CLOCKWORK SOLUTIONS

CASE STUDY

Improving Safety in Industrial Manufacturing through Simulation Modeling

BUSINESS PROBLEM: A chemical manufacturer was concerned with the incidence of injuries, particularly explosions, in the workplace. Management felt it needed to understand the factors that were contributing to these occurrences and to take corrective action to reduce the number of safety-related accidents.

Their initial approach was to develop a Failure Mode and Effects Analysis (FMEA) utilizing extensive interviews with plant engineers and operators to gather and assess their input. They identified several areas of concern including: the reliability of the process line control system, the reliability of key manufacturing equipment, availability of the back up power supply, valve clogs, and pipe leakage.

The result of this extensive interview process was quantified in fault- and event-trees that spanned more than 500 components. Analysis software was used to rank the various accident causes. The result was viewed with low confidence by management and staff for several reasons:

- Most accidents are time-dependent. **FMEA cannot model time-dependencies** thus dismissing a key variable.
- FMEA uses fixed probabilities to describe event likelihood. In several instances no data was available and consensus was difficult to reach on fixed probabilities.

SPAR™'s unique abilities to model time-dependent systems and operating procedures made it the obvious next step for the manufacturer. Using the prior analysis work as input, SPAR™ modeled time-dependent conditions, such as power loss when the reaction is critical, used probability distributions for accuracy, and modeled time-dependent processes such as corrosion and operator retention of procedures.

Clockwork Solutions Inc. * 115 Wild Basin Road Suite 301 * Austin, TX. 78746 * Office 512-338-1945 * Fax 512 338-1946

February 2002

SPAR™ provided management with a baseline model of the existing system and operating procedures to understand the dominant causes of safety problems. SPAR™'s *what if* capability and sensitivity analysis identified weaknesses and remedies.

BENEFITS: Prior to the use of SPAR™, the back-up power system and diesel generators were targeted for improvements. As a result of the analysis, the SPAR™ model identified three different areas in need of improvement: **electrical system inspection frequency, corrosion inspection frequency, and operator training frequency**

RESULT: The SPAR™ model showed that by improving these three key areas, the likelihood of injuries due to explosions could be reduced by a factor of *thirty*. As a result, the company is changing its inspection and training policies and is beginning similar SPAR™-based analysis of several other of its manufacturing lines.

Contact:

Email: **info@clockwork-solutions.com**

Website: **www.clockwork-solutions.com**

Clockwork Solutions Inc. * 115 Wild Basin Road Suite 301 * Austin, TX. 78746 * Office 512-338-1945 * Fax 512 338-1946