

## International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization, Volume 2, Special Issue 1, December 2013

**Proceedings of International Conference on Energy and Environment-2013 (ICEE 2013)**

**On 12<sup>th</sup> to 14<sup>th</sup> December Organized by**

Department of Civil Engineering and Mechanical Engineering of Rajiv Gandhi Institute of Technology, Kottayam, Kerala, India

# IMPROVING COMPETITIVENESS FOR A RUBBERISED COIR MATTRESS COMPANY THROUGH COST OPTIMIZATION

**Abdul Rahim A, Dr. M S Jayamohan**

Semester IV, M. Tech IEM, Dept. of Mechanical Engineering, Rajiv Gandhi Institute of Technology  
Kottayam, Kerala, 686501, India

Professor, Dept. of Mechanical Engineering Rajiv Gandhi Institute of technology Kottayam, Kerala,  
686501, India

### ABSTRACT

This paper presents an analysis of existing costing system in a rubberised coir mattress company. After identifying inherent problems in the system an alternative costing model based on Activity Based Costing is developed. Actual cost data for a period of one month is used for cost allocation and arriving at unit cost of cost objects consumed by various products. Production cost of a particular model is obtained based on the actual usage of cost objects as per the specification for the model. Production cost of three selected models from different segments is calculated using the new model and compared with that of existing model. The new costing system revealed that production cost for the selected models are 18%, 19% and 34% lower than the existing cost accounted. A cumulative reduction of 3.07 Cr in annual production cost is accounted for the three models.

**Keywords:** Costing, Activity Based Costing (ABC), Production cost, Cost allocation.

### 1. INTRODUCTION

The broad definition of costs is related to the economic resources (manpower, equipment, real facilities, supplies and all other resources) necessary to accomplish work activities or to produce work outputs. Usually, costs are expressed in terms of units of currency. Therefore, costs are the amount of money representing the resources spent for the production of output. A resource is a physical entity that is required to be able to execute a certain operation. Resources can be e.g. machine tools, tools and fixtures, but also operators and materials. Output can be products and services.

Usually companies with high direct labour and/or manufacturing overhead tend to be more concerned about conversion costs. Proper cost information is critical when deciding to focus on prime costs or

conversion costs. When determining costs to monitor, the magnitude of the cost and the extent to which that cost can be controlled is determined.

The costs involved are incurred in many different departments with shared facilities or services. To assign costs to each finished product, cost allocations must be used. Cost allocations assign the indirect costs to products, services, people, and business units. These products, services, people, and business units are considered cost objects. Indirect costs are assigned a cost pool and then are applied to cost objects. There are many complex cost allocation methods that are available. These methods all have the same fundamental approach of identifying cost objects, determining the cost pools, and selecting the cost allocation rule.

In this paper an attempt is made to identify problems regarding existing costing system and develop an alternative costing model to overcome the problems. It has been found that functional based costing which is now practiced has inherent anomalies in allocating direct labour and overhead cost to various models in the portfolio. The paper discusses the development of a costing model based on ABC principles which could provide solutions for the problems.

## **2.LITERATURE REVIEW**

The ABC method was found to be better than traditional costing while testing the hypothesis using t-test in a case study on a foam and mattress company on the implementation of the ABC method [6]. The study concluded that the manufacturing activities could be enhanced by effective and efficient ABC method. Time driven ABC model development in an electronics industry revealed that Time Driven Activity Based Costing (TDABC) could be used to get accurate cost information and it can also be used to maintain ABC method. It has also been recommended to use an Enterprise Resource Planning (ERP) system to implement the same and was found to be beneficial to the small and medium enterprises [12]. ABC method could be used as a practical and appropriate method for developing countries based on a case study in Taiwan. It has been concluded that ABC method could yield more accurate cost information or cost management and pricing decisions while comparing with the traditional costing system [10]. It was found that the cost knowledge could be used to improve the current production process using simulation based ABC method. It was clear that the discrete event simulation and ABC method could be used to replicate real time situations incorporating even small changes. The paper also gives us an insight regarding the methodological and organizational changes that are essential for the ABC implementation. It has been found that the relevance and applicability of the activity based costing could not be neglected and it could influence every phase of the costing process [9]. The review also gives an insight on the benefits of ABC over traditional costing. A study on the influence of ABC system implementation by the public sector of developing countries was done and has been found that ABC system information has significant relevance for the decision making process[3]. The application of the ABC system in finding the overhead allocation based study conducted in a textile industry in Pakistan. The results obtained showed better performance when compared with that of traditional costing system and the issues that were encountered during implementation phase also has been described [4].

## **3.PROBLEM IDENTIFICATION**

The company under study is concentrating on the rubberised coir mattress production with an annual installed capacity of 6000 tonnes, around 4.8 lakh units (an ISO 9001:2008 certified company). The company has been facing problems in cost competence due to inherent anomalies in costing.

The study is intended to analyse the existing costing practice of the company, to identify the major problems in the system and finally to develop an alternative that could solve the identified problems. Existing costing system is Functional based. Here the direct material cost allocation is done by direct

tracing, direct labour and overhead costs are allocated using predetermined overhead rate. Only unit level driver, here weight of coir consumed is used to calculate overhead rates. The costing sheet for a particular mattress model (9:30PM) is shown in Table 1.

Total production cost contains seven cost components which are rubberized coir block, furnishing cost, direct labour, factory overhead, depreciation and administrative overhead. The predetermined overhead rates are in rupees per kilogram of coir block used for the particular model. Overhead allocation never considers the actual consumption of various overheads by the different models resulting in ‘averagisation’ of the estimated overhead cost among the models. In this system overhead may be over-applied or under-applied to the products.

TABLE 1. PRODUCTION COST BREAK UP:9:30 PM

| COST BREAK UP |                   |       |      |         |        |            |
|---------------|-------------------|-------|------|---------|--------|------------|
| 9:30 PM       |                   |       |      |         |        |            |
| No.           | Description       | Qty.  | Unit | Rate    | Amount | Value (Rs) |
| 1             | Rubberised coir   | 14.72 | kg   |         |        |            |
|               | Coir              | 115%  | kg   | 19.50   | 329.94 |            |
|               | Latex             | 25%   | kg   | 200.00  | 736    |            |
|               | Chemical          | 8%    | kg   | 38.00   | 44.84  |            |
|               |                   |       |      |         |        | 1110.78    |
| 2             | Furnishing cost   |       |      |         |        |            |
|               | Poly 85gsm        | 2.6   | M    | 55.75   | 144.95 |            |
|               | PU foam 10mm      | 3     | nos. | 42.00   | 126    |            |
|               | Latex             | 0.25  | kg   | 120.00  | 30     |            |
|               | MRP label         | 1     | nos. | 3.00    | 3      |            |
|               | Corner Label      | 1     | nos. | 4.00    | 4      |            |
|               | Tape edge         | 50    | M    | 0.05    | 2.31   |            |
|               | Warranty Card and | 1     | nos. | 8.00    | 8      |            |
|               | Border foam       | 0.03  | kg   | 397.72  | 11.93  |            |
|               | PVC               | 0.4   | kg   | 164.00  | 65.6   |            |
|               | Total Furnishing  |       |      |         |        | 395.79     |
|               | Wastage           |       |      | 5%      |        | 75.32      |
| 3             | Direct Labour     |       |      | 8.11/kg |        | 119.38     |
| 4             | Factory overhead  |       |      | 5.33/kg |        | 78.45      |
| 6             | Depreciation      |       |      | 4/kg    |        | 58.88      |
| 7             | Administrative    |       |      | 4.42/kg |        | 65.06      |
|               | Total production  |       |      |         |        | 1904       |

#### 4.METHODOLOGY

After a detailed study of the production process, resource pools, activities and cost objects were identified and relations were established to arrive at the unit cost of cost objects. There are different costing approaches available for cost allocation. Activity based costing principles can be used suitably here for developing a costing model which gives unit cost of cost objects. The unit costs can be used for production cost calculation based on cost object usage by a particular product. A cost allocation model has been developed using Activity Based Costing (ABC) principles. Microsoft Office Excel is used as the platform for the model.

## 5. MODEL DEVELOPMENT

The new costing model has been developed using Microsoft Office Excel. The spreadsheet has four tabs representing stages of cost allocation and a final report tab. The Activity based costing principles are used to establish relations in every stage of cost allocation and uses the actual cost and resource consumption data collected from the production department. The procedure can be summarized as follows:-

Step1: The cost components of production are classified and grouped in to six Resource pools which are Raw Material, Fuel, Labour, Operational management, Energy/Infrastructure and Machinery.

Step2: The production process was analyzed and whole process is divided in to twelve different activities.

Step3: Resource pool cost is allocated to the 12 activities based on resource usage proportion (Allocation %).

Step4: Activity drivers and cost objects are identified which is shown in table 2

Step5: Unit cost for activities is then calculated in the next tab. The unit cost gives the cost incurred per unit of each activity. It is calculated using the following relations

Resource cost allocated to activity

$$\begin{aligned} \text{Resource cost allocated to activity} \\ = \text{Allocation \%} \times \text{Resource pool cost} \quad (1) \end{aligned}$$

$$\begin{aligned} \text{Activity Cost} = \sum_{n=1}^6 [\text{Resource cost allocated to activity}] \quad (2) \\ \text{where } n \text{ is resource pool number} \end{aligned}$$

$$\begin{aligned} \text{Total Activity cost allocated} = \sum_{n=1}^6 [\text{Activity Cost}] \quad (3) \\ \text{where } n \text{ is resource pool number} \end{aligned}$$

$$\text{Unit activity cost} = \frac{\text{Total Activity cost}}{\text{Total units}} \quad (4)$$

Step6: The unit activity cost is allocated to the cost objects of the activity. Here a single cost object is assumed to take up hundred percentage of an activity cost. Hence unit cost of cost object is given by

$$\begin{aligned} \text{Unit cost of cost object} \\ = \frac{\text{Total activity cost}}{\text{Total units}} \quad (5) \end{aligned}$$

## 6. COSTING WITH NEW MODEL

The actual production cost as per the profitability statement is allocated using the new model and the unit cost for cost objects are calculated. Some of the assumptions taken during the allocation are baseline period is one month, production cost is completely accounted, normal production is 800 mattress/day, inventory handling and wastage cost is negligible and activity costs are strictly proportional to cost drivers. Resource costs in lakhs allocated to various resource pools are shown in Figure 1.

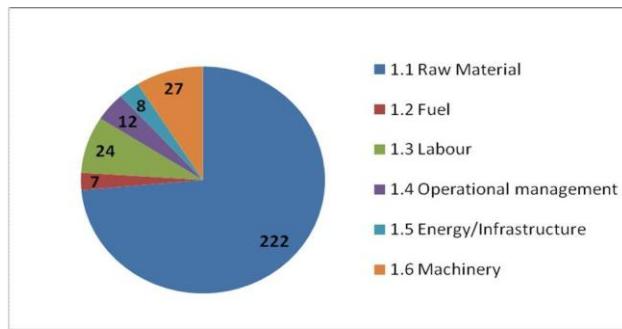


FIGURE 1. RESOURCE POOL COST ALLOCATION

The resource pool costs are then allocated to activities based on the usage proportions of various resources by individual activities. Total cost for an activity is given by the summation of cost of six resources allocated to the activity. Cost of activities thus obtained is given in Table 2.

TABLE 2. ACTIVITY COSTS

| Activity No. | Activity                               | Activity Cost (lakhs) |
|--------------|--|-----------------------|
| 2.01         | Coir preparation (drying & untwisting) | 31                    |
| 2.02         | Latex preparation(compounding)         | 92                    |
| 2.03         | Rubberised coir Sheet forming(DOA)     | 31                    |
| 2.04         | RC sheet pressing                      | 11                    |
| 2.05         | RC sheet vulcanizing                   | 9                     |
| 2.06         | Cooling                                | 2                     |
| 2.07         | Trimming and padding                   | 67                    |
| 2.08         | Quilting & Fabric preparation          | 23                    |
| 2.09         | Feeding                                | 13                    |
| 2.10         | Border stitching &Tape edging          | 6                     |
| 2.11         | Inspection                             | 2                     |
| 2.12         | Despatch                               | 15                    |

The activity cost is then allocated to the cost objects of the activity. Here a single cost object is assumed to take up hundred percentage of an activity cost. For multiple cost objects within an activity, cost allocation to them is done based on the usage proportion of the activity by the objects.

TABLE 3. COST OBJECT USAGE

| No. | Activity                               | Unit cost | Cost object usage(units) |         |             |
|-----|--|-----------|--------------------------|---------|-------------|
|     |  |           | Dreams                   | 9:30 PM | Heaven plus |
| 1   | Coir preparation (drying & untwisting) | 9.63      | 6.79                     | 14.72   | 13.3        |
| 2   | Latex preparation(compounding)         | 109.48    | 1.7                      | 3.68    | 6.65        |
| 3   | Rubberised coir Sheet forming(DOA)     | 10.80     | 6.79                     | 14.72   | 13.3        |
| 4   | RC sheet pressing                      | 54.85     | 1                        | 1.25    | 2.5         |
| 5   | RC sheet vulcanizing                   | 46.06     | 1                        | 1.25    | 2.5         |
| 6   | Cooling                                | 10.09     | 1                        | 1.25    | 2.5         |
| 7   | Trimming and padding                   | 334.32    | 2                        | 1.25    | 4           |
| 8   | Quilting & Fabric preparation          | 0.33      | 328                      | 328     | 885         |
| 9   | Feeding                                | 0.19      | 328                      | 328     | 442.5       |
| 10  | Border stitching & Tape edging         | 0.72      | 40                       | 40      | 45          |
| 11  | Inspection                             | 10.73     | 1                        | 1       | 1           |
| 12  | Despatch                               | 259.12    | 0.3                      | 0.3     | 0.8         |

The cost object unit rates obtained from the model is used to calculate the production cost of the selected models for comparison with the existing costing. The cost object usage rates are fixed based on product specification. The cost object usage for the three models is in Table 3.

## 7. RESULTS & DISCUSSION

Production cost of three mattress models are calculated using the cost object unit cost arrived at by the new model developed. The cost allocation using the new model gives outputs such as Resource pool allocation, Individual activity costs and Unit costs for the cost objects. Using the cost object unit cost and cost object usage for the three selected models, corresponding production costs are calculated.

The production cost as per the new costing system is compared with that of the existing system. Unrealized cost savings for the three models are calculated and yearly savings are projected using average production.

Total cost of resources for a period of one month is allocated to the six resource pools based on the resource cost drivers. 74% of the cost is incurred for raw material alone which includes coir, latex, chemicals, foams, cloth and other furnishing materials. Machinery and labour are allocated with 9% and 8% of total costs respectively.

Operational management, Energy/Infrastructure and Fuel are allocated with 4%, 3% and 2% respectively.

A comparison of the production cost calculated as per the new model is done with that of the existing

model. The production cost for all the selected models are found to be much lower. The cost differences are Rs 312, Rs 356 and Rs 1712 for Dreams, 9:30 PM and Heaven plus respectively. The percentage cost differences are -18, -19 and -34 respectively. This reveals the over application of overhead costs to products as per the existing costing. The comparative analysis of the production cost as per the two systems is given in Table 4.

TABLE 4. COST COMPARISON

|                    | Existing | New model | Cost difference | %Cost difference |
|--------------------|----------|-----------|-----------------|------------------|
| <b>Dreams</b>      | 1704     | 1,392     | 312             | -18              |
| <b>9:30 PM</b>     | 1904     | 1,548     | 356             | -19              |
| <b>Heaven plus</b> | 4953     | 3,241     | 1712            | -34              |

Cost savings realized in production cost as per the new costing system are calculated for individual models based on average monthly production. Yearly cost savings of Rs 90.8 lakhs, 141.6 lakhs and 74.8 lakhs for Dreams, 9:30 PM and Heaven plus respectively can be realized as per the new costing. A cumulative production cost savings of Rs 3.07 Cr has been realized. This cost savings shows that a reduced pricing is possible for the selected models in order to increase the competence. A part of it can be provided as an additional margin to the dealers and retailers. Table 5 shows the cost savings.

TABLE 5. COST SAVINGS

| Model                                 | Unit cost saving (Rs) | Avg. monthly production (No.) | Monthly cost saving (lakhs) | Yearly cost savings (lakhs) |
|---------------------------------------|-----------------------|-------------------------------|-----------------------------|-----------------------------|
| 9:30 PM                               | 312                   | 2428                          | 7.57                        | 90.8                        |
| Dreams                                | 356                   | 3336                          | 11.87                       | 141.6                       |
| Heaven plus                           | 1712                  | 365                           | 6.24                        | 74.8                        |
| <b>Cumulative yearly savings (Cr)</b> |                       |                               |                             | <b>3.07</b>                 |

## 8. CONCLUSIONS

A detailed analysis of costing has been done at a rubberized coir manufacturing company in public sector and the costing system of the company was found to have problems regarding cost allocation. A detailed

literature review is done and Activity Based Costing principles are found to be appropriate for providing a solution to the problems in costing. Hence a costing model based on ABC principle is developed and used for production cost allocation. Cost allocation and production cost calculation of the selected models using new system revealed much lower production cost which could lead to greater cost competence and better pricing.

The alternative ABC based costing model can be used for cost management in all departments of the company. Time driven approach can also be incorporated in the new model for labour intensive activities to improve labour cost allocation. An Enterprise wide Activity Based Management (ABM) system can be developed for cost management.

It is expected that by incorporating this model cost optimization for all the products can be done enabling the company to be a market leader through competitive pricing strategies.

## REFERENCES

- [1] Akyol Derya Eren, Tuncel Gonca, G. Bayhan Mirac, 2007. "A Comparative Analysis Of Activity-Based Costing And Traditional Costing", World Academy of Science, Engineering And Technology, Vol.3 ,pp. 580-583.,
- [2] Dr Anand Manoj, Dr B S Sahay, Subhashish Saha, 2006. "Activity-Based Cost Management Practices In India: An Empirical Study", IIM Indore, pp.1-25.
- [3] Carmo Luís Paulo F, Padovani Fernando, 2012. "Advances and Challenges for Adoption of Activity Based Costing (ABC) By Public Sector: A Comparative Study Of Brazil, Colombia, Uruguay And United States", International Business Research, Vol. 5, No. 2, February, pp.150-158.
- [4] Godil Danish Iqbal, Dr. Shabib Syed - Ul- Hasan, Yousuf Abid, 2013 "Application Of Activity Based Costing In A Textile Company Of Pakistan-A Case Study", Interdisciplinary Journal Of Contemporary Research In Business , Vol. 4, No. 11, March, pp. 602-625.
- [5] Krishnan Anbalagan, 2006. "An Application of Activity Based Costing In Higher Learning Institution: A Local Case Study", Contemporary Management Research, Vol.2, No.2, September, pp.75-90
- [6] Oniyama Nelson C., 2011. "The Role Of Activity Based Costing On Organization Pricing System - A Case Study Of Teetoo Foam & Mattress Industry, Liberia", JORIND, Vol. 9, No.1, June pp.265-272 .
- [7] Popesko Boris, 2010 "Utilization of Activity-Based Costing System in Manufacturing Industries – Methodology, Benefits and Limitations", International Review of Business Research Papers, Vol.6, No.1, February, pp. 1-17.
- [8] Richard Hwang Nen Chen, 2000 "Value chain tracing and cost system obsolescence: An exploratory study of small to medium sized companies", The journal of applied business research, Vol. 15, No.4, pp.95-108.
- [9] Sarbapriya Ray, 2012 "Relevance and Applicability of Activity Based Costing: An Appraisal", Journal of Expert Systems (JES), ol. 1, No. 3, pp.71-77.
- [10] Tsai Wen-Hsien, Hsu Jui-Ling, 2004 "Activity-Based Costing: A Case Study on a Taiwanese Hot Spring Country Inn's Cost Calculations", National Central University, Taiwan.
- [11] Rafael Florencio Da Silva Costa, Jose Arnaldo Barra Monteviechi, Marcos Stewart Ferraz Pamplona, Andre Luiz Medeiros, Andre Luis Faustino Da Silva, Jonathan Daniel Friend, 2012 "Discrete-Event Simulation And Activity-Based Costing To Aid The Decision Making Process In A Manufacturing Cell", Proceedings of The International Workshop On Applied Modeling & Simulation, Rio De Janeiro, May, pp.27-36.
- [12] David E. Stout, Joseph M. Propri, 2011 "Implementing Time-Driven Activity-Based Costing At A Medium-Sized Electronics Company", Management Accounting Quarterly, Vol. 12, No. 3, pp. 1-11.