Cold Chain Facilities in USA

Photo 23 : A typical ante-room connecting cold stores and truck dock

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Part 2 of 2

This is the second and concluding part of my two-part article. Two aspects of the cold chain were covered in the last article, namely post harvest and short & long term storage. In this part, I will cover refrigerated transport, loading/ unloading in controlled environments and Display Cabinets. At the same time, one part will be directed to the developments in solar technology and some more stress on the finer points and areas where, we, in India must really try to improve !

Refrigerated Transport and Logistics

Refrigerated transport holds almost the same importance as the pre-cooling or storage, but somehow in India it is felt that this point is neglected. This is where the possibility of breakage of the cold chain is higher. The next point of loading / unloading (which would normally be considered a part and parcel of refrigerated transport itself) is specifically put in separately since it is again given less importance in India.

Refrigerated transport is a huge Industry in the US. Of course, the cold chain industry itself is huge, so its transportation is bound to be sufficient to cater to the same. The first picture, *(Photo 18)* shows a typical scene in most Distribution Centres (DC) in the US. The large number of containers docked is very typical. Another interesting point to note is the size. These containers go upto 53 feet, much larger than our 40 feet container! They can have two or three internal compartments with varying temperatures.

[Author's note: There is a general feeling that in applications involving different temperatures, power consumption would vary significantly depending on the temperatures. However, in transport refrigeration that's not necessarily the case. The net power consumption would be equivalent to the lowest temperature requirement only, so its more of ease and flexibility of operation that really goes into this kind of requirement]

There are a couple of interesting things to note related to containers. More often than not, the driver's cabin with engine comes off leaving the container and the condensing unit docked. The condensing unit then gets temporary power from the DC ante-room if required. So the driver or the driving vehicle does not necessarily need to be with the container when it is

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Photo 18 : Containers docked at a DC

Photo 20 : Driving vehicle with mini-home setup

docked. The same can be seen in *Photo 19*.

The vehicles normally go very long distances and travel continuously for days on end at times. Now, though that's not very new for us here, there they have incentives for on-time delivery. So their vehicles have a neat set-up within the driving vehicle itself. *Photo 20* would give a clear idea of the same. Notice the area behind the driver's seat. It has a toilet, a small living room with a small kitchen, a bunker bed, etc. So a set of people can take turns driving and the other person can be very comfortable. But that still does not take care of one issue : what about family life ? To take care of this, some people have devised novel ways. A couple takes up the vehicle, and both take turns driving. They have they a small home set up, so they don't need anything else ! Normally these are people who love travelling and don't mind spending their days on the roads.

We were all very enthused by the idea of trying to get into one.. and see it from the inside .. but we were advised not to, citing safety reasons. It seems you can very easily get shot there if the driver feels threatened !

Now though we were not allowed to go into the driver's cabin, we could definitely see the inside of the container. This was something nice .. and there are many small features that need to be noticed here. Have a close look at *Photo 21*.

Spot the light fixture on the left side of the picture throwing light into the container. It's a flexible light, obviously very helpful and useful. Also, notice how well the dock seal and the container have sealed the points of air entry. Note the horizontal and vertical red lines shown on the container wall. That gives the level upto which the pallets can be loaded. The yellow cloth-like thing coming on the top side is a duct for air distribution, ensuring that air does not get trapped in the front and reaches the back side for even cooling. The flooring also needs to be observed. There are grooves to ensure that air flow takes place even from the floor in case direct loading takes place (without pallets). Of course, it also adds to the strength of the flooring. So what's new ?? Well, just the fact that it is so clearly spelt out, leaving no room for ambiguity.

Since we're on the topic, there's another point that I would like to show here. Observe *Photo 22*. The note put up gives directions, laterally inverted as well, so that the driver backing up and looking at his rear view mirror would also be able to read ! Its this minute attention to detail that really fascinates a person. This is not a high technology feature. Just simple basic understanding of human nature.

Logistics of these refrigerated containers is a whole different

Photo 19 : Container docked without the driving unit with only the condensing unit

Photo 21 : Inside a container

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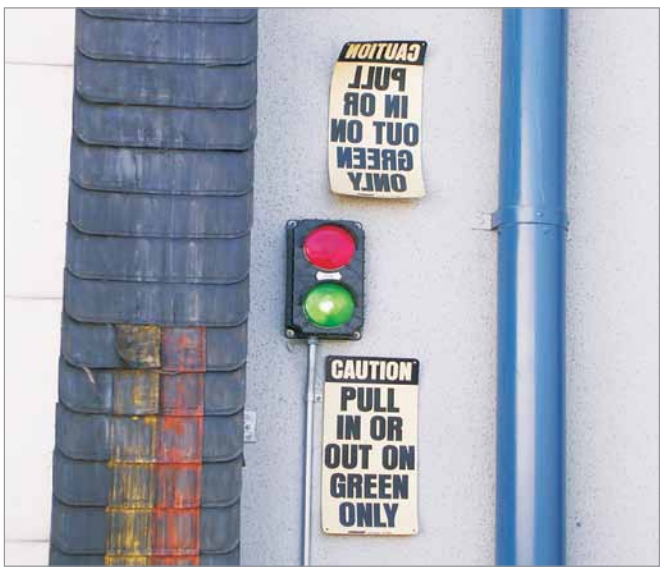

Photo 22 : Driver's instructions considering normal view as well as through a rear view mirror

ball game altogether and can be a subject of a separate article. As mentioned in the first part of the article, we did visit the Los Angeles port and the warehouse facility at the LAX airport as well. However, due to security concerns, no photographs were allowed. But what I can say here is that the same is well managed and logistics are worked out keeping maintenance of the cold chain in mind to a reasonable extent.

Loading and Unloading in Controlled Environments

For correct maintenance of the cold chain it is imperative that the products (in whatever form they may be stored in) are loaded & unloaded in the right kind of environment. This would be the docks, the Ante-rooms and the like. Ante-rooms are essentially short term (actually very short term) storage areas where temperatures are maintained high enough to enable the product stored to 'hold' its temperature till the time it reaches either the container or the storage / processing place. Another major function of the Ante-room is to restrict the passage of moisture from the outside to the inside.

As expected, this particular case was well taken care of in all the DCs alike. *Photo 23* shows a typical Ante-room with the dock doors on the left (behind the yellow coloured guards) and the cold stores on the right. Also seen are pallets loaded waiting for dispatch and pallet trucks. On close observation, the cooling unit is seen on the right side top.

An important part of the Ante-room ends up being the 'Dock Door' and 'Dock Leveller'. These are the elements that help to conveniently connect the reefer containers to the Ante-room and avoid air exchange with outside air as far as possible. A photograph of Dock Door & Dock Leveller is shown from the inside and the outside in *Photo 24 & 25* respectively.

However, in some of the other cold storages we visited, it was pretty much like the Indian scenario.

[Note from the author: Maintenance of this cold chain, as I see it, primarily rests upon the maintenance of the temperature of the 'product' at the desired levels. The product will be in the best possible condition if its temperature is maintained at the required level. Any product, once cooled, has a tendency to 'hold' its temperature for some time. If the product maintains its temperature within the required limit during transit, then the cold chain can claim to be "maintained". This is helped by the Ante-room. It is observed in India that even Deep Freezers have their doors opening directly into ambient conditions. This should be avoided as far as possible. Ante-room even provides energy saving by restricting the ambient heat and moisture coming in direct contact with the cold room air.]

Display Cabinets in a Controlled Environment

With shopping mall culture reaching India, these display cabinets are not new to us, especially for people residing in metros and urban areas. This would essentially be the last point upto which it is logically possible to have control on the cold chain, especially when we are talking about retail consumers. Once the item is bought, the cold chain has to be maintained by the consumer, to whatever extent possible.

Display Cabinets have their own internal air circulation path with a definite airflow pattern defined, so inspite of the fact that these are open, the products still stay within the set temperature. The controlled environment would mostly be air conditioning in the range of 22 ~ 25°C.

Though we did visit many stores and saw very many Display Cabinets, none of the stores allowed us to click pictures. Since these are now regular pieces of equipment seen in most shopping malls, I am not specifically putting a picture here.

Some Other Products / Developments Worth Mentioning

In the US, there's one thing that you note very specifically: These people can really 'SELL'!! They create a product out of nothing .. well, ok .. not exactly 'nothing' ..

The product I'm coming to is something called 'baby carrots'. On first view, we actually thought they have genetically modified carrots and created small forms. These were very tasty, I must say!

But during the course of conversation, we realised that these were actually not small. They were normal carrots, with a variety developed to be of a longish form. These carrots are cut and actually created (like we do on a lathe machine) to give it the

Photo24 :Dock doors from the inside. Notice that the dock levellers are kept fully upright

Photo 25: Dock doors from the outside

'rounded' edges making i t look like a small carrot.

The product was selling like hot cakes there ! And we were all impressed !!

Another interesting visit that we had was to the Solar Research Centre of ASU which needs a mention here since it gave great insights into the development of solar energy. Of course, this was in November 2008, so by now things would have moved on much further. Still, its worth mentioning that amongst the best solar panels they had went upto a power output of 150 W/m^2 (which is quite high). Now with solar radiation being close to 1000 W/m^2, we still have a long way to go in terms of getting the most out of solar energy. Currently, research is on which aims at bringing this to the range of 540 W/m^2! We were also informed that owing to some developments, production of silicon is bound to go up, on account of which, prices may fall by 30% ~ 50%. Sure hope that the day when cheap solar power is utilised in a big way comes soon !

Another product that was being developed was non-silicon based semiconductors, so the dependence on silicon is reduced. Similarly, solar cells in transparent flexible material were being tested. Once commercialised, this would then be a rage since it could then be directly put up on glass windows. The glass window would be producing electricity to sustain the building, without losing out on the elevation appearance. Architects reading this article should look out for this development !

I'm sure many people will now join me in hoping that such technologies reach the consumer fast.

Acknowledgement

As we end the discussion on the US Study Tour, I can't help reaching out to all the people who made this tour such a memorable experience. Here's a special thanks to Jim Brown who was the main coordinator. And further special thanks to Vivek Savla for getting me into this cold chain workshop, Abhijeet Kale for lending his camera on many ocassions and all my friends in the study tour and other well wishers who were with me throughout the various experiences as a part of the tour! ❖