Driving Operational Excellence™

# Process Hazard Analysis (PHA)

## Consulting Services

Manage Risk.
Enhance Compliance.
Boost Profitability.

Operational excellence for the petrochemical, oil & gas, manufacturing, mining and utility industries.

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REV 021821

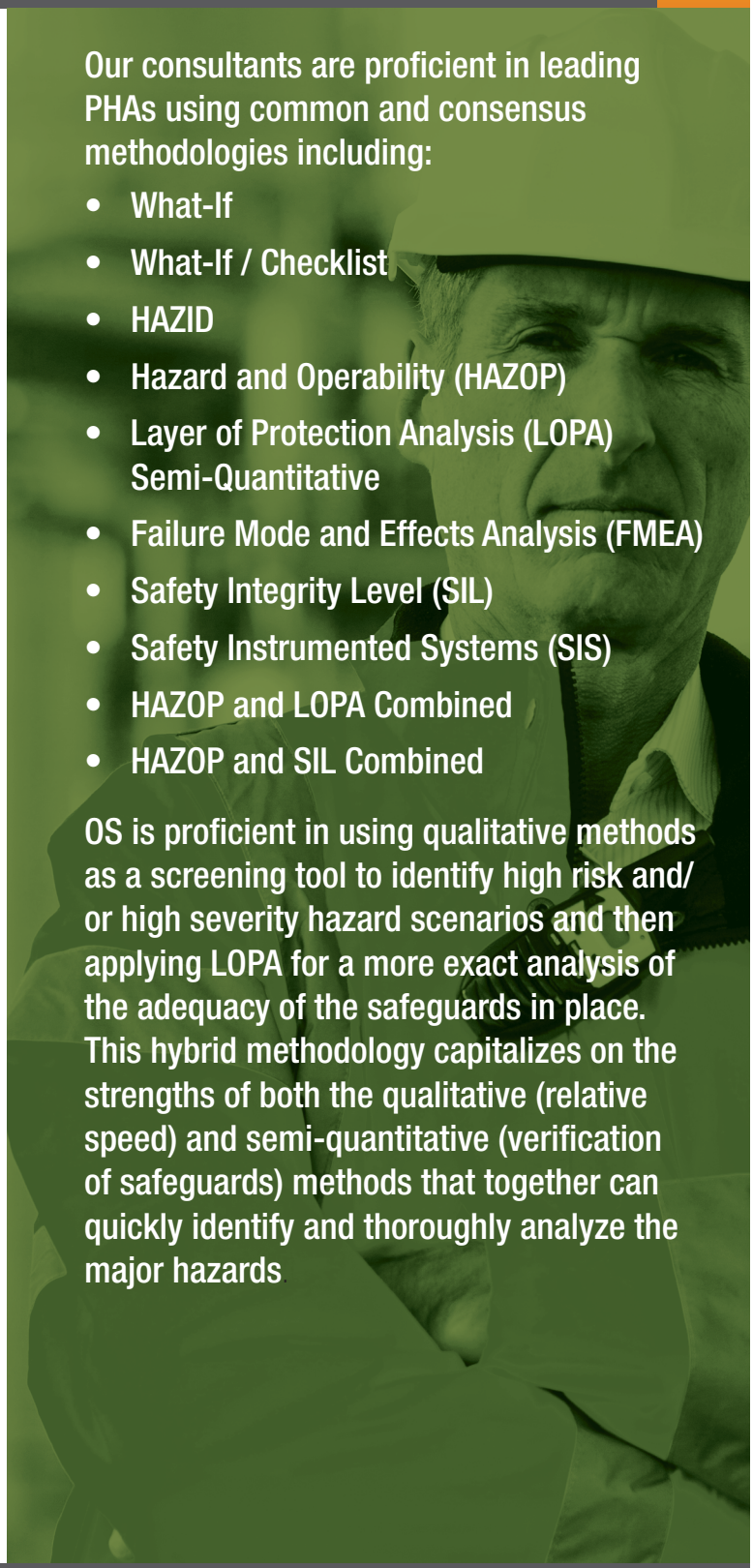
## Operational Sustainability® Overview

OS offers extensive knowledge of current and proposed process safety regulations and assures that facilitators are kept current on all regulations and the specific requirements of each client. In addition, our facilitators utilize industry best practices as part of our overall quality management approach. The OS collective résumé includes the successful completion of hundreds of PHAs in the following industries: refining, petrochemical, oil & gas, specialty chemical, pharmaceutical, agricultural, and power generation.

OS can assist you in all types of PHAs including high level preliminary hazard reviews, Front End Engineering Design (FEED) high level reviews, initial PHAs, redo of an existing PHA, and revalidations. We can also assist you in determining what PHA type or methodology is most appropriate. For example, a revalidation often turns into a more complex undertaking than doing a new study if a significant number of MOC forms have not been completed and/or the initial study quality is poor. If your initial PHA study was completed in the mid-90s and subsequent studies have all been revalidations, it may be advisable to consider a new study. Many companies are now taking that approach since studies completed during that time often do not provide the same quality as current studies.

## Process Hazard Analysis (PHA)

Process Hazard Analysis (PHA) is a blanket term for a collection of specific qualitative methodologies designed to identify and control process hazards associated with highly hazardous chemicals. Often, the motivation for PHA is regulatory, with OSHA PSM CFR 1910.119 and EPA RMP 40 CFR 68 being the primary drivers. Often facilities specify requirements for PHAs that exceed OSHA / EPA requirements in order to satisfy internal rules or other regulations such DOT, state, or local requirements.



Our consultants are proficient in leading PHAs using common and consensus methodologies including:

- What-If
- What-If / Checklist
- HAZID
- Hazard and Operability (HAZOP)
- Layer of Protection Analysis (LOPA) Semi-Quantitative
- Failure Mode and Effects Analysis (FMEA)
- Safety Integrity Level (SIL)
- Safety Instrumented Systems (SIS)
- HAZOP and LOPA Combined
- HAZOP and SIL Combined

OS is proficient in using qualitative methods as a screening tool to identify high risk and/or high severity hazard scenarios and then applying LOPA for a more exact analysis of the adequacy of the safeguards in place. This hybrid methodology capitalizes on the strengths of both the qualitative (relative speed) and semi-quantitative (verification of safeguards) methods that together can quickly identify and thoroughly analyze the major hazards.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## PHA Quality Process

OS has written quality assurance programs for all consulting activities. For example, our PHA Quality Procedure was developed based on our experiences with clients and manages the process as a lifecycle to proactively address and prevent common complaints.

| Issue | Preventative Measures |
|---|---|
| Improper application of Client Procedures | • OS client requirements capture<br>• OS management pre-meeting with facilitator<br>• OS management monitoring of progress / work product during PHA |
| Client surprised by number of action items | • Facilitator communicates number of actions items, number of high risk scenarios, and number of LOPA scenarios on a daily basis<br>• PHA Close-Out Management meeting to review action items |
| Late PHA Report Delivery or PHA Files Lost | • OS facilitators not permitted to work overlapping projects<br>• OS management will complete report if facilitator incapacitated<br>• PHA files backed up to OS secure FTP drive on daily basis |

The rigorous OS PHA Quality Assurance program is a start-to-finish approach designed to prevent common pitfalls. It can be seen as too difficult or unnecessary to apply standard quality management protocol to PHAs since they largely depend on one person for success. The common practice is to fully rely on the facilitator to execute the study to acceptable standards. While this approach sometimes works, exposure for the client is high. There are too many opportunities for requirements to be left out or misinterpreted. Commonly, PHA issues are identified during the draft report review – done well after the PHA team has disbanded. Finding significant issues at that stage is a complete failure and may require the PHA to be redone depending upon the severity of the infraction.

To prevent a negative outcome for the client, OS manages the quality of a PHA project by stages:

1. Client PHA bid
   - Exacting cost projection
   - Key client requirements on contract
2. Requirements capture
   - Detailed questionnaire
   - Confirm path forward with client
3. Facilitator competency
   - Technical competency
   - Industry preference
   - OS management PHA session review of facilitator
   - Client requirements training


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4. PHA team sessions validation
   - OS management routine review of work product during PHA
   - OS management cross-check of progress vs. schedule and PHA issues identified
5. Client communication protocol
   - OS notification of number of action items and other KPIs daily
   - Team dynamics issues – immediate client notification
   - Potential progress delays – immediate client notification
   - Close-out meeting – preliminary results
6. Reporting
   - Deadlines for draft and final reports
   - Facilitator progress monitoring and accountability
   - Secondary plan for completion if facilitator incapacitated
   - Formal PHA file backup plan

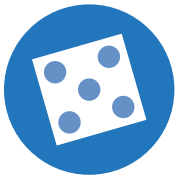
## Why LOPA?

Layer of Protection Analysis (LOPA) is a process to determine the risk associated with various hazardous events by applying semi-quantitative measures to the frequency and probability of failure of the protective layers. While qualitative risk assessments such as a Hazard and Operability Study (HAZOP) are good for identifying hazardous events, initiating causes, event severity, and initiating likelihood, PHA teams may list safeguards that only partially mitigate process risk. In addition, HAZOP does not address whether safeguards are independent of one another. This often leads to teams taking credit for more risk reduction than is possible based upon the integrity of the individual components. A team's perception of the integrity of a specific safeguard may lead to inconsistency in the number of safeguards required to adequately mitigate risk. As a result, LOPA is a useful analytical tool for indicating that adequate risk reduction can be achieved. In the event that there are not enough Independent Protection Layers (IPLs), additional Safety-Instrumented Functions (SIFs) may be required. LOPA provides specific criteria and restrictions for evaluating IPLs, eliminating much of the inherent subjectivity of qualitative techniques such as HAZOP.

We leverage Functional Safety Standards including ANSI/ISA-84.00.01, IEC 61508 and IEC 61511. In addition, we assist clients in developing LOPA programs and procedures and to facilitate LOPA studies tailored to your culture.

OS uses other PHA software such as PHA-PRO and PHA Works. In addition, OS offers its industry leading software, OESuite®.

## Process Risk Manager



### Process Risk / Risk Assessment

The **Process Risk / Risk Assessment Module** of OESuite® provides both an offline PHA solution for What-If / Checklist, HAZOP, and LOPA studies, along with an enterprise solution that offers additional risk assessment methodologies such as HAZID, FMEA, and JSA.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## *Process Hazard Analysis (PHA)*

The offline tool is just right for keeping it simple with spreadsheet-like functions, such as copy and your standard PHA reports as outputs. Search from a library of templates and reports to expedite study pre-work and planning.

The enterprise edition offers added benefits such as integrated tracking of action items, email alerts and notifications, document management, ad hoc reporting and dashboards, and enterprise visualization of your risks.

See how OESuite® helps expedite your study, while ensuring nothing falls through the cracks after the study to ensure timely closure of action items and MOCs.

**For more information about our PHA Services contact OS at info@DrivingOE.com or call (713) 355-2900.**


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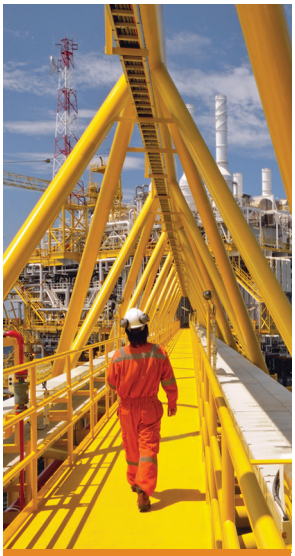
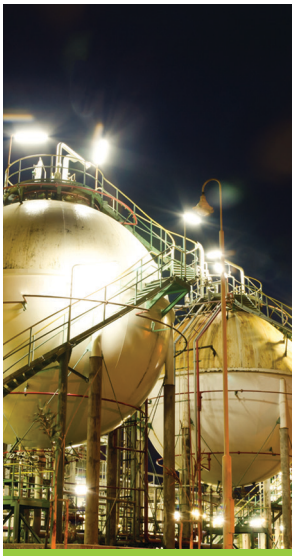
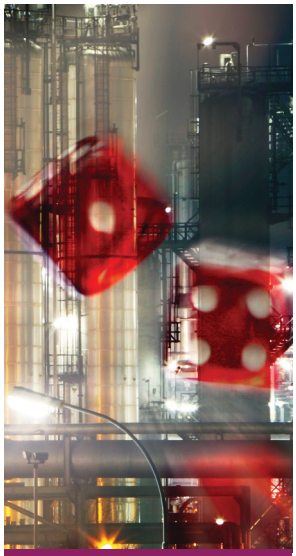

Workforce


Assets

Operations

Compliance


Risk

## Operational Sustainability® makes operational excellence simple.

Succeeding in today's complex, highly-regulated industries depends on how well your company manages **operational risk** and enables **operational discipline**. Our world-class advisory services and our industry-leading cloud-based, highly configurable software work together to enable your company to achieve **operational excellence**, including OE 4.0 tenets, and sustained **operational integrity**. We identify and help you solve any issues to move to a real-time, mobilized risk-aware culture. With an average of more than 30 years of industry experience each, our advisors can design a solution tailored to your company's culture and needs.

Learn how Operational Sustainability can advise your workforce through our consulting services and support your journey to operational excellence through our OESuite® software platform. See our full slate of free webinars, white papers, detailed module information, and scheduled workshops online at **www.DrivingOE.com**.

**Schedule your free consultation and demo today.**

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