

CHAPTER – 1

INTRODUCTION

1.1 A Brief History of Sugar Industry in India

India is the second major sugar producing country in the world, the first one being Brazil. Sugar industry occupies an important place among organized industries in India. Sugar industry, one of the major agro-based industries in India, has been instrumental in resource mobilization, employment & income generation and creating social infrastructure in rural areas. Indeed, sugar industry has facilitated and accelerated pace of rural industrialization. The advent of modern sugar processing industry in India began in 1930 with grant of tariff protection to the Indian sugar industry. The number of sugar mills increased from 30 in the year 1930 - 31 to 135 in the year 1935-36 and the production during the same period increased from 1.20 lakh tonnes to 9.34 lakh tonnes under the dynamic leadership of the private sector.

At present, there are 634 installed sugar factories, having annual installed production capacity of 230.01 lakhs tonnes, out of which only 488 factories are operational. More than 4.50 crore farmers are engaged in sugarcane cultivation and about 5 lacs rural people have got direct

employment in the industry. Sugar industry has brought socio-economic changes in rural India by way of facilitating entrepreneurial activities such as dairies, poultries, fruits & vegetable processing and providing educational, health and credit facilities.

Thus, the following **tables 1.1, 1.2 & 1.3** are prepared to show the state-wise & sector-wise installed sugar factories, installed capacity and number of sugar factories in operation (state-wise).

**TABLE NO. 1.1 - SHOWING STATE-WISE & SECTOR WISE
INSTALLED SUGAR FACTORIES DURING 2008-09**

STATEMENT SHOWING THE STATE-WISE & SECTOR-WISE INSTALLED SUGAR FACTORIES DURING 2008-09					
S.NO.	STATE	PUBLIC	PRIVATE	COOPERATIVE	TOTAL
1	PUNJAB		7	16	23
2	HARYANA		3	13	16
3	RAJASTHAN	1	1	1	3
4	UTTAR PRADESH	33	94	28	155
5	UTRAKHAND	2	4	4	10
6	MADHYA PRADESH	2	6	5	13
7	CHATTISGARH			1	1
8	GUJARAT		1	22	23
9	MAHARASHTRA		31	165	196
10	BIHAR	15	13		28
11	ASSAM		1	2	3
12	ORISSA		4	4	8
13	WEST BENGAL	1	2*		3*
14	NAGALAND	1			1
15	ANDHRA PRADESH	1	27	15	43
16	KARNATAKA	3	36	23	62
17	TAMIL NADU	3	22	16	41
18	PONDICHERRY		1	1	2
19	KERALA		1	1	2
20	GOA			1	1
	ALL INDIA	62	254	318	634
SOURCE : <i>DIRECTORATE OF SUGAR</i>					
*	<i>INCLUDES REFINERY OF RENUKA SUGARS AT HALDIA.</i>				

**TABLE NO. 1.2 - SHOWING ANNUAL INSTALLED
PRODUCTION CAPACITY**

ANNUAL INSTALLED PRODUCTION CAPACITY OF SUGAR INDUSTRY				
			<i>(Lakh Tonnes)</i>	
S.NO.	STATES	2006-07	2007-08	2008-09
1	ANDHRA PRADESH	9.33	9.33	9.33
2	BIHAR	4.85	4.85	4.85
3	GUJARAT	10.79	10.79	10.79
4	HARYANA	5.36	5.36	5.71
5	KARNATAKA	16.99	17.65	19.47
6	MADHYA PRADESH	1.54	1.65	1.99
7	MAHARASHTRA	70.52	71.61	72.70
8	PUNJAB	6.84	6.84	6.84
9	TAMIL NADU	15.79	16.97	17.52
10	UTTAR PRADESH	65.42	73.26	74.25
11	UTTRAKHAND	4.12	4.12	4.12
12	OTHERS	2.37	2.37	2.44
	GRAND TOTAL	213.92	224.80	230.01
<i>SOURCE : Hand Book of Sugar Statistics (October, 2009) by ISMA.</i>				

**TABLE NO. 1.3 - SHOWING STATE-WISE NUMBER OF
SUGAR FACTORIES IN OPERATION**

STATEWISE NUMBER OF FACTORIES IN OPERATION											
S.NO.	STATES	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09 (P)
1	ANDHRA PRADESH	35	35	35	34	28	34	37	38	38	35
2	NORTH BIHAR	10	10	10	10	10	9	9	9	8	9
3	GUJARAT	18	17	15	17	15	17	17	18	18	18
4	HARYANA	13	13	15	15	15	13	14	14	14	15
5	KARNATAKA	34	36	36	36	35	37	39	47	51	50
6	KERALA & GOA	2	2	2	2	1	1	1	1	1	1
7	MADHYA PRADESH & CHATTISGARH	7	8	7	7	7	8	8	8	9	9
8	MAHARASHTRA	123	137	135	156	138	102	142	162	172	147
9	PUNJAB	21	22	22	22	22	20	19	16	16	16
10	RAJASTHAN	2	1	1	1	1	1	1	1	1	1
11	T.N.& PONDY.	38	39	39	38	35	35	36	39	39	38
12	UTTAR PRADESH	109	100	100	100	101	106	114	132	132	132
13	UTTRAKHAND	1	10	10	10	10	10	10	10	10	10
14	OTHERS-ASSAM, ORISSA, NAGALAND & WEST BENGAL	10	7	6	5	5	7	6	6	7	7
	ALL INDIA	423	437	433	453	423	400	453	501	516	488

SOURCE : Hand Book of Sugar Statistics (October, 2009) by ISMA.

SUGAR PRODUCTION IN ANCIENT PERIOD IN INDIA

Sugarcane has been one of the major crops of India since times immemorial. *Iksu*, the term of sugarcane, is found in the *Atharvaveda*, *Vajasaneyii*, *Maitrayani* and *Taittiriya*, *Samhitas* and the subsequent *Sutras*. The Aryans knew the plant from a very early time and the fact that sugarcane is indigenous to India is beyond dispute. The word *Iksu* has no parallel in any other Indo-Aryan language,

which suggests that the Indo-Aryans came to know about the plant only after entering India. This is, supported by the fact that little evidence of sugar or sugarcane is found in any archaeological site of the pre-historic or early historical period; however, this negative evidence is no proof that it was unknown.

The cultivation of sugarcane caught the attention of the Greek visitors to India as something singular and strange. They speak of it as ***'reeds that make honey without the agency of bees'***. This phenomenon of sweet juice produced from reeds was ingeniously explained by *Megasthenes*. According to him, the sweet juice was due to the water which the cane absorbed from the soil being so warmed by the sun's heat that the plant was virtually cooked as it grew.

In addition, Indian literature provides enough evidence of availability of sugarcane in the ancient period. Sugarcane plant and its juice find mention in the medicinal works of *Caraka* and *Susruta*. In the *Jatakas*, there is a reference to pressing of sugarcane in machines. The occupation of cane pressing and the machine used in the process are specifically mentioned. The sugarcane press and allied machines were known by the name of *mahajanta* (*mahayantra* or *kolluka*) (compare with vernacular word '**kolhu**'). The *Vyavahara Bhasya* refers to sheds where such pressing machines were installed. India early evolved the

technique of manufacturing sugar. The *Arthashastra* includes the manufacture of sugar from cane juice in a list of works called *Simbanika*.

Caraka, in his medicinal work states that *ksudra gur* is formed by evaporating the juice of sugarcane down to a quarter, a third or half of the original volume. *Gur* is a purified product and contain few impurities. Even more refined are *matsyandika*, *khanda* and *sarkara*, each of which is purer than the preceding one. *Caraka* notes the medicinal properties of these four types, which are in fact four stages in the process of manufacturing granulated sugar. *Susruta* mentions *gur*, *matsyandika*, *khanda* and *sarkara*, these being in order of purity. Though, the *Arthashastra* refers to *phanita*, *guda*, *matsyandika*, *khanda* and *sarkara*.

From early Buddhist works, it seems that sugarcane was a common crop and sugarcane juice a popular object of consumption. Sugarcane fields greeted the eyes of a traveler wherever he went. *Kautilya* noticed it in the list of principal crops cultivated. But, he remarked that sugarcane is one of the least profitable crops, because it is subject to various evils and requires much care and expenditure.

Manu at one place says that garlic and sugarcane grow in the same fashion as seeds. Probably what *Manu* means is that these two crops are not normally propagate by sowing seeds but are grown from offshoots. In ancient works,

Iskuda and *Iksumati* occur as the names of two rivers. These names indicate that the Indians had knowledge of soil that best suited for sugarcane cultivation and they recognized this fact that what type of soil (irrigated by certain rivers) was more suitable for which type of crop.

Caraka mentions two varieties *paundraka* and *vamsaka*. The *Amarakosa*, though by name mentioning only the *pundra* and *kantara* types, implies many others also in the '*adayah*'. *Ksiravamin*, the commentator, names some of these. But *Susruta* mainly mentioned around eleven varieties, among others - *Paundraka*, *bhiruka*, *vamsaka*, *sataporake*, *tapaseksu*, *kasteksu*, *sucipatraka*, *naipala*, *dirghapatra*, *nilapora* and *kosakrt*.

In the Vedic period it thus seems that, though the Aryans were acquainted with sugarcane, they had not acquired the knowledge of manufacturing sugar from its juice. On the basis of the reference to the word in the early Buddhist literature, one can assign the beginning of sugar manufacturing in Aryan India to somewhere about the eighth century B.C., assuming some necessary antecedent period for the knowledge to grow.

In 399 A.D., the Chinese Buddhist *Pilgritu Fa-Hien* entered India to the east of the Indus and he writes, "*As you go forward from the mountain, the plants, trees and roots are all different from those in the land except the bamboo, the pomegranate and the sugarcane*". Three hundred years later,

he was followed by the *Hiuen-Tsang* who traveled in 629 AD observed, "*They feed themselves generally on cakes of parched gram, which they mix with milk, cream, butter, solid sugar and mustard oil. The juice of grapes and sugarcane is the food of the Khatriyas. The fermented product of grains is of Vaisyas. The Brahmans drink the juice of grapes which differs completely from that distilled from wine*". Cunningham wrote, "*Gandhara of Swat (Peshawar) produce also much sugarcane of which they make stone honey*". He mentioned, "*Punjab (Pounatch) produces much sugarcane but no grapes*". Regarding *Kosambhi* located on *Jamuna* thirty miles above Allahabad, he wrote "*This place harvests a large quantity of rice and some sugarcane.*"

Hiuen-Tsang during his visit (671-95) to India, wrote "*There are sweet melons, sugarcanes and tubers and abundant...*" When strangers are entertained in monastery ghee, honey, sugar and other eatables are offered." *A pill consisting of equal parts of the bark of yellow myrobalans, ginger and sugar is prescribed for diarrhea and solid or dry sugar cane satiate hunger and thirst when eaten.*"

SUGAR PRODUCTION IN MEDIEVAL PERIOD

In 1213 AD, the Chinese ambassador, *Ch-u-ts-ai* reported to *Jenghiz Khan* "*In this country sugarcane is cultivated. The people make wine and sugar from juice.*" In 1498, *Vasco-de-Gama* also saw large quantities of sugar at Calicut. *Ludovico di Verthema*, an Italian who traveled in the

East in 1503-8, on seeing an immense quantity of sugar at Zibit in Arabia, a hundred miles north of Perim and a Bathacala, a little south of Goa on the Malabar Coasts recorded "*a great abundance of sugar especially candied according to our way.*"

In Ain-e-Akbari written by Abul Fazal in 1590, cane is stated to have been of various kinds, but mainly of two sorts. First one was so tender, soft & full of juice that a sparrow by specking could make the juice flow, the other specie was hard. The former was grown for eating and the latter for sugar making-brown sugar candy, common sugar, white candy, and refined sugar useful for the preparation of all kinds of sweetmeats. It was evident that cultivation of sugarcane was prevalent all over India.

The discovery of sugarcane, from which sugar as it is known today, is derived dates back unknown thousands of years. It is thought to have originated in New Guinea, and was spread along routes to Southeast Asia and India. The process known for creating sugar, by pressing out the juice and then boiling it into crystals, was developed in India around 800 BC.

Its cultivation was not introduced into Europe until the middle-ages, when it was brought to Spain by Arabs. Columbus took the plant, dearly held, to the West Indies, where it began to thrive in a most favorable climate.

It was not until the eighteenth century that sugarcane cultivation was began in the United States, where it was planted in the southern climate of New Orleans. The very first refinery was built in New York City around 1690; the industry was established by the late 1830s, when the first factory was built. Until 1872, sugar factories closed down almost as quickly as they were opened. It was in 1872 that a factory, built in California, was finally able to successfully produce sugar in a profitable manner. At the end of that century, more than thirty factories were in operation in the U.S.

PRESENT STATUS OF INDIAN SUGAR INDUSTRY

India has been known as the original home of sugar and sugarcane. Indian mythology supports the above fact as it contains legends showing origin of sugarcane. India is second largest producer of sugarcane next to Brazil. Following **table no.1.4** shows India's position in the world for the last three years -

**TABLE 1.4 – SHOWING WORLD’S MAJOR SUGAR
PRODUCING COUNTRIES**

MAJOR SUGAR PRODUCING COUNTRIES				
<i>(000 METRIC TONS, RAW VALUE)</i>				
S.NO.	NAME OF COUNTRY	2006-07	2007-08	2008-09
1	BRAZIL	32635	30755	39656
2	INDIA	30766	28649	16100
3	CHINA	13041	16128	13512
4	THAILAND	7007	8059	7472
5	U.S.A.	7661	7394	6778
6	MEXICO	5547	5757	5169
7	PAKISTAN	3834	5159	3467
8	AUSTRALIA	5518	4860	4678
9	GERMANY	3895	4082	3828
10	FRANCE	3814	3853	3624
11	RUSSIA	3529	3457	3802
12	INDONESIA	2634	2858	3062
13	PHILLIPINES	2308	2544	2095
14	ARGENTINA	2279	2392	2215
15	COLOMBIA	2343	2155	2241
16	SOUTH AFRICA	2372	2179	2322
17	GUATEMALA	2280	2120	2220
18	POLAND	1883	2073	1418
19	TURKEY	1946	1993	2338
20	UKRAINE	2712	1974	1658
21	EGYPT	1895	1818	1793
22	CUBA	1181	1422	1300
23	UNITED KINGDOM	1258	1141	1174
24	IRAN	1368	1144	583
	TOTAL	143706	143966	132505

SOURCE : F.O.LICHT

Presently, about 43.95 lacs hectares of land is under sugarcane cultivation with an average yield of 70 tonnes per hectare. Following **table 1.5** shows state-wise sugarcane acreage in India, during the period 1999-2000 to 2008-09:

**TABLE 1.5 : SHOWING STATEWISE SUGARCANE ACREAGE
IN INDIA**

STATEWISE SUGARCANE ACREAGE IN INDIA											
(000 HECTARES)											
S.NO.	STATES	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09 (P)
1	ASSAM	29	27	27	26	25	24	23	27	26	26
2	ANDHRA PRADESH	231	217	218	232	209	210	230	264	247	196
3	BIHAR	97	94	113	107	104	104	101	130	109	119
4	GUJARAT	201	178	176	203	176	197	197	214	211	191
5	HARYANA	137	143	161	189	160	130	127	140	140	90
6	KARNATAKA	373	417	407	383	243	178	219	326	306	277
7	KERALA	6	3	3	4	3	3	7	5	2	3
8	MADHYA PRADESH	47	75	42	39	43	52	56	64	75	71
9	MAHARASHTRA	590	595	578	573	443	324	501	1049	1093	770
10	ORISSA	21	17	11	14	15	15	16	20	20	11
11	PUNJAB	108	121	142	154	123	86	84	99	110	81
12	RAJASTHAN	19	14	9	10	6	6	8	11	10	9
13	T.N.& PONDY.	319	317	323	264	194	233	338	393	354	314
14	UTTAR PRADESH	2011	1938	2035	2149	2030	1955	2156	2247	2179	2084
15	UTTRAKHAND		123	126	134	128	107	101	121	124	105
16	OTHERS	31	37	41	39	36	37	38	41	49	48
	TOTAL	4220	4316	4412	4520	3938	3661	4202	5151	5055	4395
<i>SOURCE : Hand Book of Sugar Statistics (October, 2009) by ISMA.</i>											

Traditional sweeteners Gur & Khandsari are consumed mostly by the rural population in India. With better standard of living and higher incomes, the sweetener demand has shifted to white sugar. **Table no.1.6** shows per capita consumption of sugar, gur & khandsari over the time period from 1990-91 to 2008-09:

**TABLE 1.6 – SHOWING PER CAPITA CONSUMPTION OF
SUGAR, GUR & KHANDSARI**

STATEMENT SHOWING PER CAPITA CONSUMPTION OF SUGAR, GUR & KHANDSARI				
SEASON	ESTIMATED POPULATION AS ON 1st MARCH (MILLIONS)	ESTIMATED PER CAPITA CONSUMPTION Kgs. / Annum		
		SUGAR	GUR & KHANDSARI*	TOTAL
1990-91	846	12.7	10.7	23.4
1991-92	861	13.1	10.9	24.0
1992-93	878	13.5	11.2	24.7
1993-94	894	13.4	11.8	25.2
1994-95	911	13.5	10.5	24.0
1995-96	929	14.1	8.0	22.1
1996-97	947	14.6	12.2	26.8
1997-98	966	15.2	12.2	27.4
1998-99	985	15.4	10.1	25.5
1999-2000	1005	16.0	8.7	24.7
2000-01	1029	15.8	8.4	24.2
2001-02	1043	16.1	8.0	24.1
2002-03	1060	17.3	5.4	22.7
2003-04 P	1077	16.0	7.1	23.1
2004-05 P	1093	16.9	7.7	24.6
2005-06 P	1106	16.7	5.3	22.0
2006-07 P	1122	18.7	3.0	21.7
2007-08 P	1138	19.8	4.4	24.2
2008-09 P	1154	19.9	4.5	24.4
* The entire production is taken to be consumed internally.				
P = PROVISIONAL				
SOURCE : Hand Book of Sugar Statistics (October, 2009) by ISMA.				

In the early 1930's nearly 2/3rd of sugarcane production was utilized for production of alternate sweeteners, Gur & Khandsari. Currently, about 1/3rd sugarcane production is utilised by the Gur & Khandsari sectors.

**TABLE 1.7 – SHOWING UTILIZATION OF SUGARCANE FOR
DIFFERENT PURPOSES**

UTILIZATION OF SUGARCANE FOR DIFFERENT PURPOSES				
SEASON	PRODUCTION OF SUGAR CANE (000 TONNES)	% OF SUGAR CANE PRODUCTION UTILIZED FOR		
		PRODUCTION OF WHITE SUGAR	SEED, FEED & CHEWING etc.	GUR & KHANDSARI
1990-91	241046	50.7	11.9	37.4
1991-92	253995	52.8	10.5	36.7
1992-93	228033	45.1	11.9	43.0
1993-94	229659	42.7	11.9	45.4
1994-95	275540	53.6	11.9	34.5
1995-96	281099	62.0	11.7	26.3
1996-97	277560	47.0	11.9	41.1
1997-98	279542	46.2	11.9	41.9
1998-99	288722	54.3	11.6	34.1
1999-2000	299324	59.6	11.5	28.9
2000-01	295956	59.7	11.5	28.8
2001-02	297207	60.6	11.7	27.7
2002-03	281574	67.8	11.9	20.3
2003-04 P	233842	55.8	11.9	32.3
2004-05 P	237088	52.6	11.9	35.5
2005-06 P	281172	67.1	11.9	21.0
2006-07 P	355520	78.4	11.9	9.7
2007-08 P	340557	73.3	11.9	14.8
2008-09 P	271200	53.4	12.0	34.6
<i>SOURCE: Hand Book of Sugar Statistics (October, 2009) by ISMA.</i>				
P = PROVISIONAL				

TYPES OF SUGAR INDUSTRY IN INDIA

The sugar industry can be divided into **two** sectors including **organized** and **unorganized** sector. Sugar factories belong to the organized sector and those who produce traditional sweeteners fall into unorganized sector. Gur and khandsari are the traditional forms of sweeteners.

1.2 Meaning & Concept of Inventory & Inventory Management

Inventory is a list for goods and materials, or those goods and materials themselves, held available in stock by a business. It is also used for a list of the contents of a household and for a list for testamentary purposes of the possessions of someone who has died. In accounting inventory is considered an asset.

Inventory management is primarily about specifying the size and placement of stocked goods. Inventory management is required at different locations within a facility or within multiple locations of a supply network to protect the regular and planned course of production against the random disturbance of running out of materials or goods. The scope of inventory management also concerns the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods and demand forecasting.

DEFINITIONS OF INVENTORY MANAGEMENT

According to,

Mitchell Reiss, "*Less emphasis on inventories, I think, may tend to dampen business cycles, because business cycles are*

typically in the grasp of inventory cycles and heavy industry-cycles."

Paul. A. Volcker, *"The inventory goes down the elevator every night."*

Nancy Pelosi, *"We want to turn our inventory faster than our people."*

Thus, Inventory Management can be defined as under-

- It involves a retailer seeking to acquire and maintain a proper merchandise assortment while ordering, shipping, handling, and related costs are kept in check.
- The Systems and processes that identify inventory requirements, set targets, provide replenishment techniques and report actual and projected inventory status.
- It handles all functions related to the tracking and management of material. This would include the monitoring of material moved into and out of stockroom locations and the reconciling of the inventory balances. Also may include ABC analysis, lot tracking, cycle counting support etc.

Management of the inventories, with the primary objective of determining and controlling stock levels within the physical distribution function to balance the need for product availability against the need for minimizing stock holding and handling costs.

In business management, inventory consists of a list of goods and materials held available in stock.

An inventory can also be a self examination, a moral inventory.

THE REASONS FOR KEEPING AN INVENTORY

There are three basic reasons for keeping an inventory:

Time - The time lags present in the supply chain, from supplier to user at every stage, requires that you maintain certain amount of inventory to use in this "lead time"

Uncertainty - Inventories are maintained as buffers to meet uncertainties in demand, supply and movements of goods.

Economies of scale - Ideal condition of "one unit at a time at a place where user needs it, when he needs it" principle tends to incur lots of costs in terms of logistics. So bulk buying, movement and storing brings in economies of scale, thus inventory.

All these stock reasons can apply to any owner or product stage.

Buffer stock is held in individual workstations against the possibility that the upstream workstation may be a little delayed in long setup or change-over time. This stock is then used while that change-over is happening.

These classifications apply along the whole Supply chain not just within a facility or plant.

Where these stocks contain the same or similar items it is often the work practice to hold all these stocks mixed together before or after the sub-process to which they relate. This 'reduces' costs. Because they are mixed-up together there is no visual reminder to operators of the adjacent sub-processes or line management of the stock which is due to a particular cause and should be a particular individual's responsibility with inevitable consequences. Some plants have centralized stock holding across sub-processes which makes the situation even more acute.

SPECIAL TERMS USED IN DEALING WITH INVENTORY

Stock ties up cash and if uncontrolled it will be impossible to know the actual level of stocks and therefore impossible to control them.

"Stock Keeping Unit" (SKU) is a unique combination of all the components that are assembled into the purchasable item. Therefore any change in the packaging or product is a new SKU. This level of detailed specification assists in managing inventory.

Stock-out means running out of the inventory of an SKU.

"New old stock" (sometimes abbreviated **NOS**) is a term used in business to refer to merchandise being offered for sale which was manufactured long ago but that has

never been used. Such merchandise may not be produced any more, and the new old stock may represent the only market source of a particular item at the present time.

CLASSIFICATION OF INVENTORIES

While the reasons for holding stock are covered earlier, most manufacturing organizations usually divide their inventory into:

1. **RAW MATERIALS**: These are goods which have not yet been committed to production in a manufacturing firm. They may consist of basic raw materials or finished components. Raw material that is consumed in the manufacturing process, is physically incorporated in the finished product, and can be traced to products conveniently is called *direct material*. In other words, this includes inventory of all materials before they are placed into production.
2. **WORK IN PROCESS**: This includes those materials which have been committed to production process but have not yet been completed. This includes all materials before they are placed into production.
3. **FINISHED GOODS**: These are completed products awaiting sale. These are the final output of the production process in a manufacturing firm. This includes manufactured goods that are complete and ready for sale.

4. **STORES, SPARE PARTS, TOOLS & APPLIANCES:** Stores and spares is a term which commonly covers all kinds of supply necessary to keep production equipment operating to turnout production to the desired quantity and quality at the desired time.

The levels of the above stated four kinds of inventories differ depending upon the nature of the business. For example, a manufacturing firm will have levels of all the four kind of inventories, while a retailer or a wholesaler will have a high level of inventories of finished goods but will have no level of raw materials or work in process. And relatively lower level of stores, spare parts etc. Furthermore, inventories may be durable or non-durable, perishable or non-perishable etc. depending upon the nature of the business concerned.

ADVANTAGES OF HOLDING INVENTORIES

Holding of inventories helps a firm in separating the process of purchasing, producing and selling various goods. In case a firm does not hold sufficient stock of raw materials, finished goods etc., the purchasing would take place only at the time of receiving order from the customer. It could result in delay in executing their valuable orders because of difficulties in obtaining / procuring raw materials, finished goods etc. Thus, inventories provide cushion so that the purchasing, production and sales functions can proceed at optimum speed.

The specific benefits of holding sufficient inventories can be put as follows-

- (I) **EFFICIENT PRODUCTION RUNS**: Maintenance of large inventories helps a manufacturing firm in reducing its set-up costs associated with each production run.
- (II) **REDUCTION IN ORDERING COSTS**: The variable cost associated with individual orders (like checking, approving, typing, mailing the order etc.) can be reduced if a firm places a few large orders than numerous small orders.
- (III) **AVOIDING SALES' LOSSES** : If a firm maintains adequate inventories, it can easily avoid losses on account of losing the customers for non-supply of goods in time.

Thus, inventories assist the firm in making sufficiently high runs resulting in lowering down the set-up costs. Moreover, adequate inventories protect against shortage that may delay or halt production.

RISKS / DRAWBACKS OF HOLDING INVENTORIES

An organization's inventory can appear a mixed blessing, since it counts as an asset on the balance sheet, but it also ties up money that could serve for other purposes and requires additional expense for its protection. Inventory

may also cause significant tax expenses, depending on particular countries' laws regarding depreciation of inventory.

(I) **INFLATED VALUE**: Inventory appears as a current asset on an organization's balance sheet because the organization can, in principle, turn it into cash by selling it. Some organizations hold larger inventories than their operations require in order inflating their apparent asset value and their perceived profitability.

(II) **INCREASED HOLDING COSTS** :In addition to the money tied up by acquiring inventory, inventory also brings associated costs for warehouse space, for utilities, and for insurance to cover staff to handle and protect it, fire and other disasters, obsolescence, shrinkage (theft and errors), and others. Such holding costs can mount up: between a third and a half of its acquisition value per year.

(III) **PRICE FALL**: This could be due to increase in the market supply of the product, introduction of a new competitive product, price cutting by the competitors etc.

(IV) **OBSOLESCENCE**: This could be due to change in customer's preferences, tastes, new techniques of production, improvement in product's specifications, design etc.

(V) **PRODUCT DETERIORATION**: This may be due to holding a product for too long period or improper storage facilities.

Businesses that stock too little inventory cannot take advantage of large orders from customers if they cannot deliver. The conflicting objectives of cost control and customer service often pit an organization's financial and operating managers against its sales and marketing departments. Sales people, in particular, often receive sales commission payments, so unavailable goods may reduce their potential personal income. This conflict can be minimized by reducing production time to being near or less than customer expected delivery time. This effort, known as "Lean production" will significantly reduce working capital tied up in inventory and reduce manufacturing costs.

HIGH LEVEL INVENTORY MANAGEMENT

It seems that around about 1880 there was a change in manufacturing practice from companies with relatively homogeneous lines of products to vertically integrated companies with unprecedented diversity in processes and products. Those companies (especially in metalworking) attempted to achieve success through economies of scope - the gains of jointly producing two or more products in one facility. The managers now needed information on the effect of product mix decisions on overall profits and therefore needed accurate product cost information. A variety of attempts to achieve this were unsuccessful due to the huge overhead of the information processing of the time. However, the burgeoning need for financial reporting after

1900 created unavoidable pressure for financial accounting of stock and the management need to cost manage products became overshadowed. In particular it was the need for audited accounts that sealed the fate of managerial cost accounting. The dominance of financial reporting accounting over management accounting remains to this day with few exceptions and the financial reporting definitions of 'cost' have distorted effective management 'cost' accounting since that time. This is particularly true of inventory.

INVENTORY TURNOVER

Inventory turnover, which indicates the rate at which goods are converted into cash, is a key factor in appraising a firm's financial condition. For financial statements, inventories may be priced either at cost or at market value.

The raw materials, work-in-process goods and completely finished goods which are considered to be the portion of a business's assets that is ready or will be ready for selling. Inventory represents one of the most important assets that most businesses possess, because the turnover of inventory represents one of the primary sources of revenue generation and subsequent earnings for the companies' shareholders/owners.

Possessing a high amount of inventory for long periods of time is not usually good for a business, because there are

inventory storage, obsolescence and spoilage costs. However, possessing not enough inventory isn't good either, because the business runs the risk of losing out on potential sales and potential market share as well. Inventory management forecasts and strategies, such as a just-in-time inventory system, can help minimize inventory costs because goods are created or received as inventory only when needed.

Manufacturing management is more interested in ***inventory turnover ratio*** or ***average days to sell inventory*** since it tells them something about relative inventory levels.

INVENTORY TURN OVER RATIO (also known as ***inventory turns***)

= COST OF GOODS SOLD ÷ AVERAGE INVENTORY

or

= COST OF GOODS SOLD ÷ [(BEGINNING INVENTORY + ENDING INVENTORY) ÷ 2]

and its inverse

AVERAGE MONTHS TO SELL INVENTORY

= Number of months a Year ÷ Inventory Turn Over Ratio

= 12 months a year / Inventory Turn Over Ratio

Alternatively,

AVERAGE WEEKS TO SELL INVENTORY

= Number of Weeks a Year / Inventory Turn Over Ratio

= 52 weeks a year / Inventory Turn Over Ratio

OR,

AVERAGE DAYS TO SELL INVENTORY

= Number of Days a Year / Inventory Turn Over Ratio

= 365 days a year / Inventory Turn Over Ratio

This ratio estimates how many times the inventory turns over a year. This number tells us how much cash/goods are tied up waiting for the process and is a critical measure of process reliability and effectiveness. So a factory with two inventory turns has six months stock on hand which generally not a good figure (depending upon industry) whereas a factory that moves from six turns to twelve turns has probably improved effectiveness by 100%. This improvement will have some negative results in the financial reporting since the 'value' now stored in the factory as inventory is reduced.

Whilst the simplicity of these accounting measures of inventory is very useful they are in the end fraught with the

danger of their own assumptions. There are in fact so many things which can vary hidden under this appearance of simplicity that a variety of 'adjusting' assumptions may be used. These include:

- Specific Identification
- Weighted Average Cost
- Moving-Average Cost
- FIFO and LIFO.

Inventory Turn Over is a financial accounting tool for evaluating inventory and it is not necessarily a management tool. Inventory management should be forward looking. The methodology applied is based on historical cost of goods sold. The ratio may not be able to reflect the usability of future production demand as well as customer demand.

Business models including Just in Time (JIT) Inventory, Vendor Managed Inventory (VMI) and Customer Managed Inventory (CMI) attempt to minimize on-hand inventory and increase inventory turns. VMI and CMI have gained considerable attention due to the success of third party vendors who offer added expertise and knowledge that organizations may not possess.

ACCOUNTING FOR INVENTORY

Each country has its own rules about accounting for inventory that fit with their financial reporting rules.

So for example, organizations in the U.S. define inventory to suit their needs within US Generally Accepted Accounting Practices (GAAP), the rules defined by the Financial Accounting Standards Board (FASB) (and others) and enforced by the U.S. Securities and Exchange Commission (SEC) and other federal and state agencies. Other countries often have similar arrangements but with their own GAAP and national agencies instead.

It is intentional that financial accounting uses standards that allow the public to compare firms' performance, cost accounting functions internally to an organization and potentially with much greater flexibility. A discussion of inventory from standard and Theory of Constraints-based (throughput) cost accounting perspective follows some examples and a discussion of inventory from a financial accounting perspective.

The internal costing/valuation of inventory can be complex. Whereas in the past most enterprises ran simple one process factories, this is quite probably in the minority in the 21st century. Where 'one process' factories exist then there is a market for the goods created which establishes an independent market value for the good. Today with multi-

stage process companies there is much inventory that would once have been finished goods which is now held as 'work-in-process' (WIP). This needs to be valued in the accounts but the valuation is a management decision since there is no market for the partially finished product. This somewhat arbitrary 'valuation' of WIP combined with the allocation of overheads to it has led to some unintended and undesirable results.

INVENTORY ACCOUNTING PERSPECTIVES

Inventory needs to be accounted where it is held across accounting period boundaries since generally expenses should be matched against the results of that expense within the same period. When processes were simple and short then inventories were small but with more complex processes then inventories became larger and significant valued items on the balance sheet. This need to value unsold and incomplete goods has driven much new behavior into management practice. Perhaps most significant of these are the complexities of fixed cost recovery, transfer pricing, and the separation of direct from indirect costs. This, supposedly, precluded "anticipating income" or "declaring dividends out of capital". It is one of the intangible benefits of Lean and the TPS that process times shorten and stock levels decline to the point where the importance of this activity is hugely reduced and

therefore effort, especially managerial, to achieve it can be minimized.

Standard cost accounting uses ratios called efficiencies that compare the labour and materials actually used to produce a good with those that the same goods would have required under "standard" conditions. As long as similar actual and standard conditions obtain, few problems arise. Unfortunately, standard cost accounting methods developed about 100 years ago, when labor comprised the most important cost in manufactured goods. Standard methods continue to emphasize labor efficiency even though that resource now constitutes a (very) small part of cost in most cases.

Standard cost accounting can hurt managers, workers, and firms in several ways. For example, a policy decision to increase inventory can harm a manufacturing managers' performance evaluation. Increasing inventory requires increased production, which means that processes must operate at higher rates. When (not if) something goes wrong, the process takes longer and uses more than the standard labor time. The manager appears responsible for the excess, even though s/he has no control over the production requirement or the problem.

In adverse economic times, firms use the same efficiencies to downsize, right size, or otherwise reduce their labor force. Workers laid off under those circumstances

have even less control over excess inventory and cost efficiencies than their managers.

Many financial and cost accountants have agreed for many years on the desirability of replacing standard cost accounting. They have not, however, found a successor. Eliyahu M. Goldratt developed the Theory of Constraints in part to address the cost-accounting problems in what he calls the "cost world". He offers a substitute, called throughput accounting, that uses throughput (money for goods sold to customers) in place of output (goods produced that may sell or may boost inventory) and considers labor as a fixed rather than as a variable cost. He defines inventory simply as everything the organization owns that it plans to sell, including buildings, machinery, and many other things in addition to the categories listed here. Throughput accounting recognizes only one class of variable costs: the truly variable costs like materials and components that vary directly with the quantity produced.

Finished goods inventories remain balance-sheet assets, but labor efficiency ratios no longer evaluate managers and workers. Instead of an incentive to reduce labor cost, throughput accounting focuses attention on the relationships between throughput (revenue or income) on one hand and controllable operating expenses and changes in inventory on the other. Those relationships direct attention to the constraints or bottlenecks that prevent the

system from producing more throughput, rather than to people - who have little or no control over their situations.

Inventories also play an important role in national accounts and the analysis of the business cycle. Some short-term macroeconomic fluctuations are attributed to the inventory cycle.

1.3 Importance of Inventory Management

Inventory Management must be designed to meet the dictates of market place and support the company's Strategic Plan. The many changes in the market demand, new opportunities due to worldwide marketing, global sourcing of materials and new manufacturing technology means many companies need to change their Inventory Management approach and change the process for Inventory Control.

Inventory Management system provides information to efficiently manage the flow of materials, effectively utilize people and equipment, coordinate internal activities and communicate with customers. Inventory Management does not make decisions or manage operations; they provide the information to managers who make more accurate and timely decisions to manage their operations.

Inventory is defined as the blocked Working Capital of an organization in the form of materials. As this is the blocked Working Capital of organization, ideally it should be

zero. But we are maintaining Inventory. This Inventory is maintained to take care of fluctuations in demand and lead time. In some cases it is maintained to take care of increasing price tendency of commodities or rebate in bulk buying.

Traditional Supply Chain solutions such as Materials Requirement Planning, Inventory Control, typically focuses on implementing more rapid and efficient systems to reduce the cost of communicating information between and across the Inventory links in the SCM.COM focuses in optimizing the total investment of materials cost and workload for every Inventory item throughout the chain from procurement of raw materials to finished goods Inventory. Optimization means providing a balance of supply to meet the demand at a minimum total cost , Inventory level and workload to meet customers service goal for each items in the link of Inventory Chain .

It is strategic in the sense that top management sets goals. These include deployment strategies (Push versus Pull), control policies, the determination of the optimal levels of order quantities and reorder points and setting safety stock levels. These levels are critical, since they are primary determinants of customer service levels.

Despite the many changes that companies go through, the basic principles of Inventory Management and Inventory Control remain the same. Some of the new approaches and

techniques are wrapped in new terminology, but the underlying principles for accomplishing good Inventory Management and Inventory activities have not changed.

The Inventory Management system and the Inventory Control Process provides information to efficiently manage the flow of materials, effectively utilize people and equipment, coordinate internal activities, and communicate with customers. Inventory Management and the activities of Inventory Control do not make decisions or manage operations; they provide the information to Managers who make more accurate and timely decisions to manage their operations.

The basic building blocks for the Inventory Management system and Inventory Control activities are:

- Sales Forecasting or Demand Management
- Sales and Operations Planning
- Production Planning
- Material Requirements Planning
- Inventory Reduction

The emphases on each area will vary depending on the company and how it operates, and what requirements are placed on it due to market demands. Each of the areas

above will need to be addressed in some form or another to have a successful program of Inventory Management and Inventory Control.

Inventory is usually a distributor's largest asset. But many distributors aren't satisfied with the contribution inventory makes towards the overall success of their business:

- The wrong quantities of the wrong items are often found on warehouse shelves. Even though there may be a lot of surplus inventory and dead stock in their warehouse(s), backorders and customer lost sales are common. The material a distributor has committed to stock isn't available when customers request it.
- Computer inventory records are not accurate. Inventory balance information in the distributor's expensive computer system does not accurately reflect what is available for sale in the warehouse.
- The return on investment is not satisfactory. The company's profits, considering its substantial investment in inventory, are far less than what could be earned if the money were invested elsewhere.

1.4 Objectives of Inventory Management

Through efficient Management of Inventory, the wealth of owners can be maximized. To reduce requirement of cash

in business, inventory turnover should be maximized and management should save itself from loss of production and sales, arising from its being out of stock. On other hand, management should maximize stock turnover so that investment in inventory could be minimized and on other hand, it should keep adequate inventory to operate the production & sales activities efficiently. Main objective of inventory management is to maintain inventory at appropriate level so that it is neither excessive nor short of requirement. In other words,

(1) To keep inventory at sufficiently high level to perform production and sales activities smoothly.

(2) To minimize investment in inventory at minimum level to maximize profitability.

Both in adequate & excessive quantities of inventory are undesirable for business. These mutually conflicting objectives of inventory management can be explained is from of costs associated with inventory and profits accruing from it low quantum of inventory reduces costs and high level of inventory saves business from being out of stock & helps in running production & sales activities smoothly.

The objectives of inventory management can be explained in detail as under:-

- (i) To ensure that the supply of raw material & finished goods will remain continuous so that production process is not halted and demands of customers are duly met.
- (ii) To minimize carrying cost of inventory.
- (iii) To keep investment in inventory at optimum level.
- (iv) To reduce the losses of theft, obsolescence & wastage
etc.
- (v) To make arrangement for sale of slow moving items.
- (vi) To minimize inventory ordering costs.

1.5 Factors affecting Inventory Management

Often it is said that by avoiding process, design, operational and management problems, inventory can be avoided but it is not always so. These are some basic reasons for the growth of inventory which is not at all desirable by any firm.

But there are many more factors which can lead to the growth of inventory and they need to be dealt with to avoid losses in the future. Some factors have long term impact on inventories so it is imperative to recognize them first and then deal with them. Until and unless one identifies the problems one can fight them and prevent inventories going up.

Inadequate and faulty designing can largely lead to increase in the inventory. If the firm is scattered with a number of departments which are not properly connected and managed it can give rise to inventory. This is so because there can be many discrepancies with regard to the control of the production, proper utilization of services, space.

It is very important to have competent people around who can effectively manage the supply and demand factors. Proper management of demand and supply, data integrity is very important and it can be done by providing the employees with training on management.

DANGER OF “UNDER-INVESTMENT” AND “OVER - INVESTMENT”

A consistent policy of flagrant “under-investment” in inventories will surely have an adverse effect on the profitable result for a business enterprise. One of the obvious results forms this type of policy would be that sales would suffer. If insufficient materials are on hand for a manufacturing concern, prompt deliveries for products sold will be affected. For a retail business, shortage of selection of merchandize will certainly displease the customers.

Another result of a shortage of an inventory for manufacturing enterprises is that costs are increased. In situations where the product line is awaiting materials labor and overheads costs continue resulting in higher unit costs.

During periods of rising prices, unit costs will be increased due to low stock-piles of inventories, and recording at higher prices. Cost of products is also increased as a result of under-investment since transportation costs are higher on account of frequent additional shipments of material.

In connection with an extreme policy of "over-investment" in inventories, there is usually corresponding results of strain on the enterprises financing for other possible purposes. In case where a misappropriate amount of funds are invested in inventories, excessive borrowings or other financing would be required bringing about increased interest expense and reduced profits. Maintaining a greater amount of inventories then might be required involves & increases in affiliated cost. Some of these increased costs are –

1. Additional storage costs
2. Transportation expenses
3. Insurance cost
4. Material handling expenses.

In the words of Harry Gross "***One of the most costly factors related to Over-investment in inventories is obsolescence spoilage***". There is more likely hood for this type of waste then inventories are excessive.

1.6 Objectives of the Study

Management of inventory is the central core of materials management. The need and importance of inventory varies in direct proportion to the idle time cost of men and machinery, and the urgency of requirements. If men and machinery in the factory could wait and so could customers, material would not lie in wait for them and no inventories, need be carried.

Because material constitute a significant part of the total production cost of a product and since this cost is controllable, to some extent, proper planning and controlling of inventories are of great importance. Inventory control is a planned method of determining what to indent, when to indent, how much to indent and how much to stock, so that purchasing and storing costs are minimum without affecting production or sales. Without proper control, inventories have a tendency to grow beyond economic limits. Lack of control over inventory also leads to excessive consumption and wastage as operatives are liable to become careless with un-rationed supply of materials.

Every enterprise needs inventory for smooth running of its activities. It serves as a link between production and distribution processes. There is, generally a time lag between the recognition of a need and its fulfillment.

In short, the main objectives of the study can be categorized as under-

1. To define the concept, importance, objectives and factors etc. of inventory and inventory management.
2. To review the views of different authors & wizards on inventory management.
3. To explain the various techniques of inventory control with their merits and demerits and to examine & determining the most suitable inventory control technique for a sugar industry.
4. To throw light on the profile of both sugar mills.
5. To analyze the inventory management in Mawana Sugars Limited.
6. To analyze the inventory management in Simbhaoli Sugars Limited.
7. To compare & analyze the inventory management of both sugar mills.
8. To bring to surface the findings on various aspects of inventory management of both sugar mills along with the suggestions for improvement of inventory management.

1.7 Limitations of the Study

Normally, all the research projects are usually hindered in their smooth flow by some unforeseen and unpredictable problems. The problems arise in the form of constraints by way of scope of the study, budget, time etc.

The current research is also no exception to all these factors.

The present study was also conducted under certain limitations. It remained not only difficult but just next to impossible to convince the managerial authorities of both the sugar mills that the purpose of our present research is to study the management of inventory and nothing else. But, unfortunately, a strong unwillingness on the part of their management to participate and aid the research made it difficult to move in the desired direction most of the times. As a result, this study is mainly based upon the information collected from various annual reports of both the sugar mills, statistics published by sugar mills association, data available on the internet etc. and that too for a time period from **2004-2005** to **2008-2009**. Thus, our research work is mainly based upon secondary data.

The researcher had time and monetary limitations too but with the help of his respected supervisor and other well-wishers he was able to complete the research work with utmost satisfaction.
