construction
- No construction documents guidelines
- Different PUF insulation properties
- Adequate PUF thickness for Energy Savings
- Proper fabrication drawings with jointing details
- PUF panels different than conventional Transportation panels
- PUF category different than normal cavity wall pouring in truck body building
- Camlocks in addition to tongue & groove jointing of panels
- Proper insulated door specifications
- Chequered plate flooring finish
- Proper estimation
- Testing of panels

- Excise duty on PUF Panels 12.36%
- Excise duty on PUF Chemical 12.36%
- Import duty on PUF Chemical (MDI)14.4%
- Import duty on GRP sheet 10%

Mr Amitabha Chaudhary, MD, APL IndiaLinx

He took his agenda as constraints faced by the railways for transporting perishables. He revealed that transport of F &V contributes to 0.02% of the total cargo being transported by railways and negligible amount in terms of the revenues earned. The only produce transported is onion, potato, banana, orange and mango which are seasonal in nature. Given these facts, railways consider fruits and vegetables transport to be comparatively unproductive in monetary terms.

The constraints on the other hand faced by the customer are as follows:

1. Scale: small sizes cant be transported and leads to increase in cost
2. Lack of availability of modes of transport at the point of origin
3. This leads to the introduction of several layers of middlemen which further ads to the cost
4. No loading and unloading in between the transit so produce should be able to survive the time taken in the transit.

Intermodal agencies have worked as a comparatively better option which combines railways and stationary storage at point of produce and consumption.

The role of a nodal body should be resolve the issue of scale, arrange for food parks and primary storage, incite service providers to offer integrated solutions and services.

He stressed on the policies and steps which benefit the two ends of the cold chain-farmers in realizing a better price for their produce and investor to get a decent ROI on his investment.

S.K. Sarkar, Crystal Logistics

LSP perspective - status & constraints in reefer transportation

Constraints in reefer vehicle:

- Imposition of additional ac tax on reefer vehicles in certain states entailing additional tax burden and clarity.
- High toll expenses enroute.
- Undue holding at check post with temperature sensitive cargo causing extra fuel consumption.
- Lack of trained manpower and driver shortages.
- Vehicle insurance does not cover loss due to ac failure in vehicle.
- Levying of higher road tax for reefer vehicles under commercial vehicle.
- No subsidy from govt. For promoting cold chain development.

- High penalty in different states in absence of original documents in the vehicles.
- No tax benefit – income tax.

Mr. Siddharth Mishra, CEO, HLM

Introduction to HLM India Pvt. Ltd.

- HLM India Pvt. Ltd. is a Joint Venture between HLM Holland BV and TSI
- Almost 40% of India's food and perishable goods produce is wasted due to inadequate cold chain infrastructure for storage and transportation. The Indian government has recognized this and has announced several subsidized and promotion schemes for cold chain solutions for reefer trucks and trailers
- Currently the Indian reefer truck market is dominated by small, local unorganized manufacturers with outdated technology
- The Joint Venture is focusing on addressing the needs of the cold chain industry for this rapidly growing Indian market

Insulated Panel Construction Technology (Summary)

- **GRP – Glass Reinforced Polymer**
 - Low weight
 - Elasticity
 - Water resistance
 - High insulation (0.2 W)
 - Non corrosive
- **XPS Foam**
 - Low weight
 - High thermal insulation (0.025W)
 - Higher Density than PUFF(38-42)
 - Good damping resistance
 - Excellent stiffness and hence strength
- **Wood**
 - Low weight
 - High insulation (0.15W)
 - High strength
 - Excellent stiffness
- **Glue**
 - Excellent adhesion
 - Clamping providing excellent insulation

Box Construction Technology

Floor

- § Steel reinforcements in cross members for fitting to sub frame/chassis
- § XPS hard foam with closed cell structure (no moisture absorption) in combination with cross members.
- § Standard equipped with strong plywood layers and GRP
- § In the back of the floor extra cross members, reinforced for fork lift based driving in/out

Side walls

- § Wooden reinforcement beam integrated at underside panel, for extra fixation floor.
- § GRP, XPS hard foam and strong plywood layers.
- § Standard aluminum kick strip inside, mounted 250 mm. from floor.

Front wall

- § Standard equipped with a Steel reinforcement frame for mounting the refrigerating unit
- § Wooden reinforcement beam integrated at underside panel.
- § The XPS hard foam, GRP, and strong plywood layers.
- § Standard aluminum kick strip inside, mounted 250 mm from floor

Roof Panel

- § Standard equipped with a wooden reinforcement frame for mounting the evaporator unit
- § The XPS hard foam GRP, and strong plywood layers.
- § Interior lamps (optional)

Rear Portal

- § Standard coated steel rear frame bolted to the walls and covered with stainless steel rear portal.
- § Aluminum reinforcements in door panel for hinges and locks.
- § The XPS hard foam core has a closed cell structure,
- § Standard on each door, stainless steel hinges and door locks (container type)
- § Two led positioning lights (optional)

Advantages of HLM Reefer Box Technology in India

- § Much lighter in weight (about 1.5 to 2 Tonnes lighter for an equivalent 24ft box)
- § Higher in insulation due to the better components (GRP and XPS foam), better construction which results in lower temperature loss
- § Better on fuel economy as it is much lighter in weight, has a higher isolation and lower temperature loss
- § Better in hygiene as it is made of GRP, wood, Stainless Steel and Aluminium. There is no steel which will result in rusting, corrosion, etc.
- § Much larger in internal space as the technology used allows for a lower thickness of panels to be used to provide the same level of thermal isolation

- § Longer in life – Aluminium kick strips on the inside, Aluminium frame all around the box, Aluminium protector plates on the outside of the box to protect against side impact damage, better construction and gluing technology
- § Better in image for the transport company in the eyes of their customers.

In the Longer Run:

Floor

- § XPS does not absorb water, hence no repairs required/ replacements required over the years.
- § There is no rust hence floors do not need replacements every 3-4 years

Accidental Damage:

- § Cheaper and faster repair process as no welding, denting or injections required.
- § Major Damages can be repaired within few days.
- § After repair, the repair work is nearly invisible.
- § No damage to insulation properties after repairs.

More Carrying Capacity:

- § 24 ft Box in Steel and Puf format (125mm thick) would have an internal space of 38 Cu.M against 42 Cu.M in HLM Boxes.

SESSION IV: Technology & Strategy Perspective

Mr Aman Khanna, Associate Director, Ernst and Young

In the Fresh & Perishable Food supply Chain Driving down the wastage is the main key. Issue that causes more damages than value adds is the lack of supply chain:-

- Improper post harvest handling storage.
- Improper harvesting processing.
- Improper packaging, Poor Handling.
- Multiple players in supply chain.
- No single owner being responsible
- Absence of value added services .For e.g.: Use of crates.

The Loss is about 50,000 crore under 5000 service providers.

Extracting this loss/wastage and distributing it to the service providers (in form of margins).This is the main objective of perishable Food supply chain.

Process Food Supply Chain

Process food includes Chocolates, Confectionaries, milk products and Dairy Products

Maximizing the Efficiency is the main Key.

- Not Much Wastage.

- Just efficient distribution doesn't work.
- Small godowns all over the place.

Driving down wastage in the fresh food supply chain basically includes these three issues:

1. Structural Issues
2. Human Resources issues
3. Individual Enterprise.

Structural Issues can be handled through:

- Greater integration along the chain.
- Greater scale in each segment of chain.
- Single ownership ensures minimal losses.
- Must not change too many hands.

Human resources Issues can be controlled by:-

- Encouragement of staff through training.
- Knowledgeable manpower.
- Temperature Control.

Initiatives that can be taken to support human Resource Challenge:-

- Developing Institution for upgrading the skills of manpower.
- Certification in grading program.
- Creating good manpower.

Enterprise Level Efficiency:

- Service provider need to invest.
- Spreading Knowledge.
- Less hands in supply.

SUMMARY

- Refrigerated Transport is better linked.
- Support of government should be in reducing the wastage.
- Driving down wastage in fresh food and perishable food supply chain.
- Improving efficiency in process food supply chain.

Mr. Purvin Patel, COO/Business Head, Radha Krishna Foodland

5 Key Factors:

1. Infrastructure
2. People/Manpower
3. System
4. Technology system
5. Appliance

5 Areas that needs to be efficient:

The Assets

- The infrastructure associated with supply chain.

- Drivers and delivery boys should bring the stock to the store in most orderly manner.
- In Transit Issue
 - (i) Bribing the cops.
 - (ii) Harassment such as clearance problems.
 - (iii) Taxation issues.
- Network Effect
 - (i) Storing in well maintained condition.
 - (ii) Not many hands in transferring from farm to retail.
 - (iii) Mishandling should be controlled.

Conclusion:

1. Get the basics right.
2. No wastage.
3. Delivering Right.
4. Efficiency in delivering.

Mr. B T Gorti, Saradiro E Service

Food Safety Concerns in Reefer Containers

Common practices and challenges and emerging trends risk for food safety concerns

Issues:

- Capacity Problems
- Knowledge drivers shortages, and
- Customer demands are the food transportation industry's top challenges

Drivers Role:

Driver shortages and capacity problems may result in a lack of driver education in and adherence to proper procedures for the safe transportation of food

Backhauling

- Food safety is the latest emerging logistics challenge
- Engage in backhauling (transporting a different load in the empty truck on a return trip)

Backhauling increases the risk for cross- Contamination if potentially hazardous foods or other items are carried in succession without proper sanitation

Manufacturers

Manufacturers who outsource their transportation needs relinquish control of safety of their product as it moves from the processing facility to the retailer.

- Majority of supply chain operators outsource the transportation to 3rd party logistic
- Good communication and management systems are required to maintain product integrity throughout the distribution chain.
- The other concerns are tampering and sabotage, temperature abuse, and cross contamination

- While there is limited data on food safety failures that are directly attributable to transportation practices, some industry experience suggests that such incidents may be widely underreported

Problems at Distribution Centers

Temperature management is not a core competency

- DC management has limited experience handling temperature sensitive product
- Lack of understanding on the interconnectivity of product temperature management & food quality or safety
- Inconsistent compliance on monitoring temperatures.
- Make random changes without considering the problem from a holistic perspective.

Need to define, implement, enforce, and comply to standard processes for:

- Trailer loading and unloading
- Temperature settings and monitoring throughout supply chain

Solutions for effective preventive controls for food safety concerns

Stakeholder, Consumers, Channel partners, Governmental regulatory staff need extensive awareness of risk and risk management for food safety during cold chain transportation and training on critical food safety concerns.

- Awareness and training program should reaches to mass in villages where basic agriculture produces are produces.
- Standards and guidelines of food safety across the reefer transportation.
- Availability of expertise on development, implementation and monitoring of protocols for reefer container operations across business country covering end to end solution for cold chain business.
- Government involvement in creating a mechanism for regular maintenance of food safety audit and surveillance system.
- Management commitment from business owner and all other stakeholders for sincere and serious development, implementation and monitoring of food safety framework
- from farm to fork.
- Protocols to be develop and ensure to implement for food safety framework for continuous improvement through rigorous food safety surveillance system

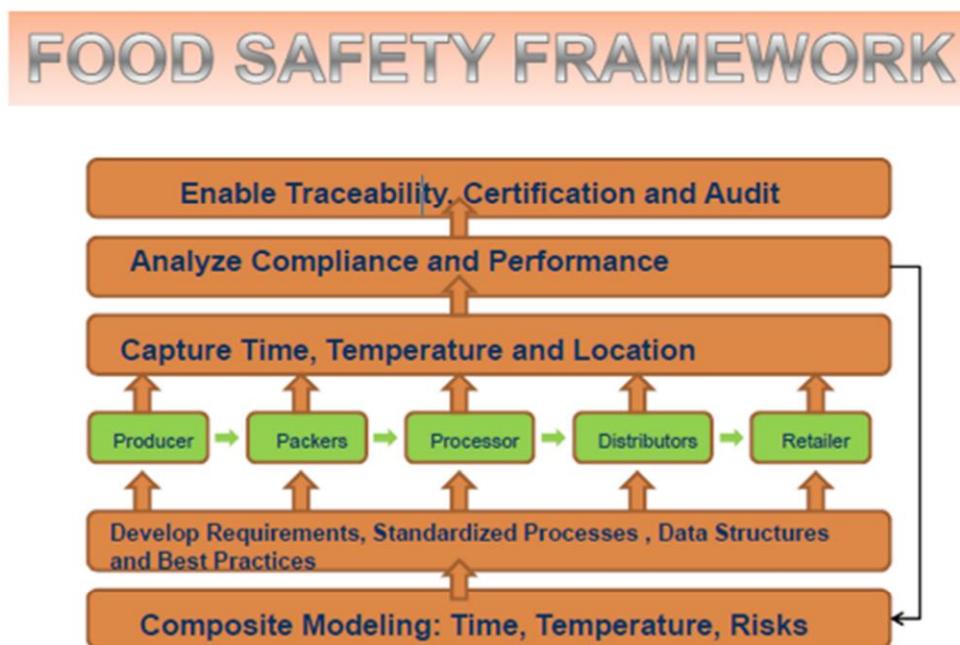
Government support for:

- Solution to make fast track corridor
- Solution to provide the infrastructure facility to meet the global and demanding food safety standards.
- Solution to link up the financial support with development and implementation of food safety framework.
- Further linking up financial support to monitoring and continuous improvement of food safety frame work.

Government fast track solutions

Solutions are to allow easy imports of

- Monitoring equipment for use of appropriate transportation vehicles (i.e., dedicated vehicles when necessary)
- Acquisition of appropriate temperature recording system and tracking system by adapting use of tracking technologies (i.e. satellite or radio frequency identification) technology.
- Technical knowhow for proper monitoring of infrastructure, food safety and food security surveillance system.
- Adoption of packing and operation procedure to distribute food containers safely across the food chain through reefer containers.



Ms Cosima, MD, Lamilux India

During her presentation she explained the benefit of GRP over steel and urged NCCD to take up the issue of import duty on the GRP sheets.

Mr Anil Chopra, MD Field Fresh Vegfru

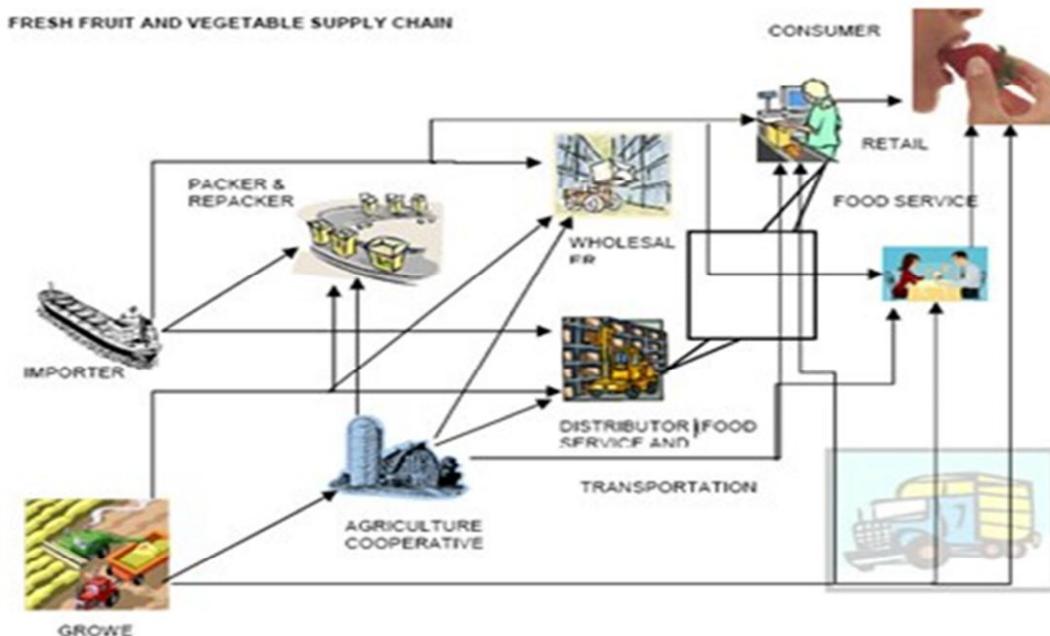
Food logistics – a case for optimization

- n Elements of logistics are remarkably expensive, if not controlled effectively.
- n Holding stock or inventory in warehouses just in case it is needed is a highly costly activity.
- n The stock itself is expensive and might not sell or could become obsolete, or in the case of food, "wastage".
- n Warehouses generally are expensive to build and maintain as well as operate.

- n Vehicles to transport goods between warehouses and stores are major costs, both in terms of capital and running costs, with drivers' wages and ever higher fuel costs.
- n There is thus an imperative to making sure that logistics is carried out effectively and efficiently.

Introducing Reverse Logistics

- n Logistics is “the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements”.
- n Reverse logistics includes all of the activities that are mentioned in the definition above with a difference that reverse logistics encompasses all of these activities as they operate in reverse.
- n Therefore, reverse logistics is: “The process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal”



the arrows are transport vehicles and packaging materials – including cold containers, wagons, trucks, pallets, crates, boxes etc...

Introducing Packaging Logistics and Pools

- n Dominating assumption is still that packaging is a part of logistics, or even a part of warehousing activities
- n Packaging logistics is “The process of planning, implementing and controlling the coordinated packaging system of preparing goods for safe, efficient and effective handling, transport, distribution, storage, retailing, consumption and recovery, reuse or disposal and related information combined with maximizing consumer value, sales and hence profit.”
- n Pool systems for returnable transport packaging are a sub-area within packaging logistics

What are Package Pools ?

- The first type of pool system is a transfer system;
 - the sender owns his own need of returnable transport packaging and exchange one-by-one with its suppliers and customers.
- The second type of pool system is a depot system where:
 - an agency owns the packaging and is responsible for package hygiene
 - The agency has two ways of operating: either a book system where the senders continuously provide the agency with accurate data on the location of the packaging,
 - or a deposit system where a deposit follows the packaging all the way until the agency pays back the deposit when empty packaging is returned.
- The third option is a pool system without any return logistics, where:
 - the sender rents the packaging from an agency
 - takes full responsibility for all administration, handling, cleaning, maintenance etc. until surplus or worn-out packaging is sent back to the agency by the sender.

Way forward

- § Sell the vision to all stakeholders begin with Govt (NHB / NHM, MOA)
- § Study / Plan
- § Perform a large-scale pilot test, including project financing
- § Design an administrative concept for the pool system
- § Design a functional standard for crates, pallets etc.
- § Develop a standardize returnable tray, boxes and pallets for fresh produce
- § Develop a specification of requirements to be placed on a business-wide, nationwide returnable packaging material, followed by a tender process
- § Design an administrative concept for the pool system, form a part-owned pool company
- § Roll out – perhaps on a PPP mode

Mr. J M Gupta, APC Polycoat

COLD CHAIN

The cold chain involves the transportation of temperature sensitive products along a supply chain through thermal and refrigerated packaging methods and the logistical planning to protect the integrity of these shipments.

INFLUENCE ON COLD CHAIN DEVELOPMENT

- n GLOBALISATION has made relative world much smaller
- n For transporting perishable products globally, PHYSICAL SEPERATION OF GLOBAL REGIONS needs complex transport operations involved.

COLD CHAIN BOTTLENECKS

DAMAGE TO GOODS due to break of chain

- n By shocks during transportation
- n undue temperature variations
- n Time delay may have negative consequences due to chemical reactions and quality may degrade

EMERGENCE OF COLD CHAIN & ITS HISTORY

- n The refrigerated movement of temp. sensitive goods in practice dates back 1797 when British fishermen used natural ice to preserve their fish stock piles while at sea.
- n In the late 1870s and early 1880s, France was starting to receive large shipments of frozen meat and mutton carcasses from South America, while Great Britain imported frozen beef from Australia and pork and other meat from New Zealand.

TEMPERATURE CONTROLLED ENVIRONMENT: TODAY'S SCENARIO

The success of industries that rely on the cold chain

- n Knowing how to ship a product with temperature control adapted to the shipping circumstances.
- n Different products require different temperature level maintenance to ensure their integrity throughout the travel process. Most common temperature standards are :-
 - n "banana" (13 °C),
 - n "chill" (2 °C),
 - n "frozen" (-18 °C) and
 - n "deep frozen" (-29 °C).

INTEGRITY OF SHIPMENT

- n Staying within this temperature is vital to insure and optimal shelf life. Divergence can result in irrevocable and expensive damage; a product can simply lose any market or useful value.

IMPACT OF TECHNOLOGY ON REEFER TRANSPORTATION SYSTEM DESIGN OVER EXTENDED TIME (30-45 DAYS)

Type of container and refrigeration method

Is essential to ensure that a shipment will remain within a temperature range for an extended period of time comes down largely to the type of container that is used and the refrigeration method. Factors such as

- n duration of transit,
- n the size of the shipment and
- n the ambient or outside temperatures experienced
- n type of packaging required.

Construction of container

- n Can range from small insulated boxes that require dry ice or gel packs, rolling containers,

53 footer reefer which has its own powered refrigeration unit

TEMPERATURE CONTROLLED ENVIRONMENT: COOLING SOURCE TECHNOLOGY-1

The major cold chain technologies

- n **DRY ICE:** Solid carbon dioxide, is about -80°C and is capable of keeping a shipment frozen for an extended period of time. It is particularly used for the shipping of pharmaceuticals, dangerous goods and foodstuffs. Dry ice does not melt, instead it sublimates when it comes in contact with air.
- n **LOW TEMP ICE SLURRY:** Use as secondary refrigerant. A mixture of chilled water and food grade polypropylene
- n **GEL PACKS:** Large shares of pharmaceutical and medicinal shipments are stored at 2 and 8°C classified as chilled products. Method to provide this temperature is to use gel packs containing phase changing substances which can go from solid to liquid and vice versa to control an environment. Can either start off in a frozen or refrigerated state.
- n **EUTECTIC PLATES:** The principle is similar to gel packs. Instead, plates are filled with a liquid and can be reused many times.

TEMPERATURE CONTROLLED ENVIRONMENT: COOLING SOURCE TECHNOLOGY -2

- n **LIQUID NITROGEN:** An especially cold substance, of about -196°C , used to keep packages frozen over a long period of time. Mainly used to transport biological cargo such as tissues and organs.
- n **QUILTS:** Insulated pieces that are placed over or around freight to act as buffer in temperature variations and to maintain the temperature relatively constant. Thus, frozen freight will remain frozen for a longer time period. Can also be used to keep temperature sensitive freight at room temperature while outside conditions can substantially vary (e.g. during the summer or the winter).
- n **REEFERS:** Generic name for a temperature controlled container, which can be a van, small truck, a semi or a standard ISO container. These containers, **which are insulated**, are specially designed to allow temperature controlled air circulation maintained by an attached and independent refrigeration plant. The term increasingly apply to refrigerated forty foot ISO containers. Technological advances are making them much less prone to defects.

n REFRIGERATED CONTAINERS: IMPACT OF INSULATION

Impact Of Insulation And Refrigeration System On Container Cost

- n **Refrigerated containers** (called "reefers") represent a specific category that account for a growing share of the refrigerated cargo being transported around the world. The cost of reefer containers may vary from \$5,000 to \$30,000.
- n **Cost Difference** Attributed to
 - n insulation and
 - n the refrigeration unit
 - n All reefers are painted white to increase the albedo (share of the incident light being reflected);

EFFECT OF HIGH ALBEDO

- n high albedo implies less solar energy absorbed by the surface) with the dominant size being 40 high-cube footers (45R1 being the size and type code).
- n For instance a low albedo container can have its internal temperature increase to 50°C when the external temperature reaches 25°C on a sunny day while a high albedo container see its internal temperature increase to only 38°C under the same conditions.

- n The refrigeration unit of a reefer requires an electric power source during transportation and at a container yard.
- n It is important to underline that the refrigeration units are designed to maintain the temperature within a prefixed range, not to cool it down.

REFRIGERATED CONTAINERS: TODAY'S SCENARIO

Warehousing Loading and Unloading Facilities

Before being loaded into a reefer, which requires specialized warehousing and loading /unloading facilities.

A NEW GENERATION OF REEFERS is coming online, which are equipped with an array of sensors monitoring effectively the temperature and shutting the cooling plant when unnecessary. This enables to improve the reliability of temperature control and well as extend the autonomy of the reefer.

The Setting and Organization Of Cold Chains

- n **Shipment Integrity:** Moving a shipment across the supply chain without suffering any setbacks or temperature anomalies requires the establishment of a comprehensive logistical process the maintain the **shipment integrity**. This process concerns several phases ranging from the preparation of the shipments to final verification of the integrity of the shipment at the delivery point:
- n **Shipment preparation:** When a temperature sensitive product is being moved, it is vital to first assess its characteristics. A key issue concerns the temperature conditioning of the shipment, which should be already at the desired temperature. Cold chain devices are commonly designed to keep a temperature constant, but not to bring a shipment to this temperature, so they would be unable to perform adequately if a shipment is not prepared and conditioned. Other concerns include the destination of the shipment and the weather conditions for those regions, such as if the shipment will be exposed to extreme cold or heat along the transport route.

Modal choice key factors.

- Often includes a set of intermediary locations,
- the size and weight of the shipment,
- required exterior temperature environment and
- time restrictions of the product.

Custom procedures: If the freight crosses boundaries, custom procedures can become very important, since cold chain products tend to be time sensitive and more subject to inspection than regular freight (e.g. produce, pharmaceuticals and biological samples). The difficulty of this task differs depending on the nation (or economic bloc) and the gateway since there are variations in procedures and delays.

The "Last Mile": The last stage is the actual delivery of the shipment to its destination, which in logistics is often known as the "last mile". Key considerations when arranging a final delivery concern not only the destination, but the timing.

Integrity and quality assurance: After the shipment has been delivered, any temperature recording devices or known temperature anomalies must be recorded and made known. This is the step of the logistical process that creates trust and accountability, particularly if liability for a damaged shipment is incurred. If problems or anomalies that compromise a shipment do occur, an effort must be made to identify the source and find corrective actions.

FOOD TRANSPORTATION

Innovation And Preservation Method: There is a variety of methods for the transport of food products with the banana accounting for the world's most significant commodity transported in the food cold chain with 20% of all seaborne reefers trade. Land, sea and air modes all have different structures for keeping food fresh throughout the transport chain.

Packaging: Innovations in packaging, fruit and vegetable coatings, bioengineering (controlled ripening), and other techniques reducing the deterioration of food products have helped shippers extend the reach of perishable products. For food products such as fruits and vegetables, time has a direct impact on their **shelf life** and therefore on the potential revenue a consignment may generate. Concomitantly, new transport technologies have permitted the shipment of perishable products over longer distances.

Improved Roads And Intermodal Connections: For instance, improved roads and intermodal connections along the African coast reduced food transport time to European markets from 10 days to 4 days.

Transport Mode: Certain domestic or transnational supply chains may only require one transportation mode, but many times ground shipments are one link in a combination of transport modes. This makes intermodal transfer critical for the cold chain.

Intermodal Shipments: Typically use either 20 or 40 footers refrigerated containers that are capable of holding up to 26 tons of food. The container makes loading and unloading periods shorter and less susceptible to experiencing damage. The environments in these containers are currently controlled electronically by either plugging into a generator or power source on the ship or truck, but early food shipments would cycle air from stores of wet or dry ice to keep the food refrigerated.

CONSOLIDATION OF COLD STORAGE FACILITIES TO CAPTURE NEW OPPORTUNITIES.

- n **Air Travel:** Another efficient mode for transporting foodstuffs is air travel. While this is a preferred form of travel for highly perishable and valuable goods due to its ability to move much faster over longer distances, it does lack the environment control and transfer ease of the ground and sea transports. Also, during the flight the cargo is stored in a 15°C – 20°C environment, but close to 80% of the time the package is exposed to exterior weather while waiting to be loaded onto the plane or being moved to and from the airfield.
- n **Uncompromising Strategy And Regulations:** This is a troubling consideration when importance is placed on quality and freshness. More uncompromising strategies and regulations will have to be embraced and enacted.
- n **Global Seasonal Variations And Efficiency And Reliability Of Temperature Controlled Transportation:** has reached a point which allows the food industry to take advantage of global seasonable variations, meaning that during the winter the southern hemisphere can export perishable goods to the northern hemisphere while an opposite trade, generally of smaller scale, takes place during the summer. Countries such as Chile have substantially benefited from this and have developed an active agricultural and food transformation industry mainly servicing the North American market during the winter, but also with several niche markets such as wine.
- n **Floriculture Industry:** A similar issue concerns some African countries such as Kenya that have developed a fresh produce and flower industries catering the European market.

- n The fast food industry is also an active user of cold chain logistics as every outlet can be considered as a factory.

**VIABILITY ISSUES OF OPERATING COST OF REFRIGERATED TRANSPORT
FUEL CONSUMPTION ANALYSIS OF REFRIGERATED TRANSPORT**

✓ RATED CAPACITY OF TRUCK	14-15 tons
✓ VEHICLE SIZE	L=25 ft, W=16 ft, H=8-9 ft
✓ GROSS VOLUME OF STORAGE CAPACITY	25x16x8 = 3200 cu. Ft
✓ PER TON CUBIC FT	3200/15 tons = 213 cft/ton
✓ AVG. RUNNING OF TRANSPORT /24 HRS. DURING TRANSIT	16 Hours
✓ FUEL CONSUMPTION IN LTRS.	2.5X16 = 40 Ltrs
✓ COST OF DIESEL	40 ltrs x Rs. 50 = Rs. 2000
✓ AVG. DISTANCE COVERED FROM BOMBAY TO DELHI	16 km
✓ AVG. TIME TAKEN	3 Days
✓ TOTAL COST OF DIESEL USED	Rs. 2000x3 = Rs. 6000
✓ COST OF DIESEL/TON PRODUCT KEPT	6000/15 = Rs. 400
✓ OTHER OHS ASSUMING 100% COST/TON OF VEHICLE:Rs.	800/- per ton
✓ REFRIGERATED TRANSPORTATION COST PER KG OF PRODUCT	Rs. 0.8 per kg
✓ REFRIGERATED STORAGE COST OF TYPICAL SINGLE COMMODITY FOR FULL SEASON PER KG 6-8 MONTHS (fruits & vegetables) @ Rs. 80/- per bag of 50 kg	1.6/- per kg

---X---

Complied by:



ICE Centre of Excellence
D-18, Nizamuddin East
New Delhi, 110013