RiskWatcher Fulfill CRM Requirements in China

In China, the National Nuclear Safety Administration (NNSA) has issued several technical policies and guidance for PSA applications related to Configuration Risk Management (CRM) for nuclear power plants. One of the requirements is to conduct CRM for nuclear power plant operation and maintenance activities, to improve the scientific basis and effectiveness of nuclear safety management decisions. The application of the CRM makes China one of the leading countries in the application of risk monitors.

Before carrying out maintenance activities at nuclear power plants in China, plants must evaluate the configuration risk of the maintenance plan. If the risk level is in the yellow zone, it is necessary to evaluate non-quantifiable factors and develop risk management measures. If the risk level is in the red zone, it is not allowed to enter the configuration. If the evaluation results indicate that there is a high risk of carrying out the planned maintenance activities under the current configuration, it is needed to adjust the maintenance activity time window.

RiskSpectrum RiskWatcher is today widely used for CRM World-Wide, and the Web version is particularly popular in China.

RiskWatcher is used for calculating, among other things, measures such as Allowed Configuration Time (ACT) and equipment importance. In addition many plants in China use a RiskWatcher interface with various plant information systems to access real-time plant status and automatically trigger calculations of plant risk levels when plant configuration changes.

Facts

✓ Configuration Risk Management (CRM) is a method that uses the probabilistic safety analysis model to calculate risk indicators according to the actual operation configuration of nuclear power plants.

✓ Probabilistic Safety Assessment (PSA) have been successfully used for CRM in nuclear power plants worldwide. Typically, the PSA model is utilized for the purpose by employing a risk monitor software.

All the Output Needed

RiskWatcher supports the blended approach of risk-informed decision making by providing qualitative and quantitative evaluations. The instantaneous risk can be quantified according to the changes of plant configuration. Examples of important risk information that can be presented in RiskWatcher are:

- A risk profile showing the risk level over time.
- Comparison of different risk curves for different planned activities.
- Cumulative risk assessments.
- Indication of current risk level at a given time point in the form of a number (relative or absolute risk), and in the form of colour indication e.g. green, yellow, orange and red.
- An estimated risk for the coming days, based on the current state and considering the planned activities in the days to come

- Qualitative "defence-in-depth" status, which shows whether safety functions, systems, sub-systems and components are available or fulfilling technical specifications.
- Importance measures showing how important components and systems are in terms of contributing to current risk, or in terms of possible reduction of current risk.

The Allowed Configuration Time (ACT) is an important aspect of CRM. The ACT is the calculation of cumulative risk during the time that there are equipment out of service. The ACT is presented based on a cumulative risk consumption approach, considering the risk budget consumed since the equipment became unavailable. ACT is presented as the time left until the risk budget is consumed.
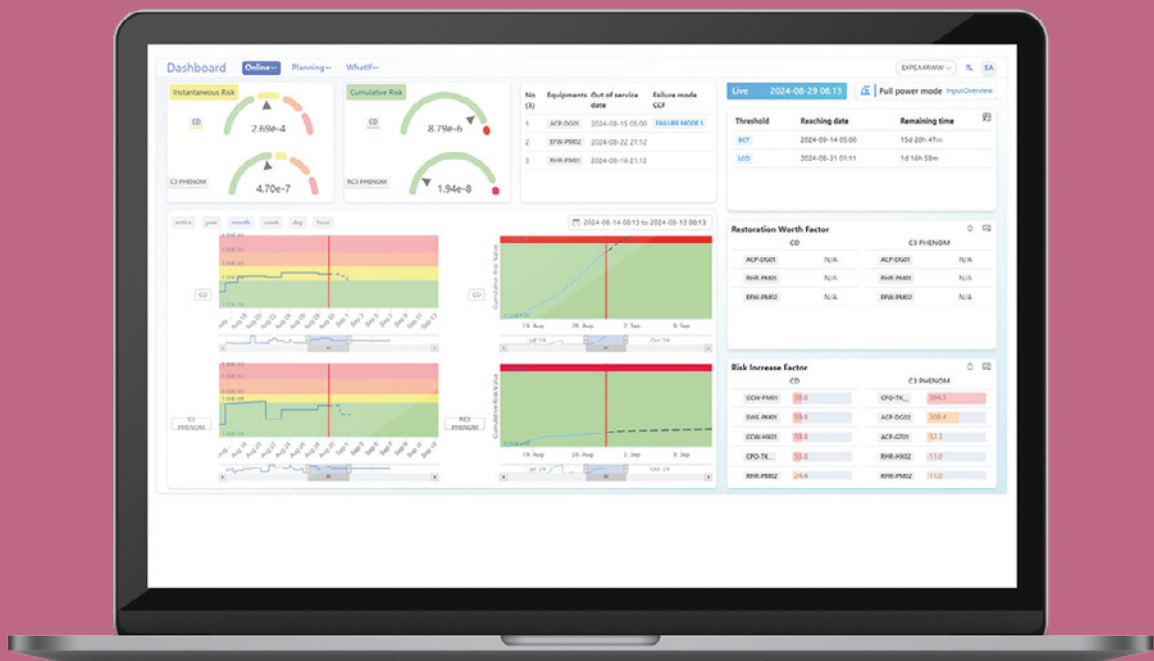

Figure 1. Improved overview of current situation using the RiskWatcher Dashboard.

Time is of the essence

Calculation speed is one of the key issues for a real-time risk monitor application system. It becomes even more important for a web-based risk monitor since it is designed to accommodate many concurrent users running calculations in parallel. The most recent release of the RiskSpectrum calculation engine, RSAT 4.0.0, has been given a major overhaul including a new algorithm for optimising the calculation speed. In-house trials as well as clients' trials benchmarking state-of-the-art, large size PSA models has indicated a calculation time reduction of up to 10 times!

The calculation speed is also very important using RiskWatcher as it adjusts the PSA model to represent each new plant configuration before it calculates risk levels. The results are always based on the full scope model, re-generating the MCS-lists for each new configuration.

No Operator Intervention Required

Though RiskWatcher is a tool designed to be easy to use for non-PSA personnel, you still might want to reduce the efforts needed by planners or operators. For this purpose, we have developed RiskWatcher Connector (RWC). It is a tool that is designed to read event log data from a desired data source, convert, and merge it with logs in RiskWatcher database.

RiskWatcher can interface with the plant's existing information system through RWC. RWC can connect to planning systems or the plant information system, convert to equipment status based on mapping rules and update the Event Log in RiskWatcher. Calculations are automatically initiated after a configuration change and the risk profile will be refreshed after completed calculation.

Figure 2. RiskWatcher Connector can import from your planning tools and your plant log.

In theory, no operator intervention is required during the whole process of operation risk updating by using this function. It reduces the workload of using a risk monitor for operational risk monitoring and increases the accuracy and real-time characteristics of risk and safety criteria.
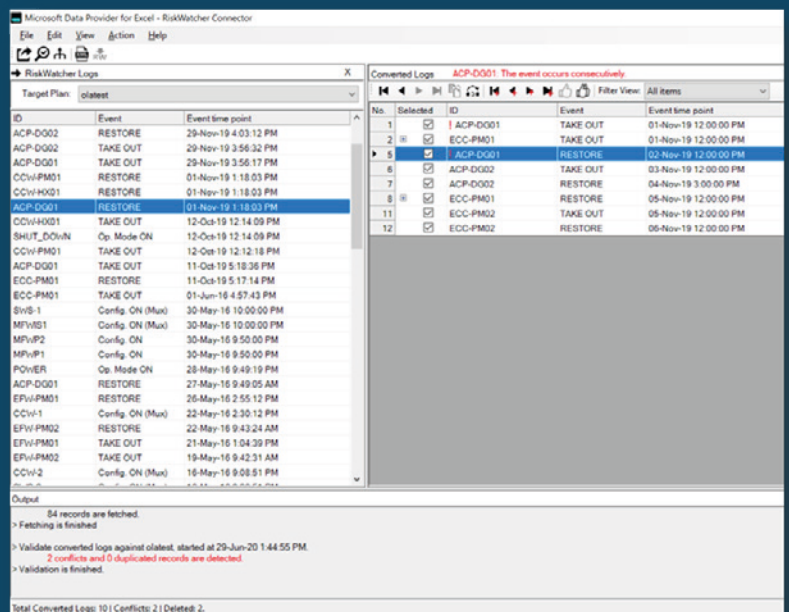
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