

Integrity Management Decision-Support using Bayesian Networks

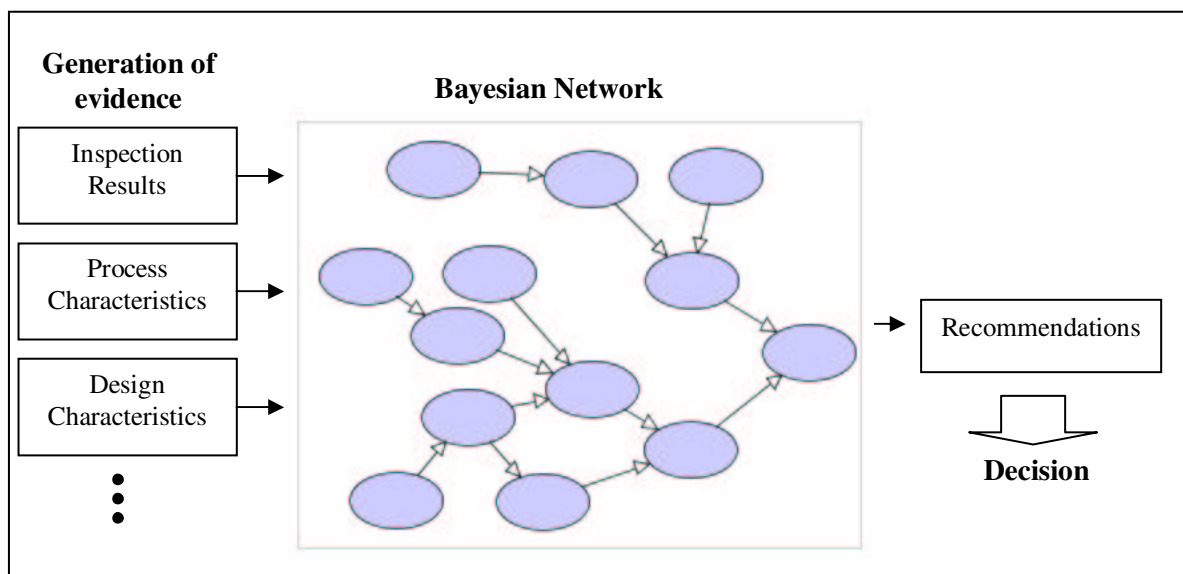
ERA Technology has just completed an intensive program of work for the Abu Dhabi Gas Liquefaction Company Ltd (ADGAS). One aspect of this work was providing ADGAS with a decision-support tool to assist with prioritising vessel inspection regimes.

The challenge in managing the integrity of any heavy asset/plant lies in balancing the contradictory needs of availability versus the cost associated with maintenance regime downtime and resource usage. If a plant is over-maintained/inspected, then this is costly in terms of resources, plant downtime or the stress that is put on the compensating plant. If the plant is under-maintained, then this can result in costly breakdowns, compromise personnel safety and/or impact on the environment.

In order to prioritise inspection and maintenance regimes, the plant manager must consider a variety of information that can encompass changes in operational conditions, inspection and test results, online monitoring, local repairs and faults, the design characteristics of different parts of the plant, and the points of view of various personnel with differing responsibilities and expertise. It is extremely difficult to make the right decision, when overwhelmed by a variety of different sources of information.

The solution that ERA has provided ADGAS is a decision-support tool using Bayesian Network (BN) technology. Although BNs have been around for a long time, it is only in the last few years that efficient algorithms and tools have become available. ERA chose AgenaRisk from Agena Ltd., to develop and run the BN as it is the most user-friendly and professional BN development tool currently available.

A BN is a directed graph and associated set of probability tables. A means of describing complex probabilistic reasoning, a BN encodes relationships between a variety of data. Using probability calculus and Bayes Theorem, information determined from observable events is propagated through the BN updating the values for previously unknown variables.



The key benefits of using BNs for risk-based decision support are:

- The ability to combine diverse data into one model;
- The ability to reason systematically in uncertain conditions;
- Assumptions about the impact of different forms of evidence are exposed,
- Recommendations are visible and auditable.
- Demonstration of the decision path is enhanced due to the intuitive graphical interface;
- What-if analysis, diagnosis and prognosis is enabled;
- Information about unobservable data can be determined, based on observable data.

For information about how decision-support through BNs can help your company, contact beth.bateman@era.co.uk