

Prediction Study on Cost Management of High-Density Polyethylene Project

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One of the most important means to improve the competitive capacity and economic benefits of enterprises is to improve the cost management system and control the project cost rationally. This paper analyzes the current situation of cost management of the high-density polyethylene project in a chemical enterprise, analyzes the main influencing factors of the cost management of projects in the enterprise and proposes related measures to improve the cost management system and optimize the management structure based on project cost management theory. The research shows that there are some problems in the cost management of high-density polyethylene construction project, such as imperfect management system such as unsound management system, weak cost management awareness of employees and insufficient project cost management; the improvement of the cost management awareness of grassroots employees and managers, the introduction of professional management talents, the optimization of the cost management method and the implementation of project manager system with unified responsibility and rights and the project risk mortgage system are beneficial to the implementation of the cost management optimized decision-making of enterprises and can promote chemical enterprises to achieve maximum benefits by using reasonable cost. This study provides a theoretical basis for the optimization and improvement of enterprise cost management system.

1. Introduction

In recent years, the chemical industry has developed rapidly, and the scale, production capacity, and enterprise management of enterprises in chemical industry have made great progress (Zhang, 2006; Matipa et al., 2008). At present, the production capacity of enterprises has basically been able to meet the needs of national production and consumption. The accumulation in the large-scale construction during the peak period leads to overcapacity and investment shrinkage. Therefore, there is increasingly intense homogeneous competition among enterprises that have not been able to achieve active transformation in the oversupply market (McKetta et al., 1993; Denmead, 1980; Gu et al., 2011). Therefore, it is an inevitable trend in the market environment for chemical enterprises to pay attention to the cost management of project construction so that they can have core competitiveness in the homogenized market competition (Jin and Lin, 2010; Hynes, 2009). For construction enterprises, an effective method to achieve the profit maximization of projects is to conduct project cost management and control project construction cost rationally (Asgar et al., 2010; Laurentis et al., 2010). The level of project cost management and the integrity of the management system directly determine the market competitiveness of enterprises. Therefore, strengthening project cost management and optimizing management methods will be necessary conditions for the survival and development of enterprises (Wei and Liu, 2013).

It has become problems urgently need to be solved for chemical and construction enterprises in the cost management process to adopt reasonable technical means and management methods and implement dynamic management of project costs so as to achieve the project cost objective as planned and to reduce ineffective or inefficient costs. The project management of some enterprises or units still stays in the management stage of personnel, materials and machinery consumption management and the management personnel have a limited view that the engineering cost is the value of resource investment in the project construction process (Monaghan et al., 2007). However, this management method does not consider the critical issues in project cost management from a systematic and dynamic view (Smith and Peter, 2014;

Benigni et al., 2013). To this end, domestic and foreign experts and scholars have proposed the whole-process cost management method to manage the project construction costs and to perform the whole-process management of the construction project from various aspects such as organizational form and management method. However, this method has low applicability and still cannot satisfy the comprehensive cost management needs of existing enterprises (Galloway et al., 2004; Garel and Gilles, 2013).

Based on this, this paper takes the construction of a high-density polyethylene project in a chemical enterprise as an example, analyzes the problems in the cost management of the construction project of the chemical enterprise and points out the shortcomings in the current project cost management. This paper also analyzes the cause for the cost management problem in chemical construction projects with advanced cost management theory and puts forward practical suggestions. This research is conducive to improving the competitiveness of chemical enterprises, help enterprises complete project construction with high quality and realize the maximization of profits and social benefits.

2. Project Overview and Deficiencies in Cost Management

2.1 Overview of Chemical Projects

The paper studies the construction and project management of the high-density polyethylene project in a city. The project is designed to produce 800,000 tons of ethylene and 10 million tons of oil per year. After construction and production, it will form a production pattern of large-scale ethylene and refinery in the region and will become one of the important petrochemical raw material bases in the country. After the completion of the chemical project, it can produce double-peak and single-peak high-density polyethylene products and reach the national level. The budget of this construction project is US\$230 million. There is less than month from the bidding of the construction organization (A chemical construction enterprise) to the starting, which has a tight implementation time. As a result, there are many deficiencies in the pre-cost management of the chemical project, such as missing of minor items in the cost budgeting process, unscientific project cost planning indicators, inefficient implementation of project management cost decomposition and unclear management scope. Therefore, it is necessary to conduct in-depth cost management optimization in the construction of chemical projects to avoid cost waste and economic loss.

The cost budgeting and internal control indicators of cost management for the high-density polyethylene project are shown in Table 1. In the table, A is civil engineering; B is ground pipe; C is steel structure; D is equipment; E is process; F is electrical engineering; G is instrument; H is fire control; I is ventilation; and J is insulation. The implementation of the cost indicators for this project is shown in the table below. It can be seen that the actual cost of the project is US\$29.568 million while the bid price is US\$5,425,700, which means that this enterprise makes a profit of US\$349.41 million.

Table 1: Completion of high density polyethylene project cost

Major	Bid amount ($\times 10^4$ \$)	Executory costs ($\times 10^4$ \$)	Post budgetary cost ($\times 10^4$ \$)	Actual cost ($\times 10^4$ \$)	Cost index - actual cost ($\times 10^4$ \$)	Post budgetary cost - Actual cost ($\times 10^4$ \$)
A	1275.18	1214.56	1259.26	1325.00	-110.29	-65.59
B	121.50	115.59	115.44	116.03	-0.37	-0.47
C	727.50	692.79	607.65	586.62	106.32	21.18
D	106.32	101.32	95.59	85.29	16.03	10.29
E	747.94	712.21	755.15	780.59	-68.38	-25.44
F	253.82	241.76	203.68	-110.29	40.59	2.50
G	179.56	171.03	161.18	-0.37	22.79	12.94
H	76.62	73.09	71.32	1.03	2.94	1.18
I	25.59	24.26	22.94	24.12	0.21	-1.18
J	95.59	90.88	88.97	95.15	-4.15	-6.18
K	65.15	61.91	58.82	53.68	8.24	5.09
Total	3674.7	3499.41	3440.01	2956.84	13.93	-45.68

The project cost management organizational structure of A chemical construction enterprise is shown in Figure 1. The cost management process of this chemical construction enterprise is shown in Figure 2. As can be seen from the following figure, there are many problems in the project cost management of this chemical construction enterprise such as imperfect management mechanism and unscientific multi-sector parallelism in

the organizational structure. Specific problems in the project cost management are detailed in the next chapter.

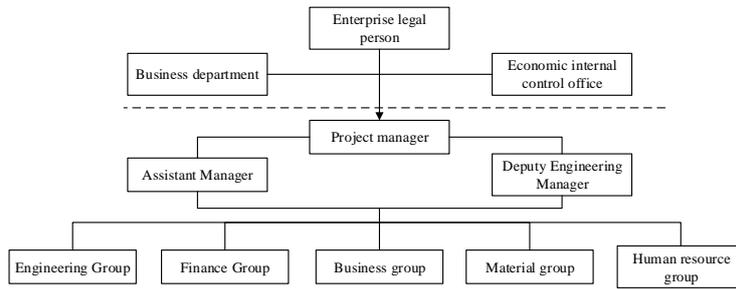


Figure 1: Project cost management organization of chemical construction enterprise

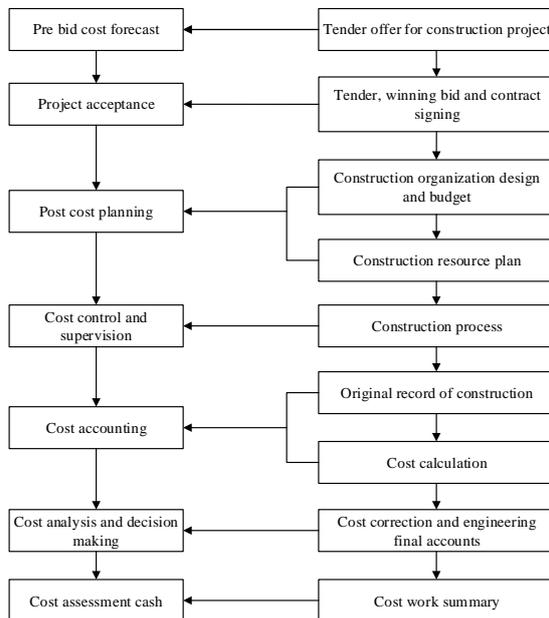


Figure 2: Project cost management process of chemical construction enterprise

2.2 Problems in Project Cost Management

Most employees of A chemical construction enterprise have weak cost management awareness and lack the motivation for cost control in the construction of the high-density polyethylene project. The finance department and the operator are responsible for the project cost control and the situation caused by this management mode is that the technicians are only responsible for the technology; the engineering group is only responsible for the construction production and schedule; and the quality team is only responsible for the quality. Superficially, everyone has a clear responsibility and it is a definite division of labor, but this ignores the cost awareness which should be valued by every employees. Therefore, it is an irresistible trend in the cost management of chemical enterprises to establish the cost awareness of every and enable every participant in the chemical project construction process to be the influencer of project cost and the implementer of cost management control. In addition, the quality of cost management personnel will also directly affect the management level of the project. Therefore, improving the professional quality and cost management expertise of employees and managers is also an important measure in project cost management.

3. Cost Control Measures

3.1 Strengthening Cost Management Awareness

Facing the new market economic environment, A chemical construction enterprise need to reduce project costs through organizational, technical and economic measures in the cost management process of high-

density polyethylene chemical construction projects. Also, it is necessary to pay enough attention to the whole process of bidding and quotation and to implement effective management of construction cost in the whole process from starting to completion, thereby improving the whole-process, all-factor, total-risk and all-round project cost management philosophy. Operator in A chemical construction enterprise need to develop a sound and effective cost management process, cost control system and reward and punishment measures in the construction of high-density polyethylene project; the project manager should lead the technicians to learn advanced cost management methods and continuously apply and improve these methods in practice. Also, the awareness of cost management and control of front-line employees should be cultivated. We should make joint efforts to save the cost and improve the enterprise revenue in the high-density polyethylene chemical construction project, guarantee the long-term survival and development of enterprises and provide reference for the cost control of related construction projects.

The cost management effectiveness is affected by the level of cost management. Enterprises can introduce professional talents related to project cost management and construction projects and introduce advanced cost management theory and practical management experience into the project management practice of enterprises so as to quickly and effectively improve the management level of project costs. Professional technical and management talents can also generalize the advanced theory to employees at other levels of the project, so that grassroots employees can understand and grasp the importance and methods of cost management.

3.2 Improving Enterprise Cost Management System

As the key to realizing the project cost control objective, cost data statistics should run through the whole process of project construction. For the research case of this paper, the project department in A chemical construction enterprise responsible for the high-density polyethylene project can send a specially-assigned person to be responsible for the statistical analysis of the cost data of the construction project. Through the statistics on the daily use of personnel, materials and machines, the daily work report can be formed in the system. Based on the analysis and comparison of the daily report, the reasons that lead to the fluctuation in the project management cost can be summarized in a timely manner and the man-made factors that lead to cost increase can be corrected.

According to the schedule of the project, the quality and progress of the project can be assessed periodically to timely discover all aspects of problems in the project cost management, timely reward the work with good budget completion, analyze excessive budget work and eliminate uncontrollable factors, implement additional responsibility for responsible persons, combine assessment system and reward and punishment system, thus achieving cost controllable. In addition, A chemical construction enterprise responsible for the construction of high-density polyethylene project should strengthen the timely auditing of the project cost management work, which is conducive to strengthening the project management and improving the project profitability. In order to ensure the completion of the operation indicators of the project execution cost control rate, the chemical construction enterprise should have a planned auditing of the economic internal control of the project. For projects within the cost plan, according to the actual cost expenditure, the amount of cost savings can be counted and part of the funds saved from the cost savings can be rewarded to employees to mobilize their working enthusiasm; the over-expenditure in the project should be analyzed. Also, the relevant responsible persons should be educated and economic penalties can be imposed.

3.3 Improving Project Cost Management Mode

The project cost management covers the whole process from the bidding quotation, project cost calculation, construction arrangement design of project, project construction to the completion acceptance of the chemical construction project. The project cost management mode of A chemical construction enterprise in the high-density polyethylene project ignores the whole-personnel and total-factor characteristics, which greatly reduces the cost awareness of full participation and ignores the influence of the front-line work team on the cost. A chemical construction enterprise should join the front-line construction personnel into the organizational structure of cost management so that everyone should be responsible for cost management; this chemical construction enterprise should also take appropriate measures to improve the organization mode between the functional management department and the project department and that between the subsidiary and the project department. Also, the labor subcontract management form should be implemented to change the current labor employment management mode of the enterprise; in addition, this enterprise needs to conduct the rotation training of the management personnel and increase the construction experience of the construction personnel so that they can play their role in future cost management work. In addition, the enterprise also needs to regularly recruit technical management personnel, cultivate the professional skills of employees and timely replenish them into project management.

4. Safeguards Measures for Project Cost Management

4.1 Establishing a Staff Training System

In order to enable the employees' professional proficiency and professional quality to meet the strategic development and human resource management requirements of enterprises, A chemical construction enterprise should systematically train grassroots employees and management personnel to achieve the strategic goal of common development and progress of enterprises and employees. The training content should not be limited to job training, technical training and simple safety education, but the project cost management and improvement of management concept for all staff, so that grassroots employees can truly participate in the cost management. The professional cost training of the employee system can provide compound talents for enterprises to improve the work efficiency and per capita efficiency.

4.2 Establishing a New Project Manager Responsibility System

Based on the problems analyzed above, in order to improve the comprehensive benefits and optimize the cost management system of the enterprise, this paper optimizes the organizational structure of the high-density polyethylene chemical construction project and the improved project cost organizational management structure is shown in Figure 3. In the project cost management system, in addition to exercising administrative authority, the project manager should be given enough power in resource allocation, task division and fund management and be responsible for the revenue and expenditure and profit and loss of the entire project. The new project manager responsibility system should enhance the resource option, fund management right during the project construction process and the cash flow distribution right of the project manager; in addition, the project manager should have to right to give reward and punishment for some situations in the project so that they can take corresponding reward and punishment measures based on personnel performance to mobilize the enthusiasm of personnel.

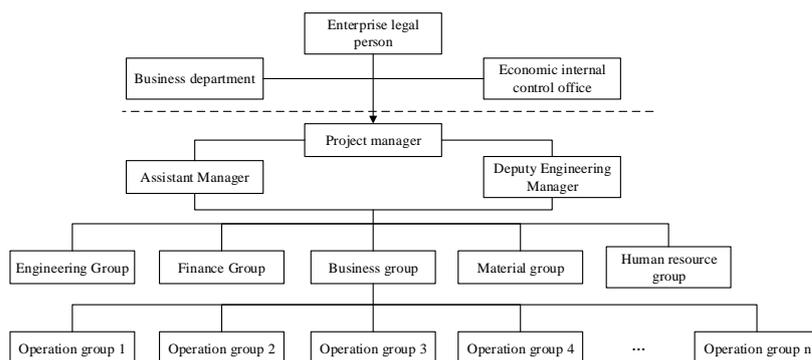


Figure 3: Improved cost management organization

4.3 Implementing the Project Management Risk Mortgage System

In order to improve the project cost management system and reasonably predict the project construction cost, various systems corresponding to the project manager responsibility system should be established when improving the cost management system. In order to effectively ensure the implementation effect of the project cost management system, the enterprise responsible for the high-density polyethylene chemical construction project can implement the project risk mortgage system. The benefit whole of this system is the project department of the construction enterprise and the project manager signs the operation responsibility contract with the enterprise on behalf of the project department to determine the annual project output value, target, cost, profit target and reward and punishment measures of overfulfilment.

Taking the construction of the high-density polyethylene project in this paper as an example, A chemical construction enterprise should ask all project managers participating in the project to pay a certain risk mortgage according to the output value of the chemical project. After the completion of the chemical construction project, the enterprise should give reward or punishment to relevant personnel according to the proportion of the risk mortgage deposit based on the profit and loss of the project. For employees or managers who have outperformed the profit indicator, the mortgage deposit will be returned and the reward of the agreed ratio will be distributed to the project department. Then, after the recording and reviewing, the project manager will make secondary allocation in the project department; for the management personnel or department that do not achieve the profit indicator, the corresponding amount of the mortgage deposit should

be deducted according to the unfinished degree and a fine should be imposed on the project department according to the loss ratio. Finally, after the recording and reviewing, the project manager will make secondary allocation of the fine in the project department; this new system can stimulate the enthusiasm of employees at all levels to participate in cost management, giving project managers more initiative.

5. Conclusion

This paper uses the project cost management theory to analyze the main influencing factors of the project cost management of chemical construction enterprises and proposes corresponding improvement measures. Enterprises can guarantee their cost control and realize the goal of maximizing benefits through the optimization of the project cost management method. The main conclusions are as follows:

(1) A series of problems such as unsound management system, weak awareness of cost management of employees and insufficient project cost management in the cost management of high-density polyethylene project lead to the decline of economic benefits and limit the long-term development of this enterprise.

(2) Enterprises should strengthen the cost management awareness of employees, introduce professional management talents, optimize cost management method and cost management system, improve and coordinate the organizational structure of the enterprise to maximize benefits through project cost management.

(3) Enterprises should carry out the cost management training for employees, implement project manager responsibility system with unified responsibility and rights and the project risk mortgage system, which is beneficial to ensure the implementation of cost management optimization decision-making of the enterprise. This can improve the enthusiasm of employees and managers to implement the project cost management system and promote chemical enterprises to achieve the goal of maximum benefits through reasonable costs.

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