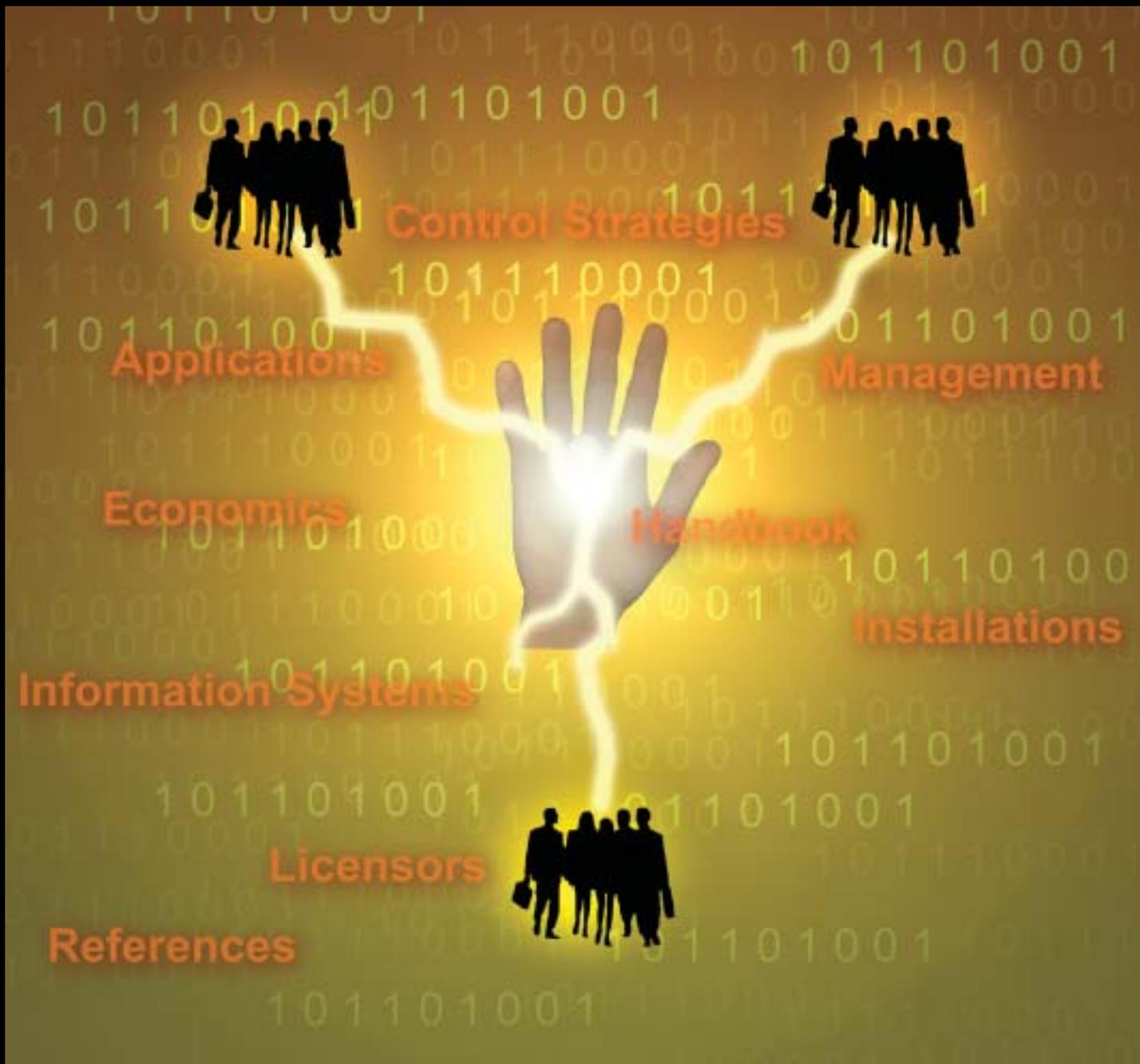


ADVANCED CONTROL AND INFORMATION SYSTEMS 2001



Olefins (reliability/operations management)

Applications. Nexus Oz is an expert system-based framework for sitewide deployment of reliability operations management applications. Benefits of advanced control applications are based on incremental improvements to process operation over long runtimes, and high service factors, while Nexus Oz targets reduction in unit downtime, which represents a total loss of production. This is significant in an olefin plant where, except for the furnaces, there is no parallel equipment. A process failure in a compressor, the cold box, or distillation columns means a complete shutdown of the process. Although the value of Nexus Oz in preventing operating deviations and shutdowns is significant to the site, justification is more difficult because the situations being diagnosed occur at irregular intervals. Nexus Oz enables clients to use the quantifiable benefits of the operations management applications to justify system installation.

Reliability and operations management. Nexus Oz quickly configures the functions from the control system database to provide sensor validation and process operations advisory functions for the process units. The sensor elements are then configured into their required relationships to the process equipment to detect abnormal operation scenarios before they escalate into major incidents. The typical olefin plant will have over 10,000 process measurements and over 350 control loops. With typically two operators monitoring the DCS, it is very difficult for the operators to continually monitor all of these signals. Failure analysis is based on status of the sensors and inference of their performances based on material and energy balance models configured from a library of equipment objects. As a potential failure is diagnosed, a message is propagated to the operator on a message board specific to the operating area. Selecting the message displays the appropriate operations response for the situation.

Reliability management. Reliability management applications integrate dynamic sensor data from vibration analysis systems with Nexus Oz to support equipment health logic diagnostics. Vibration analysis is especially important for the cracked gas, propylene refrigeration, ethylene refrigeration and methane compressors. Component level failure analysis models, based on industry and plant data, are then deployed within the Nexus Oz equipment object models to yield a plant topology data model for the olefin plant. Results of these models are integrated with the client's maintenance management and predictive maintenance applications for improved asset management benefits.

Operations management. The rules and procedural-based reasoning and inferential logic features of Nexus Oz facilitate information management between offline planning and optimization models, and online unit operations. Operations management applications are process unit specific such as predicting furnace run lengths and monitoring performance of the acetylene and MAPD converters. Operator advisories are provided for diagnostics on furnaces, distillation columns and other process operations. Operations management applications are scoped with clear economic benefits based on their direct impact on process operations.

Operator advisory. Operations advisory applications are a subset of the previous applications. Base levels and rules deployed through operator advisory applications are generated from the client's OSHA process safety management documents. Logic from standard operating and emergency response procedures are implemented in the Nexus Oz software to provide dynamic advisories to the operators as abnormal situations are diagnosed. The knowledge engineering process yields additional process management rules beyond the standard operational procedures. Examples of rules for olefins applications are management of furnace operations, diagnostics on performance of distillation columns, interaction of the expert system with MVC applications to step controller constraints through various modes of operation, etc.

Benefits. Typical savings, for example from a furnace run length management application at a billion pound per year olefin plant, range from \$1.25-2.5 million per year, depending on the feedstock type and operation severity.

Commercial installations. Nexus Oz has been installed in one olefins plant and is being considered for three others.

Licensors. Nexus Engineering, Kingwood, Texas.

Plant information (reliability/operations management)

Applications. Nexus Oz is an expert system-based framework for sitewide deployment of reliability and operations management applications. Benefits of advanced control applications are based on incremental improvements to process operation over long runtimes and high service factors, while Nexus Oz targets reduction in unit downtime, which represents a total loss of production. Although the value of Nexus Oz in preventing operating deviations and shutdowns is significant to the site, justification is more difficult because the situations being diagnosed occur at irregular intervals. Nexus Oz enables clients to use the quantifiable benefits of the operations management applications to justify system installation.

Reliability and operations management. Nexus Oz quickly configures the functions from the control system database to provide sensor validation and process operations advisory functions for the process units. The sensor elements are then configured into their required relationships to the process equipment to detect abnormal operation scenarios before they escalate into major incidents. Failure analysis is based on status of the sensors and inference of their performances based on material and energy balance models configured from a library of equipment objects. As a potential failure is diagnosed, a message is propagated to the operator on a message board specific to the operating area. Selecting the message displays the appropriate operations response for the situation.

Reliability management. Reliability management applications integrate dynamic sensor data from vibration analysis systems and other equipment diagnosis with Nexus Oz to include equipment health logic in the operations diagnostics. Component level failure analysis models, based on industry and plant data, are then deployed within the Nexus Oz equipment object models to yield a plant topology data model for the refinery. Results of these models are integrated with the client's maintenance management and predictive maintenance applications for improved asset management benefits.

Operations management. The rules and procedural-based reasoning and inferential logic features of Nexus Oz facilitate information management between offline planning and optimization models, and online unit operations. Production management applications include the systems addressing shared resources with multiple consumers and producers such as fuel gas, steam, hydrogen and amine systems for the complex. Additional operations management applications are process unit specific such as operator advisories for diagnostics on furnaces, distillation columns and other process operations. Operations management applications are scoped with clear economic benefits based on their direct impact on process operations.

Operator advisory. Operations advisory applications are a subset of the previous applications. Base levels and rules deployed through operator advisory applications are generated from the client's OSHA process safety management documents. Logic from standard operating and emergency response procedures are implemented in the Nexus Oz software to provide dynamic advisories to the operators as abnormal situations are diagnosed. The knowledge engineering process yields additional process management rules beyond standard operational procedures. Examples of rules for olefins applications are management of furnace operations, diagnostics on performance of distillation columns, interaction of the expert system with MVC applications to step controller constraints through various modes of operation, etc.

Benefits. Typical savings, for example from a hydrogen management application at a 150 Mbpd refinery, range from \$1-2 million per year depending on system complexity. Potential benefits at some locations are considerably higher based on larger capacities and higher complexity. In these complex scenarios, multiple operators are unable to optimally manage the system without a rules-based application.

Although benefits of production management applications can be very significant, real benefits of the system are in reduced process upsets associated with abnormal situation applications.

Commercial installations. Nexus Oz has been installed at a number of refinery, petrochemical and chemical plants.

Licensors. Nexus Engineering, Kingwood, Texas.

Polymers (reliability/operations management)

Applications. Nexus Oz is an expert system-based framework for sitewise deployment of reliability and operations management applications. Benefits of advanced control applications are based on incremental improvements to process operation over long runtimes and high service factors, while Nexus Oz targets reduction in unit downtime, which represents a total loss of production. This is significant in a polymer plant where there are very few instances of parallel equipment. A process failure in a catalyst feed system, temperature controller, recycle compressor or recovery distillation columns means a complete shutdown of the process. Although the value of Nexus Oz in preventing operating deviations and shutdowns is significant to the site, justification is more difficult because the situations being diagnosed occur at irregular intervals. Nexus Oz enables clients to use the quantifiable benefits of the operations management applications to justify system installation.

Reliability and operations management. Nexus Oz quickly configures the functions from the control system database to provide sensor validation and process operations advisory functions for the process units. The sensor elements are then configured into their required relationships to the process equipment to detect abnormal operation scenarios before they escalate into major incidents. The typical polyolefin plant will have as many as 1,000 process measurements (including feed preparation, reaction area, solvent and monomer recovery, and finishing area) and over 50 control loops. With typically one or two operators monitoring the DCS, it is very difficult for the operators to continually monitor all of these signals. Failure analysis is based on status of the sensors and inference of their performances based on material and energy balance models configured from a library of equipment objects. As a potential failure is diagnosed, a message is propagated to the operator on a message board specific to the operating area. Selecting the message displays the appropriate operations response for the situation.

Reliability management. Reliability management applications integrate dynamic sensor data from vibration analysis systems with Nexus Oz to support equipment health logic diagnostics. For polymer applications, monitoring catalyst feed, production rates, recycle rates and polymer properties are key operating parameters. Component level failure analysis models are then deployed within the Nexus Oz equipment object models to yield a plant topology data model for the polymer plant. Results of these models are integrated with the client's maintenance management and predictive maintenance applications for improved asset management benefits.

Operations management. The rules and procedural-based reasoning and inferential logic features of Nexus Oz facilitate information management between offline planning and optimization models, and the online unit operations. Operations management applications are process unit specific such as predicting catalyst consumption per ton of polymer, monomer and comonomer usage, recycle flows and additive consumption. Operations management applications are scoped with clear economic benefits based on their direct impact on process operations.

Operator advisory. Operations advisory applications are a subset of the previous applications. Base levels and rules deployed through operator advisory applications are generated from the client's OSHA process safety management documents. Logic from standard operating and emergency response procedures are implemented in the Nexus Oz software to provide dynamic advisories to the operators as abnormal situations are diagnosed. The knowledge engineering process yields additional process management rules beyond standard operational procedures. Examples of rules for polymer applications are management of catalyst preparation and reactor operations, diagnostics on performance of distillation columns, interaction of the expert-system with APC applications to step the controller constraints through various modes of operation, etc.

Benefits. Typical savings, for example from a reactor and finishing area application at a 40,000 lb per hour polymer plant, range from \$500 thousand to \$1 million per year.

Commercial installations. Nexus Oz has been installed in one polymer plant and is being considered for five others.

Licensor. Nexus Engineering, Kingwood, Texas.



www.nexusengineering.com

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N E X U S



You're not in Kansas anymore.

Nexus Oz™ - Reliability & Operations Management System

Waking up to a new business environment? Reliability and Operations Management is an emerging focus for operating companies striving to maximize their profits while delivering the expected responsible Health, Safety & Environmental performance. Although the control systems and the advanced control applications deliver the expected results on throughput, they do little to address the reliability of the process unit.

Nexus Oz™ is an expert system-based framework for the site-wide deployment of reliability & operations management applications. The key functions are:

- **Sensor Validation** - provides high integrity process data for the advanced automation & enterprise level application
- **Operations Management** - process diagnostics detect production opportunities & abnormal situations while providing operations personnel with the appropriate actions to take
- **Reliability Management** - integrated equipment diagnostics advise operations personnel on real-time actions
- **Operator Interface** - integrated with the existing operator's DCS consoles to provide a unified access to procedures, process, and equipment information

Although the benefits of the operations management applications are significant, the real benefits of Nexus Oz are in the reduction of process upsets.

Nexus Oz provides process and equipment diagnostic information with the recommended actions to the operators through their existing operator consoles. The real-time diagnostics enable the operators to respond to reliability and operations management issues before they escalate into major incidents. The results are reduced process upsets and extended process unit run-times which lead to sustainable economic performance.

The improved plant reliability and process operations contribute to a safer facility with reduced environmental impact. Nexus Oz has been installed at numerous sites and with additional projects underway, it will be coming to a site near you. If your plant is still operating "back on the farm", visit our web site or call Nexus to find out how you can benefit from a new world of plant operations with Nexus Oz.



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