

# THE APPLICATION OF ACTIVITY-BASED COSTING IN THE COST CALCULATION OF THERMAL-POWER ENTERPRISE

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*The advantages of Activity-Based Costing (ABC) include promoting the basic budget of activities and improving the management of activities, process and activity chain (value chain). ABC method, as an important tool of cost management in management accounting, extends the management of cost to the whole value-chain in the enterprise, and it also effectively changes the limitation of the focus of the law of manufacture costing on the study of the process concerning the making of certain products, thus offering adequate help to the enterprise in establishing systematic cost management. This paper, starting from the construction of thermal-power enterprises and through an analysis of the application of ABC method in improving the quality and increasing the efficiency of the thermal enterprise, aims to point out the ways to eliminate the non-value-added activities so as to improve the management of value chain of the construction of the thermal-power enterprises by setting up multi-thermal-resource network operation center, thermal provision center and thermal –power enterprises .*

*Key words: Activity-Based Costing; thermal-power enterprise; cost driver*

## **1. Introduction**

According to *Guidelines to the Application of Management Accounting* issued by the Ministry of Finance in 2017, the advantages of Activity-Based Costing refer to the ability to promote basic budget of activity and the management of activity, process and activity chain[1]. Currently, the activities of improving the quality and increasing the efficiency promoted by the State-owned Assets Supervision and Administration Commission of the State Council are in full swing in the management and operation of the enterprises. The focus of the study of ABC method lies in the cause of costing, the appraisal and adjustment of allocation of resources and extending cost management to the whole value-chain. However, due to the limited function of the cost calculation of enterprises by means of traditional Manufacture-Based Costing, how to involve Activity-Based Costing in cost management in the climate of structural adjustment and enterprise transformation remains an important issue calling for progressive

researches and profound analyses.

Therefore, taking thermal enterprise as a study case, this paper, after a detailed analysis and elaboration of the process and practicability of establishing the execution of ABC method at different levels, aims to make some humble contributions to improving and bettering the ABC of the available management accounting system in order to improve the quality and increase the efficiency of the thermal enterprises.

## **2. Literature Review**

Activity-Based Costing was first proposed by the American accounting master Eric Kohler in his *Dictionary of Accountants* in 1952, and its comprehensive application did not take place until the publication of *How the Cost Accounting Systematically Twisted the Product Cost*, a landmark monograph co-authored by Robert Kaplan and Robin Cooper, both of whom were professors of Harvard University. Its major principle is to take activity costing as the media between resources and products in order to achieve a more scientific and rational allocation of the indirect costs. Its initial aim lies in a more accurate calculation of the cost of the manufacture enterprise in order to convert the attention of the managers from the statistical result of the products to the reasons leading to the formation of the cost [2].

One of the assumptions of ABC method is that all the costs are changeable. The time-honored ABC method can help to identify the operational abilities applicable in each and every department and process, and then allocate these costs to corresponding objects according to the work load or work type. Through activities such as promotion, optimization, production line, order and customers, the enterprises can reduce the work load of these departments in their processes. The reason why that cost can be taken as a changeable cost is that in ABC method, information is analyzed and operation activity is conducted. Based on this, by using ABC method to make an evaluation of the unneeded resources, the management can make a reallocation of the resources or set aside the unused resources out of the enterprises[3].

With the deepening researches and widening applications, ABC method is becoming closely connected with the whole value chain including the design and decision-making of the product, and the scope of its application can be gradually expanded to industries such as including logistics, trade, finance and so on.

Wen holds the view that ABC method makes a calculation and allocation of the cost and an analysis of the cost driver on the basis of activities. The ABC costing calculation process is in constant consistency with the actual consumption process. It not only leads to an increased accuracy of the cost calculation of a particular enterprise, but also helps highlight its value-added part of the cost calculation and reduce the waste so as to make it possible for the enterprise to maintain an efficient and effective control of the cost. An analysis based on the accurate cost will help the management authorities to come up with more effective cost strategies in order to increase the operation efficiency of the enterprise and improve its competitive edges [4]. Lu also believes that ABC method has expanded the cost management of the enterprise, in which the activity chain covers the whole process of the birth of a specific product including the initial idea, production and marketing so that it can provide a valuable aid to the establishment of a cost management system[5]. Liu believes that equipped with the tool of management accounting, ABC method and management of Activity-Based Costing,

combined with the concept of value management, represent an innovative transformation of mode of the traditional value management[6].

As to manufacture industry in which thermal enterprise is also a component, the the focus of the study of ABC method lies in the cause of costing, the appraisal and adjustment of allocation of resources and extending cost management to the whole value-chain, however, the unique characteristics of the thermal industry calls for further improvement and perfection in terms of ABC. This paper, from the perspective of systematic thinking, starting from the whole process of the cost management of the thermal industry, aims to provide ways to implement ABC method at different levels through the establishment of thermal provision development center, multi-thermal resource and cold co-production enterprises and multi-thermal network operation center in order to erase the non-value-added activities in hope that the management of the value-chain will help improve the quality and increase the efficiency of the thermal enterprises.

From the above, it could be seen that ABC method enjoys a wide scope and application in businesses and enterprises because it can help to clarify the responsibility, power and benefits and controlling the cost in order to improve the organizational competitiveness of the enterprises.

### 3.The status quo of the thermal-power enterprises in X city

As a state-owned thermal-power provider in X city, the X City Thermal-Power Company is highly committed to providing thermal power to households and enterprises in the city throughout the year. Its total asset amounts to 5.3 billion RMB yuan, with the responsibility of providing heat for an area of 9.2 million square meters with a total capacity of 7605t/h. Its main heat tubes stretches 444.7 kilometers and its customers include 1,200 big users scattering the whole city.

**Table 1 Heating in Urban Area (County)**

<i>Item</i>	<i>2010</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>	<i>2018</i>
<i>Heating Capacity</i>						
<i>Steam (tons/hour)</i>	2235	2893	3013	3013	6200	4325
<i>Hot Water (megawatts)</i>	3531	13967	17191.9	17765.9	14477	14465.47
<i>Length of Centralized Heating Pipelines(km)</i>	541	894.24	1054.41	1141.24	1842	1516.83
<i>Heated Area (10 000 sq.m)</i>	6094	13492.55	16690.65	19566.81	29118.9	24922.93
<i>Residential Buildings</i>	5009	11828.59	14730.49	17282.39	17541.1	20751.73

Source: Xi'an Calculation Yearbook 2018

Table 1 shows that in 2018, the total area of heat coverage provided by X City Thermal-Power Company is 24,922.93 square meters among which the residential area occupies 20,751.73 square meters, constituting 83.26% of the total. This shows that the main business of the company is residential heat provision. In X city, there are 22 thermal-power-providing enterprises, nine out of which are deficit-ridden enterprises whose total deficit amounts to 387,69 million RMB yuan.

**Table 2 Major Economic Indicators of Industrial Enterprises above Designated Size (2018)**

Unit: ten thousand RMB yuan

<i>Industries</i>	<i>Production and Supply of Electric Power and Thermal Power</i>	<i>Ratio(%)</i>
<i>Number of Enterprise</i>	22	
<i>Deficit-ridden Enterprise</i>	9	40.91
<i>Total Asset</i>	2,991,254	
<i>Total Current Asset</i>	1,167,446	39.03
<i>Original Price of Fixed Asset</i>	3,050,382	
<i>Net Value of Fixed Asset</i>	1,518,229	49.77
<i>Total Debt</i>	2,473,811	82.70
<i>Total Current Asset</i>	1,658,737	67.05
<i>Operating Revenue</i>	1,043,846	
<i>Revenue of Main Business</i>	1,019,625	
<i>Operating Cost</i>	905,419	
<i>Cost of Main Business</i>	893,920	87.67
<i>Sales Expenditure</i>	9,438	0.93
<i>Management Expenditure</i>	43,527	4.27
<i>Financial Expenditure</i>	39,331	3.86
<i>Total Profit</i>	80,871	
<i>Total Loss of Deficit-ridden Enterprise</i>	38,769	47.94

Source: Xi'an Calculation Yearbook 2019

Table 2 also shows that all the 22 enterprises are large-scale companies, boasting a total asset of 29.913 billion RMB yuan and averaging 136 million RMB yuan respectively. 2. Non-current asset occupies 60.97% of the total asset, and the fixed asset takes up 49.77% of the total asset. These companies are characterized by poor mobility and high risks, so it is of first and foremost importance for each and every one of them to increase their own profit-making capacities. 3. The debt ratio of thermal-power enterprises averages 82.7% with a current debt occupying 67.05% of the total, thus they are often confronted with high risks and high demand in the long-term and short-term cash flows. 4. The business cost of the thermal enterprises occupies about 87.67% of the total revenue, harvesting very limited profit. 5. The total loss of the deficit-ridden enterprise takes up about 47.94% of the total profit of all the thermal enterprises in X city, which shows that the thermal enterprises are socially-desired industry targeting the benefit the people, therefore, their business principle includes thin profit and the prices are under government and department supervision and regulation.

To sum up, when the pillar profit-making business has been decided, the thermal-power enterprises should set up the goal of making profit and maintaining stable and sustainable development. Starting from the cost program, ABC method should be effectively and extensively employed to make precise calculation and reduce waste and highlight the

value-added part to provide help to the enterprise in their effort to preserve the product cost under control.

X City Thermal-power Company is the largest enterprise in its industry in the city, and its cost structure is typical of the majority of the thermal enterprises in X city.

#### **4. An analysis of the cost of activities of X City Thermal-Power Company**

##### **4.1 The main items of cost of activities**

Traditional cost: The direct material vapor is water. Fuel power includes natural gas, crude coal and electric power. Direct labor cost includes the salaries, bonuses and other benefits of the employees.

Equipment depreciation: Up till November 2019, X City Thermal-Power Company possesses 23 stoves and the depreciation of stoves is the important component of cost items. In the meanwhile, the above-quoted figures have already revealed that while the upgrading of the fixed asset of the thermal enterprises is under way, it is also necessary to take into consideration the depreciation of the cost items.

Programs with development potentials include expenditures on research and development, increasing investment on technological development, and setting up regional thermal-provision development center. The centralized thermal-provision is dependent on the technological innovation and promotion. The operation of multi-thermal resources in the network can optimize production and operation mode, which proves to be an efficient and effective means to reduce the cost of thermal provision.

##### **4.2 An analysis of the production process**

###### *4.2.1 Traditional production process*

According to the calculation of the manufacture cost method of the financial accounting, the cost items of the thermal-power enterprises include direct material, direct man labor, fuel power, manufacture expenditure, corresponding production flow of softened water-water recycle-into the stove-providing fuel and power-producing vapor.

###### *4.2.2 The production process under the ABC method*

ABC method extends the management of the cost of the enterprise from the conception of a product to its final sale [2]. From the above, an effective means to increase the efficiency of an enterprise is to invest heavily in research and development. The process of the production of the thermal-power enterprise starts with the research and development activities, which means from thermal provision development center to multi-thermal resource and cold co-production enterprises to multi-thermal network operation center. If the process of cost calculation is in accordance with the actual consumption process, the accuracy of the cost of the enterprise can be ensured and increased. In the meanwhile, the value-added parts of the production process can be highlighted, as a result, the waste is appropriately reduced and the cost is effectively controlled [7].

## **5.The designing plan of the application of ABC method in thermal-power enterprises**

The importance of thermal-power enterprise to the welfare of the people and the pressure of its production and operation will make the execution of ABC method possible. ABC method involves resources, activities, activity center and cost activity, activity cost pools and cost drivers. Its working principle lies in that the product consumes the resources, production makes the activity possible and activity leads to cost.

### **5.1 Dividing activities, setting up activity centers and deciding cost drivers**

#### *5.1.1 Dividing activities*

The first and foremost task of the thermal-power enterprise is to provide warmth to the urban people, and it is also its main industry. Therefore, in accordance with this, the calculation of the thermal cost can be divided into the first-line activity and the second-line activity, the former including the direct activities concerning the production of vapor and the latter containing the indirect activities of the production of vapor.

#### *5.1.2 Setting up activity centers*

The rational setting up of the activity center is very important for the application of ABC method. The first-line activities concerning the thermal enterprises should be taken as a group to form an activity center of the thermal-power and cold co-production enterprises and be included in the resource consumption relating to the activities. The above-mentioned corresponding production activities will include water softening, softened water recycling, fuel-energy provision and vapor production.

The second-line activities can include the expenditures on technology introduction and technology research of the power provision technology development center, multi-resource network operation center and thermal provision technology center, expenditure on the exchange programs concerning production, learning and research, the expenditures on the transfer of technological result of the thermal provision development and the expenditure on attracting best technological personnel. The multi-thermal resource operation center can put together the expenditures concerning the whole production of vapor.

#### *5.1.3 Deciding activity drivers*

After setting up the first-line activity center, the activity driver will be decided according to the consumption mode of the different activity resources combining with practical methods.

First-line activity center: The thermal-power and cold co-production enterprises mainly include the purchase of source materials such as energy, water and power, therefore, the money spent on for these purchases can be taken as cost drivers. The process of vapor production can also be taken as cost drivers according to the number of activities. Processing can be calculated according to machine hour and salaries can be decided according to labor hour.

Second-line activity center: Thermal provision technology development center mainly include the expenditures on paper publication, program application and data-base establishment, which can be taken as cost drivers according to the size of heat-provision area.

The multi-thermal resource operation center aims to provide operation tubes for the heat-provision construction and it can be included in the cost drivers according to the length of the tubes[8].

## 5.2 Collecting activity cost and allocating it to cost objects

First of all, allocate direct cost to cost objects. As previously mentioned, the authorized resources of the cost objects of the thermal-power enterprises do not need to be divided by the activity center, but they should be directly calculated into corresponding cost objects.

Secondly, divide indirect cost to different activity centers, which can allocate indirect cost to different activity centers. In dividing the indirect cost, the consumption of the resources can be allocated to different activity centers according to the cost drivers. Finally, as resources, the indirect cost can be allocated to cost objects at different activity centers.

## 6. Conclusion

The application of ABC method can help eliminate useless activities, improve the entire value chain and objectively reflect the investment-output ratio, which is conducive to the decision-making on the part of the enterprise management and the re-allocation of the resources in the enterprises[9]. In the future, people's desire for a better life is the driver and precondition of the sustainable development of the enterprises. X city, as a metropolis with an international view in the western region of China, takes the living standard of its people as an important indicator, and the thermal-power enterprise is an important embodiment of it because it is committed to providing heat and bringing warmth to people. ABC method proves to be an effective solution to relieving the operating pressure and maintaining a sustainable development, thus it possesses a high practical value in the better management and operation of an enterprise.

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