

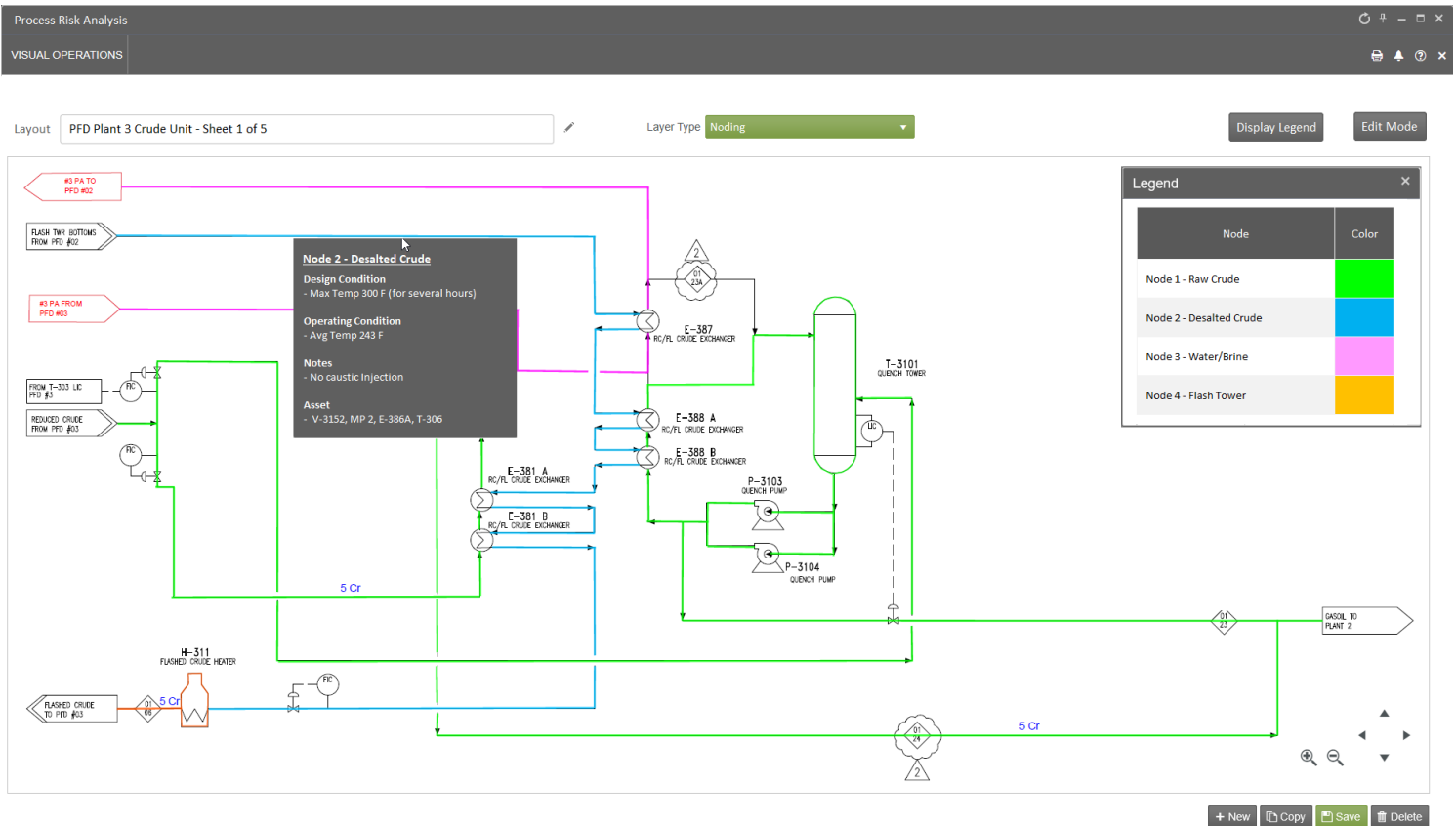


Process Hazard Analysis / Process Risk Management

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The Operational Sustainability, LLC® (OS) OESuite™ **PHA / Process Risk Management (PRM) Module** is a comprehensive solution for assessing and managing risk. Our comprehensive risk management solution allows users to create their own risk ranking matrix, while incorporating customized content (e.g., HAZOP guidewords, human factors checklists, facility siting checklists).

The PHA / PRM Module enables users to evolve the level of risk assessment applied and quickly pre-node using our embedded **Redlining Function** – no red pencil and scanner needed. Users can also add simple action items within PRM. If you are conducting a Management of Change (MOC), our interoperable **PHA / PRM Module** allows you to conduct risk assessments.



The PHA / PRM Module links Process Safety Information (PSI) from your file server, Microsoft SharePoint, or our **Document Management / Redlining Module**. Our interoperable **Asset Registry Function** allows physical assets to be linked to your nodes. You can also access your damage mechanisms from the **Inspection Management Module**.



Process Hazard Analysis / Process Risk Management

ASSET REGISTRY

Entity: Unit 1 Ref Loc: Reactor 1

Asset: 21-201A ID #: 09-HOT OIL Class: Heat Exchanger Class Type: Shell and Tube

Description: REGEN GAS HEATER

Details Property Component Protected By Inspection Asset Activities Asset Life Document Criticality

1 Task / Compliance 1 Management of Change (MOC) 0 Work Management 1 Incident/Event 1 Process Risk / PHA 6 CAPA (Corrective/Preventive Action) 0 Operator Rounds

Add CAPA

Entity	CAPA #	Study Title	Type	Date Initiated	Initiator	Status	CAPA Coordinator	Action Item Coordinator
Unit 3	2017-CAPA-00066	Need to repair the header	General / Management Recommendation	3/28/2017	Administrator, OESuite	Initiated		
Unit 3	2017-CAPA-00067	Need to inspect the piping	General / Management Recommendation	3/28/2017	Administrator, OESuite	Initiated		
Unit 1	2018-CAPA-00089	013399 Inspection - Fix Pipe	Inspection Finding	6/6/2018	Administrator, OESuite	Action Item	Administrator, OESuite, Huynh, Nam	
Unit 3	2018-CAPA-00090	Pipe is leaking	General / Management Recommendation	6/6/2018	Administrator, OESuite	Initiated		
Unit 1	2018-CAPA-00093	Excessive corrosion	General / Management Recommendation	8/14/2018	Administrator, OESuite	Initiated		
Unit 1	2019-CAPA-00114	Excessive Corrosion found on 20-PV-210	Inspection Finding	10/18/2019	Administrator, OESuite	Action Item	Administrator, OESuite	

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Users can adjust columns to fit their culture, leverage our calculation engine for LOPA scenarios, utilize smart text, copy nodes and cells, create their own risk matrix, drag cell content, import and export HAZOP templates from leading PHA tools, spell check, and more to customize the **PHA / PRM Module** for your needs. This module utilizes our **Bow Tie / Swiss Cheese Analysis** and our **Damage Mechanisms Functions** as well, giving you process risk insights from multiple perspectives within one module.

PROCESS RISK HAZOP/LOPA Study for Unit 1 (Node 1-5)

Study Preparation Team and Session Related Information Perform HAZOP Perform Facility Setting Perform Human Factor Perform LOPA Recommendation(s) Workflow

Node: 1 - NG Feed and 112-HPU-C-001 NG FEED COMPRESSOR H2 recycle

#	Consequence	Cause	Initiating Event	Initial Event Likelihood	Frequency Modifier	Conditional Modifier PFD	CAT	S	TMEL	Risk Reduction Factor (RRF) Required	Safeguards	Independent Protection Layers (IPL)	IPL Type	IPL PFD	Total IPL PFD	LOPA GAP	LOPA GAP Resolution	LOPA Recommendations
1	Potential block in case of S-1031. Potential increased pressure in piping upstream and S-1031 up to 105 kg/cm2g resulting in potential gasket leak. Potential fire, potential personnel injury & environmental impact. No Community, Water, Soil/Ground Water impact. Deviation - Consequence: 1:1.6.3	1 10" manual valve (110) inadvertently closed on error S-1031 Overhead line (Dwg.1001A)	Human	0.01	N/A									0.100	0.3000	10	LOPA GAP is Greater Than 1. Mitigation Required	1 Implement HAZOP Recommendation #1 "Ensure CSO/CSO/LO/LO/LO/LO/LO C valves are added to an administrative program controlling access to stated valves. This recommendation is to be applied globally to the LACC EP Project."
2	Potential increased pressure in piping upstream and S-1031 up to 105 kg/cm2g resulting in potential gasket leak. Potential fire, potential personnel injury & environmental impact. No Community, Water, Soil/Ground Water impact. Deviation - Consequence: 1:1.7.1	1 PV-060 closed when needed to be open on line to Dry Flare (Dwg 1001A)	BPCS	0.10	N/A									0.100	0.0100	10	LOPA GAP is Greater Than 1. Mitigation Required	1 Implement HAZOP Recommendation #1 "Ensure CSO/CSO/LO/LO/LO/LO/LO C valves are added to an administrative program controlling access to stated valves. This recommendation is to be applied globally to the LACC EP Project." to provide one IPL (RRF of 10) to close assigned LOPA gap. 2 Provide a means for testing and maintenance on PV-116 such as upstream or downstream block valve with bleed. (Dwg 5401A) 3 Ensure BPCS() Functions used as IPL(s) meet the requirements of an IPL. The BPCS must be designed

COLUMN CONFIGURATION

Column Name: LOPA GAP

Field Group: Consequence

Type: Calculation

Equation: [TOTAL IPL PFD]/[TMEL]

Font Color: Read-Only: Visible: Read-Only: Bold: Verify Equation

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Information from HAZOP studies are available for the LOPA study automatically, based on risk-level filtering. Clients can leverage the LOPA functionality to take credit for independent protective functions that sync with the visualization module to ensure you have the proper level of engineering and administrative safeguards while assessing changes to threats in real-time. The PHA / PRM Module is part of the OS Safety Lifecycle Management portfolio that includes integration with engineered safeguards, like the **Safety Instrumented Systems / IPL Lifecycle** and **Alarm Management Modules**.



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In addition, OESuite offers an **Intelligent PHA™** managed service, cutting study time down 20-30% and greatly enhancing the study's quality. Intelligent PHA supports the facilitator by providing a knowledge database, which serves as a sound foundation that contains industry equipment templates, information based on consensus codes, standards, and other industry best practices.

It is equipment-based, so any specific piece of equipment will provide PHA Cause-Consequence pairs for review by the PHA Team. If a facilitator knows the right questions to ask, they will have a pre-populated list of standard scenarios during preparation. Users can also quickly re-validate previous hazard reviews without recopying any records.

This process helps prevent missing standard hazard scenarios, because the process of selecting equipment is more efficient. Teams can validate or adjust scenarios as necessary, rather than spending big chunks of time identifying causes. Ultimately, the team has more time to focus on identifying major, potentially subtle hazards. While the Intelligent PHA process and tools do not absolve the team of their hazard identification responsibility, it does ensure the team can better accomplish their tasks.

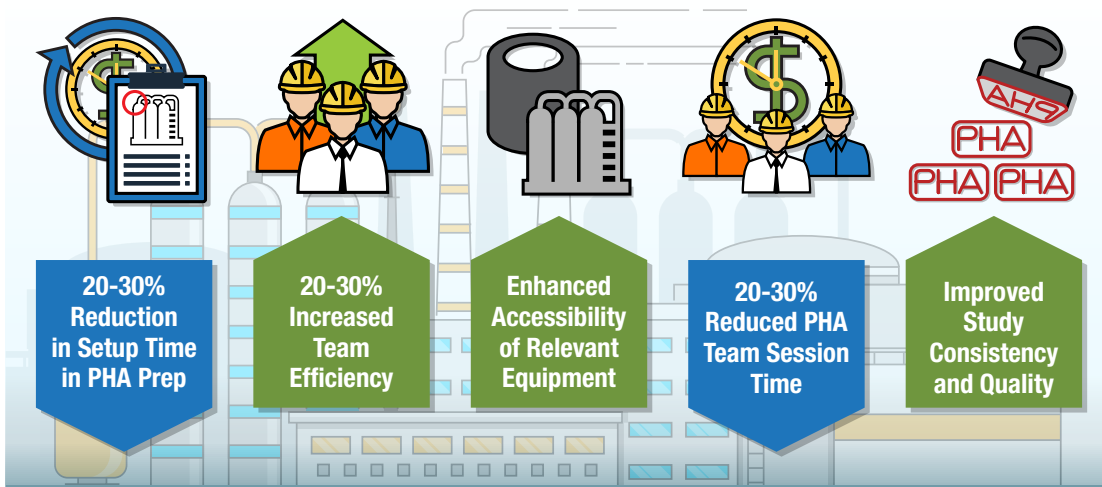
ASSET LIBRARY			
Facility	Asset	Fractionator	Equipment Type
Acme Gas Plant	EC-0CC EXPANDER / COMPRESSOR	Compressor	Centrifugal
Acme Gas Plant	EC-0PD EXPANDER / COMPRESSOR	Compressor	Positive Displacement
Acme Gas Plant	EC-0XX0Q EXPANDER / COMPRESSOR	Compressor	Positive Displacement
Acme Gas Plant	E-XX0 DEMETHANIZER REFLUX CONDENSER	Pressure Vessel	Non-Fired
Acme Gas Plant	E-XX0 DEMETHANIZER TRIM REBOILER	Boiler/Reboiler	Natural Gas Boiler
Acme Gas Plant	E-XX0# DEMETHANIZER REBOILER	Boiler/Reboiler	Natural Gas Boiler
Acme Gas Plant	E-XX09 DEMETHANIZER TRIM REBOILER	Boiler/Reboiler	Natural Gas Boiler
Acme Gas Plant	E-XX09 INLET GAS HEAT EXCHANGER	Heat Exchanger	Shell and Tube
Acme Gas Plant	E-XX0Z DEMETHANIZER SIDE HEATER	Heater/Furnace	General
Acme Gas Plant	F-YY#Q INLET FILTER / COALESCER	Filter	Liquid Filter
Acme Gas Plant	P-XXX DEMETH PRODUCT PUMP	Pump	Centrifugal

— PRE-POPULATION —

PHA WORKSHEETS			
DEVIATION	CAUSE	CONSEQUENCE
No Flow	Suction Blocked	Cavitation	
	Discharge Blocked	Deadheading	
Etc	Etc	Etc	Etc
Etc	Etc	Etc	Etc

Need to work in remote areas? OESuite also offers an offline PHA capability with synchronization back to the system. Our offline solution is built with ease of use in mind.

Figure 1 – Return on Intelligent PHA





Process Hazard Analysis / Process Risk Management

Once the risk assessment is complete, recommendations can be managed in our **MOC, CAPA / Action Item Management, Task / Compliance Management, and Work Management / CMMS / EAM Modules**. OESuite's interoperability helps ensure nothing falls through the cracks once your study is done.

OESuite™ Integrations

The **PHA / Process Risk Management Module** integrates with other OESuite™ Modules. It utilizes our **Asset Registry, Bow Tie / Swiss Cheese Analysis, Damage Mechanism, and Redlining Functions**.



Document Management / Redlining



Management of Change



CAPA / Action Item Management



Work Management / CMMS / EAM



Inspection Management / Mechanical Integrity



Task / Compliance Management



Enterprise Risk Management



Alarm Management



Safety Instrumented Systems / IPL Lifecycle

For more information email us at info@DrivingOE.com or call (713) 355-2900.