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Adoption of an activity based costing model in an Indian steel plant

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Abstract

In the age of relentless global competition, constantly improving technology and better information systems, managers are often compelled to devise new strategies to maintain sustained competitive advantage while adopting new business management approaches. So, in this paper, an activity based costing (ABC) model is proposed for a raw material handling section of an Indian steel plant. The results obtained from ABC model application in the said department facilitates quantification of the unit cost of each process, analysis of various activities in order to identify inefficiency, setting-up of better budget allocation, initiation of cost minimization procedure and establishment of an efficient resource requirement plan. Moreover, the cost information derived from ABC model is compared with that extracted from the traditional costing system to demonstrate that ABC model can significantly minimize the product cost distortion resulting from unsystematic allocation of overhead costs. This paper also discusses the practical implication of the implemented ABC model with respect to its critical role in effective resource control, improved strategic and operational decision making, and aid in continuous improvement through internal cost minimization in the department.

Introduction

Steel is one of the most vital products of the modern world and has immense strategic importance in long term development of any country's economy. The relevance of steel industry is more in a country, like India, where according to a Government report of Investment and Technology Promotion division of Ministry of External Affairs, published in 2014, nearly 2% of the country's gross domestic product (GDP) and employment to over 600000 people were provided solely by the steel sector. Till date, majority of the Indian steel plants are engaged in practicing traditional cost accounting systems, which often fail to provide detailed and accurate cost information often required in taking various managerial decisions, like analyzing internal process of the organization, estimating product and customer profitability, establishing better performance measure, evaluating new investment opportunities, examining capacity utilization of the organization etc. This incapability of the traditional costing systems emerges from the fact that they generally allocate overhead cost based on a single volume measure, such as direct labor hour, machine hour etc. Activity based costing (ABC) model is designed to address those shortcomings of the traditional accounting systems, through evaluating work-flows and processes of the organization to identify actual activities that result in costs, instead of just listing cost factors and allocating them to products arbitrarily (Gupta and Galloway 2003). The ABC is a methodology for allocating costs to products, services, projects, tasks etc. according to the activities that go into them and the resources consumed by those activities. It can provide managers with realistic and strategic view of the cost associated with various activities of the organization that are essential in effective planning, controlling and decision making. Therefore, ABC approach is an important management tool which can help organizations to achieve a sustainable competitive advantage in this global competitive environment by positioning themselves strategically in their sector through adopting cost leadership position.

Steel market in India is expected to rise by 4–5% in the financial year (FY) 2015 and will achieve a 15% compound annual growth rate after FY 2017, and it has the potential to become the second largest steel consuming nation behind China during FY 2015–2020, according to a research report of Deutsche Bank. With such an enormous opportunity available in the Indian market, there is bound to be immense competition among the Indian steel plants to acquire as much market share as possible. So, there is a need of application of a modern accounting tool in the form of ABC model in the Indian steel plants, which can provide accurate cost information at different activity levels of the plant in order to manage costs according to the prevailing business environment. Thus, this paper intends to develop and implement an ABC model in a raw material handling department of an Indian steel plant to demonstrate its efficiency in improving organizational performance, productivity and profitability. The results derived from the application of ABC model in the said department are helpful to show how it guides the managers of the organization to analyze the efficiency and effectiveness of resources and activities with a view to formulate new innovative strategies related to products, resources and market in order to satisfy the changing demands of the customers for long term competitive edge.

1. Review of the past literature

Baxendale (2001) demonstrated that the application of ABC model in a manufacturing organization would provide more strategic information than the traditional costing system, and assist the managers in improving their business competitiveness. Narayanan and Sarkar (2002) discussed about the impact of cost information derived from ABC model on manager's product pricing, product portfolio and customer portfolio decisions. Dickinson and Lere (2003) elucidated the ways in which ABC approach could assist in managing the marketing functions of an enterprise. Beheshti (2004) discussed about the usefulness of an activity based cost management (ABCM) system in providing managers with a strategic view of those essential activities for having a competitive edge of the organization. Roztocki and Weistroffer (2005) presented a framework for evaluating information technology investments, integrating value chain analysis with ABC model and fuzzy logic. Gonzalez-Gomez and Morini (2006) proposed an adapted ABC model for cost estimation of winemaking and showed that the information provided by ABC method would assist the winery managers in improving their business competitiveness. Singer and Donoso (2006) analyzed how the ABCM methodology could assist in cost estimation and feasibility assessment, by describing the production system as a network of activities connected by physical flows. Tsai and Lai (2007) applied an ABC model on joint products decisions while incorporating capacity expansion and outsourcing features through employing a mathematical programming approach. Banker et al. (2008) studied the impact of ABC model on adoption of world-class manufacturing practices and plant performance. Rezaie et al. (2008) proposed a costing framework on the basis of ABC model and product cost tree concept for flexible manufacturing systems. Kim (2009) developed a framework based on ABC approach to quantify the cost savings that the implementation of an enterprise resource planning system should achieve in order to justify the investment. Popesko (2010) detailed out the necessary steps required in implementation of an ABC model in a manufacturing organization, and also elucidated those procedures for activity output measurement and cost assignment. Savory (2010) integrated ABC and discrete event simulation models to provide estimate of manufacturing costs for a part family and U-shaped manufacturing cell. Ahmadzadeh et al. (2011) examined how organizational factors, such as size, industry type, cost structure, importance of cost information, and products and services would diversely affect adoption of ABC model in the listed companies of the Tehran Stock Exchange. Kareem et al. (2011) developed an ABC model to estimate cost of a job on a lathe machine considering maintainability of the machine tool. Kim et al. (2011) applied an ABC model to assign rebar fabrication cost to project for demonstrating its superiority over the traditional costing system, while providing more precise and detailed cost information on product and processes. Pedro et al. (2011) implemented an ABC model in a Portuguese enterprise manufacturing metallic structures to understand its real advantages and disadvantages. Al-Tahat and Abbas (2012) proposed a costing model based on ABC to estimate the production cost of steel casting. Gupta (2013) presented the implementation methodology of an ABC model in a global manufacturing enterprise having various product lines to exhibit its impact on the organization's performance. Kumar and Mahto (2013) performed a comparative analysis of application of ABC model with traditional costing method in an automobile parts manufacturing company in order to comprehend the true cost of the components. Chen et al. (2014) implemented ABC model and economic value added approach in the traditional profitability analysis to derive a better performance measurement system. Kaspina et al. (2014) discussed about the applicability of ABC model in an organization to prove its appropriateness in business model building process, while providing critical insights about expense structure, revenue structure, cash flow pattern and cost of a product/service of the enterprise.

The past researchers have successfully implemented ABC model in several manufacturing as well as service industries for solving diverse tactical, operational and strategic managerial decision making problems. Even though, ABC model has several benefits, its successful implementation is relatively expensive than the traditional costing system, and its application needs support from the domain experts. It is noticed that till date, ABC model has not been adopted in any of the Indian steel plants. So, this paper proposes the application of ABC model in a specific department of a steel plant of India. The derived results from the application of ABC model in the said department provide more accurate cost information at various activity levels. Additionally, the information extracted from the adopted ABC model is effectively employed to identify different value adding and non-value adding activities in the organization, which in turn provide its mangers with opportunities to streamline or reduce costs through minimizing or eliminating the non-value adding activities. The possible problems related to ABC model implementation in the said department may be the reluctance of the existing employees to accept this new cost management system and lack of appropriate management information system for supporting its seamless adoption.

2. ABC model development

The accounting system of a raw material handling plant (RMHP) of an Indian steel plant is considered here for the development and subsequent implementation of ABC model. The identity of this steel plant is not disclosed here for confidentiality reason, and henceforth, it is referred to as XYZ Limited. It has a capacity to produce 2.088 million tons of hot metal, 1.8 million tons of crude steel and 1.586 million tons of saleable steel annually.

The RMHP of XYZ Limited primarily handles five kinds of raw materials, i.e. iron ore lump, limestone, dolomite, iron ore fines and coke. So, five corresponding cost objects associated with managing of the above-mentioned raw materials in RMHP are identified as iron ore lump handling cost, limestone handling cost, dolomite handling cost, iron ore fines handling cost and coke handling cost respectively. The cost object of iron ore lump handling cost mainly consists of the expenditure related to five activities, i.e. tippling, screening, conveyor belt movement, stacking and reclaiming. Figure 1 demonstrates the procedure of iron ore lump handling in RMHP before it is delivered to blast furnace. Here, iron ore lumps are first unloaded employing tipplers, which then undergo for screening to separate any undersized fraction. The separated iron ore lumps are then stored with the help of stackers to form beds. Reclaimers are subsequently utilized to retrieve iron ore lumps from these beds in order to despatch them to blast furnace.

The cost objects of limestone handling cost and dolomite handling cost comprise of the total expenses incurred on managing of limestone and dolomite respectively in RMHP, while utilizing various activities, like tippling, screening, conveyor belt movement, stacking, reclaiming, bunker storage, blend mixing and flux crushing. The activities used for handling of limestone and dolomite in RMHP of XYZ Limited are almost the same. It is observed that limestone or dolomite is first tippled, and then delivered to three different places according to the requirement, i.e. stackers for bed formation, bunkers for storage and flux crushers for crushing. When the raw materials of limestone or dolomite are transported to stackers, reclaimers are applied to recover them from the stacked bed to ultimately transfer them to the bunkeRs. Raw materials stored in the bunkers are finally conveyed to the lime calcination plant. On the other hand, limestone or dolomite delivered to crushers is first pulverized, and afterwards screened to remove any unacceptable range of size. Further, the crushed and separated raw materials are sent to bunkers (different from the earlier one) for intermittent storage, and subsequently to sinter mix/blend mix beds for production of the base mix. The prepared base mix is stacked and reclaimed with the aim of finally dispatching it to the sinter plant. Conveyor belts are used for movement of materials between different operation points. The detailed limestone or dolomite handling process in RMHP of XYZ Limited is exhibited in Figure 2.

The procedures carried out in handling of coke are very similar to those performed in limestone or dolomite handling. The exception is that the raw materials in this case are only delivered to coke crusheRs. In other words, all those activities necessary in delivering raw materials to the lime calcination plant as mentioned earlier are excluded. The screening activity is also not performed here after the crushing of coke, and instead of tipplers, other mechanical equipments are employed for unloading. Figure 3 exhibits the coke handling procedure in RMHP. The cost object of coke handling cost provides information on the total expenditure incurred on all activities/processes carried out while managing coke movement in RMHP.

The cost object of iron ore fines handling cost contains the total cost associated with all those activities required in systematic and continuous flow of iron ore fines from the unloading points to sinter plant. Tippling, conveyor belt movement, stacking, reclaiming, bunker storage and blend mixing are the main activities performed while managing iron ore fines in RMHP. The complete handling process of iron ore fines in RMHP is shown in Figure 4.

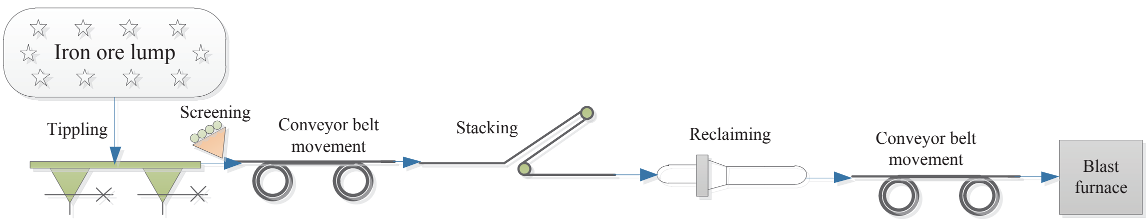

Figure 1. Detailed procedure of iron ore lump handling in RMHP.

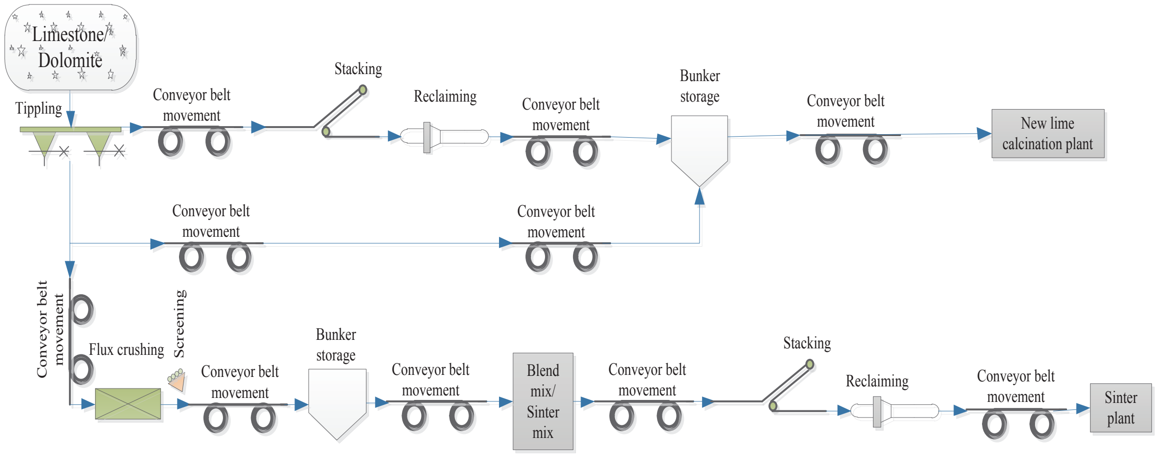

Figure 2. Limestone/dolomite handling process in RMHP.

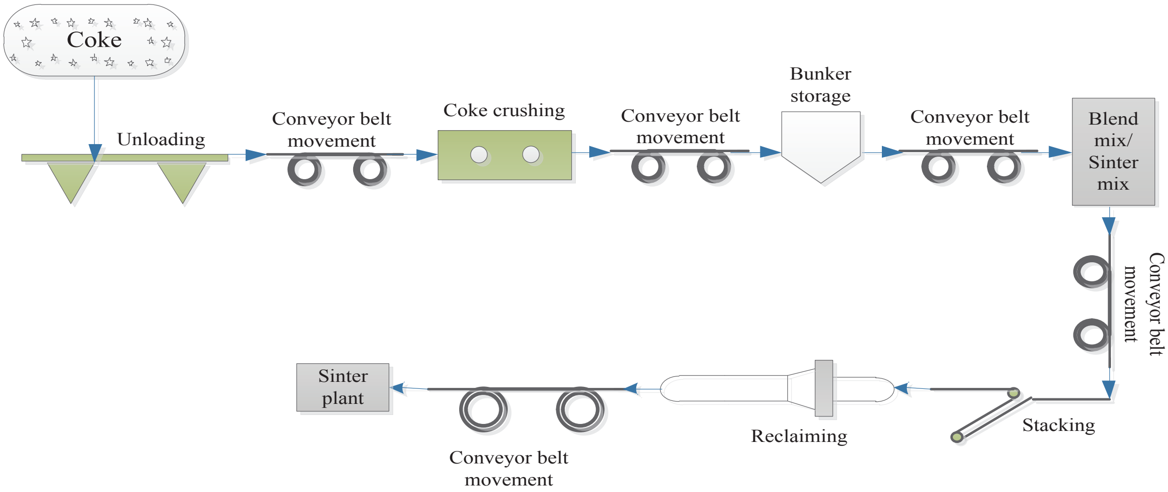

Figure 3. Coke handling procedure in RMHP.

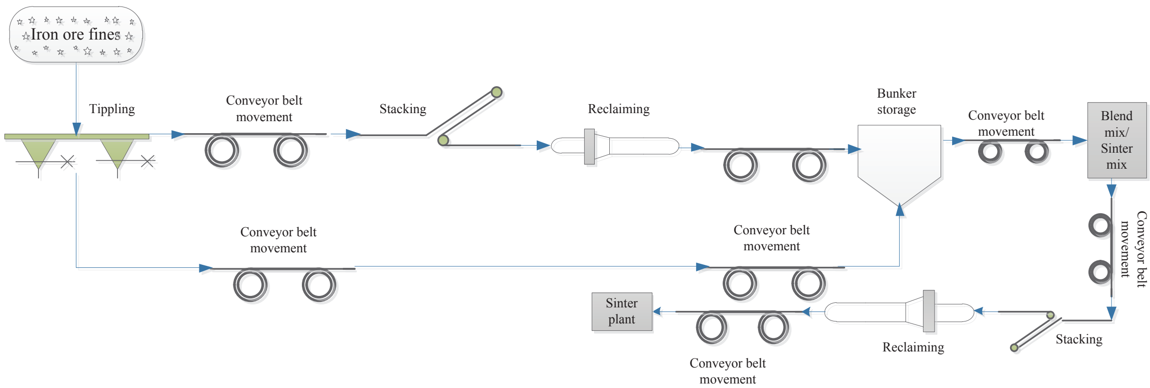

Figure 4. Handling process of iron ore fines in RMHP.

It is concluded from the above discussions that the activities required by the five cost objects can be classified into ten activity pools, i.e. reclaiming, stacking, tippling, conveyor belt movement, screening, flux crushing, bunker storage, blend mix/sinter mix, unloading and coke crushing. The activity pool of reclaiming comprises of those activities required to recover raw materials from various beds. Further, it is observed that sinter mix/blend mix bed is the place where the base mix is produced, and hence, all the activities related to blending base mix are accumulated into the activity pool of blend mix/sinter mix. The activity pools of flux crushing and coke crushing consist of all those activities as carried out in running flux crushers and coke crushers respectively. Additionally, each and every activity required for storing raw materials in bunker is put into the activity pool of bunker storage. A series of belt conveyors are employed to transfer materials from one stage to another stage, and therefore, all activities connected to operation of conveyor belts are attached to the activity pool of conveyor belt movement. The activity pool of tippling includes all those activities directly associated with off-loading of iron ore lump, iron ore fines, limestone and dolomite while utilizing tipplers, whereas, unloading activity pool comprises of those activities related to off-loading of coke using different mechanical equipments. Moreover, it is observed that screens are engaged in RMHP to separate any undesired range of size of raw materials, so all the activities linked to those screens are placed into the activity pool of screening. The activity pool of stacking contains those activities required during storing of raw materials for bed formation, while employing stackeRs. The next step in ABC model development is to identify different resource centers required by these activity pools, and they are recognized through critically analyzing the ten activity pools. Executive manpower resource cost, non-executive manpower resource cost, electricity resource cost, operating supplies resource cost, maintenance cost, mechanical spares resource cost, electrical spares resource cost, administrative resource cost and contract staff resource cost are recognized as various resource centers essential for the above-mentioned activity pools. The developed ABC model in RMHP of XYZ Limited is exhibited in Figure 5.

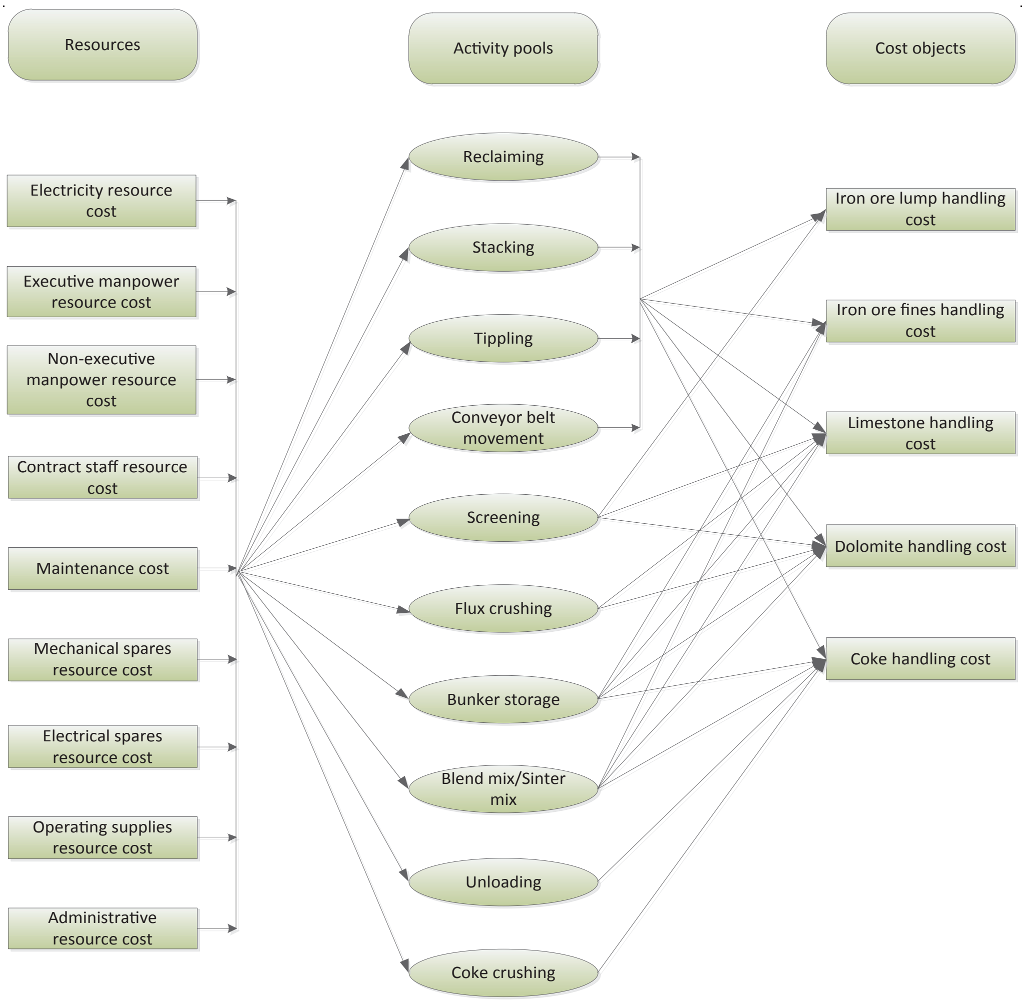

Figure 5. Developed ABC model for RMHP of a steel plant.

3. Implementation of ABC model in RMHP

The RMHP of XYZ Limited has 56 executive staffs and 493 non-executive staffs in FY 2013–2014 working as a team to achieve the objectives of the plant. The services of contract workers are also utilized by the plant in case of any unseen incidental requirement. All the relevant data necessary for implementation of ABC model in RMHP are accumulated from FY 2013–2014.

3.1. Assignment of resource cost

Executive staff members employed in RMHP are categorized into three groups in accordance to their nature of work, i.e. mechanical maintenance, electrical maintenance and operational supervision. The total working hours per year dedicated to the ten activity pools differ for each individual group of executive workers, and are traced down from their respective scheduled duty charts and job log books. These time allocations are further translated into monetary units through converting time devoted by individual group of staff members to each activity into the time equivalent cost. It is estimated that the total executive manpower resource cost assigned to ten activity pools is Rs. 15163409 in reclaiming, Rs. 13600137 in stacking, Rs. 6186812 in tippling, Rs. 17416731 in conveyor belt movement, Rs. 3642723 in screening, Rs. 7821622 in flux crushing, Rs. 5752392 in bunker storage, Rs. 9363782 in blend mix/sinter mix, Rs. 1663427 in unloading and Rs. 4311934 in coke crushing.

Similarly, non-executive employees of RMHP are also grouped into three categories (mechanical, electrical and operations). Scheduled duty routines of individual group of the non-executive workers are referred to accumulate information on respective time devoted by each group to different activities. These time allocations to ten activity pools are then converted into monetary units utilizing the methodology adopted earlier. It is computed that the total non-executive resource costs allocated to the activity pools of reclaiming, stacking, tippling, conveyor belt movement, screening, flux crushing, bunker storage, blend mix/sinter mix, unloading and coke crushing are Rs. 73994308, Rs. 67071591, Rs. 31587486, Rs. 88005555, Rs. 15296302, Rs. 29763537, Rs. 34281957, Rs. 50407327, Rs. 8912480 and Rs. 15213396 respectively.

Contract workers are also employed in RMHP of XYZ Limited to complete some constrained works that usually occur due to some unprecedented situations. It is observed that one set of contract workers only performs jobs related to a single activity in RMHP. So, the total number of contract workers employed for each activity of RMHP and the corresponding expenditure outlay towards their salary are traced down from the contract labor record book and financial report of the department for the concerned period. It is observed that the total non-executive manpower resource cost apportioned to ten activity pools is Rs. 17526899 in reclaiming, Rs. 1625349 in stacking, Rs. 7384760 in tippling, Rs. 20768072 in conveyor belt movement, Rs. 4271430 in screening, Rs. 8735876 in flux crushing, Rs. 7339640 in bunker storage, Rs. 11240076 in blend mix/sinter mix, Rs. 2155768 in unloading and Rs. 4592288 in coke crushing.

The financial report for FY 2013–2014 of RMHP also provides the cost information on the total expense incurred on electricity consumption in that specific department. This electricity resource cost is then distributed among different activity pools according to their proportionate electricity consumptions (in kilowatt-hours). It is estimated that the total cost related to electricity consumption in RMHP equals to Rs. 135637434, from which Rs. 18107597 is assigned to reclaiming, Rs. 15557614 is allocated to stacking, Rs. 8287447 is allotted to tippling, Rs. 30993154 is assigned to conveyor belt movement, Rs. 3960613 is allocated to screening, Rs. 18745093 is allotted to flux crushing, Rs. 1966743 is assigned to bunker storage, Rs. 16479948 is allocated to blend mix/sinter mix, Rs. 2875514 is allotted unloading and Rs. 18663711 is assigned to coke crushing.

It is noticed that RMHP employs a wide range of equipments, like stackers, conveyor belts, reclaimers, tipplers, crushers, screens etc., which require various types of electrical and mechanical spares at the time of their breakdowns. The information associated with consumption of mechanical and electrical spares by each activity during the concerned period and their equated cost are derived from the spare parts consumption registers maintained in the department. So, it is calculated that the total mechanical spares resource cost apportioned to ten activity pools is Rs. 16296088 in reclaiming, Rs. 14918523 in stacking, Rs. 6673539 in tippling, Rs. 20214496 in conveyor belt movement, Rs. 4377597 in screening, Rs. 11051136 in flux crushing, Rs. 5285769 in bunker storage, Rs. 10489905 in blend mix/sinter mix, Rs. 2163288 in unloading and Rs. 10571539 in coke crushing. On the other hand, the total electrical spares resource costs allotted to the activity pools of reclaiming, stacking, tippling, conveyor belt movement, screening, flux crushing, bunker storage, blend mix/sinter mix, unloading and coke crushing are Rs. 125631, Rs. 113585, Rs. 51394, Rs. 196030, Rs. 18113, Rs. 129824, Rs. 12402, Rs. 103413, Rs. 16418 and Rs. 125452 respectively.

Operating supplies comprise of non-salary related expenditures necessary for the daily operation of RMHP of XYZ Limited. The total cost associated with operating supplies of RMHP is obtained from its financial report of FY 2013–2014, which equals to Rs. 73713044. The total cost incurred on operating supplies is apportioned among the activity pools of reclaiming, stacking, tippling, conveyor belt movement, screening, flux crushing, bunker storage, blend mix/sinter mix, unloading and coke crushing depending on the amount of operating supplies utilized in those activities. It is calculated that the total operating supplies resource cost assigned to ten activity pools is Rs. 10666277 in reclaiming, Rs. 9597438 in stacking, Rs. 4312213 in tippling, Rs. 13975993 in conveyor belt movement, Rs. 1872311 in screening, Rs. 10452510 in flux crushing, Rs. 1562717 in bunker storage, Rs. 10260856 in blend mix/sinter mix, Rs. 1444776 in unloading and Rs. 9567953 in coke crushing.

Further, it is observed that the services of third party are also required for periodic maintenance of various machineries/equipments employed in RMHP, once their warranty periods expire. The total payments given to third party for their services in the concerned period are put into maintenance resource cost. The maintenance resource cost is then proportionately allocated to the activity pools of reclaiming, stacking, tippling, conveyor belt movement, screening, flux crushing, bunker storage, blend mix/sinter mix, unloading and coke crushing according to the service utilization of the third party by those activities in RMHP, and equals to Rs. 4494437, Rs. 4013417, Rs. 1776527, Rs. 6037832, Rs. 1142053, Rs. 4087193, Rs. 528237, Rs. 2827098, Rs. 658082 and Rs. 3945543 respectively.

In addition, it is also noticed that there are some organization level departments, like human resource department and finance department whose services are often necessary for smooth functioning of RMHP. The total cost of salaries for all the staffs deputed in these departments is obtained from the book of accounts of XYZ Limited. This administrative resource cost is allocated to RMHP based on the proportionate time devoted by the employees of those departments for performing administrative jobs related to RMHP. The administrative resource cost allotted to RMHP is further apportioned to ten activity pools in accordance to proportionate utilization by the activities, i.e. reclaiming, stacking, tippling, conveyor belt movement, screening, flux crushing, bunker storage, blend mix/sinter mix, unloading and coke crushing. Thus, it is computed that the total administrative resource costs allocated to activity pools of reclaiming, stacking, tippling, conveyor belt movement, screening, flux crushing, bunker storage, blend mix/sinter mix, unloading and coke crushing are Rs. 4110600, Rs. 3801200, Rs. 1671800, Rs. 5298800, Rs. 956800, Rs. 2943200, Rs. 1021800, Rs. 3034200, Rs. 517400 and Rs. 2644200 respectively.

3.2. Allocation of activity costs to cost objects

The next step of the developed ABC model is to estimate the value of the activity cost driver rate, which is calculated through dividing the total cost allocated to each activity pool by the operational hours available annually in the respective machine/equipment required for that activity. The annual available operational time for each machine is computed taking into account the time required for various types of maintenance activities, and considering the slack that is necessary for continuous and smooth functioning of RMHP. Subsequently, the activity cost driver rate so computed for each activity is multiplied by the actual running hours of the machinery utilized in that activity to obtain the actual cost related to that activity pool. The difference between the total cost allocated to one activity pool and the actual cost estimated for the same provides information on the unused capacity cost. The unused capacity cost of all activity pools sums up to Rs. 276978740 and it becomes the opportunity cost due to underutilization of various machines employed in RMHP. A detailed calculation of actual cost related to various activity pools as estimated using ABC model is given in Table 1.

Furthermore, it is also noticed that activity pools of tippling, conveyor belt movement, stacking and reclaiming are required in handling of all the raw materials in RMHP of XYZ Limited. Therefore, the actual cost assigned to those activity pools is proportionately allocated to cost objects of iron ore lump handling cost, iron ore fines handling cost, limestone handling cost, dolomite handling cost and coke handling cost on the basis of amount of total raw material managed in RMHP. Moreover, the facilities of bunker storage and blend mix/sinter mix are employed while managing the raw materials of dolomite, limestone, iron ore fines and coke. Thus, the

Table 1. Detailed calculation of actual cost related to various activity pools.

Activity pool	Total cost allocated (Rs)	Actual running hours of machine/year	Total un-utilized hours of machine/year	Activity cost driver rate (Rs/hour)	Actual cost allocated (Rs)	Total unused capacity cost (Rs)
Reclaiming	160485248	4380	2920	21984	96291149	64194099
Stacking	144926997	5840	1460	19853	115941598	28985399
Tippling	67931979	6570	730	9306	61138781	6793198
Conveyor belt movement	202906664	4015	3285	27795	111598665	91307999
Screening	35537942	6570	730	4868	31984148	3553794
Flux crushing	93729991	6570	730	12840	84356992	9372999
Bunker storage	57751656	5840	1460	7911	46201325	11550331
Blend mix/ Sinter mix	114206606	4745	2555	15645	74234294	39972312
Unloading	20407152	2190	5110	2796	6122146	14285007
Coke crushing	69636016	6570	730	9539	62672414	6963602

actual costs related to activity pools of bunker storage and blend mix/sinter mix are apportioned among various cost objects, i.e. dolomite handling cost, limestone handling cost, iron ore fines handling cost and coke handling cost according to the proportionate utilization of the two activities during systematic movement of those four raw materials in RMHP. It is recognized that the activity pools of coke crushing and unloading comprise of those activity costs needed for uninterrupted flow of raw materials of coke in RMHP, and hence, the actual costs related to coke crushing and unloading are directly allocated to the cost object of coke handling cost. Flux crushers are required for pulverizing dolomite and limestone, and therefore, the actual cost associated with the activity pool of flux crushing is assigned to the cost objects of dolomite handling cost and limestone handling cost on pro rata basis based on the quantity of those two raw materials crushed. Similarly, it is acknowledged that screens are employed while handling iron ore lumps, dolomite and limestone. So, the actual cost linked to the activity pool of screening is apportioned to cost objects of iron ore lump handling cost, dolomite handling cost and limestone handling cost according to proportion of total raw material screened in those three cases. Table 2 shows a detailed allocation of ten activity pools' cost to various cost objects based on ABC model.

Table 2. Allocation of ten activity pools' cost to various cost objects.

Activity pool	Iron ore lump handling cost (Rs)	Iron ore fines handling cost (Rs)	Limestone handling cost (Rs)	Dolomite handling cost (Rs)	Coke handling cost (Rs)
Reclaiming	30543552	34934429	10726834	9850584	10235749
Stacking	36776675	42063612	12915894	11860825	12324592
Tippling	19393221	22181150	6810860	6254497	6499052
Conveyor belt movement	35399097	40487996	12432091	11416543	11862938
Screening	18147806	–	7154854	6681489	–
Flux crushing	–	–	39521251	44835741	–
Bunker storage	–	23530335	7918907	7188926	7563157
Blend mix/Sinter mix	–	37807526	12723758	11550856	12152154
Unloading	–	–	–	–	6122146
Coke crushing	–	–	–	–	62672414

4. Results and discussions

It can be comprehended from the annual cost data of RMHP, estimated through implementation of the proposed ABC model, as given in Table 3, that ABC approach presents cost information in a more detailed and accurate manner than the traditional costing system, as shown in Table 4.

The information on unused capacity cost associated with each activity of RMHP is also revealed from the results elicited from the proposed ABC model, which otherwise remains hidden while employing the traditional costing system. In addition, the results provide the administrators of the department with an idea about the actual cost related to all the processes undertaken in RMHP. It would help the management of RMHP in taking correct decisions regarding capacity utilization, resource requirement plan, capital budgeting and cost minimization. Figure 6 shows various annual cost components of RMHP as computed utilizing information derived from ABC model.

Based on ABC model, cost per unit volume of material handled in RMHP is computed after dividing the total cost assigned to iron ore lump handling, iron ore fines handling, limestone handling, dolomite handling and coke handling by the respective quantity of raw materials managed in the department annually. In traditional costing system, cost per unit volume of material managed in RMHP is estimated after dividing the sum of total costs allocated to cost head of salaries and wages, operating supplies, raw water, treated water, electricity, rail traffic, road transport, mechanical spares, electrical spares and general maintenance (outside) by the total amount of all the raw materials handled in the department during the concerned year. It is acknowledged that ABC model provides more distinct value of cost per unit volume of material handled for each type of material managed in RMHP. Table 5 compares the average cost per unit volume of raw material handled in RMHP as estimated using the two costing models.

Table 3. ABC report of annual cost in RMHP for FY 2013–2014.

Cost object	Amount (in Rs)
Iron ore lump handling cost	140260351
Iron ore fines handling cost	201005047
Limestone handling cost	110204449
Dolomite handling cost	109639463
Coke handling cost	129432202

Table 4. Traditional costing report of RMHP in FY 2013-2014.

Cost head	Expenditure (in Rs)
Salaries and wages	599725208
Operating supplies	73713044
Raw water	2439628
Treated water	2414262
Electricity	135637434
Rail traffic	69286462
Road transport	38272046
Mechanical spares	102041880
Electrical spares	892264
General maintenance (outside)	29510422

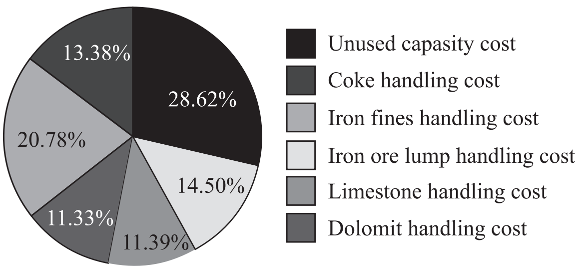

Figure 6. Different cost components of RMHP on the basis of ABC model.

Conclusions

Steel demand in India is expected to remain high in the coming years on the basis of strong fundamental economic factors and small per capita consumption of steel, according to a presentation given to the Ministry of Mines by Tata Steel in 2014. However, traditional costing methods (practiced by the most of the steel plants in India) are not only incapable to provide the necessary framework for measuring cost accurately, but they are also inept to empower managers with sufficient information required for managing the organization's day-to-day activities effectively and efficiently. Besides, the long term sustainability of those steel plants is also highly dependent upon satisfying market requirements through a continuing value creation process. So, there is a need of a management technique that would facilitate in achieving cost leadership position for steel plants operating in the Indian contextual environment. This paper demonstrates the applicability of ABC model in a department of an Indian steel plant in providing more reliable and meaningful cost information to its managers that would guide them in taking a range of tactical, operational and strategic decisions. A framework to implement the ABC model in an Indian steel plant setting with bare minimum initial investment and almost negligible modification in the existing traditional management information system is also presented. These attributes of the developed ABC model make it easy and cost efficient to implement. The results derived from the implementation of ABC model would help the administration to improve the performance of various processes and activities, while utilizing the related information on the unused capacity cost, with the aim of obtaining long term sustainable competitive advantage. These results also provide strategic information to facilitate informed management decisions in the organization as well as help in monitoring various activities of the department in order to implement those decisions. Additionally, the application of the ABC model facilitates analysis of the efficiency and effectiveness of the department's resources and activities. Moreover, the distinct cost per unit volume data of quantity handled for five types of material in RMHP, computed using ABC model, helps to devise specific strategies for each type of material to minimize the associated costs. Although, this ABC model is designed for a specific department of a steel plant, there is enough future scope of its application at organization-wide level.

Table 5. Comparison of average cost per unit volume of raw material handled in RMHP.

Cost object	ABC model		Traditional costing system
	Cost/unit volume of raw material handled (Rs/ton)	Average cost/unit volume of raw material handled (Rs/ton)	Average cost/unit volume of raw material handled (Rs/ton)
Iron ore lump handling cost	78		
Iron ore fines handling cost	98		
Limestone handling cost	175	151	186
Dolomite handling cost	189		
Coke handling cost	215		

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