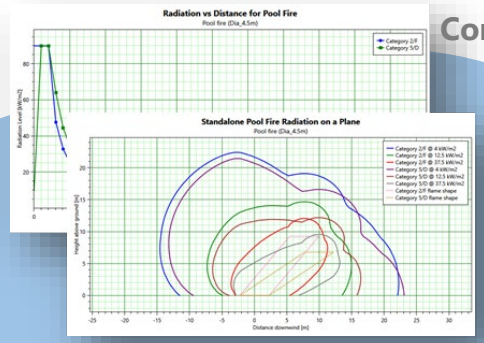
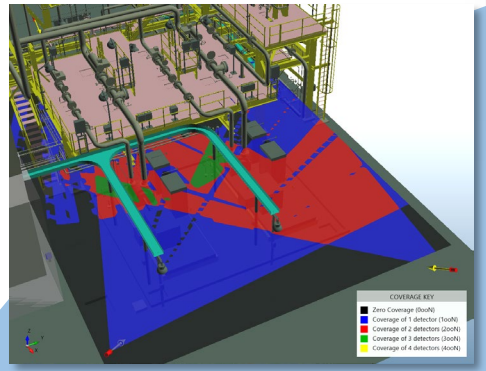
HSE

HSE services focus on systematic identification and evaluation of plant risks based on our long experience in on-site HSE and our own excellent evaluation methods, and on proposing systems that can ensure safe plant operation without major CAPEX.

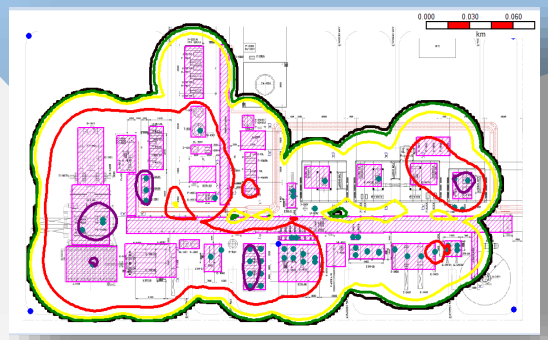
Consulting Service



Fire Hazard Simulation

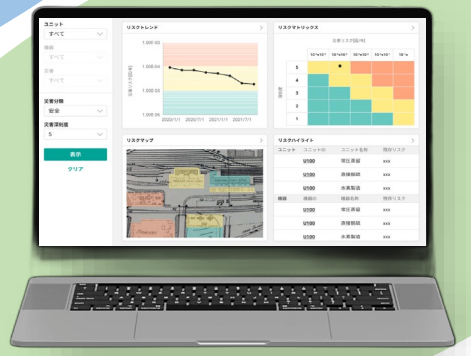


Fire and Gas Mapping Study Technology



Quantitative Risk Analysis (QRA)

Application Product



CoreSafety®

[Return to OE Service menu](#)

Service Menu

Operational HSE Risk Management Program

HSE Risk Management
- Formal Safety Assessment
- Hazard Identification (HAZID)
- HAZOP/SIL/LOPA (*) /Bow-tie Analysis
- Operational Hazard Reduction
- Management System Review
- Process Safety Management

Fire Protection Improvement Program

- Active Fire Protection Assessment
- Fireproofing Assessment
- Fire and Gas Assessment

HSE Improvement Program

- Escape Simulation and Assessment
- Hazardous Area Classification (HAC) Optimization
- Noise Assessment

Application for Risk-Based Process Safety

- CoreSafety®

(*)HAZOP : Hazard and Operability Studies / SIL : Safety Integrity Level / LOPA : Layer of Protection Analysis

Operational Excellence Services

Health・Safety・Environment (HSE)

HSE Risk Management

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HSE Risk Management

Do you have any of these issues?

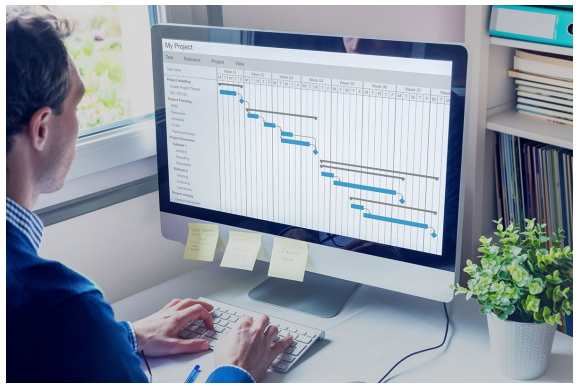
- ☹ **Formalizing facility safety**
- ☹ **Process and operational safety concerns**
- ☹ **High insurance fees**

HSE Risk Management Solutions

- Justify safety using a prescribed process, which includes:
  - Formal Safety Assessment
    - Quantitative Risk Analysis (QRA)
    - Hazard Identification (HAZID)
    - Hazard and Operability Studies (HAZOP)
    - Layer of Protection Analysis (LOPA)
    - Bow-tie Analysis
  - Operational Hazard Assessment/Reduction Study
  - HSE Management System Review

Assessment \ Hazard		Potential Hazards: General	Potential Hazards: Process	Previous Hazards (Incidents/Near Misses)
Hazard Identification		HAZID	HAZOP	OHR *
Risk Assessment	Qualitative	HAZID	HAZOP	OHR *
	Semi-Quantitative	LOPA		
	Quantitative	Consequence Analysis / QRA		

* OHR : Operational Hazard Reduction Study



Combination of Desk-top Study and Workshop

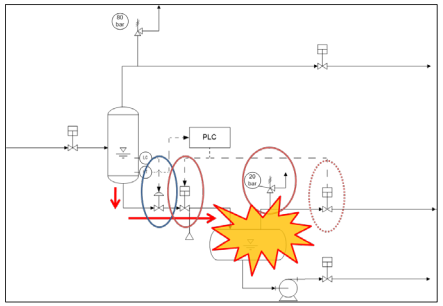
HSE Risk Management

Return to HSE menu

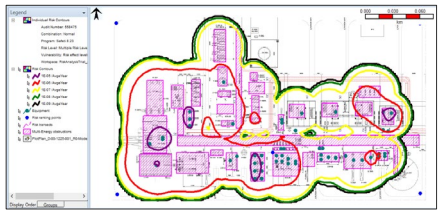
Workflow & Results

Safety Philosophy	Concept of Safety in Design
HAZID HAZOP Hazard Register	Hazard identification
Fire Risk Analysis Explosion Risk Analysis QRA	Risk Analysis
ALARP Study	ALARP Demonstration
Bow-tie Analysis	Visualization of Threat, Consequence and Barriers and Recovery Measures
SCE&PS	Define Safety Critical Element and Performance Standard

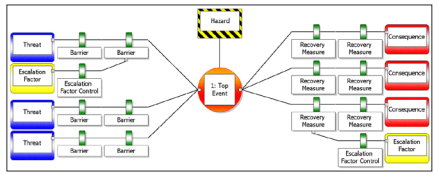
HSE Risk Management System / Safety Case



Hazard Identification in P&ID



QRA



Bow-tie Diagram

Our Strengths

- Professional Safety, Process, Control, Mechanical, Operation and Maintenance Teams
- Top global experience of EPC execution
  Plant types - Refinery, Gas Processing, LNG, Chemical
  Plant locations – Onshore, Offshore
  Clients – IOC, NOC
- Huge record of HAZID/HAZOP and Operational Hazard Reduction

Our Experiences

20+
Cases

20+ HAZOP revalidation, OHR, and HSEMS development

500+
Cases

500+ Process safety plant design

Operational Excellence Services

Health・Safety・Environment (HSE)

Active Fire Protection Assessment

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Active Fire Protection Assessment

Do you have any of these issues?

☹ **Fire and explosion incidents**

☹ **High maintenance and inspection cost**

☹ **High insurance fees**

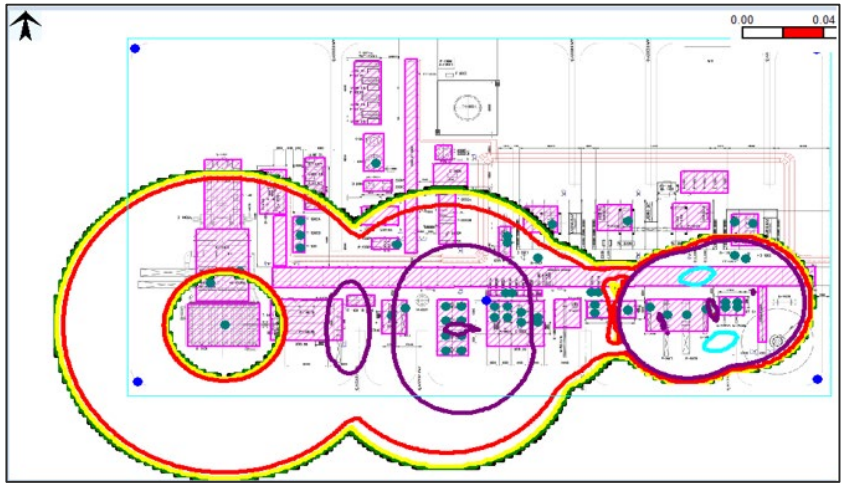
Foam Extinguisher System

Monitor Protection

Water Spray Protection

Active Fire Protection Assessment Solution

- Re-evaluation for facilities based on credible fire scenario and codes & standards
- Fire scenario simulation based on identified fire scenario
- Fire fighting system evaluation by;
  - Hydraulic calculation
  - Fire water monitor coverage assessment
  - Foam system performance evaluation
  - Etc.



Example of Jet Fire Risk Contour

Active Fire Protection Assessment

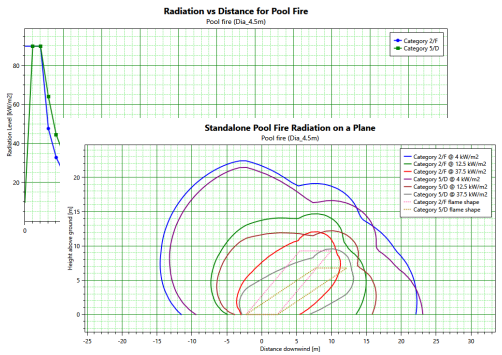
Return to HSE menu

Workflow & Result

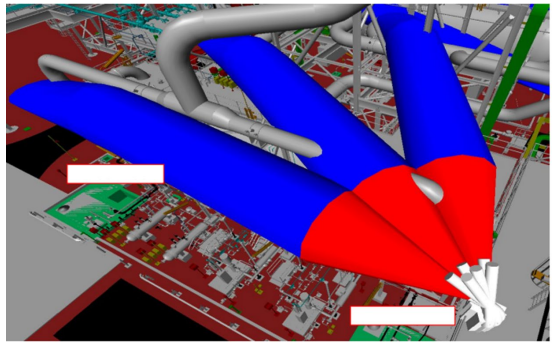
Fire Hazard Scenario Identification → Site Survey + Gap Analysis → Fire Fighting System Assessment
- Fire Water Monitor Coverage
- Hydraulic calculation

→ **Cost-Effective Improvement**

Fire Hazard Scenario + Fire Water Monitor Coverage Assessment



Fire Hazard Simulation



Visualizing Monitor Coverage in 3D model

Our Strengths

- Professional Fire Protection and Analysis Teams
- Top global experiences of active fire protection design and application from EPC execution

  Plant type - Refinery, Gas Processing, LNG, Chemical

  Plant location – Onshore, Offshore

  Client – IOCs, NOCs

  Code and Standards – NFPA, API, BS, etc.
- Strong relationships with global firefighting equipment suppliers
- Analysis software – Phast (DNV), in-house simulation

Our Experiences

20+

Study

Fire water monitor coverage assessment 20+ studies.

500+

Cases

500+ Active Fire Protection Design

Operational Excellence Services

Health・Safety・Environment (HSE)

Fireproofing Assessment

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Fireproofing Assessment

Do you have any of these issues?

☹ **Is Our Plant Really Safe from Fire Hazard?**
☹ **High Maintenance Cost for Fireproofing**
☹ **Compliance with Latest Standard?**

Evaluation of existing Fireproofing

Fireproofing Assessment Solution

- Evaluation of existing fireproofing based on identified fire hazard and latest standard.
- Identification of critical fireproofing improvement points.
- Optimization of fireproofing by fire risk assessment and structural redundancy analysis.
- Recommendations of cost-effective improvement solutions.

Deterministic method
>International Code and Standard
>Local regulation
>Fireproofing Application

Conventional Method

Fire Risk Analysis **X** **Redundancy Analysis** **=** **Cost-Effective Improvement**

Latest Method

Fireproofing Assessment

Return to HSE menu

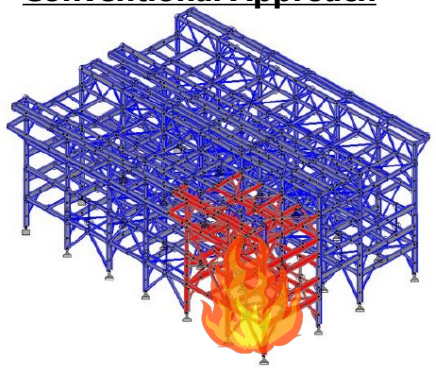
Workflow & Result

Fire Hazard Scenario Identification → Site Survey & Gap Analysis → Structural Redundancy Analysis → Cost-Effective Improvement

Structural Redundancy Analysis

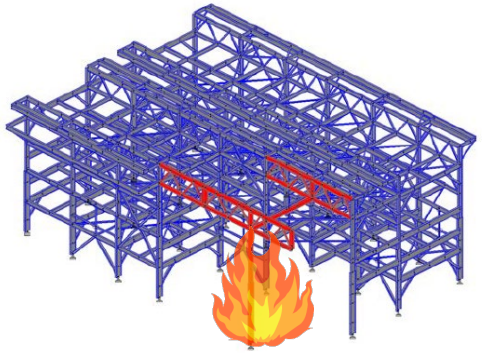
➢ **JGC original method to optimize fireproofing based on API RP 2FB**

Conventional Approach



Fireproofing on Red Structure
(All load bearing structure)

New Approach



Fireproofing on Red Structure Only
(Only critical structure for integrity)

Significant Reduction of Fireproofing / Justify the Available Fireproofing

Our Strengths

- Professional Fire Protection, Structure, Material and Analysis Teams
- Top global experiences of fireproofing design and application from EPC execution
  Plant type - Refinery, Gas Processing, LNG, Chemical
  Plant location – Onshore, Offshore
  Client – IOCs, NOCs
  Code and Standards – NFPA, API, BS, etc.
- Strong relationships with global fireproofing material suppliers
- Analysis software – Phast, FLACS, STAAD.Pro, Abagus, etc.

Our Experiences

3+
Plants

Fireproofing assessment service for 3+ plants.

500+
Cases

500+ Fireproofing Design

Operational Excellence Services

Health・Safety・Environment (HSE)

Fire and Gas Assessment

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Fire and Gas Assessment

Do you have any of these issues?

☹ **Insufficient Fire and Gas detector coverage**
☹ **High Maintenance Cost of fire and gas detector**
☹ **High Insurance Fee**

Gas Detector

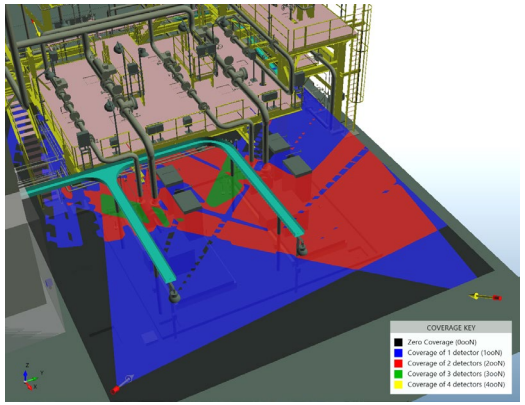
Plant are covered by Fire and Gas Detectors

Flame Detector

Fire and Gas Assessment Solution

- Evaluation of facility and gap analysis
- Identification of credible fire and gas leak hazard
- Conduct fire and gas mapping study to ensure the effectiveness
- Safety improvement by appropriate fire and gas detector placement

Evaluation of facility



Fire and Gas Mapping Study Technology

Fire and Gas Assessment

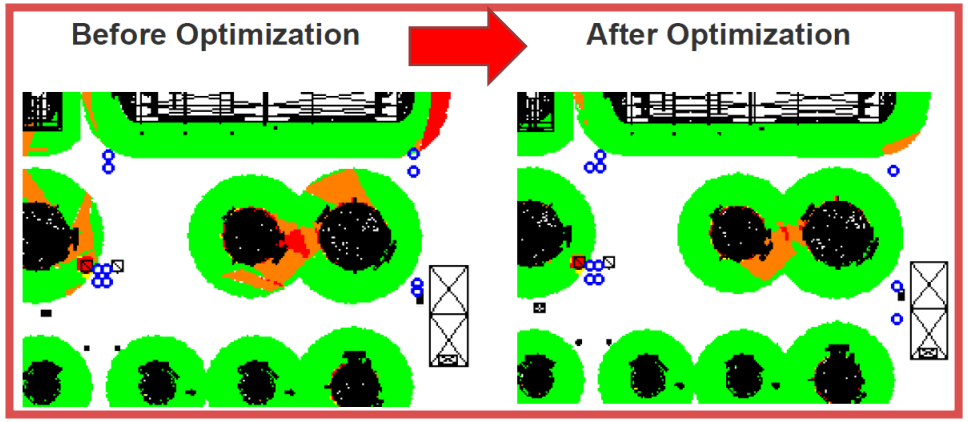
Return to HSE menu

Workflow & Result

Fire and Gas Leak Hazard Scenario Identification → Site Survey + Gap Analysis → Fire and Gas Mapping Study → **Cost-Effective Improvement**

Mapping study

One of the method to analyze the effectiveness of fire and gas detector, and optimize detector location



Same quantity of gas detectors --> Better coverage (wider green area)

Our Strengths

- Professional Safety, Instrument, Process and Analysis Team.
- Top global experiences of fire and gas system design and application from EPC execution
  Plant type - Refinery, Gas Processing, LNG, Chemical
  Plant location – Onshore, Offshore
  Client – IOCs, NOCs
  Code and Standards – NFPA, API, BS, etc.
- Relationship with global fire and gas detector suppliers
- Analysis software – Detect 3D(Insight numerics), Phast (DNV),

Our Experiences

20+

Mapping Study

Fire and Gas Mapping Study Experience 20+ Study

500+

Cases

500+ Fire and Gas Design

Operational Excellence Services

Health・Safety・Environment (HSE)

Escape Simulation and Assessment

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Escape Simulation and Assessment

Do you have any of these issues?

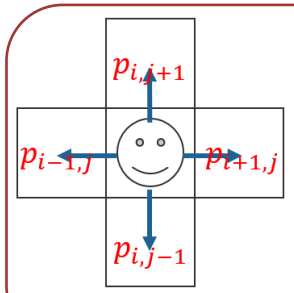
☹ **Insufficient escape and evacuation plans**

☹ **Maintenance plan without safety consideration**

☹ **Many modification in the facility**

Escape Simulation and Assessment Solutions

- Evaluation of current escape route by specialized escape route simulation program.
- Identification of critical point (bottle neck) in escape route plan
- Provide improvement plan of escape route
- Escape simulation in accidental scenario
- Provide safe maintenance plan (location of maintenance, number of maintenance persons, barricade plan in maintenance period)

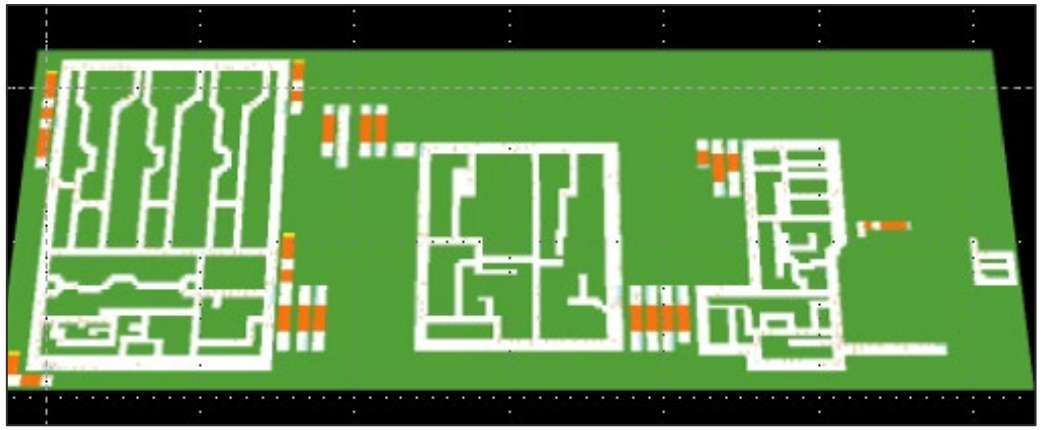


$$p_{ij} = N \exp(k_D D_{ij}) \exp(k_S S_{ij}) p_i(i,j) pw$$

S_{ij} : Static floor field
k_S : Effect of Static floor field
D_{ij} : Dynamic floor field
k_D : Effect of Dynamic floor field
$p_i\ (i,j)$: Effect of direction
p_w : Effect of walls

Human Escape Model

+Characteristics of Plant Facility



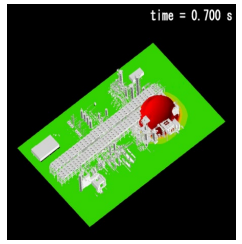
Specialized Plant Escape Route Simulation Program (developed with the University of Tokyo)

Escape Simulation and Assessment

Return to HSE menu

Workflow & Result

Plant Layout → Accident Scenario Definition → Escape Simulation → **1) Improvement Plan 2) Maintenance Plan**



OUTPUTS

1) **Improvement Plan**
   - ✓ Modification plan of escape route to enhance safety for operators in normal situation and accidental situation
2) **Maintenance Plan considering safe operator escape**
   - ✓ Maintenance activities in same location
   - ✓ Number of maintenance person
   - ✓ Barricade plan

Our Strengths

- Professional Safety, Operation and Maintenance Teams
- Top global experiences of escape route design and evacuation planning from EPC execution
  Plant type - Refinery, Gas Processing, LNG, Chemical
  Plant location – Onshore, Offshore
  Client – IOCs, NOCs
- Specialized escape simulation program developed with the University of Tokyo. Research Article is available in "Chemical Engineering Transactions (CET) Journal Vol 90(2022)"

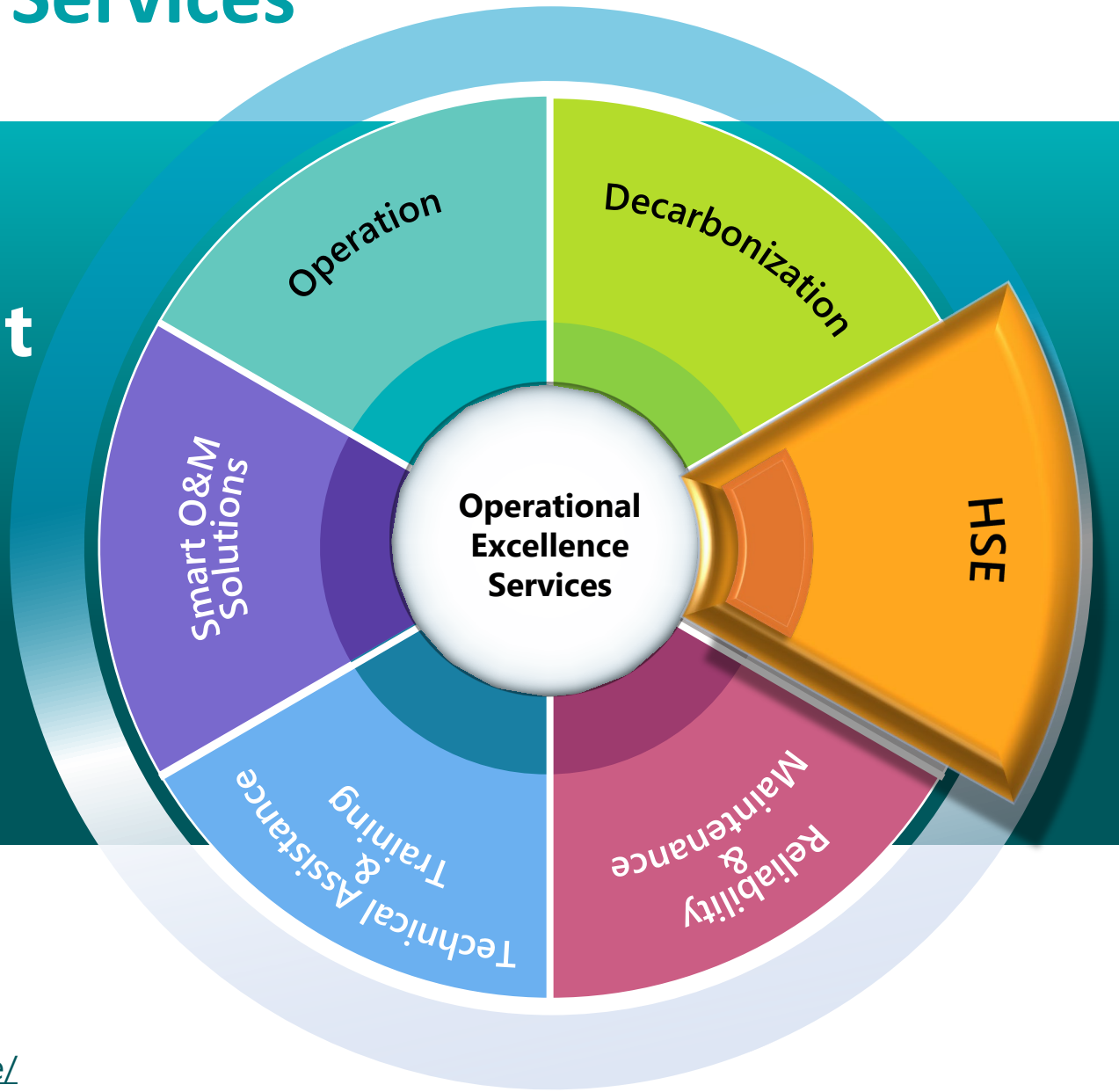
Our Experiences

Plant and Escape Route Design Cases **500+ Cases**

Operational Excellence Services

Health・Safety・Environment (HSE)

Hazardous Area Classification (HAC) Optimization



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Hazardous Area Classification (HAC) Optimization

Do you have any of these issues?

☹ **Cannot use unclassified electrical devises at site**

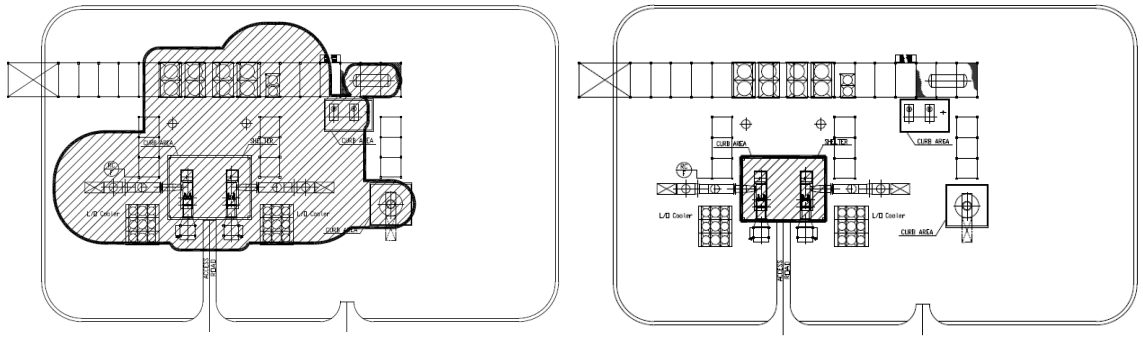
☹ **Many manual works for inspections and recording**

☹ **Increase cost for inspections and recording**

Unclassified electrical devices can not be used in hazardous area

HAC Optimization Solution

- Optimize the hazardous area for unclassified electrical device with International Standards (IEC 60079-10)
- Based on the detail analysis, the classified area can be reduced/optimized
- Propose a plan to use unclassified electrical devices to minimize the accident risk



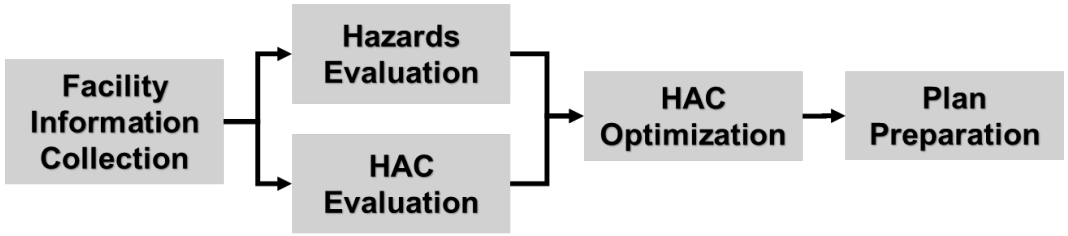
HAC for permanent items **HAC for portable items**

Hazardous Area Optimization for temporary use of unclassified electrical devices

Hazardous Area Classification (HAC) Optimization

Return to HSE menu

Workflow & Result



- Collection of facilities information
- Evaluation of existing hazardous area classification
- Evaluation of potential hazards' magnitude
- Optimization hazardous area classification considering not only hazardous area classification requirements but also potential impact in case of ignition
- Preparation of plan for use of unclassified electrical devices

Our Strengths

- Professional safety and electrical engineers for not only hazardous area classification but also risk assessment
- Top global experience of hazardous area classification design
  Plant type - Refinery, Gas Processing, LNG, Chemical
  Plant location – Onshore, Offshore
  Clients – IOCs, NOCs
- Wide knowledge for international standard such as, IEC, IP, EI, API, NFPA, JIS, etc.

Our Experiences

Hazardous Area Classification Design Experiences

500+ Cases

Operational Excellence Services

Health・Safety・Environment (HSE)

Noise Assessment

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Noise Assessment

Do you have any of these issue?

☹ **Noisy work environment**

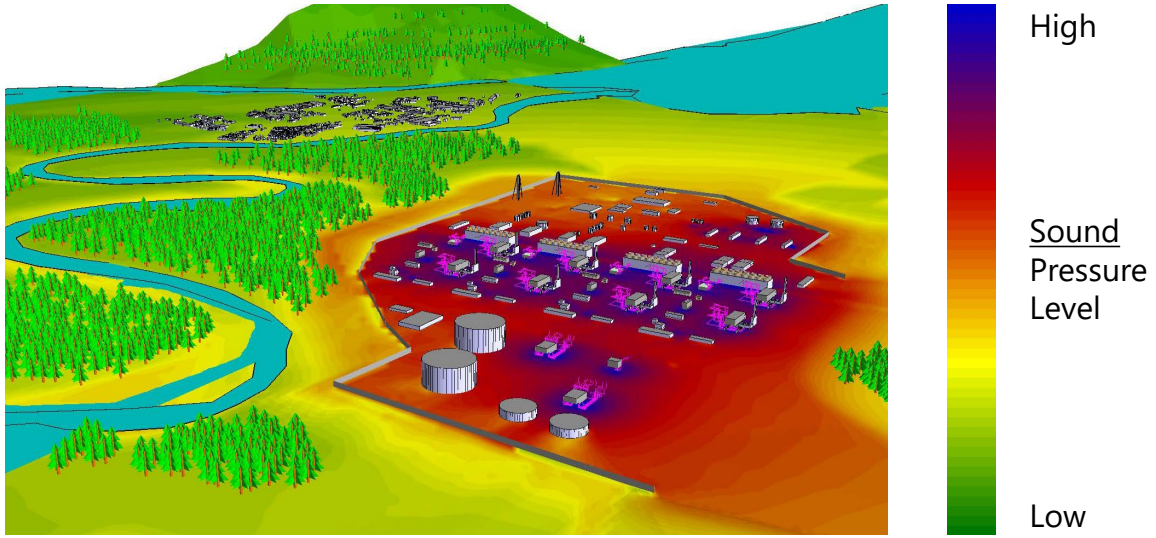
☹ **High cost noise mitigation for noise emitters**

☹ **Need for consulting partner for noise assessment**

Noise Assessment Solution

- Through noise survey;
  - ➢ Identify noise sources
  - ➢ produce noise contour maps before and after noise mitigation plans
- Propose most effective and cost-minimum noise mitigation plans based on result of noise simulation
- Verify the effectiveness of noise mitigation plans

Noise contour map



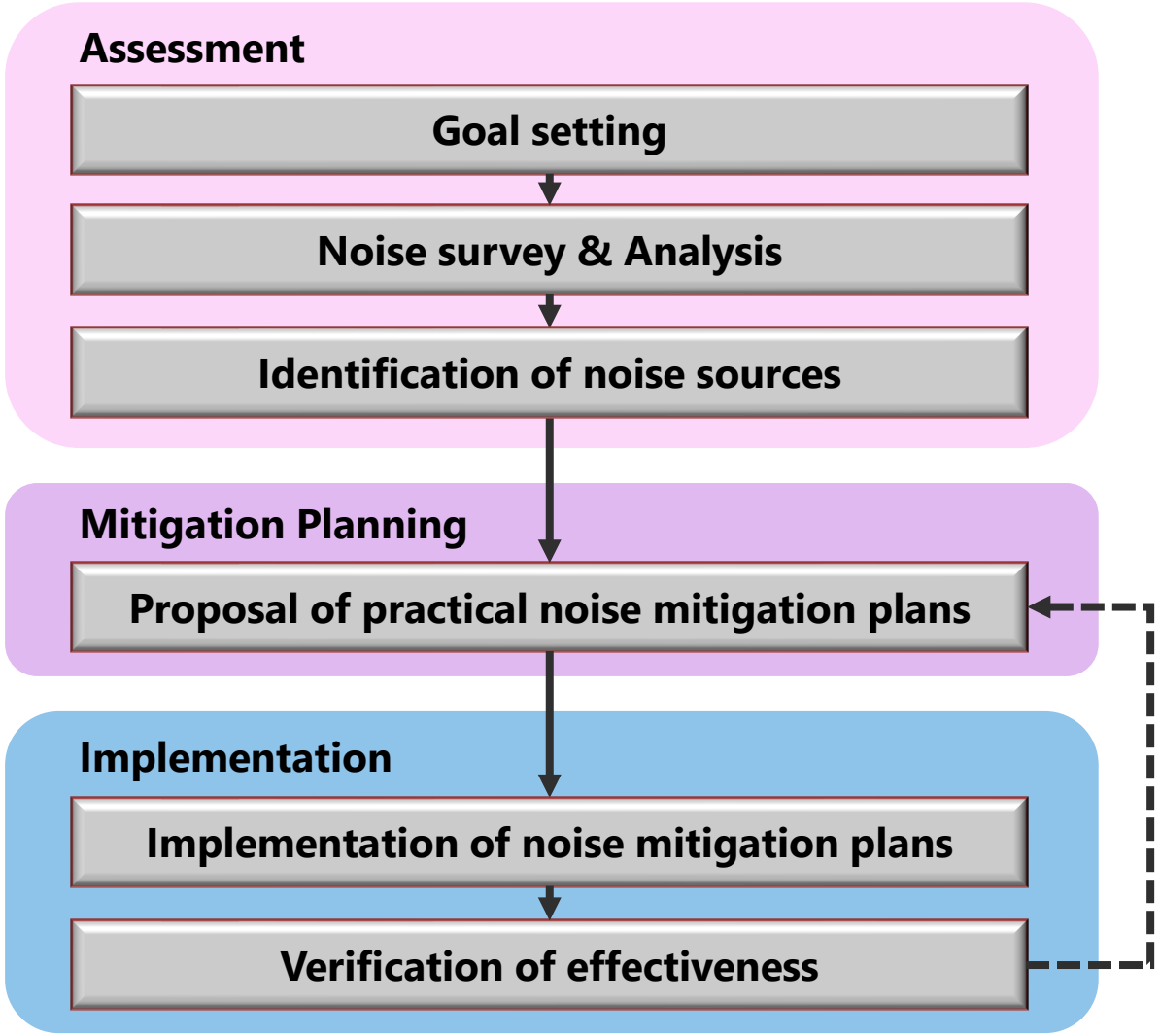
Example of noise mitigation plan (Acoustic insulation)

Before

After

Noise Assessment

Workflow & Result



Our Strengths

- Experienced with noise assessment/control technologies for domestic and overseas customers for many years, and solved various noise problems
- Provided services for noise survey, evaluation, planning of countermeasures, and confirmation of effectiveness after implementation of countermeasures

Our Experiences

600+
Cases

Noise assessment/control technology for 600+ cases.

50+
Years

We have been accumulating noise assessment/control technologies for more than 50 years through EPC businesses and consulting services.

Noise Assessment

PLANT PLUS

Return to HSE menu

Regulatory Inspections

We provide prompt and accurate measurements and analysis of site boundaries and neighborhood measurements for regulatory inspections, as well as equipment, piping, and indoor measurements within the plant site.

- **All Inclusive (Noise maps & Proposal)**

  Measurement results are shown as noise maps, and proposal of variety of noise mitigation measures are included.

- **Latest Measurement Technology**

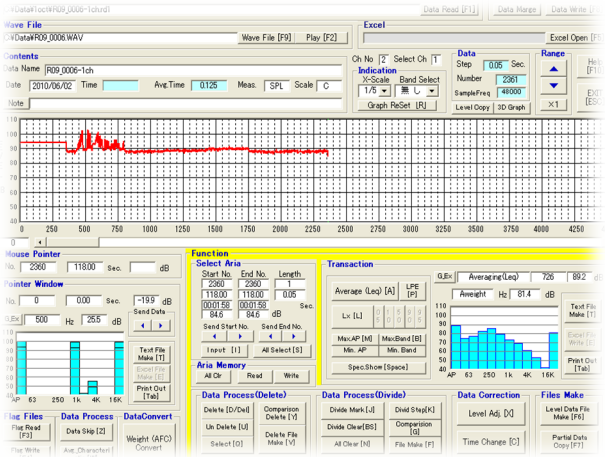
  In addition to the conventional noise level measurement using a sound level meter, we offer the best measurement method such as measurement system using a tablet, cell phone or unmanned noise monitoring measurement with the latest technology. We will propose the most suitable measurement method for each client.

Noise Measurement and analysis

Conventional measurement

Noise monitoring

Tablet measurement system



Noise analysis

Operational Excellence Services

Health・Safety・Environment (HSE)

CoreSafety®

Application for Risk-Based Process Safety

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Access to CoreSafety

https://sales.coresafety.biz/en/

CoreSafety®-Risk-Based Process Safety Application

Do you have any of these issues?

- **Only limited persons know where PHA(*) data such as HAZID, HAZOP, LOPA(**) is stored**
- **PHA data is not actively used for optimization of asset management program**
- **Risk profile of facilities is not shared in organization**

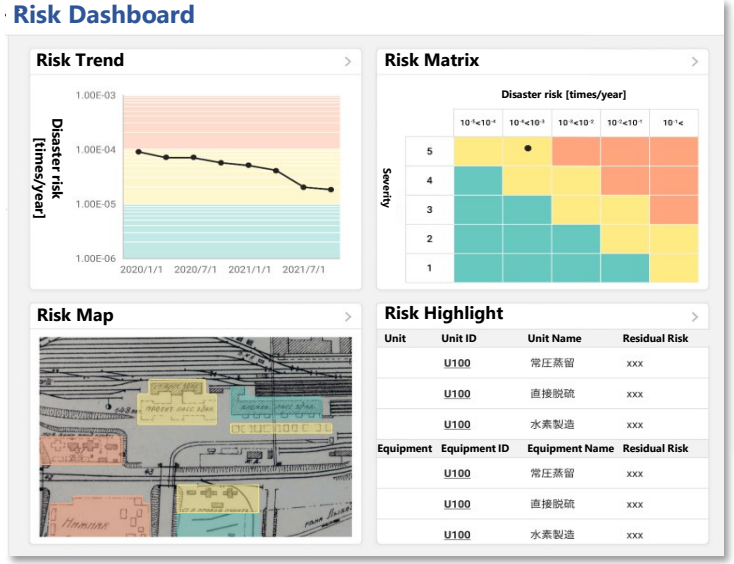
(*)PHA : Process Hazard Analysis

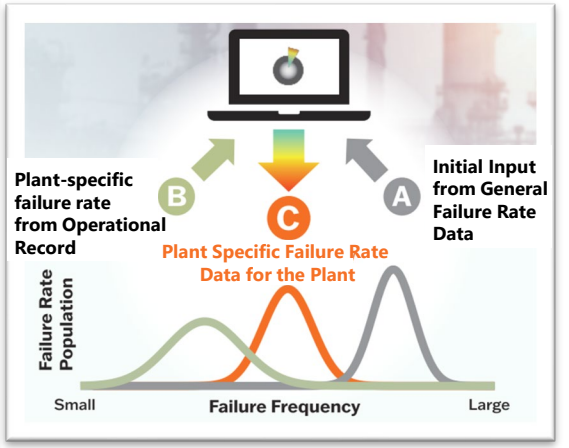
(**) HAZID : Hazard Identification Study
HAZOP : Hazard and Operability Studies
LOPA : Layer of Protection Analysis

Functional Features

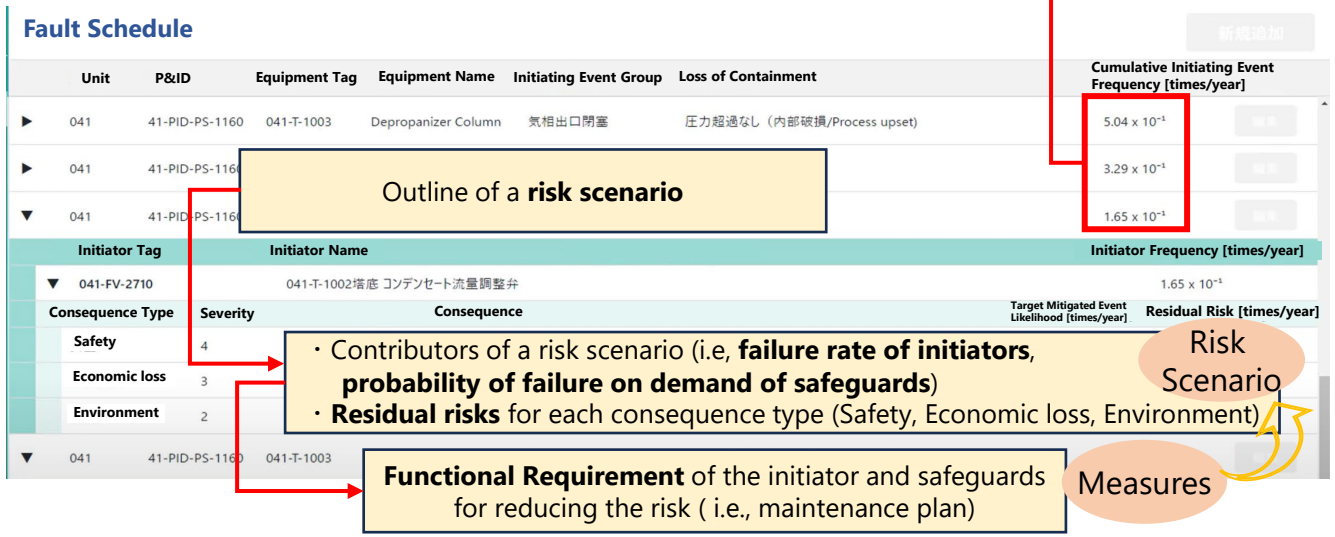
CoreSafety®, one of JGC in-house application, can summarize and register PHA results to visualize Risk Profile, and easily accessed through a web browser

- **Risk Dashboard**
- **Up-to-date risk by Bayesian Update(***)**
- **Fault Schedule (i.e., hazard register)**
- **Functional Requirements' management tied with risk scenario**
- **Safety Performance KPI monitoring**





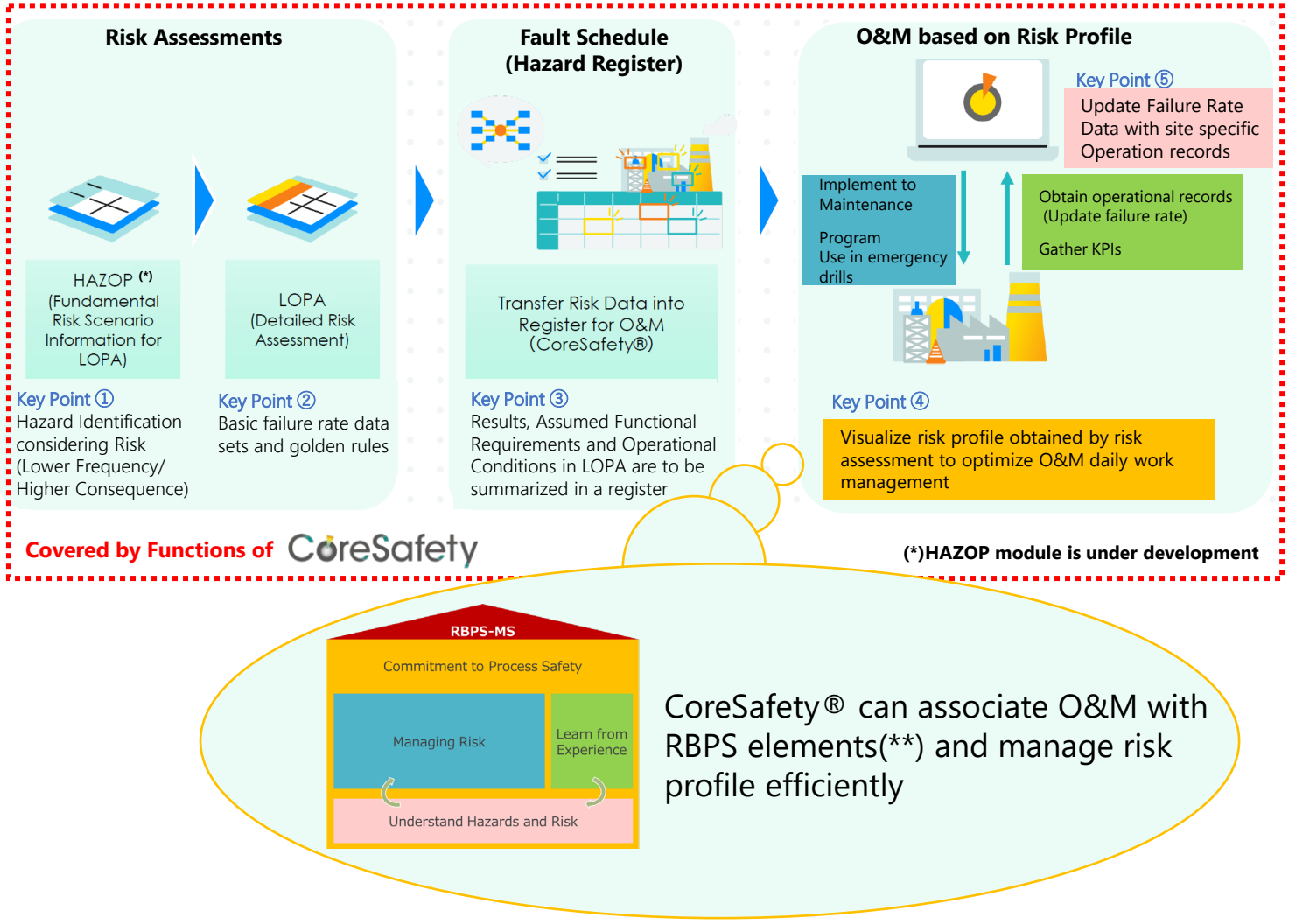
Bayesian Update



(***) A statistical method that updates the probability for a hypothesis as more evidence or information becomes available.

CoreSafety®-Risk-Based Process Safety Application

Implementation of Smart RBPS (Risk Based Process Safety)



(**)RBPS Elements are suggested by AIChE CCPS (American Institute of Chemical Engineers Center for Chemical Process Safety)

Advantages of CoreSafety®

- **Assured by Collaborative Research Projects:**
  Smart RBPS methodology taken in CoreSafety is assured by a collaborative research project involving academia, regulatory bodies, and industry in Japan.
- **Risk Profile Library:**
  1. **Based on our experience**
     Be built on extensive Process Safety Management (PSM) and Process Hazard Analysis (PHA) experience in global Oil & Gas, Chemical, and Nuclear industry projects.
  2. **Standardized Profiles**
     Provides standardized risk profiles for various equipment types (e.g., pumps, fractionation columns, drums).
  3. **Efficient Assessment**
     Enables efficient risk assessments without needing detailed design information.

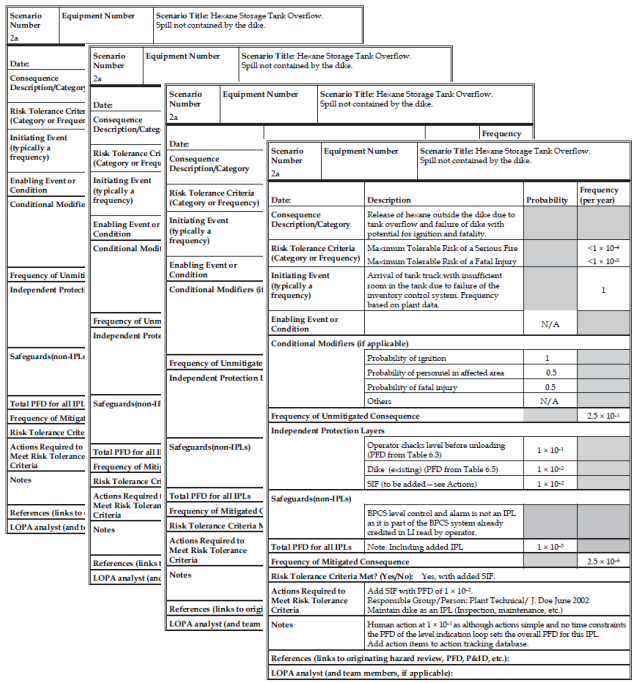
e.g.) Two Phase Separator
Standardized **P&ID** and **Risk Scenario** are available for risk assessments

CoreSafety®-Risk-Based Process Safety Application

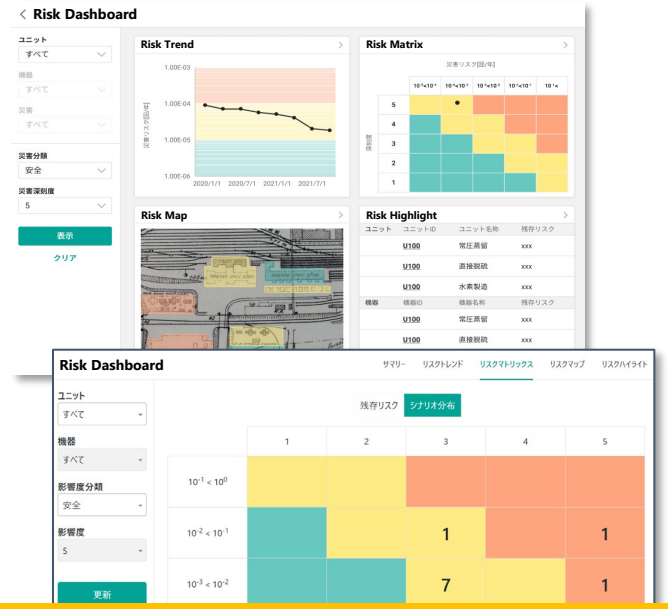
Return to HSE menu

User Benefits

BEFORE PHA by Excel/Paper



Implementation CoreSafety



- Visualizes Risk and Optimizes O&M Tasks
- Brings “Risk Data” to the center of RBPS Management System.

AFTER RBPS’s cycle is improving

Actual Benefits of adopting CoreSafety®

- Achievement of ALARP(*) Decision for Higher Risk Items

(*)ALARP : As Low As Reasonably Practicable

- Improved Response and Procedure for Safety Critical Alarms by efficient training utilizing CoreSafety®
- High Integrity and Reliability of Equipment and Safety Systems
- Enhanced Risk Management at MOC and PTW (**)

(**)MOC : Management Of Change, PTW : Permit To Work

- Sophisticated Emergency Planning for Designated Process Incidents