

Development of Maintenance Effectiveness and Target Observation System

Huichang Yang,^a Gi Yong Kim,^a Mi Ro Seo,^b Hyun-Jong Jeong,^b Kwang-Hee Choi,^b Sung-Yull Hong^b
a Atomic Creative Technology, 1688-5 Shinil-dong Daeduk-gu Daejeon, Korea, 306-230, hcyang@actbest.com
b Korea Electric Power Research Institute, 103-16, Munji-dong Yuseong-gu Daejeon, Korea, 305-3801

1. Introduction

Maintenance effectiveness and target observation system(MENTOS) is a maintenance rule implementation software for plant personnel to collect, edit, store, and analyze all information required for maintenance rule implementation. MENTOS is developed as a JAVA[®] and ORACLE[®]-based client-server application. MENTOS has function scoping module, significance determination module, performance criteria determination module, failure analysis module, performance monitoring module and (a)(1)/(a)(2) status tracking module. MENTOS has all features required as a maintenance rule implementation supporting software. Add-on's required for the system engineer workstation are suggested.

2. MENTOS Development

In this section, objectives of MENTOS development, MENTOS software environment, features, and add-on's for MENTOS to be upgraded as a system engineer workstation are discussed.

2.1 Objectives of MENTOS development

Pilot Maintenance rule(MR) implementation project has started and under progress for Ulchin 3&4 and Kori 3&4. During the MR implementation process, the database and analysis tools are required to collect, edit, store, and analyze all information required for MR implementation.

Main MR processes are function scoping, significance determination, performance criteria determination, failure analysis, and performance monitoring. For the success of MR implementation, integrated database and analysis tools based on networking ability are required.

MENTOS is being developed to meet the software requirement as a MR implementation tool and MENTOS has the feature of failure mechanism analysis and performance trending as a MR analysis tool. Objectives of MENTOS development is illustrated in figure 1.

2.2 Software Environment

MENTOS is programmed in JAVA language and uses ORACLE database for the future enhancement. The advantage of JAVA is the independence from platform type and this feature enables the easy porting to another operating system while the consistency of user interface is maintained. The ORACLE based

system has an advantage of handling large amount of data very fast. By adopting above two software development environment, MENTOS have client-server structure which is necessary for actual use in plants.

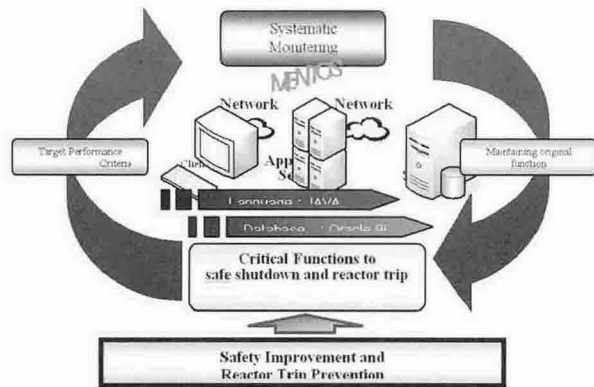


Figure 1. Objectives of MENTOS Development

2.3 MENTOS Features

MENTOS has function scoping module, significance determination module, performance criteria determination module, failure analysis module, performance monitoring module and (a)(1)/(a)(2) status tracking module. MENTOS has all features required as a maintenance rule implementation supporting software. From figure 2 and 4, MENTOS login screen, function scoping module and significance determination module are presented as examples.



Figure 2. MENTOS Login Screen

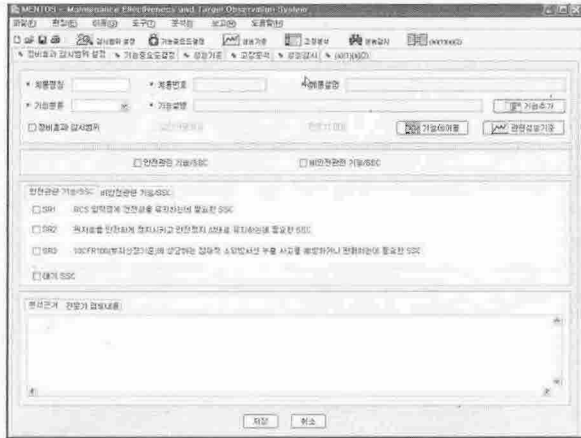


Figure 3. MENTOS Function Scoping Module

For illustration, add-on screen designs for some analysis modules were illustrated in figure 5 to figure 6.



Figure 5. Functional Dependency Evaluation Module



Figure 4. MENTOS Significance Determination Module



Figure 6. Risk Assessment Information Module

2.4 Add-on's for System Engineer Workstation

MENTOS has capability to meet the software requirement as a MR supporting system. Additionally, MENTOS has failure analysis module and performance trending capability. By adding some add-on modules to MENTOS, it will be powerful analysis tool for system engineer, or system engineer workstation. The add-on's for MENTOS are as below:

1. Functional Dependency Evaluation Module
2. Functional Failure Analysis (FFA) Module
3. Function FMEA Module
4. Root Cause Analysis (RCA) Module
5. Accident Analysis Evaluation Module
6. Defense-in-depth (DID) Evaluation Module
7. Risk Evaluation Module
8. Tech Spec Evaluation Module
9. EOP Evaluation Module
10. Function Condition Monitoring Module

3. Conclusion

The main objective of MENTOS is to develop an integrated database and analysis tool for MR implementation. MENTOS has ability to support MR implementation and additional features. If add-on's for system engineer workstation were added to MENTOS, MENTOS could be a useful tool for MR and ER.

REFERENCES

[1] USNRC, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Regulatory Guide 1.160, 1995.
 [2] NEI, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plant," NUMARC 93-01, rev. 3, 2000.
 [3] USNRC, "Lessons Learned from Maintenance Rule Baseline Inspections," NUREG-1648, 1999.