WAREHOUSE DESIGN

Finding Optimum Storage Solution

Sugato Chandra, **President (Projects & Technology), M. J. Logistic Services Ltd.,** **explains that optimization of storage capacity takes center stage when designing a logistics center.**

With ever increasing land prices and high investments that are required to make storage and material handling equipment in a Logistics Center (LC) or a 'Hub', the need to find optimum storage solutions is paramount. Every stakeholder profits from a well designed LC, be it the owner/investor, the Logistics Service Provider (LSP) or the service user. Hence the methodology involved in designing an LC is a complex and resource intensive process *(See box: A Simple Depiction of A Logistics Center)*.

Rules To Know

Creating a complete material and operational flow that meets the throughput requirements is the main objective while building a warehouse. In the process, the space as well as material handling productivity must also be enhanced. These are however traditional design objectives. Ergonomics is one of them and it refers to creating an environment for people which is safe, but at the same time helps in improving the productivity. Product safety in terms of both storage and handling is another. But the most important addition is the concern for sustainability. Efforts are being made to reduce carbon foot print, increase the use of renewable energy and conserve natural resources in the supply chain.

Many MNCs already have a clear mandate on these as a part of their global policy. Therefore, use of sky-lights to reduce dependency on artificial lighting, installation of CFL, LED and solar powered lamps instead of incandescent / fluorescent lamps and rain water harvesting systems etc. are common in the new warehouses and distribution centers in India today. At this rate India will have its first Green LC very soon.

Design: Do's And Don'ts

As we can see there are many variables and constraints involved in designing warehouses, each of which need to be carefully considered and analyzed. Modern simulation software is of great help here. The entire simulation exercise, right from model building, defining the process constraints and establishing the input and output parameters to analyze the results and optimize the performance, all call for special skills and expertise. To aid this there are specialized people and organizations that offer these services at a cost effective price in India today.

A word of caution in this regard would be not to adopt the 'best practices' of the developed nations blindly while designing a hub in India. Our business practices and ground realities are very different from them and can change the design parameters significantly. Some examples of issues that crop up in this regard are - how much should the receipt staging area be when majority of goods are moved in a non palletized load by trucks of varying shapes and sizes? How many dock levelers would be needed? How does the planning for receiving take place when Advance Shipment Notice (ASN) is virtually nonexistent, especially in domestic procurement and distribution? How to overcome the poor use of IT at the back end?

Optimum Storage Capacity

The following example will help understand storage capacity utilization clearly: In order to find out the optimum cube utilization, we must first look into the pros and cons of three commonly used racking systems viz., Selective Pallet Racking (SPR), Double Deep and High Density / Drive in. Very Narrow Aisle (VNA) and Automated Storage & Retrieval Systems (AS/RS) are out of the purview due to their rarity in India and exorbitant costs. *(See table: Pros and Cons of Racking Systems)*

Please note that the floor area utilization under SPR can be improved by over 20 percent if Reach Truck is used instead of CBT which requires a wider aisle space to operate. High density/Drive in racks offer significant improvement in cube utilization; hence the aim will be to use it for storage as much as possible in the limited SKUs.

Interestingly, drive-in racks can also be used effectively in the receiving or dispatch area. For example, a large warehouse where incoming goods peak at a certain time of the day and the receiving process takes time due to quality inspection, high density racks can hold the inventory truckwise, very effectively. Similarly an export warehouse can aggregate all the items, destination wise and container wise at the dispatch staging area using Drive in racks.

Now for the regular storage using SPR, the choice, therefore, is between

A. Use CBTs for material handling in a LC with 8M height, both of which tends to lower total investment outflow, or

B. Build a LC with a height of 12M and use combination of Reach trucks & CBT to reduce the unit cost of storage.

For a LC with a size of 9,324 sq mt the comparative cost under both the scenario will be as shown in Fig 3 (Comparative Cost of an LC).

Although the total investment under option B is higher by over Rs 64

Pros and Cons of Racking Systems

Parameters	SPR	Double Deep	Drive in
Picking selectivity	Good	Limited	Average
Accessibility	100%	50 pc	25-30 pc
Stock Rotation	Good	Average	Limited
Max. storage height	12M	10M	9M
Floor area utilization	30 pc	40 pc	60 pc
MHE required	Stacker/CBT / Reach truck	Special reach truck with telescopic fork	CBT / Reach truck
Industry application	Practically all industry	Mainly in Cold stores	Limited product type

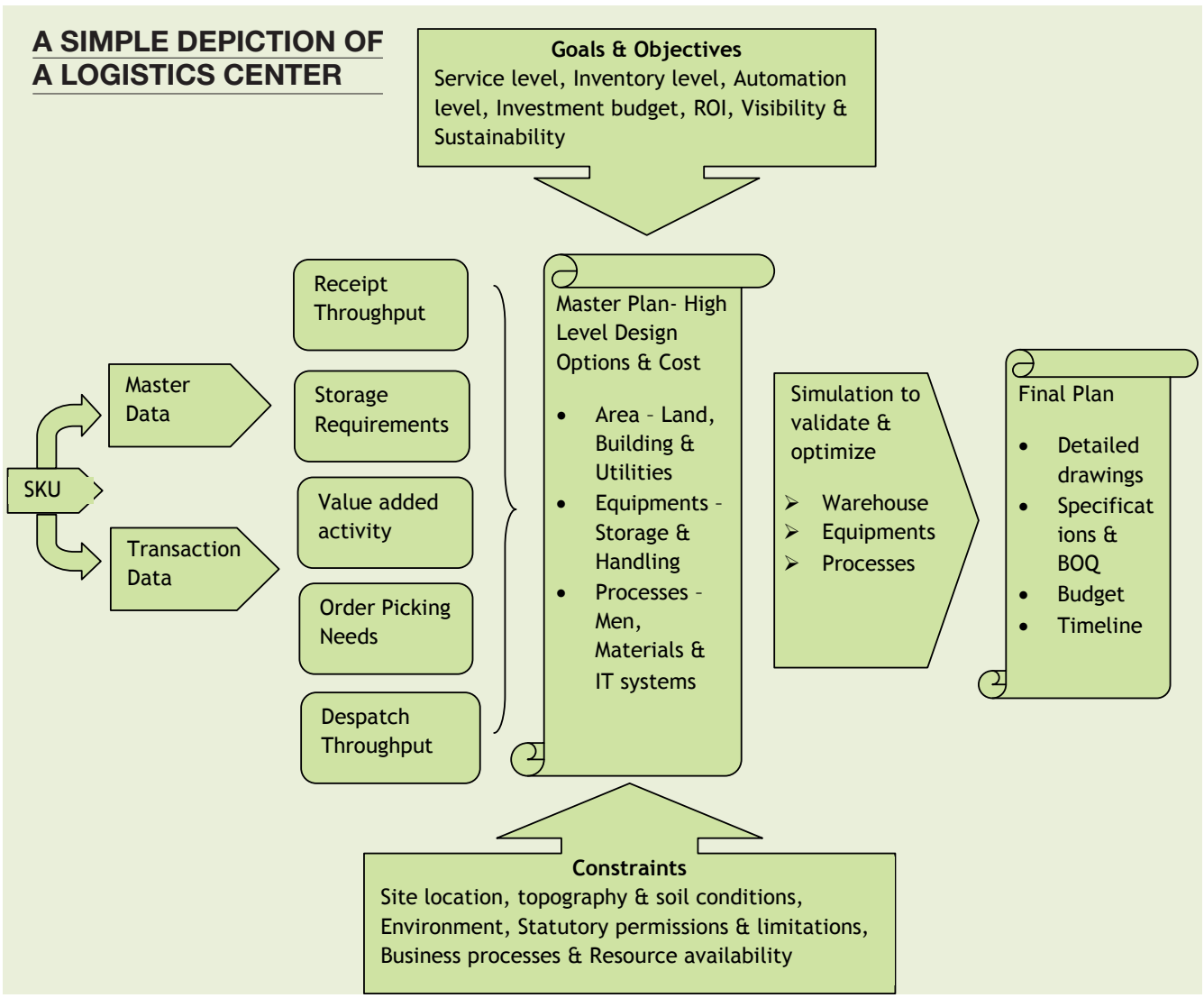

Fig 3: Comparative Cost of an LC		
Options >	**8M with CBT**	**12M with RT**
Total # pallet	5,640	14,830
Investment in	**(Amt in ₹ mn)**	**(Amt in ₹ mn)**
PEB	48.6	63.4
Civil	33.1	41.7
Electrical, Fire Fighting & Lighting etc	25.5	27.6
Storage & MHE	35.1	73.9
Total Investment	142.3	206.6

million, the unit cost per pallet comes down by 45 percent due to improved use of the vertical storage space as well as narrower aisle space. Please note that the cost of land has not been considered in the above example as it varies widely from one place to another. Should you decide to factor in the investment in land then the case becomes even stronger for utilizing vertical height to the maximum possible.

Bottlenecks To Progress

Most of the large warehouses are constructed away from the city or municipal limits in a 'decontrol' area where one can build almost anything as long as the village panchayat has no objection. This is prevalent throughout India. The reason for this is the traditional mindset of landlords and owners to build as much as possible as more the warehouse area, more the rental income. A ground coverage of 70-80 percent for the warehouse building is not an exception.

In any case, all trucks both loaded and empty are to be parked outside on the road. Taller warehouses are not built as rent is paid on per square foot basis. Many companies are willing to sign long term lease agreements for their warehouses but are averse to invest in storage and material handling equipment. The landlords are also not comfortable investing in such equipment as they do not know what to do with them, should the company decide to terminate the contract prematurely.

Contracts with a 'lock in' period covering the entire life span of the equipment are yet to be seen. But fortunately such archaic ideas are changing. The new LCs that are being built by many third party logistics service providers in India adhere to the various norms with respect to ground coverage, maximum height, fire safety, seismic zone parameters, etc. as prescribed by the local authorities or the National Building Code. The cube space for storage that will be available for a given parcel of land can thus be accurately ascertained.

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