AGEING MANAGEMENT AT THE NPPS OF ENBW IN GERMANY

B. Bletz[a], Dr. G. Koenig[b], M. Alt[b], W. Hoffmann[c]
EnBW, KWG NT, Philippsburg, Germany[a]
EnBW, EnKK, Neckarwestheim, Germany[b]
EnBW, EnKK, Philippsburg, Germany[c]

Email address of main author: b.bletz@enbw.com

Abstract

The following report gives a short introduction to the Ageing Management Programm (AMP) implemented at the NPPs of EnBW. The main objective of the EnKK AMP is to ensure the safe and reliable future utilizability of the four NPPs in service. The program is a relevant element for plant safety as a precaution to prevent damage and to gain a sustainable basis for a prolongation of durability.

1. Introduction

Ageing Management (AM) at the NPPs of the EnKK (GKN and KKP) is a relevant element for plant safety as a precaution to prevent damage. Therefore the objective of the AMP is to identify early enough relevant ageing phenomena relevant for safety by technical and organisational measures and to control them for the plant life time. AM is also to be reflected in respect to the political situation in Germany. The political decision to shut down the NPPs step-by-step and not to allow the new building of NPPs is the absolute opposite direction of the world-wide-trend of life-time-extension or bulding of new NPPs. AM is at the moment legally based on the RSK-recommendation "Management of ageing processes at nuclear power plants", which was a result of the international discussion. Based on this recommendation and the experience in the implementation process of the AM in German NPPs the experts are formulating a new technical guideline (KTA). Simultaneously the legal requirements in Germany are going to be developed, initiated by the BMU (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety) and the WENRA-Process to harmonize the European regulations.

2. The Ageing Management Programm of the EnKK

Based on these conditions the licensee EnKK created an Ageing Management Programm (AMP). The idea of the AMP is to identify ageing phenomena relevant for safety by technical and organisational measures and to control them for the plant life time.
Objective of this Programm is to ensure the high safety standard in the NPPs by applying standardized criterions and collimating information to analyse them systematically (eg in a detailed analysis or a systematic weak-point analysis). Fundamental of this AMP is an integral approach.

The AMP in the NPPs of EnBW is based on the national RSK-recommendation which is integrating the national and international experience. Our AMP covers the technical issues (mechanical engineering, I&C, structural engineering and operating supplies) and is now being implemented at all NPP-sites. The non-technical issues like AM of personell or documents, which are required by the RSK-recommendation, are treated separately. All the

information about ageing effects are merged in the knowledge base of the NPP which is itself the base for the AMP. This knowledge base includes all, documents, databases and knowledge of the personnel.
This paper is constricted on the AMP of mechanical SSC as the most advanced issues. The other technical issues are treated in a similar way. The most important difference is the grouping itself and the existence of SSC (Group 1 as described in the text below) which are monitored and controlled solely in the AMP. For this monitoring and controlling prozess a technical requirement KTA 3201.4 exists which is just applianced in the AMP.

3. Grouping of systems and components in regard to AM

For the AMP the SSC are classified on their relevance to safety. The classification is depending on the technical issue and the requirements, which the SSC have to fullfil. In the AMP SSC - which are not relevant for safety – have not been addressed. They are predominantly relevant for the availibility of the NPP. Only if there could be extracted information which could effect SSC relevant for safety, the results are checked for transferability. In the case of transferability to SSC relevant for safety it will be reported in the AMP.
For mechanical SSC three groups are defined. In the AMP only SSC of Group 1 and Group 2 are treated. These three groups are defined as follows:

3.1. Group 1

Group 1 addresses mainly passive SSC which are subjected to the integrity-concept. For them the quality has to be ensured and malfunctions are not allowed. According to this the Ageing effects should be known and controlled. These SSC are, beyond the procedure which is described detailed in this paper, monitored and controlled as it is described by the integrity concept and accordingly. The requirements therefor are described in the technical requirement KTA 3201.4. The SSC of Group 1 are mainly SSC of the reactor coolant pressure boundary.
Especially for components of this group a knowledge base was installed documenting the actual condition of the integrity. The warranty of the component integrity under operating conditions is given by a comprehensive monitoring programm during operation (causes and consequences). Base therefor is the knowledge of degradation processes and and of the resultant effects.

3.2. Group 2

Group 2 addresses the safety relevant SSC, which are not assigned to Group 1.. The quality of this SSC is if possible to be ensured and if necessary to be reconstructed. Malfunctions are allowed in individual cases. Ageing effects should be minimized and systematic failures should be excluded. The required quality is mainly ensured by preventive maintenance. Primarily these SSC are part of the outer systems.

3.3. Group 3

Part of group 3 are all the other SSC. SSC could fail and they are replaced after failure. The lincensee is solely responsible for these SSC. They are predominantly relevant for the availibility of the NPP. In the AMP only the first and the second group have to be treated.

4. The EnKK AMP procedure

After the SSC are classified and the scope is defined, the AMP - as a part of the management system – is attached to the different processes of the NPP. In the AMP the information and feedback of the operating experience (eg preventive maintenance programmes; in-service inspection, surveillance, testing and monitoring programmes; corrective maintenance) and so the AM-relevant information out of the relevant processes for countervailing ageing effects is bundled. Together with the information of transferable external events and research programmes the information is systematically analysed in detail by experts again. If the analysis and evaluation necessitates to further measures, these are comunicated to the responsible person of the SSC and they are executed in the affected processes. These lead to a closed PDCA-Cycle, which is shown in figure 1 and in the following chapters explained in detail.

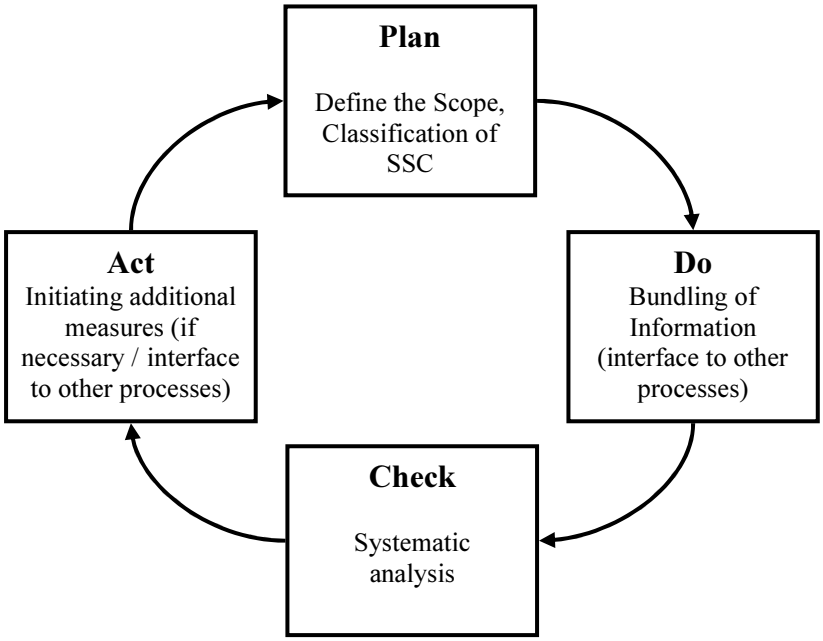


FIG.. 1: PDCA-Cycle

5. Appliance of the EnKK AMP procedure

On account of the numerousness of the SSC of the group 1 and 2 EnBW decided to implement a systematic and computer-assisted procedure which could be applied to all technical issues.
Therefore collectives of components, which are eg identical in construction, size and stresses (pressure, temperatur and medium), were established.Documentation and status-sheets were prepared for the collection of data. Three different types of documentation and status sheets exist, which include the relevant data for the analysis in the AMP, such as description of the component or the collective, technical data, requirements, measures for preventive maintenance, supporting documents, methods for monitoring, history of the component and the results of the AM-analysis (cp. Figure 2). These sheets are part of the knowledge base of the NNP-site.

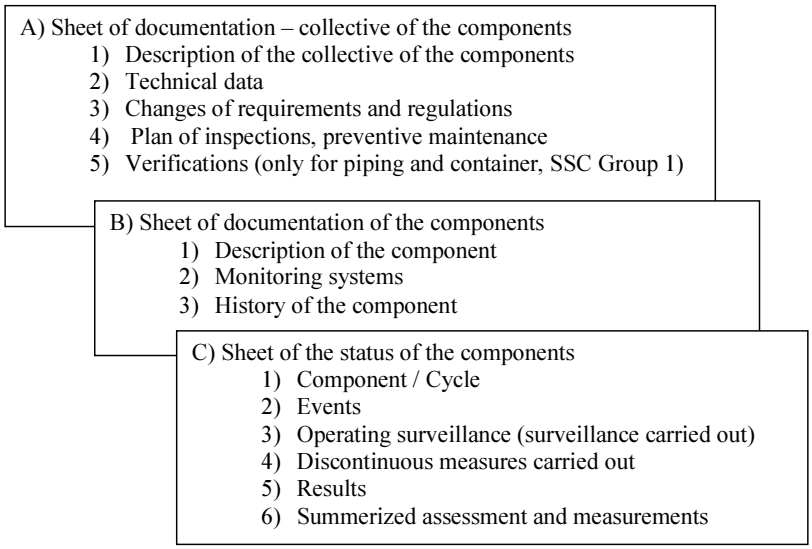


FIG.. 2: Example of documentation and status sheet

Furthermore these sheets are elements of the computer-assited procedure where the information is flowing e.g. directly from the experience of the preventive maintenance in to the AMP to be analysed completely in a systematic, reproducible way and independent of individuals.

The relevant sources for the AMP and the backflow are shown in Fig. 3.

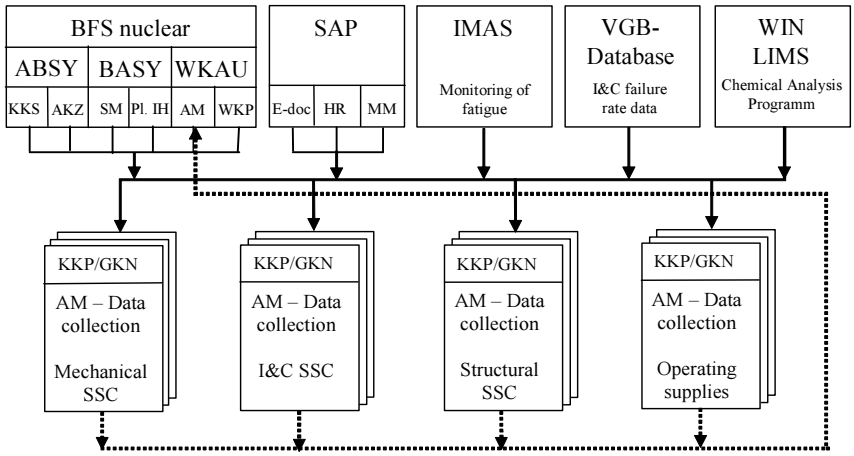


FIG.. 3: Schematic illustration of AM data sources

In the last years EnBW has established a computer-assisted AM to execute advanced analysis of scheduled or unscheduled measures and events. The former, which is based more on case-by-case activity, is being changed to an integral approach of the NPP.

6. Procedure of the AMP at the NPPs of EnKK

In consideration of the large amount of mechanical SSC with relevance for safety a computer-assisted AM has been established. Within this computer-assisted process the information is filtered to identify AM relevant information.

Advantages of this computer-assisted process are the systematics, completeness, traceablity and the independency from individuals. It is based on the knowledge base of the NPP site. In Fig. 4 the procedure to identify AM relevant information in the first step of the AMP is shown. In this step eg all the information of SSC not relevant for safety (SSC Group 3) are

excluded. All the potential sources of data are treated. Source of data is eg BASY, as a database for all the planned and unplanned operational activties. The computer-assisted process leeds to a reduced volume of information which could be assessed in more detail in the next step of the AMP.

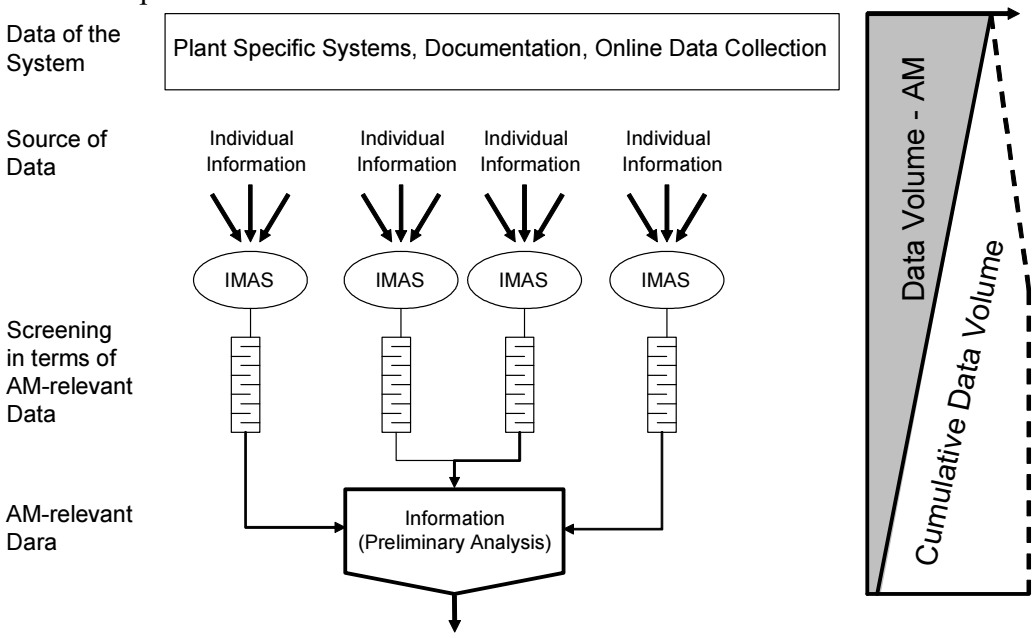


FIG. 4. Schematic procedure to identify AM relevant information

The more detailed description of this AMP procedure is shown in Fig. 5. All the mal function messages and all information about planned and unplanned operational activities are merged in BASY. Based on this the reports (eg maintenance reports) are prepared. Then it is checked if the SSC is to be handled in the AMP. Therfore the SSC is compared in two steps with the list of AM relevant Systems and Components. If the SSC is a Group 1 or Group 2 SSC it is checked if the event is based on ageing effect. In the next step of the AMP all the identified potential AM relevant events are analysed by an expert team.

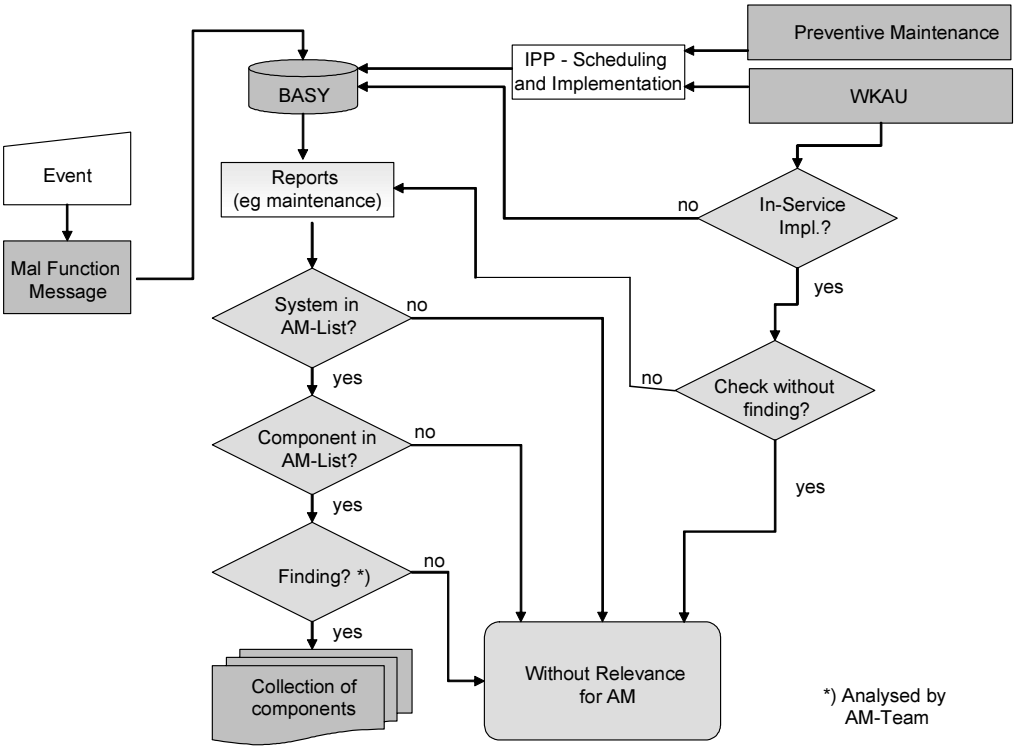
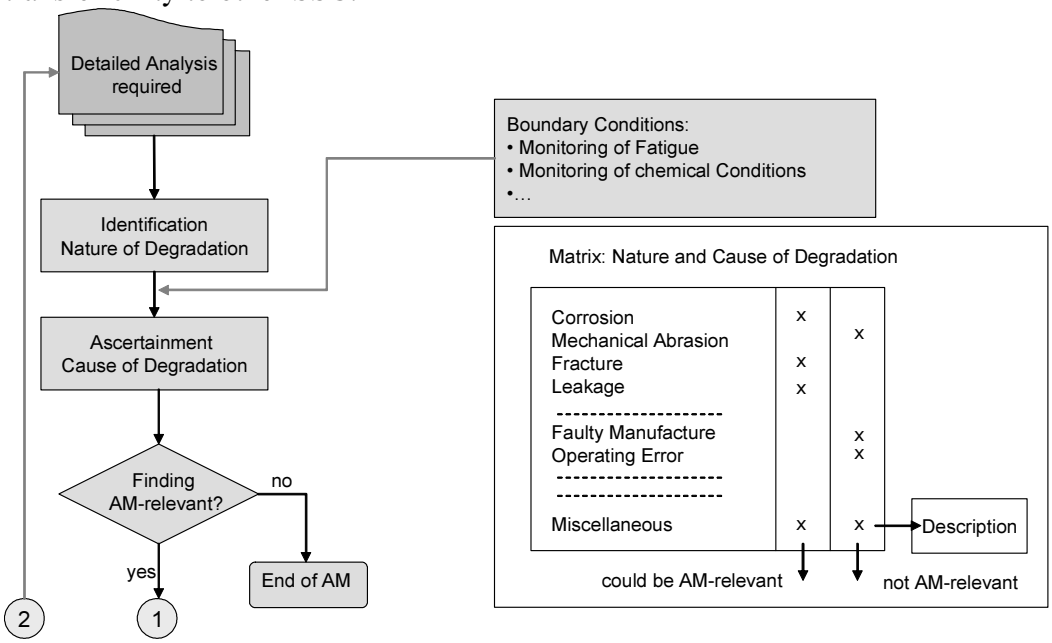


FIG. 5. Procedure to identify components with relevant finding (fine structure)

In the following fig. 6 the detailed analysis is shown. This procedure leads to a traceable assay of potential AM-relevant events. It provides also to identify common-mode-failures and the transferibility to other SSC.



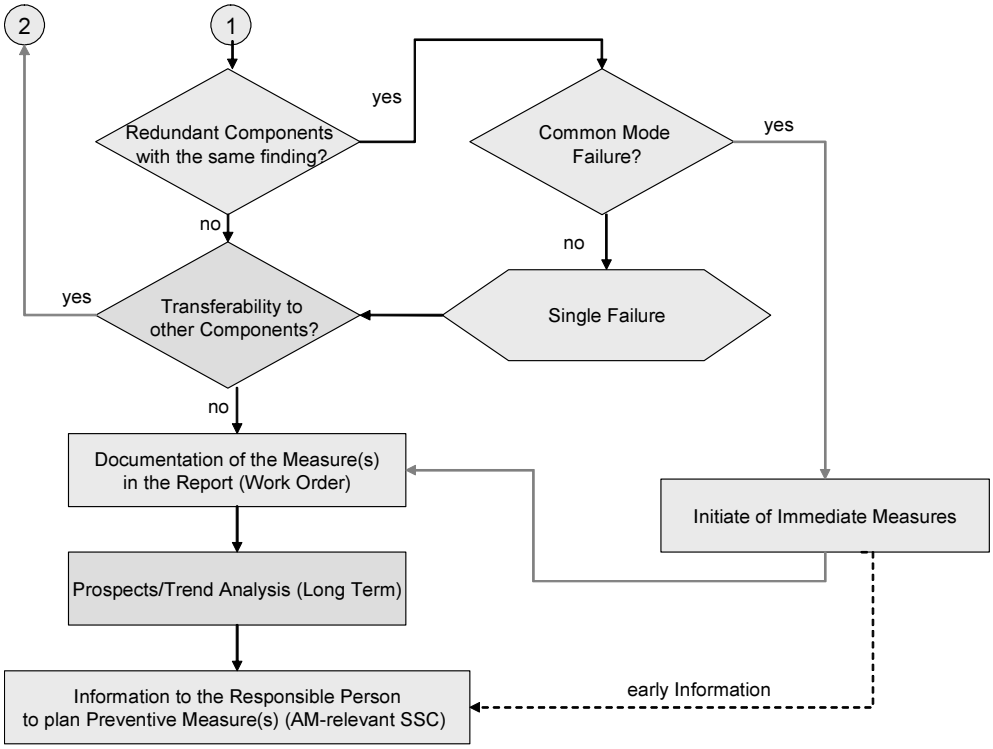


FIG. 6. Schematic description to the detailed evaluation of AM relevant findings and the corresponding treatment

The results of these different steps of the AMP are documented and presented in the annual status report.
The realization of this concept is a relevant element for plant safety as a precaution to prevent damage.

REFERENCES

[1] Ilg, U., G. König, F. Schöckle, H.-J. Kirchhof: Einführung des operativen Alterungsmanagements für mechanische Komponenten an den Standorten GKN und KKP. 32. MPA-Seminar, 5. und 6. Oktober 2006, Stuttgart

[2] RSK-recommendation: Management of ageing processes at nuclear power plants; 374. Meeting of the RSK (22th July 2004)