Chapter: 6 – By-Products of Sugar Industry &
their implications on Cost -
Structure
CHAPTER 6
BY – PRODUCTS OF SUGAR INDUSTRY AND THEIR
IMPLICATIONS ON COST STRUCTURE

6.1 Definitions Of Joint Products And By-Products :-

The basic concepts of the joint products and by –products are reproduced from the literature in the area of Cost and Management Accounting. The relevant terms are defined in the following paragraphs.

6.1.1. Joint Products :-

Joint products are the result of same raw material and same processing operations. The processing of a particular raw material may result in the output of two or more products. If all the products are of equal economic importance and none of them can be termed as major products, these will be referred as joint products. Joint products cannot be produced separately. These products have got more nearly the same importance and values relative to each other than the by-products. Joint products can be defined as Joint products are distinguishably different major products that are inevitably produced simultaneously from the same common input factors. Some of the examples of the joint products are mentioned below.

e) In sugar Industry, One of the by-products is bagasse. From this “Paper” is produced. If the sales value of the paper is equal to the sale price of sugar, it will be a joint product along with sugar.
f) Another by-products emerging out of sugar manufacturing is Molasses. This product is utilize for producing Alcohol. It the selling
price of Alcohol is equal to the selling price of sugar, it will be a joint products with sugar.

Joint products may further be classified as complementary or substitutable. If the increase in the production of one joint product leads inevitable to an increase in the production of another joint product, the two are complimentary. In some cases, however, the production of one joint product impedes or precludes the production of another joint product and in such cases the two products are called as substitutes or alternatives.

6.1.2 By-Products:-

The By-product is a secondary product, which incidentally results from the manufacture of a main product. By-products are also produced from the same raw material and same process operations but they are secondary results of operation. A joint product is usually of greater commercial importance than a by-product. The relationship between the by-product and the main product changes with changes in economic or industrial conditions or with advancement of science. What was once a by-product of an industry, may become a main product and onetime main product may become a by-product. For example, in war time, glycerine a by-product in soap making was in such a demand, that it virtually became the main product while the soap was reduced to a by-product. What is by-product of one industry may be a main product of another industry. By-products are generally formed in continuous process industry. Some of the examples of the by-products are given below.

a) In sugar manufacturing three important by-products emerge. The fist one is the bagasse, the second one is Molasses and the third one is the Press Mud.
6.1.3 Joint Costs :-

Joint costs is the pre-separation cost of commonly used input factors for the production of multiple products. Costs can be termed joint cost only when commonly used input factors result into the production of multiple products. The chief characteristic of joint cost is that in this case cost is incurred as lumpsum for the combination and not separately for individual products.

6.1.4 Co-Products/Multi Products :-

The term co-products is occasionally used synonymously with the term joint products. However, co-products and joint products are two different terms. Both, co-products and joint products differ from each other in the sense that in the manufacturing process, production of one product if stopped will not result in stopping the production of another product. In other words, the co-products do not necessarily arise from the same process. Similarly change in the production of the co-product will not necessarily result in change in the production in the other.

6.1.5. Split-Off Point :-

This is a point up to which input factors are commonly used for production of multiple products, which can be either joint products or by-products. After this point, the joint products or by-products gain individual identity. This point has a special relevance in the accounting of the joint products and the by-products because the joint cost incurred before this point is to be apportioned appropriately in the joint products.
6.2 By Products Of Sugar Industry :-

If we study the manufacturing process of sugar factories, it will be observed that there are three important stages in the same. The first stage is crushing of sugarcane and extracting the sugarcane juice. The second stage is the clarification of the juice by heating it and through the chemical process. The third and the last stage is that of the crystalisation where the juice is rotated through the centrifugal machines to separate the molasses and the sugar crystals. In each of these processes a by-product is emerging. For convenience, the by-products of the sugar industry can be broadly classified as follows.

6.2.1 By-Products of the sugarcane farm :-

These include canetops and cane trash.

6.2.2 By-products of sugar manufacture:-

These By-Products are,

a) Bagasse
b) Press Mud.
c) Molasses.

6.3 Description Of By-Products In Sugar Industry :-

6.3.1 By-Products of Sugarcane Farm:-

The cane tops and cane trash constitute 25-35% of the harvested cane When the sugarcane crop is harvested, the sugarcane tops are removed and the stems are cleaned of their leaves (trash) most of which are dry. The production of tops and trash is usually 25-35% of the weight of cane on the field. These by-products are explained below.

6.3.11 Sugarcane Tops :-

The sugarcane tops form a valuable fodder for the cattle. Suggestions have been made from time to time to utilize the green leaves of the
cane tops for extracting leaf protein but this idea had not been transformed into action till now as the green fodder is available in abundance right now. It seems that as long as the bullock cart is in use in India, the sugarcane tops will be continued to be used as a fodder and possibility of their industrial use seems to be very remote.

6.3.12 Cane Trash :-

The leaves removed from the cane stalk dry up and remain on the field till the field is required for the next crop. The quantity of this trash is quite considerable in volume. The trash material can be used for thatching purposes for the huts of the seasonal labout as camp fire fuel and also for preparing compost. Trash is also used to cover the land between two rows of cane with a layer of trash so as to prevent weeds from coming up. Trash which is still left on the field is burnt which not only kills the insects and pests but also leaves behind an ash rich in potash.

As trash is a cellosic material, attempts have been made to produce biogas from it by anaerobic digestion whereby methane gas is obtained for lighting and fuel purpose and the digested residue serves as a valuable compost. Another use of trash was tried at Ravalgaon sugar factory Ltd. Where cardboard or wrapping paper was produced from trash on an experimental basis. However the unit had to be abandoned as it was damaged in an accidental fire. A similar unit was installed by Walchandnagar Industries Ltd., Walchandnagar, for producing corrugated paper. This plant was also closed down as the disposal of the effluents presented a problem.

6.3.13 By Products Of Sugar Manufacturing :-

From the manufacturing process of sugar, the following three by-products emerge.
6.3.21 Bagasse :-

Bagasse is the fibrous residue left after the juice has been extracted from the sugarcane. It is normally directly (normally) fed to the boilers in the sugar factories for the generation of steam. The quantity of bagasse produced in any sugar factory mainly depends upon the fibre content of the sugarcane. The cane in the northern India has an average fibre content of 15-17%, while in the southern India the fibre content is usually 12-14%. This results into moist bagasse produced to the tune of 33-36% of cane in the northern India while in the southern India the yield is about 26-30% of cane. Average production of bagasse has been varying between 32 =34% on cane in recent years.

a) Composition of Bagasse :-

Bagasse has the following composition,

- Fibre including pith, clay, and sand :- 47%
- Water :- 50%
- Soluble matter :- 3%

Bagasse is almost pure lingo-cellulose with small amounts of unextracted sugars, gums, and waxes. The water insoluble portion of bagasse is the fibre composed of cellulose, pentosans, lignin and some mineral matter. The percentage of dry bagasse vary widely in different countries and typically the percentages are as given below:

- Cellulose :- 36%
- Pentosans:- 26%
- Lignin :- 20%
- Ash :- 2.2%

A sugar factory can save 3-5% of bagasse after meeting the requirement of boiler for running the plant. Thus a sugar factory handling 500-600 thousands tones per annum will save 20,000-25,000
tonnes of wet bagasse with about 48-50% moisture and as the sugar factory runs on an average for 5-8 months in a year, it has to store the same properly. Special care is to be taken while storing as the bagasse is highly inflammable and has a very low density.

b) Utilisation of Bagasse :-

Normally the entire bagasse is burnt in the sugar factory boilers for the generation of the steam. However in recent years, many sugar factories are saving bagasse for different purposes. The main uses of bagasse are mentioned below:

c) Bagasse can be utilized for manufacturing ‘paper’.

As a raw material for paper, bagasse offers the following advantages.

I) Easy collection from sugar factories.
II) Paper has good opacity and printability
III) Bagasse pulp requires less refining.
IV) Paper has good burning strength.

d) Fibre Board :-

It is made from refined or partially refined fibers. Bonding agents or other materials may be incorporated for increasing strength, as well as resistance to moisture, fire or decay. They are usually sold as insulation boards, soft boards and hard boards according to density.

e) Particle Board :-

It is produced from small pieces of wood or other lignocellulosic material impregnated with an organic binder or compressed under heat and pressure. These boards are suitable for furniture preparation. It has been observed that though it is possible to produce very large quantities of particle board from bagasse, no such utilization of bagasse is taking place. One of the reasons responsible for this is that wood waste is available at a considerably lower price than bagasse.
f) Furfural and Acetic Acid :-
Furfural has been manufactured traditionally from oat husk in U.S.A. Furfural has a wide market because of its outstanding property as a selective solvent, which can be easily recovered. It can be produced from any fibrous raw material containing pentosans under the action of aqueous acid at higher temperature. Furfural can be further utilized for manufacturing furfuryl alcohol, nylon 66 and xylitol.

g) Alcohol :-
Alcohol can also be produced from the bagasse.

h) Activated carbon :-
Attempts are made to prepare activated carbon from bagasse.

i) Bagasse ash :-
This ash removed from the boilers amounts to be about 0.3% on cane. Bagasse ash is utilized for glass making and has the following advantages.
   a. Ash is easy to grind.
   b. All the main ingredients are already present in the intimate chemical composition.

j) Co-generation :-
One of the important uses of bagasse which can really turnaround the sugar co-operatives is that it can be used for the purpose of cogeneration of electricity. After the passing of the Electricity Bill 2003, the power sector has been opened up and the private players can now enter in this field. The sugar co-operatives will be in a position to enter into this sector and produce the electricity. After satisfying their need they can sell the same to the State Electricity Boards at the rate decided by the Electricity Regulatory Commission. In the Maharashtra State, 7 sugar co-operatives have established the cogeneration projects.
6.3.22 **Press Mud Or Filter Cake** :-

In the process of manufacture of sugar, the first stage is the extraction of juice and the subsequent stage is the clarification of juice. This process is called as ‘clarification’ or ‘purification’.

In India, there are two processes utilized for ‘clarification’ i.e. carbonation and sulphitation. In the carbonation process, a large quantity of lime is used. This lime is reacted with carbon dioxide gas in the medium of the juice. A bulky precipitate which is largely calcium carbonate is produced. This precipitate absorbs and carries with it a large percentage of the organic and some mineral impurities present in the juice. The juice is filtered in filter presses or rotary vacuum filters and the press mud which entrains some juice containing sugar is washed with water and steamed to free it from most of the sugar present in it. The desugarised mud is discarded which is called as the ‘press mud’ or ‘filter cake’.

In the sulphitation process, the quantity of lime used is only about one tenth of that used in the carbonation process and sulphur dioxide gas is used instead of carbon dioxide. The heated juice is boiled and settled. The clear juice is decanted and the settings or muddy juice after mixing with bagacillo is filtered in rotary vacuum filters. The cake formed on the drum is desugared as much as possible by washing and then it is discarded. This filter cake or press mud which mainly contains calcium sulphite, calcium phosphate and some of the organic impurities of the juice is on the weight basis about 3% of the weight of cane crushed. On dry basis it is about 1%.\(^9\)

Carbonation filter cake is not of practical use while sulphitation filter cake is more useful. It is utilized almost entirely as manure. It is most useful in acidic and saline soils. The filter cake however contains
much of the wax that was originally present on the surface of the sugarcane stalk as a whitish surface. If extracted and properly processed, this wax can be a valuable raw material.

6.3.23 Molasses :-
In the process of sugar manufacture purified cane juice is concentrated to about 1.31 specific gravity when it is called syrup. The syrup is further concentrated when crystallisation takes place and the resulting product is called as ‘massacuite’. The ‘massacuite’ is spun in centrifugal machines to separate the crystals from the adhering ‘mother liquor’. This ‘mother liquor’ is termed as ‘molasses’ or ‘green syrup’. The molasses resulting after first crystallisation is called as first molasses, which is again crystallised to yield a second crop of crystals and second ‘molasses’. Usually the crystallization process is repeated three or more times and the sugar content of the third or forth molasses is so small that it is not economically feasible to have further crystallisation for extracting sugar. The molasses is called as the ‘final or waste molasses’ and is discarded as a by-product. It is thus a dark chocolate coloured viscous liquid containing about 15-20 % water, 50-55% of total sugars and the rest non sugars. Molasses can be classified into the following categories according to the process of manufacture.\(^{(10)}\)

i) Raw sugar molasses formed during the production of raw sugar.
ii) White sugar molasses formed during the production of direct consumption white sugar.
iii) Refining molasses formed when raw sugar is refined.
iv) Discard stefen molasses formed from desugarising of beet molasses by stefen process. Commercial importance of this molasses is very minor.
The detailed composition of molasses is as follows.\(^{(11)}\)

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>20%</td>
</tr>
<tr>
<td>Sucrose</td>
<td>32%</td>
</tr>
<tr>
<td>Glucose</td>
<td>14%</td>
</tr>
<tr>
<td>Fructose</td>
<td>16%</td>
</tr>
<tr>
<td>Non sugar</td>
<td>10%</td>
</tr>
<tr>
<td>Inorganic materials</td>
<td>08%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

A) **Utilisation Of Malasses:**

Molasses can be used for a number of uses and a number of products can be made from the same. However, the ingredients of molasses play a crucial role in the manufacturing various products. Inorganic salts are not of much use except that attempts have been made to utilize the potash salts as potassic fertilizers for the cane crop either by irrigation or by folior spray.

Sugar presence in the molasses is approximately 40-60% of the weight of the molasses. These sugars can be utilized by using molasses directly for the production of,

i) Cattle feed
ii) Edible syrup
iii) Acids, like citric acid, lactic acid, oxalic acid, maleic acid, itasonic acid, butyric acid,
iv) Solvents and chemicals like ethanol, butonol, acetone, glycerol etc
v) Vinegar
In addition molasses can be used for the manufacture of the following products

B) Ethyl Alcohol :-

In India, molasses is primarily utilized for the production of ethyl alcohol. About 50-60 % of the total alcohol production goes for chemical conversion, while about 20% is utilized for liquor

c) Use as a fertilizer :-

Molasses contains substantial amounts of potassium and small quantities of nitrogen and phosphate. If used as a fertilizer these three constituents would be immensely beneficial to the crop.

d) Road surfacing :-

Molasses can be used for road surfacing after mixing with asphalt.

e) Boiler fuel :-

As molasses contains about 70% of organic substances, many attempts have been made to use it as a boiler fuel.

f) Ethanol:

One of the most important use of the ethanol in the today’s situation is that the ethanol can be manufactured with the help of molasses. The ethanol is blended with petrol to be used as fuel for automobiles. Ethanol India has published the statistics regarding the production of the alcohol and its use for
Various purposes and the surplus available for the production of ethanol is given below.

**TABLE NO. 6.1**

**SURPLUS PRODUCTION OF MOLASSES FOR PRODUCING ETHANOL**

<table>
<thead>
<tr>
<th>Year</th>
<th>Molasses produced</th>
<th>Production of alcohol</th>
<th>Industrial use</th>
<th>Potable use</th>
<th>Other uses</th>
<th>Surplus availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>7.00</td>
<td>1411.8</td>
<td>534.4</td>
<td>584.0</td>
<td>55.2</td>
<td>238.2</td>
</tr>
<tr>
<td>1999-00</td>
<td>8.02</td>
<td>1654.0</td>
<td>518.9</td>
<td>622.7</td>
<td>57.6</td>
<td>455.8</td>
</tr>
<tr>
<td>2000-01</td>
<td>8.33</td>
<td>1685.9</td>
<td>529.3</td>
<td>635.1</td>
<td>58.8</td>
<td>462.7</td>
</tr>
<tr>
<td>2001-02</td>
<td>8.77</td>
<td>1775.2</td>
<td>539.8</td>
<td>647.8</td>
<td>59.9</td>
<td>527.7</td>
</tr>
<tr>
<td>2002-03</td>
<td>9.23</td>
<td>1869.7</td>
<td>550.5</td>
<td>660.7</td>
<td>61.0</td>
<td>597.5</td>
</tr>
<tr>
<td>2003-04</td>
<td>9.73</td>
<td>1969.2</td>
<td>578.0</td>
<td>693.7</td>
<td>70.0</td>
<td>627.5</td>
</tr>
<tr>
<td>2004-05</td>
<td>10.24</td>
<td>2074.5</td>
<td>606.9</td>
<td>728.3</td>
<td>73.5</td>
<td>665.8</td>
</tr>
<tr>
<td>2005-06</td>
<td>10.79</td>
<td>2187.0</td>
<td>619.0</td>
<td>746.5</td>
<td>77.2</td>
<td>742.3</td>
</tr>
<tr>
<td>2006-07</td>
<td>11.36</td>
<td>2300.4</td>
<td>631.4</td>
<td>765.2</td>
<td>81.0</td>
<td>822.8</td>
</tr>
</tbody>
</table>

Source:- Statistical Publication of "Ethanol India".

Note :- 1) All figures given are in millions litres.

2) The figures from the year 2003-04 are the projected figures.
From the above-mentioned figures it is quite evident that there is surplus availability of the alcohol for the manufacture of ethanol to satisfy the demand of the same. If the sugar co-operatives are encouraged to produce ethanol and if the sugar co-operatives also take initiative to produce the same, it can be a turnaround stage in case of the sugar co-operatives.

6.4 Cost Implications Of The By-Products On The Profitability Of Sugar Co-Operatives.

For better understanding of the cost implications of the by-products on the profitability of sugar co-operatives, it would be appropriate to review the Accounting Methods for By-Products Accounting.

6.5 Methods Of By-Product Accounting:-

By-products are jointly produced products of minor importance and do not have separate costs until the split off point. By-products are often emerging in continuous process industries. The method of apportioning costs of by-products are discussed in the following paragraphs under two heads.\(^{(12)}\)

6.6.1 Non-Cost Methods:-

The following methods are included in these non-cost methods.

1) Other income or miscellaneous income method :- Under this method, sales value of by-products is credited to the Profit and Loss Account and no credit is given in the cost accounts. The credit to the Profit and Loss Account is treated as other income or miscellaneous income. No effort is made for ascertaining the cost
of the product. No valuation of inventory is done and all costs and expenses are charged to the main product. This is the least scientific method and it is used in those industries where the value of the by-product is negligible.

II) Total Sales Less Total Cost :- Under this method, sales value of by-product is added to the sales value of main product. Further, total cost of the main product (including cost of by-product) is deducted from the total sales revenue of main product and by-product. This method suffers from the same limitations as compared with the first method in the sense that there is no inventory valuation of the by-product and hence the valuation of stock of main product is inflated. All costs and expenses are charged to the main product which is yet another limitation of this method.

III) Total Cost Less Sales Value of By-product :- Under this method, the total cost of production is reduced by the sales value of the by-product. This method seems to be more acceptable because like waste and scrap, by-products revenue reduces the cost of major products.

The main limitation of this method is that the cost of the main product fluctuates with the changing prices of by-products from period to period. Alternatively, the standard selling prices of the by-product can be used. Under this method, the inventory of the by-products on hand is valued at the market value.
IV) Total Cost Less Sales Value of By-products After Setting Off Selling and Distribution Overheads of By-products :- Sales value of the by-product minus the selling and distribution cost of by-product is deducted from the total cost. Selling and distribution expenses are charged only against by-products actually sold.

V) Total Cost Less Net Yield of By-products :- Under this method, cost incurred on the by-products after the point of separation and selling distribution overheads of the by-products are deducted from the sales value of the by-product. The net realization is then deducted from the total cost of the main product.

VI) Reverse Cost Method :- This method is based on the view that the sales value of the by-product contains an element of profit. It is agreed that this element of profit should not be credited to the Process Accounts. The cost of the by-product is arrived at by working backwards. Selling price of the by-product is deflated by an assumed gross profit margin. The net amount is then deducted from the main product. Thus under this method, sales value of the by-product is first reduced by, an estimated profit margin, selling and distribution expenses and then the post spilt off costs, and then the cost of the main product is thus reduced by this net figure.

6.6.2 The methods described above are based on the sales value. For apportioning the joint costs to the by-products, there are some methods prescribed which are based on the cost. These methods are described in the following paragraphs.
I) Replacement or Opportunity Cost Method :- If the by-products are consumed captively, the by-products are valued at the opportunity costs or replacement cost. This means the cost which would have been incurred had the by-product been purchased from outside. For example, bagasse, which is one of the main product of sugar industry and which is used for the factory as fuel in the boiler is valued at the market value, i.e. the price that would have been paid if it would have been purchased from outside.

II) Standard Cost Method :- Under this method, the by-products are valued at the standard cost determined for each product. The standard cost may be based on technical assessment. Standard cost of the by-product is credited to the process account of the main product. Accordingly, the cost control of main product can be exercised effectively.

III) Joint Cost Proration :- When the by-products are of some significance, it is appropriate that the joint costs should be apportioned between main products and by-products on a most suitable and acceptable basis. This method, thus do not make any differentiation between the main products and the by-products. Industries, where the by-products are quite important, use this method. For example, in a petroleum refinery, gas was earlier considered as a by-product. Now it has assumed the importance like petrol, diesel, etc and it is being treated as joint products. Accordingly, when a by-product is treated as a main product, the costs up to the separation point are prorated between the main product and the by-product.
6.7 IMPACT OF BY-PRODUCTS ON THE COST STRUCTURE OF SUGAR CO-OPERATIVES:

The implications of the by-products on the cost structure of selected sugar co-operatives are discussed in the following paragraphs.

IMPACT OF BY PRODUCTS ON PROFITABILITY OF SELECTED SUGAR CO-OPERATIVES WITH BY-PRODUCTS: - CONTROL GROUP NO-1

FACTORY NO-1

NAME: - SHRI DUTT SHIROl SHETKARI CO-OPERATIVE SUGAR FACTORY LTD. SHIROl DIST:- KOLHAPUR PRODUCTWISE AND OVERALL PROFITABILITY OF THE FACTORY.  (Rs. In lakhs)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PROFITS/LOSSES FROM SUGAR</th>
<th>PROFITS/LOSSES FROM DISTILLERY</th>
<th>TOTAL PROFITS/LOSSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>(-)131</td>
<td>237</td>
<td>6</td>
</tr>
<tr>
<td>1999-2000</td>
<td>(-)433</td>
<td>335</td>
<td>(-)98</td>
</tr>
<tr>
<td>2000-2001</td>
<td>(-)852</td>
<td>357</td>
<td>(-)492</td>
</tr>
<tr>
<td>2001-2002</td>
<td>(-)725</td>
<td>375</td>
<td>(-)350</td>
</tr>
</tbody>
</table>
Observations :-

It can be observed from the above statement that the factory has been suffering from continuous losses in the last three years. In the year 1998-99 they had earned a profit of Rs. 6 lakhs, however from the next year onwards, they have been suffering from losses.

The factory has established a Distillery for producing the products like Alcohol and other such products. It can be seen that the distillery is earning profits throughout the period under observation and the trend seen is that of increasing in all the four years. On the other hand, the factory is suffering losses from the sugar business and these losses have been mounting continuously with the exception of the year 2001-02 where the loss has slightly declined. The reasons behind the losses from the sugar business are that the cost of the material consumed has been increasing continuously in the last four years as shown in the previous chapter and same trend has been noticed in the case of the interest cost which is also rising substantially in the last four years.

The amount of sales, however has not gone up in the same proportion and that is the reason behind the losses from the sugar business.

It can be concluded that because of the profits from distillery, the factory is able to reduce the overall losses, otherwise the losses could
have been much more. It should be noted that the factory had established a Paper Mill for which the bagasse was used as a raw material, but due to heavy losses continuously, they have shut it down two years back.
FACTORY NO-2:
NAME:- SHRI TATYA SAHEB KORE WARNA CO-OPERATIVE SUGAR FACTORY LTD. WARNANAGAR, DIST:- KOLHAPUR.

PRODUCTWISE AND OVERALL PROFITABILITY OF THE FACTORY. (Rs in lakhs)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PROFITS/LOSSES FROM SUGAR</th>
<th>PROFITS/LOSSES FROM DISTILLERY</th>
<th>PROFITS/LOSSES FROM PAPER MILL</th>
<th>TOTAL PROFITS/ LOSSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>179</td>
<td>107</td>
<td>(-)371</td>
<td>(-)85</td>
</tr>
<tr>
<td>1999-2000</td>
<td>404</td>
<td>89</td>
<td>(-)461</td>
<td>32</td>
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<tr>
<td>2000-2001</td>
<td>133</td>
<td>169</td>
<td>(-)433</td>
<td>(-)133</td>
</tr>
</tbody>
</table>
Observations :-

It has been observed that in case of this factory also, the profits/losses from the by-products based units are affecting the overall profitability of the factory. This factory has established Distillery for the utilization of the Molasses and also Paper Mill for the utilization of the Bagasse. It is absolutely from the above statement, that the sugar business of the factory is making profits, though in the year 2000-01, the profits have declined from Rs. 404 lakhs to Rs. 133 lakhs but again in the year, 2001-02, they have increased to Rs. 232 Crores. The paper mill established by the factory has been suffering from losses continuously from the year 1998-99 but the distillery unit is making profits though the trend shown is quite fluctuating from year to year.

It can be concluded that though the sugar business and the distillery division are making profits, because of the losses from the paper mill, the overall profit and profitability have come down.
FACTORY NO-3:-
NAME:- VASANTDADA SHETKARI CO-OPERATIVE SUGAR FACTORY LTD, DIST:- SANGALI

PRODUCTWISE AND OVERALL PROFITABILITY OF THE FACTORY.
(Rs in lakhs)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PROFITS/LOSSES FROM SUGAR</th>
<th>PROFITS/LOSSES FROM DISTILLERY</th>
<th>PROFITS/LOSSES FROM OTHER DIVISIONS</th>
<th>TOTAL PROFITS/LOSSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>(-)170</td>
<td>129</td>
<td>36</td>
<td>5</td>
</tr>
<tr>
<td>1999-2000</td>
<td>(-)304</td>
<td>361</td>
<td>(-)54</td>
<td>3</td>
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<td>2000-2001</td>
<td>(-)332</td>
<td>382</td>
<td>(-)45</td>
<td>5</td>
</tr>
<tr>
<td>2001-2002</td>
<td>(-)345</td>
<td>384</td>
<td>(-)35</td>
<td>4</td>
</tr>
</tbody>
</table>
Observations :-

This factory has established Distillery for the utilization of the Molasses and they have also established other divisions like Petrol Pump and other activities.

It is clear from the statement that the sugar business of the factory has been suffering from continuous losses in all the four years under observation and an increasing trend has been noticed in the same. At the same time the distillery business is earning profits and the trend witnessed in the same is that of continuous increasing. The other divisions have earned profits in the year 1998-99 but thereafter they are also suffering from losses. However the losses from the other divisions have shown a decreasing trend in the last three years.

Thus it can be concluded that the losses of the sugar business and also of the other divisions have been reduced by the profits earned from the Distillery and the overall profitability have improved.
FACTORY NO-4:-
NAME:- THE MALEGAON CO-OPERATIVE SUGAR FACTORY LTD,
DIST:- PUNE.

Productwise and overall profitability of the factory.

(FIGURES IN LAKHS OF RS.)

<table>
<thead>
<tr>
<th>Year</th>
<th>Profits/losses from sugar</th>
<th>Profits/losses from distillery</th>
<th>Profits/losses from other divisions</th>
<th>Total profits/losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>(-)247</td>
<td>195</td>
<td>57</td>
<td>5</td>
</tr>
<tr>
<td>1999-2000</td>
<td>(-)248</td>
<td>194</td>
<td>59</td>
<td>5</td>
</tr>
<tr>
<td>2000-2001</td>
<td>(-)251</td>
<td>196</td>
<td>61</td>
<td>6</td>
</tr>
<tr>
<td>2001-2002</td>
<td>(-)250</td>
<td>190</td>
<td>62</td>
<td>2</td>
</tr>
</tbody>
</table>
Observations:-

This factory has established Distillery and Other Divisions like CO2, Petrol Pump etc. Here also the sugar business has been suffering from losses and the trend witnessed in the four years under observation has been quite fluctuating. Same fluctuating trend has been seen in case of the Distillery where the profits shown in the initial years have come down in the year 1999-2000 and again increased in the next year 2001-02 and thereafter again decreased in the year 2001-02. In case of the other divisions also the same trend has been observed.

Thus on the overall basis the profits shown by the factory are the results of the profits from the distillery and from the other divisions.
FACTORY NO-5:-

NAME:- KRISHNA CO-OPERATIVE SUGAR FACTORY LTD,
KARAD DIST:-SATARA

PRODUCTWISE AND OVERALL PROFITABILITY OF THE FACTORY. (Rs in lakhs)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PROFITS/LOSSES FROM SUGAR</th>
<th>PROFITS/LOSSES FROM DISTILLERY</th>
<th>PROFITS/LOSSES FROM OTHER DIVISIONS</th>
<th>TOTAL PROFITS/LOSSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>(-)240</td>
<td>238</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>1999-2000</td>
<td>(-)651</td>
<td>651</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2000-2001</td>
<td>(-)657</td>
<td>660</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2001-2002</td>
<td>(-)648</td>
<td>652</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>
Observations :-

This factory has established Distillery and Other Divisions like CO2, Petrol Pump etc.

The losses from the sugar business have been increasing alarmingly in the last four years though in the last year under observation i.e. 2001-02, the loss has slightly reduced. On the other hand the distillery is making quite substantial contribution to the overall profitability with the profits continuously increasing. The contribution from the other divisions is positive but the impact is negligible.

Thus it can be concluded that the factory is able to earn overall surplus only because of the profits from the distillery business.
FACTORY NO-6:-

NAME:- KISAN VEER CO-OPERATIVE SUGAR FACTORY LTD,
BHUINJ DIST:- SATARA

PRODUCTWISE AND OVERALL PROFITABILITY OF THE
FACTORY. (Rs in lakhs )

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PROFITS/LOSSES FROM SUGAR</th>
<th>PROFITS/LOSSES FROM DISTILLERY</th>
<th>PROFITS/LOSSES FROM OTHER DIVISIONS</th>
<th>TOTAL PROFIT/LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>(-)333</td>
<td>154</td>
<td>181</td>
<td>2</td>
</tr>
<tr>
<td>1999-2000</td>
<td>(-)262</td>
<td>95</td>
<td>172</td>
<td>5</td>
</tr>
<tr>
<td>2000-2001</td>
<td>(-)267</td>
<td>130</td>
<td>140</td>
<td>3</td>
</tr>
<tr>
<td>2001-2002</td>
<td>(-)278</td>
<td>154</td>
<td>130</td>
<td>6</td>
</tr>
</tbody>
</table>
Observations :-

The factory has established Distillery and Other Divisions like Fertiliser Division etc.

More or less the same picture emerges as that of the other factories under this group. The sugar division is suffering from losses and the trend observed in the four years under study is that of continuously increasing. Distillery is making good profits, but in the year 1999-2000, the profits from the distillery had gone down. However in the next three years, they have shown an increasing trend. In case of other divisions, the trend witnessed is that of decreasing in the last three years.

Thus once again it can be concluded that the factory has been showing overall profits only because of the profits from the distillery and other divisions.
FACTORY NO-7:-

NAME: - SHRIGONDA CO-OPERATIVE SUGAR FACTORY LTD, SHRIGONDA DIST: - AHMEDNAGAR

PRODUCTWISE AND OVERALL PROFITABILITY OF THE FACTORY (Rs in lakhs).

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PROFITS/ LOSSES FROM SUGAR</th>
<th>PROFITS/ LOSSES FROM DISTILLERY</th>
<th>PROFITS/ LOSSES FROM OTHER DIVISIONS</th>
<th>TOTAL PROFITS/ LOSSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>(-)141</td>
<td>95</td>
<td>3</td>
<td>(-)43</td>
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<tr>
<td>1999-2000</td>
<td>(-)309</td>
<td>95</td>
<td>4</td>
<td>(-)210</td>
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<tr>
<td>2000-2001</td>
<td>(-)298</td>
<td>104</td>
<td>3</td>
<td>(-)191</td>
</tr>
<tr>
<td>2001-2002</td>
<td>(-)310</td>
<td>110</td>
<td>4</td>
<td>(-)196</td>
</tr>
</tbody>
</table>
Observations :-

This factory has also established Distillery and other divisions like Fertiliser divisions etc. Sugar business has been suffering from continuous losses and the trend shown is that of continuous increasing. Distillery division is making profits continuously and the contribution from the other divisions is also positive though the amount is quite small. The overall losses of the factory have come down due to the substantial profits from the distillery.

Overall Observations:

Thus the overall observations of the above factories are summarized in the following paragraphs.

1. All the factories except one, ie factory no2 (Warana ) are suffering from losses in case of the sugar business

2. All Distilleries are making good profits and thus contributing to the overall profits of the sugar business.

3. Some of the factories have established Paper Mills and it has been observed that the Paper Mills have been suffering from losses and consequently one of the factories under observation ( Shree Dutt Shirol ) had decided to close down the Paper Mill.
4. Other divisions established by some of the factories have been contributing to the overall profitability in a positive manner in majority of the cases though the amounts are very small.
PROFITABILITY OF SELECTED SUGAR CO-OPERATIVES:-

FACTORIES WITHOUT BY-PRODUCTS:- CONTROL GROUP II

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FACTORY NO 1</td>
<td>(-)0.50</td>
<td>(-)126</td>
<td>(-)135</td>
<td>(-)134</td>
</tr>
<tr>
<td>FACTORY NO 2</td>
<td>(-)0.70</td>
<td>0.69</td>
<td>0.78</td>
<td>0.84</td>
</tr>
<tr>
<td>FACTORY NO 3</td>
<td>45</td>
<td>81</td>
<td>95</td>
<td>90</td>
</tr>
</tbody>
</table>

FACTORY NO 1:- SANT TUKARAM CO-OPERATIVE SUGAR FACTORY LTD, MULSHI DIST:- PUNE

FACTORY NO 2:- DUDHGANGA VEDGANGA CO-OPERATIVE SUGAR FACTORY LTD, BIDRI DIST:- KOLHAPUR.

FACTORY NO 3:- BHOGAVATI CO-OPERATIVE SUGAR FACTORY LTD, PARITE DIST:- KOLHAPUR.
References for Chapter Six

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(2) Academic Publishers kolkata, B.K. Bhar –Cost Accounting, Methods and Problems.

(3) S.Chand and Co.-Advanced Cost and Management Accounting- S.C. Saxecedena and Vasishtha.

(4) ibid.

(5) S.Chand and Co.-Advanced Cost and Management Accounting- S.C. Saxecedena and Vasishtha.

(6) Vasantdada Sugar Institutes Publication-By-Products of Sugar Industry.

(7) ibid.

(8) Vasantdada Sugar Institutes Publication-By-Products of Sugar Industry.

(9) Vasantdada Sugar Institutes Publication-By-Products of Sugar Industry.

(10) Vasantdada Sugar Institutes Publication-By-Products of Sugar Industry.

(11) Vasantdada Sugar Institutes Publication-By-Products of Sugar Industry.

(12) ibid.

(13) S.Chand and Co.-Advanced Cost and Management Accounting- S.C. Saxecedena and Vasistha.