A Study on the Obsolescence Management Methodology and Its Application

J.S, Kim*, H.W. Kim, J.S. Park, S.G. Jung
KEPCO-E&C, M-TOWER Building, 188, Gumi-dong, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-870, Korea
**Corresponding author: jongshab@kepco-enc.com*

1. Introduction

The importance of life-cycle management in nuclear power plants has been increased in over the past several years. With respect to LCM process, obsolescence management for the components of operating nuclear power plants have been developed for improvement of safety and reliability and to maximize plant's asset value. The obsolescence management makes it possible to maximize the operational capability and minimize the limiting conditions for operation. Obsolete equipment and their issues for all operating nuclear plants have been identified by utilizing the Proactive Obsolescence Management System in U.S nuclear industry. However, systematic obsolescence management has not been performing in domestic nuclear industry. In this study, obsolescence management process focusing on issue prioritization has been described for domestic nuclear fleet and its application has been demonstrated in terms of long term asset management. The ultimate goal of this study is to determine the optimum timing of refurbishment on the basis of obsolescence management and its evaluation results.

2. Obsolescence Management Process

Obsolete equipment is defined as items in plant service that are no longer manufactured or supported by the original manufacturer or that are otherwise difficult to procure and qualify. Figure 1 illustrates the overall obsolescence management process for managing obsolescence. In this study, the above obsolescence management process is described focusing on prioritization of obsolescence issues.

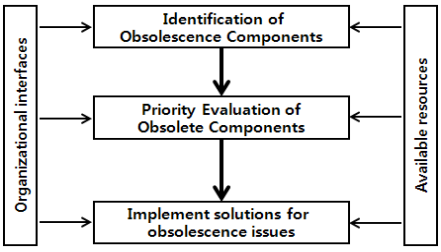

Fig. 1. The basic process for managing obsolescence

2.1. Identification of Obsolete Components

The fires step of obsolescence management process is to identify the population of obsolete items currently required to support their plant. Identification of obsolete components can be often accomplished by the organizations that handle plant equipment data, bill of materials, stock item data or procurement.

2.2. Prioritization of Obsolescence Issues

Prioritization of issues may involve several steps and can be ranked by using a more detailed analysis to determine the obsolescence issues. The prioritization method taking into consideration is shown in Table I.

Table I: Obsolescence Value Ranking(OVR) Calculation Basis

Parameter	Weight	Points Associated with Classification		
		5 Points	3 Points	1 Point
Quality Classification	8%	Safety Related	Augmented	Non Quality
Criticality Classification	7%	Critical	Non-Critical	
Technical Specification	7%		Yes	
Probabilistic Risk Assessment Classification	7%		Yes	
Maintenance Rule	5%	Yes		
Environmental Qualification	5%	EQ		
Seismic Category	5%	Seismic	Two over One	
Manufacturer/ Model Count	4%	>20	6-20	<6
Fire Protection	3%		Yes	Appendix R
Emergency Core Cooling System Division	3%	1 or 2		
In-Service Inspection	3%		Yes	
ASME Section XI Testing	2%			Yes
Design Change	2%		Yes	
Stock Quality Code	8%	Safety-Related	Augmented Quality	
Work Order Priority	7%			
Job Type 1	3%	Corrective		
Job Type 2	2%		Preventive	
Job Type 3	1%			Elective
Historical Usage Over 5 years	5%	>11	6-10	<6
Lead Time(Days)	5%	>151	61-150	<61
Quantity In-Stock	5%	0	1-10	>11
Future Demand	3%	0-6	6.1-11.9	>12

As shown in Table 1, the more detail priority assessment utilizes a total 22 parameters and Obsolescence Value Rating (OVR) is calculated by multiplying the assigned weight and point associated with classification.

3. Pilot Applications

The methodology of obsolescence issue prioritization has been applied to several important components of domestic operating nuclear power plants. As the state-of-the-art technology for managing obsolescence issues will be generated based on subsequent application, this pilot application is significantly valuable for establishing technical basis for practical obsolescence management in site.

3.1 Obsolescence Issues Prioritization for a Specific Component by Units

The example of application results for aux feed water pump is represented in Table 2 and Fig 2. As can be seen form Table 2 and Fig. 2, the average obsolescence value of aux feed water pump is approximately 3. The obsolescence value of each unit does not show large difference. However, as the operating year increase, the values tend to yield higher because the OVR has been calculated a high score from work order priority, job type, historical usage over 5 years.

Table II: Obsolescence value and priority assessment for main feed water pump

Unit	Obsolescence Value	Priority	Unit	Obsolescence Value	Priority
K1	3.24	4	U1	3.1	7
K2	3.52	1	U2	3.1	7
K3	3.33	2	U3	3.03	11
K5	3.33	2	U4	2.89	15
Y1	3.24	4	U5	2.93	14
Y2	3.24	4	U6	2.79	16
Y3	3.1	7	W1	2.19	20
Y4	3.1	7	W2	2.65	17
Y5	3	12	W3	2.56	19
Y6	3	12	W4	2.65	17

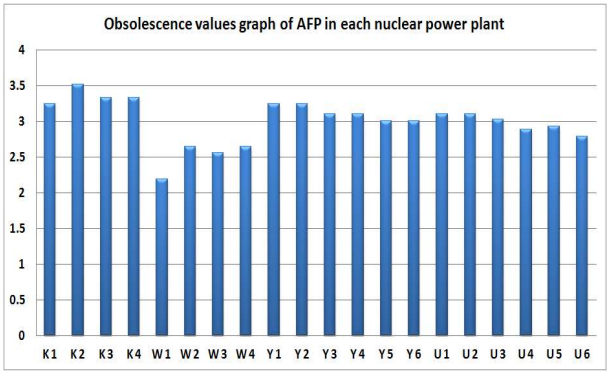

Fig. 2. Obsolescence value graph of aux feed water pump

3.2 Obsolescence Issues Prioritization for fleet by selected components

The OVR assessment has been performed for 21 major component selected with regard to long term asset management. The results are shown in Fig. 3. As shown in Fig. 3, the large motor represents the highest value. Also, circuit breaker and switch gear, component cooling sea water pump, emergency diesel generator generally have high values compared to other components. There components that have a significant impact on the safety yield a high obsolescence value and thus become important components in terms of obsolescence management.

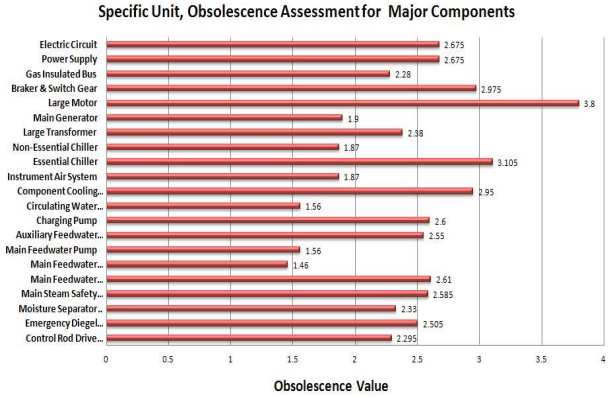

Fig. 3.Obsolescence assessment for major components

4. Conclusion

In this study, the obsolescence management methodology has been reviewed and applied to domestic operating nuclear power components. Specifically, obsolescence issues prioritization method have developed and some parameters have been modified to reflect plant-specific circumstance of domestic nuclear power plants. In order to apply the obsolescence management methodology more effectively and systematically, it is necessary to consider and integrate an accurate feedback from the manufacture, utilities and obsolescence experts.

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