

## **Evaluation of the Current Maintenance System and Maintenance Management System in KIMIA Co**

**Ghasem Ebadi**  
**Chlor - Alkali Process Department**  
**BIPC, Mahshahr, Iran**

### **Abstract**

This paper describes the current condition of the maintenance system and maintenance management system in one of the petrochemical subsidiaries in Iran. It also assess approaches in both side of maintenance aspects such as the human resources and the technical issues in KIMIA Co by means of a questionnaire and concludes practical recommendations to help the company to reach to the reasonable performance for the future excellence in the maintenance organization. Such as:

- Development of training in the organization of the maintenance contractors
- Improve the work order system
- Improve the spare parts supply chain management system
- Development of the knowledge management culture in the maintenance organization

### **Keywords**

Preventive maintenance, corrective maintenance, Questionnaire, Bandar Imam Petrochemical Company (BIPC)

### **Introduction**

This paper is about the evaluation of the maintenance system in KIMIA Co. KIMIA Co is one of the NPC's subsidiaries that located in the south of IRAN. Due to the working condition and nature of the chemical companies that comprise corrosion, weather conditions (dust, moisture, hot and so on). Regarding to these parameters which have great impact on the health and working of these devices (rotary and fix devices) it is crucial to pay attention to both side of maintenance: managerial and technical aspects. On the other word, I try to find reasonable and proper answer to these questions:

- Does the maintenance management system in KIMIA Co have a proper performance?
- Which of the maintenance managerial aspects (Human Resource or Technical) have greater impact on performance of maintenance in KIMIA Co?
- Does the current maintenance organization in KIMIA Co work?

As it mentioned before, due to the nature of the petrochemical industries that has big challenge with corrosion and erosion and meanwhile, according to the weather condition in the south of IRAN which has high humidity and dusty condition. It needs special consideration to the maintenance aspects such as preventive action to protect plant from unexpected shut down and increasing in plant cost as well. Achieving these tow goals, need strategic planning and creative management in the maintenance. For managing the maintenance, the manager needs to pay special attention to the both side of maintenance organization (Human resource and technical aspects such as role of IT in the maintenance and managerial maintenance method as well).

KIMIA Co is one of the BIPC's (Bandar Imam Petrochemical Company) subsidiaries. BIPC itself is one of the NPC (national petrochemical company) subsidiaries as well that has been located in the south of IRAN in MAHSHAHR city.

The BIPC's subsidiaries that consist of five petrochemical and non petrochemical companies such as KIMIA, BASPARAN, ABNIROO, FARAVARESH and KHARAZMI that the last cited company works as a facilitator for the other fourth companies. BIPC founded in 1973 under the name of IJPC (Iran Japan Petrochemical Company) and in 1990 renamed to BIPC (Bandar Imam Petrochemical Company).

From the organizational point of view, KIMIA co totally has about 400 staff in all departments. The organizational chart of KIMIA Co has been illustrated in figure 1 in this figure we can see the organizational hierarchy of KIMIA Co.

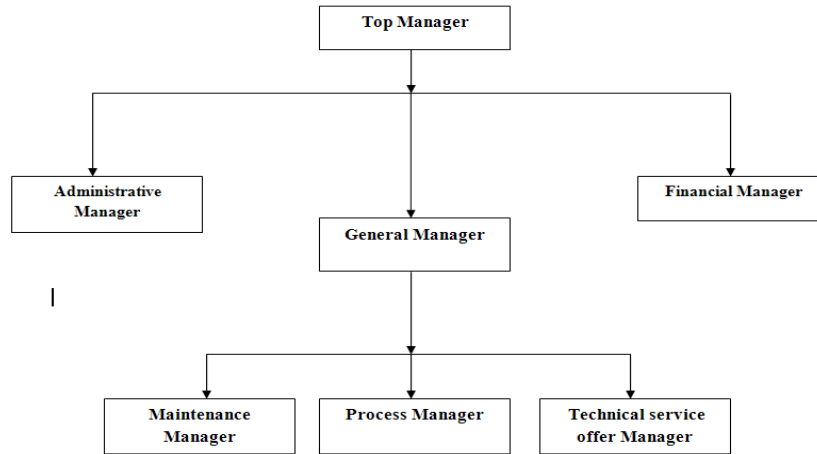


Figure 1: The KIMIA Co organizational chart

### The maintenance in KIMIA Co

For evaluation the maintenance system in KIMIA Co three important aspects as overall topics in this regards has been considered. The Managerial, technical and human resources are assessment point in this section. The maintenance in KIMIA Co from organizational point of view is mixing of centralize and decentralized organization depends on the working condition of that plant and even that section. The strategy of maintenance in KIMIA Co has targeted the proactive maintenance. Third party in KIMIA Co works as a supply chain management for providing the spare parts. They have PM, CM system and CMMS as well; the IT in the maintenance system of KIMIA Co has significant position. From the execution point of view in the KIMIA Co’s maintenance it has done by third party as the “maintenance contractor”

### The KIMIA Co maintenance organization

The maintenance organization in KIMIA Co as figure 2 shows consist of the supervision and the execution sections which together confirm the maintenance activities. The supervision section manages by the KIMIA Co owners and the execution section manages by contractor. The maintenance supervision in KIMIA Co has the centralized structure and directly manages by the KIMIA Co maintenance manager (see Figure 3). The execution section of the maintenance in KIMIA Co confirms its activities in the centralized and decentralize manner. In the execution section there are three different contractors that all of these three contractors directly work under supervision of the KIMIA Co’s owners.

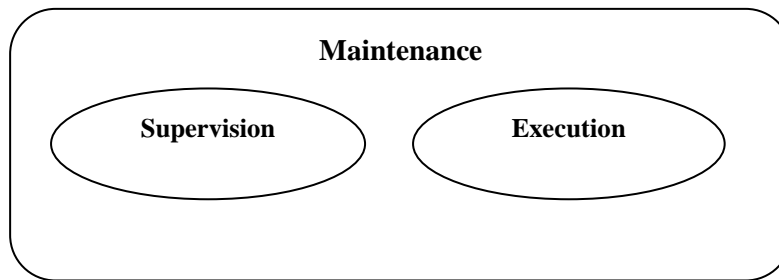


Figure 2: Maintenance in KIMIA Co

The KIMIA Co maintenance system has PM, CMMS and other new maintenance approaches but In this regard as figure 3 illustrate there is no defined chart for this purpose in KIMIA Co’s maintenance supervision department. The numbers of staff in the KIMIA Co’s maintenance supervision department is about 40 staff.

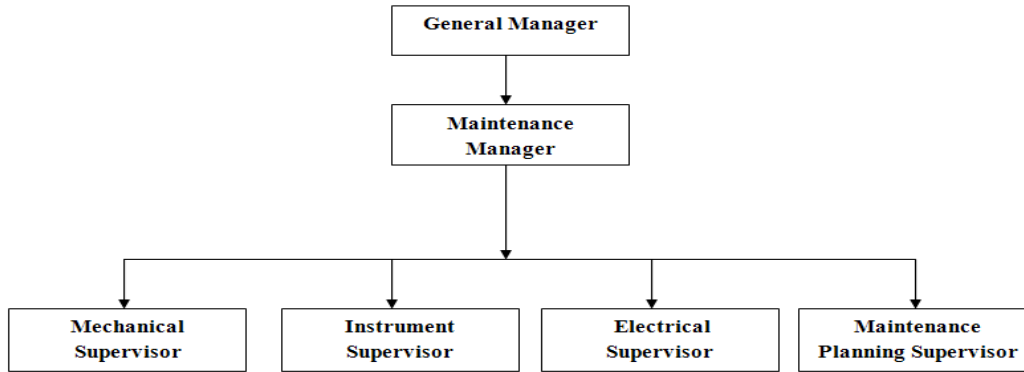


Figure 3: The KIMIA Co maintenance supervision organizational chart

The organizational chart of the maintenance contractor in KIMIA Co is same as the maintenance supervision department. All activities related to the PM, CMMS and so on are executed by contractor’s staff. The total numbers of the contractor staff is about 500 persons that serve in the different maintenance department such as mechanical department, machinery department and so on. (see Figure 4)

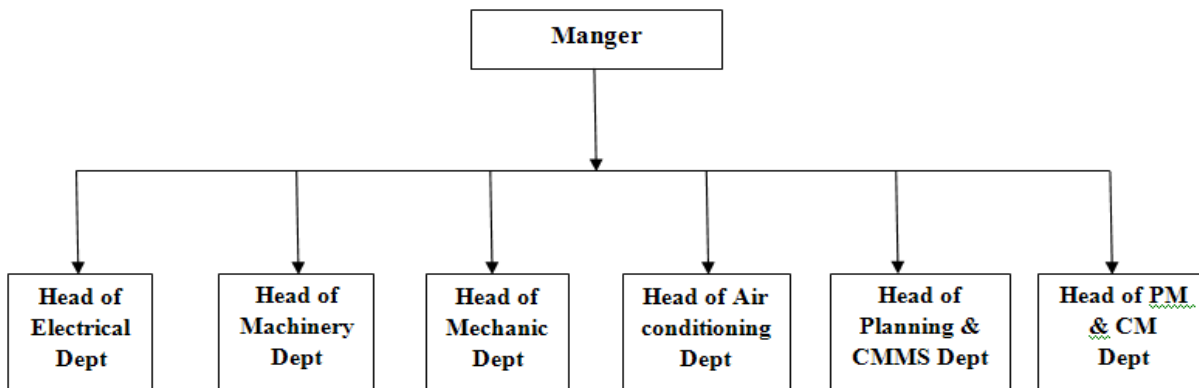


Figure 4: The contractor’s organizational chart

### The Maintenance execution procedure in KIMIA Co

Due to the type of work, the process department or planning department of KIMIA Co issue a work order. This work order in second step assess by the KIMIA Co planning department in order to allocate the required man hour to that work. Another duty of planning department before to send the work order to the execution group is to consult another involved group such as inspection about that work. After these the work orders is ready to send to the execution groups (the maintenance contractor) this process that is confirmed by the planning department called the “authorization” of work orders. After the work order authorization, the work orders are sent to the contractor for execution. After execution work done must be approved by the issuer of the work order. At the end, the work order must be returned to the planning department (feed back).

### The PM work orders in KIMIA Co

One of the routine and important work orders that issue in KIMIA Co is the PM (Preventive Maintenance) work orders. This type of work orders are scheduled and issued according to the equipment designer’s recommendation to keep that equipment in good condition and prevent it from unexpected shut down. In some other equipment like fix equipments (Tank, Pipe line and so on) the condition of the work and the environment determine duration and quality of the PM work orders. The maintenance planning department in KIMIA Co annually reports the statues of the issued PM work orders in KIMIA Co at the end of each year beside weekly and monthly reports as well. (see Figure 5)

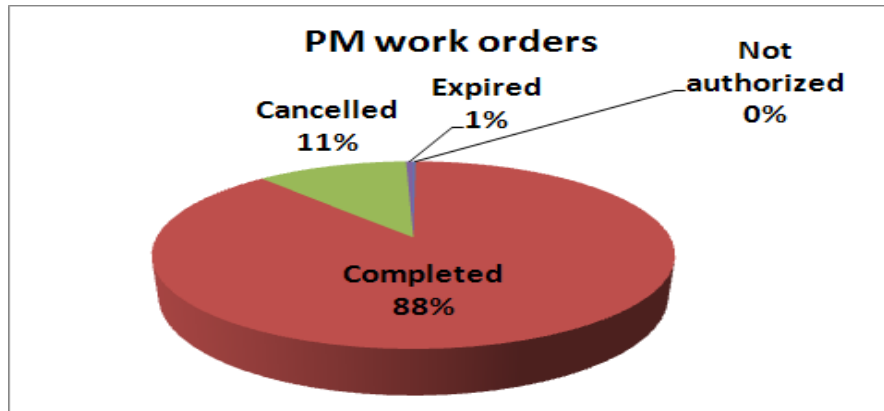


Figure 5: The status of KIMIA Co's PM work orders in 2008

### The CM work orders in KIMIA Co

The CM (Condition Monitoring) work orders in KIMIA Co are issued according to the recommendation of the equipment and spare part designer and also the working condition of that equipment. For preventing and predicting bad event for rotary equipments KIMIA Co needs this sort of work orders. One of the CM work orders controlling and evaluating methods in KIMIA Co is annually report of the status of the issued CM work orders in KIMIA Co per plant. (see Figure 6)

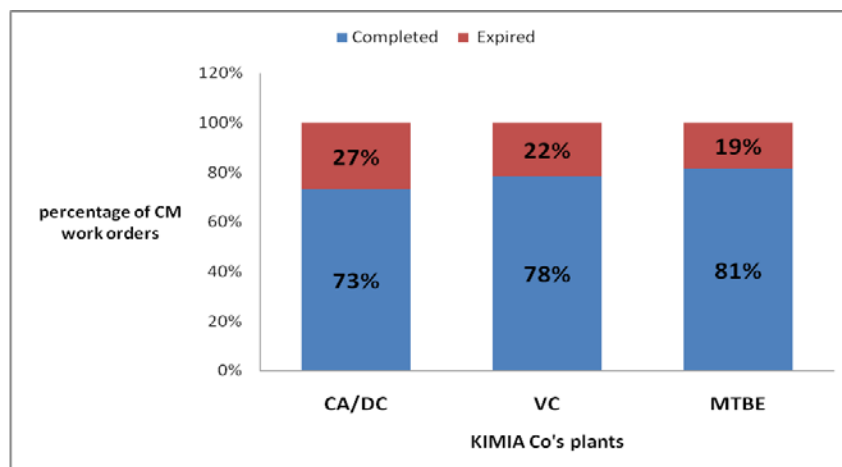


Figure 6: The status of CM work orders in KIMIA Co per plant in 2008

### The Result and Assessment

In this regard we conduct a survey in the maintenance management system field by means of a questionnaire that was prepared for this purpose (see Table 1). This questionnaire consist of 20 questions in three different categories (managerial, technical, human resources) based on standards, literature review, expert's opinion and KIMIA Co methods in the maintenance performance evaluation. Each question is scored from digit 1 to digit 5 which digit one is the lowest score and digit 5 is the highest score for each question.

Table 1: Questionnaire form

Field	Question		Score				
			1	2	3	4	5
Managerial	1	How do you evaluate the quality and the quantity of the KIMIA Co's maintenance objectives from the "to be well defined, to be realistic and to be reachable" point of view?					
	2	How do you evaluate the proportion of the maintenance strategy in order to meet the KIMIA Co's maintenance objectives?					
	3	How do you evaluate the accordance of the maintenance strategy with the strategy of KIMIA Co?					
	4	How do you evaluate the using quality of the maintenance ratio in order to assess the maintenance performance?					
	5	How do you evaluate the out sourcing for maintenance in KIMIA Co?					
	6	How do you evaluate the performance of spare part supply chain system?					
	7	How do you evaluate the strategic management for spare part?					
	8	How do you evaluate the performance of maintenance contractor?					
	9	How do you evaluate the performance of the spare parts supply chain contractor?					
	10	How do you evaluate the idea of choosing the MC (main contractor) as spare part supply chain contractor and maintenance contractor?					
	11	How do you evaluate the performance of maintenance organizational structure?					
Technical	12	How do you evaluate the quality and the quantity of the ratio and index in the KIMIA Co's maintenance?					
	13	How do you evaluate using of the failure analyses methods in the KIMIA Co?					
	14	How do you evaluate the performance of PM in KIMIA Co?					
	15	How do you evaluate the performance of CM in KIMIA Co?					
	16	How do you evaluate the performance CMMS in KIMIA Co?					
Human Resource(HR)	17	How do you evaluate the performance of the training in the KIMIA Co's maintenance organization?					
	18	How do you evaluate the using of tools & document by means of maintenance staff?					
	19	How do you evaluate the time and work condition for maintenance staff?					
	20	How do you evaluate the role of appraisal form for the staff of maintenance contractor?					

These questionnaires were distributed between 50 persons who involved in the KIMIA Co maintenance system with different organizational hierarchy. These persons were chosen from the maintenance supervision department and the contractor's execution head teams and from top managers of KIMIA Co as well. In this survey we tried to select all who involved in the maintenance system and be familiar with maintenance methods and the maintenance approaches from all section of the KIMIA Co's maintenance system. These 50 persons somehow can affect the maintenance strategy, maintenance planning, maintenance execution and the maintenance decision makings. All of these 50 questionnaires was filled and was returned to us by them. The reliability of this questionnaire was measured by means of cronbach's alpha by SPSS software. The reliability that measured in this regard as mentioned later presented by cronbach's alpha that was 0.83. Due to this method reliability of this questionnaire was approved. The objective of this survey is evaluation the KIMIA Co maintenance management system from maintenance staff in different organizational hierarchy point of view. Figure 7 shows the average score for each category in the mentioned questionnaire. As we can see in figure 7 the average score for managerial aspect in KIMIA Co is 2.9 out of 5 and the average score for technical and HR (Human Resources) aspects in KIMIA Co are 2.66 and 2.62 out of

5. This score state, that the status of maintenance management system in KIMIA Co in its entire context (managerial, technical and human resource) is more than 53.2% that seems not to be so bad.

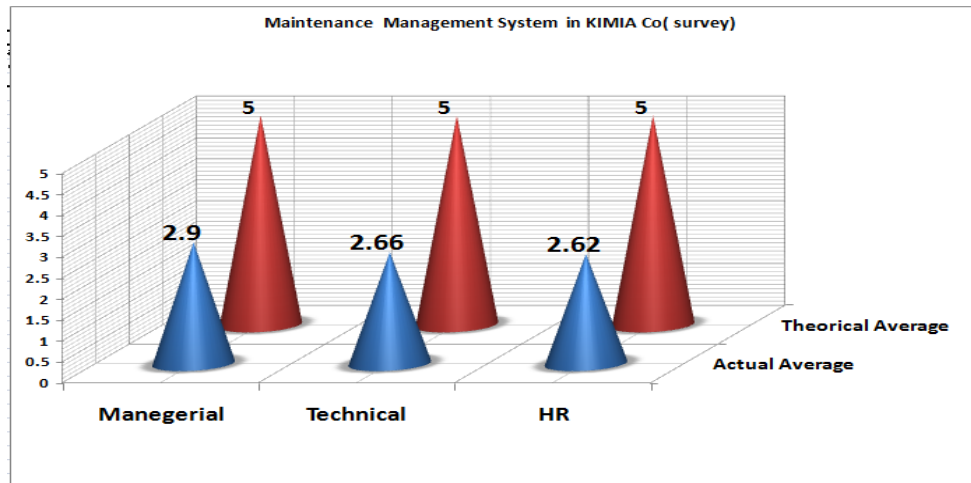


Figure 7: The result of maintenance management system survey in KIMIA Co

## Conclusion and Recommendation

As mentioned before in the maintenance management system evaluation (MMSE) there is several tools and method for this purpose that due to the condition and culture which dominate at that system are used. In this regard and of course in this paper we used questionnaire method. In the conclusion section we will consider three aspects and categories in the maintenance management system of KIMIA Co such as Managerial, Technical and Human resource (HR). According to this questionnaire we found that for improvement of the existing maintenance system KIMIA Co should:

- Concentrating more on the managerial aspects for instant matching strategy of maintenance with objectives of maintenance and so on.
- Development of training in the organization of the maintenance contractors
- Improve the work order system
- Improve the spare parts supply chain management
- Improve the culture of failure analyzing in the maintenance system
- Development the knowledge management culture in the maintenance organization
- Matching the maintenance organizational chart with their real needs

## References

1. Dhillon, B.S, 2002, *Engineering Maintenance: A Modern Approach*. CRC Press
2. Dhillon, B.S, 2006, *Maintainability, Maintenance, and Reliability for Engineers*. CRC Press
3. Ebadi, G., 2009, "Evaluation of the Current Maintenance System and Development of an Improved Maintenance Management System in Kimia Co" Msc Thesis, Npc, Ggsb, Iut
4. Mobley, R.K, 2002, *An Introduction To Predictive Maintenance*. 2nd Ed. Butterworth-Heinemann
5. Sherwin, D, "A Review of Overall Models For Maintenance Management", *Journal Of Quality In Maintenance Engineering*, Vol. 6 No. 3, Pp. 138-164, (2000)
6. Wilson. A., 2002, *Asset Maintenance Management: A Guide to Developing Strategy and Improving Performance*. New York, Industrial Press.
7. Weir, B, (2007, *CMMS: An Impartial View of CMMS Functions, Selection and Implementation*. Available From: [Http://Www.Plant-Maintenance.Com/Articles/Cmms\\_Systems.Shtml](http://www.Plant-Maintenance.Com/Articles/Cmms_Systems.Shtml) [Accessed 28 April 2008]