



Biorisk AR&M

Improve system availability by considering system failures and maintenance

AR&M (Availability, Reliability & Maintainability) studies are used to compare alternative designs, maintenance approaches and / or operating strategies. A detailed understanding of the facility systems or processes is obtained by evaluating the main contributors to failure scenarios.

Our Approach

AR&M studies are used to predict system availability (potential downtime) and to identify ways to improve reliability by considering both equipment failures and maintenance requirements. The AR&M study complements a **HAZOP** in evaluating different components of a system and identifying critical elements and the causes of failure scenarios.

The purpose of the AR&M study is to estimate the likelihood of unplanned events (e.g. failure of an effluent treatment process, failure of the HAVC system...) that may occur as a result of failures in individual components. It takes into account the selection and configuration of components in the system and the maintenance requirements. The results of the study can be used to optimise the design and operation of the plant, support the selection of critical components and define the maintenance program.

An AR&M study begins with a functional breakdown of the system using a **Failure Modes and Effects Analysis (FMEA)**. Each of the sub-systems and components in the system are examined to determine how they may fail, and the impact of failure on the system as a whole. The outcome of the HAZOP forms the basis of the FMEA.

Next, a mathematical representation of system failure modes is used to produce a reliability model. This evaluates how individual component failures can combine to contribute to unplanned events.

Greater understanding of the reliability of the system can be developed by quantifying the reliability model in the last stage of the AR&M. Reliability data on individual components (e.g. time to failure, time to detect, time to repair) together with inspection and test data are applied to the model to determine the likelihood of a failure occurring. Sensitivity analysis can then be conducted to highlight the critical components, and the benefits of alternative strategies.

Value delivered

- A detailed overview of the failure scenarios for facility systems and its main contributors;
- A model evaluating the impact of the reliability and the maintenance strategies on the overall reliability of the facility;
- Identification of an optimal maintenance schedule.