

ioMosaic[®]

Minimizing risk. Maximizing potential.[®]

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Process Safety Enterprise[®] - AIMS / KPI - Dashboard

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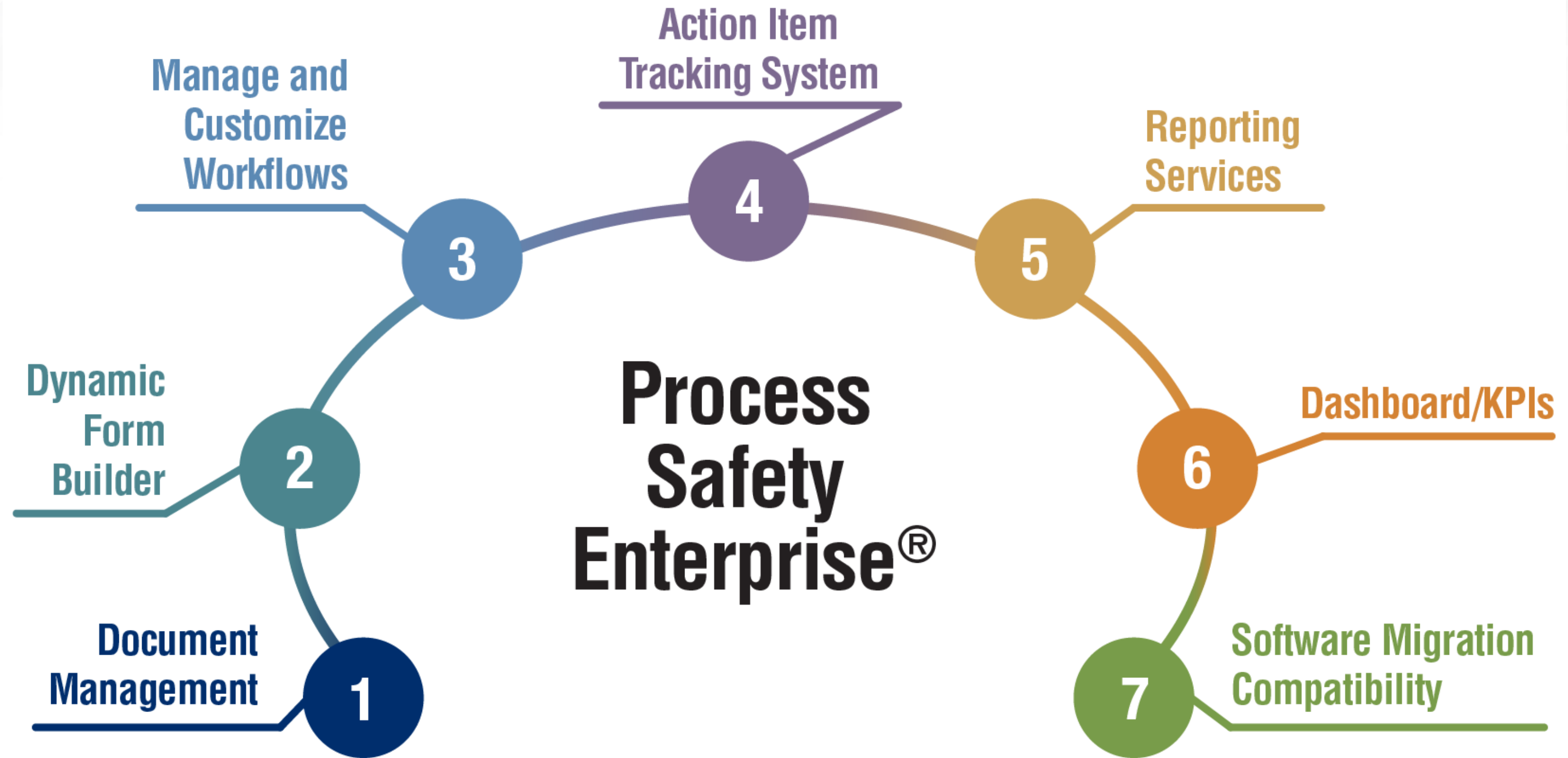
Tao Yao – Vice President and Partner ioMosaic Corporation



- ▶ M.S. Computer Science (Northeastern University)
- ▶ M.S. Chemical Engineering (University of Alabama)
- ▶ Technical Expertise includes:
 - ▶ Software Design
 - ▶ Web Application, Web Services
 - ▶ Database Architecture
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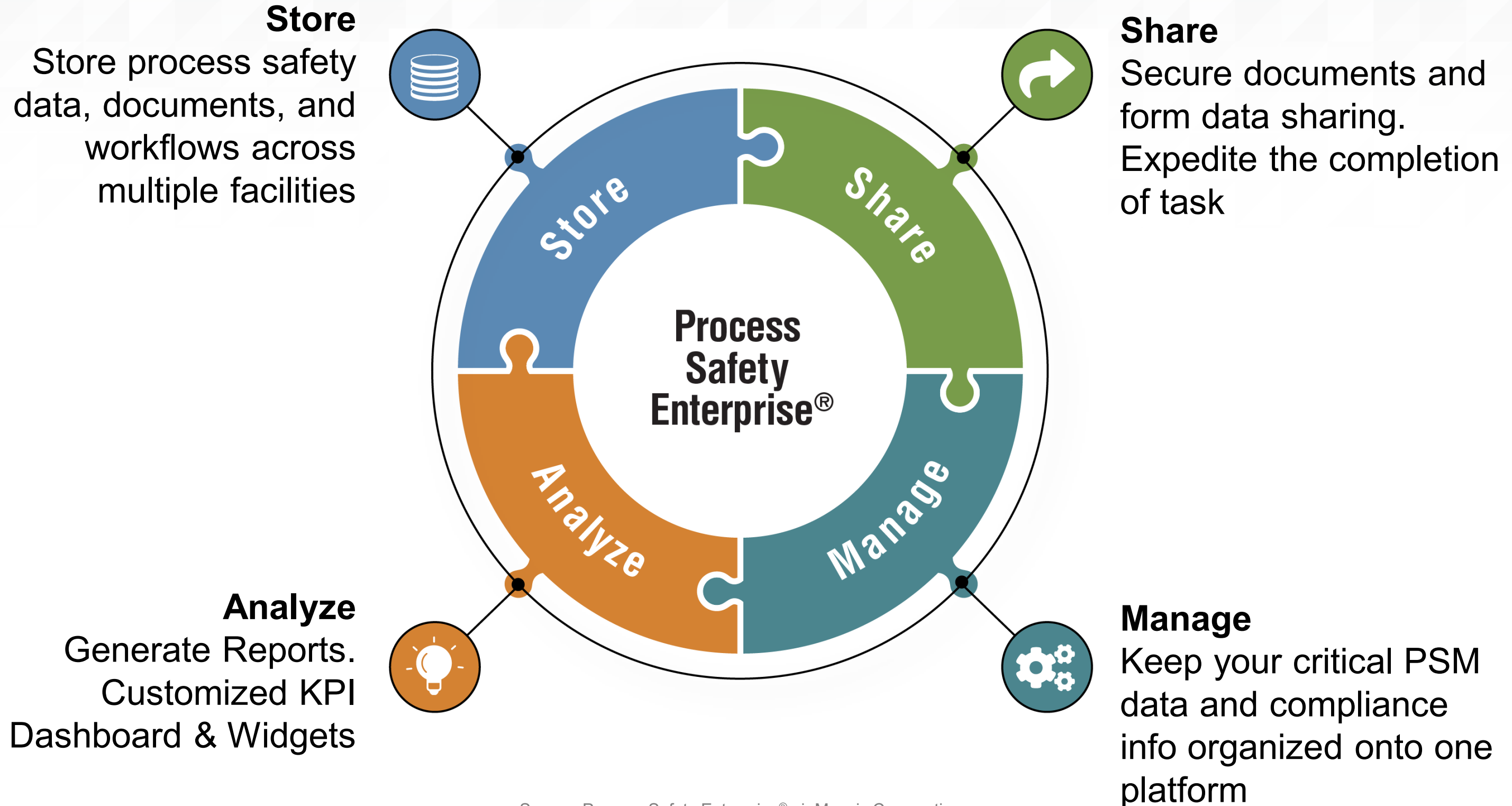
Process Safety Enterprise® (PSE)

- ▶ Enterprise-level, user configurable and evergreen data management platform
- ▶ Integrate all the PSM elements and visual workflow in one enterprise system
- ▶ Securely maintain and easily manage the lifecycle of process safety data for compliance, risk management, and business advantage
- ▶ Enforces data reliability, availability, auditability and maintainability, delivering a complete and evergreen data management
- ▶ Accessible anytime and anywhere



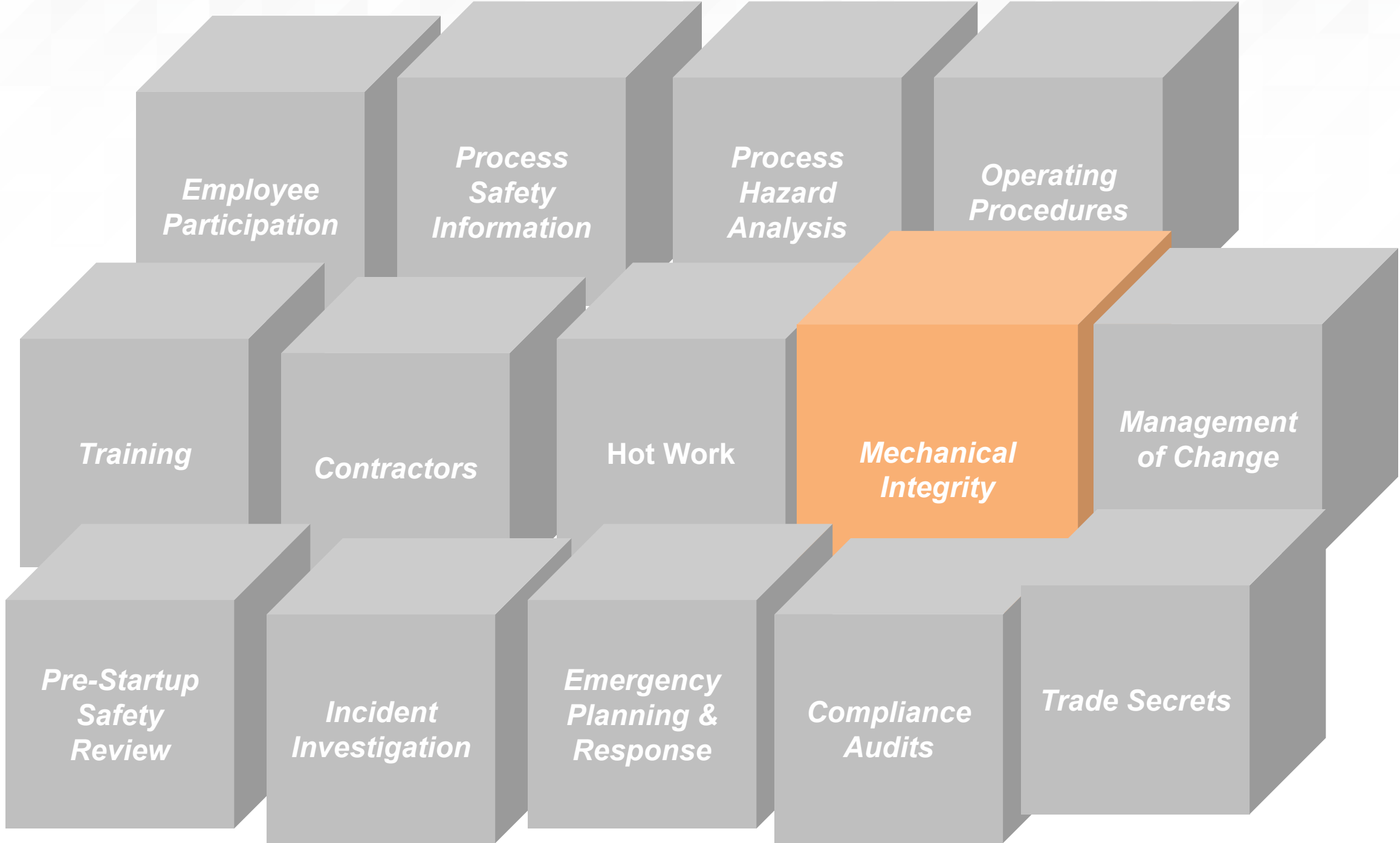
Source: Process Safety Enterprise® - ioMosaic Corporation

Single Source



Source: Process Safety Enterprise® - ioMosaic Corporation

The PSM Elements – Building Blocks for Reducing Risk



Source: ioMosaic Corporation

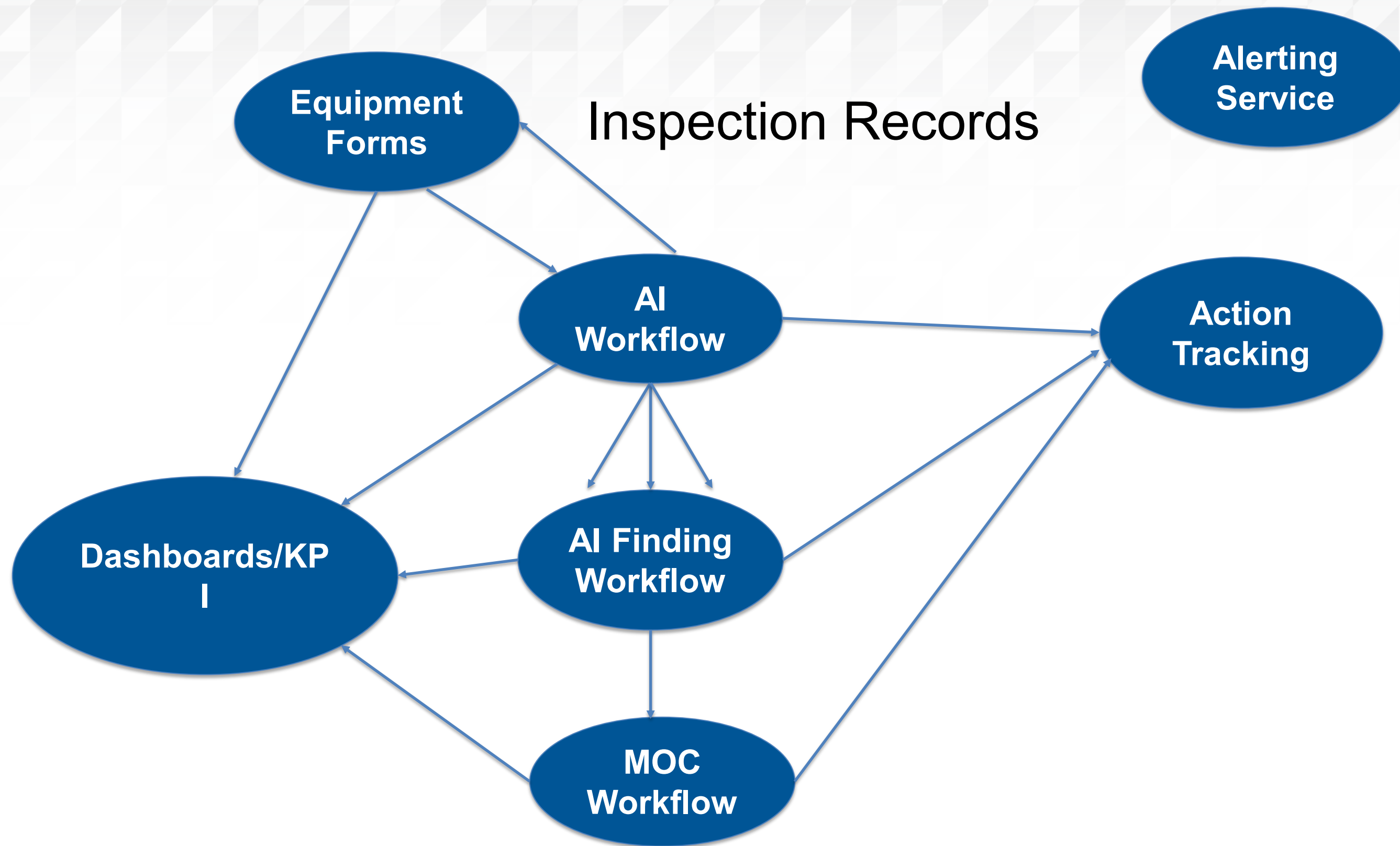
PSE Asset Integrity Management Service (AIMS)

AI Requirement	How PSE addresses requirement
Documentation of maintenance procedures	Document library the user can organize
Documentation of included equipment, equipment design information, specifications, and operating conditions	Established equipment forms that self-modify depending upon user responses
Documentation of required ITPM and frequencies and the RAGAGEP used to establish them	Inspection records tab on the equipment forms and the ability to attach documents from the library. Reference table for inspection frequencies.
Execution of ITPM at established frequencies	AI Module workflow connects to equipment forms and tracks ITPM to completion. Standard report assists with scheduling
Documentation of details of the executed ITPM	AI Module workflow requires this information. Inspection checklists templates can be saved in the library.
Resolution of equipment deficiencies/findings	AI Finding workflow connects to the AI workflow and tracks findings to completion. Standard report assists with scheduling.
Timely completion of ITPM and resolution of deficiencies	Reports and dashboards to schedule tasks and summarize workflow status and on-time completion rates. Contain live links back to the AI and AI Finding workflow tasks.
Management of change if equipment or parts are not replacement in kind, if equipment has to be re-rated, taken out of service or temporarily repaired.	MOC Module

PSE – AIMS

- ▶ Platform to document equipment design, specifications and operating condition using Equipment Forms for easy access and retrieval
 - ▶ Can be customized per client request
 - ▶ Assistance in populating data
- ▶ Platform to store and easily retrieve inspection information
- ▶ Customized workflows for AI - inspections and AI – Findings with a link to Management of Change Workflow
- ▶ Customized Reports and Charts
- ▶ Thickness readings documentation with corrosion and remaining life calculations
- ▶ Connectivity between Equipment Forms and Workflows to allow initiation of Workflows from the Equipment Form and automatic transfer of information between Equipment Forms and Workflows
- ▶ Reports provide live links to Equipment Forms and Workflow from the report page. These links stay live when the reports are exported to Excel.
- ▶ Electronic Action Item tracking

PSE – AIMS



Source: ioMosaic Corporation

AIMS – Equipment Forms

AI - Agitator
AI - Blower
AI - Centrifugal Pump
AI - Compressor
AI - Conservation Vent
AI - Dust Collector
AI - Emergency Vent
AI - Fan
AI - Filter

AI - Fin Fan Air Cooler
AI - Flame Arrester
AI - Heat Exchanger - Plate and Frame
AI - Heat Exchanger - Shell and Tube
AI - Hopper or Bin
AI - Instrumentation
AI - Piping Circuit
AI - Positive Displacement Pump
AI - Pressure Vessel

AI - Relief Valve
AI - Rotary Valve
AI - Rupture Disc
AI - Screw Conveyor
AI - Scrubber
AI - Storage Tank
AI - Vacuum Breaker



AIMS – Pressure Vessel Inspection Records

General Construction & Materials Trays & Internals Service Conditions Vessel Damage Mechanism Nozzles Service Conditions Jacket Service Conditions Coil

Inspection Records Inspection Company Data History

RBI Assessment Yes No **RBI Assessment Completed on**

Inspection Documents Folder

Inspection Records Inspection

*Person to be notified if overdue inspections or T-min issues Dianne Coor

Inspection Type Frequency

Inspection Type Frequency

Inspection Type Frequency

Operations Status

Next Inspection Date

Operations Status

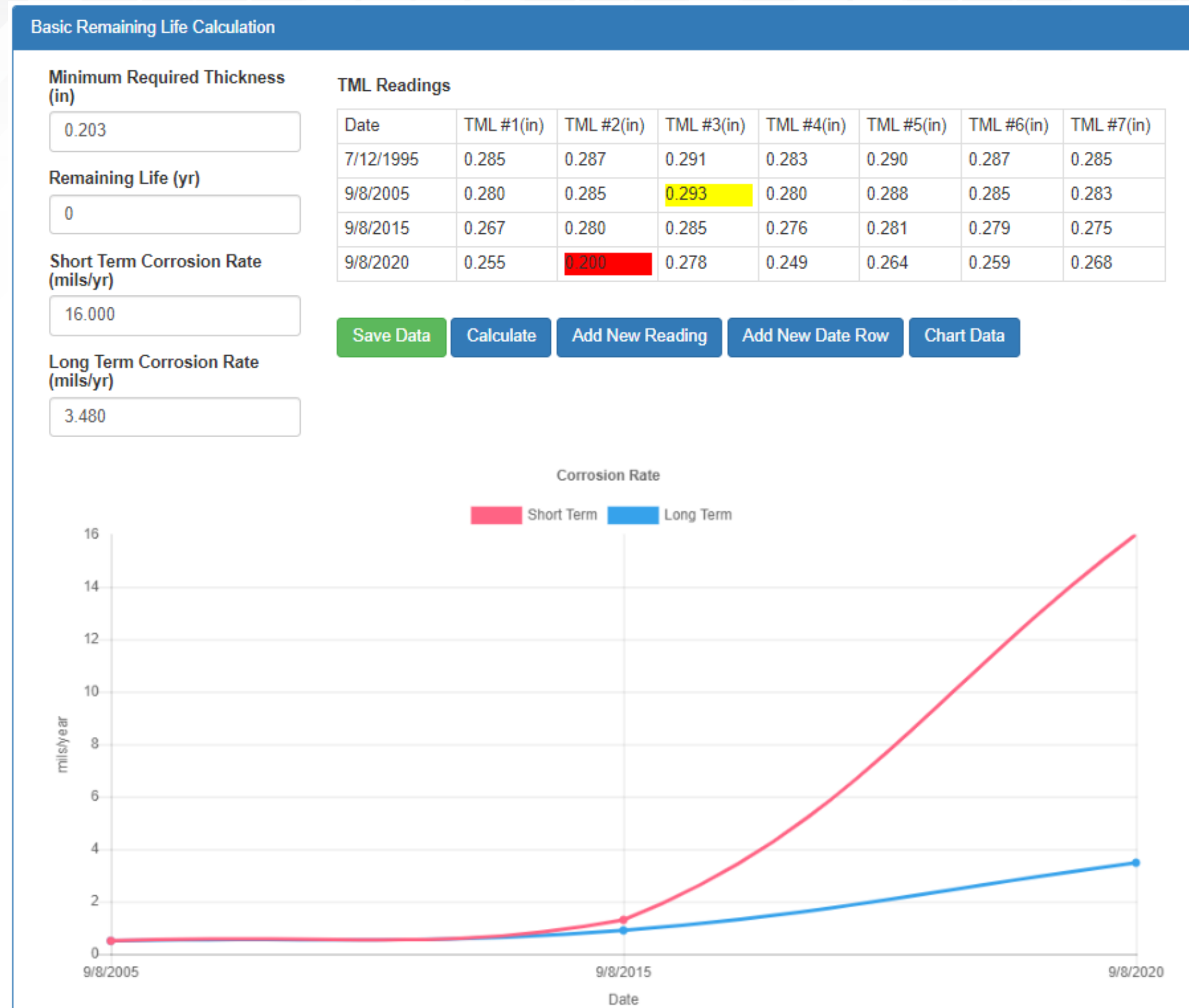
Next Inspection Date

Inspection records —

Inspection Date	Inspection Type	Inspection Findings	Report approved By	Labor Hours	Labor Cost	Material Cost	Total Cost
	<input type="text" value=""/>	<input type="text" value="N/A"/>					
7/29/2015	<input type="text" value="Formal Visual Extri"/>	<input type="text" value="No"/>	Dianne Cool	3	2	4	2
9/17/2010	<input type="text" value="Formal Visual Intn"/>	<input type="text" value="Yes"/>	Dianne Cool	2	250	300	800
9/29/2020	<input type="text" value="Thickness"/>	<input type="text" value="Yes"/>	Dianne Cool	6	300	0	1800
8/26/2020	<input type="text" value="Formal Visual Extri"/>	<input type="text" value="Yes"/>	Dianne Cool	5	400	0	2000

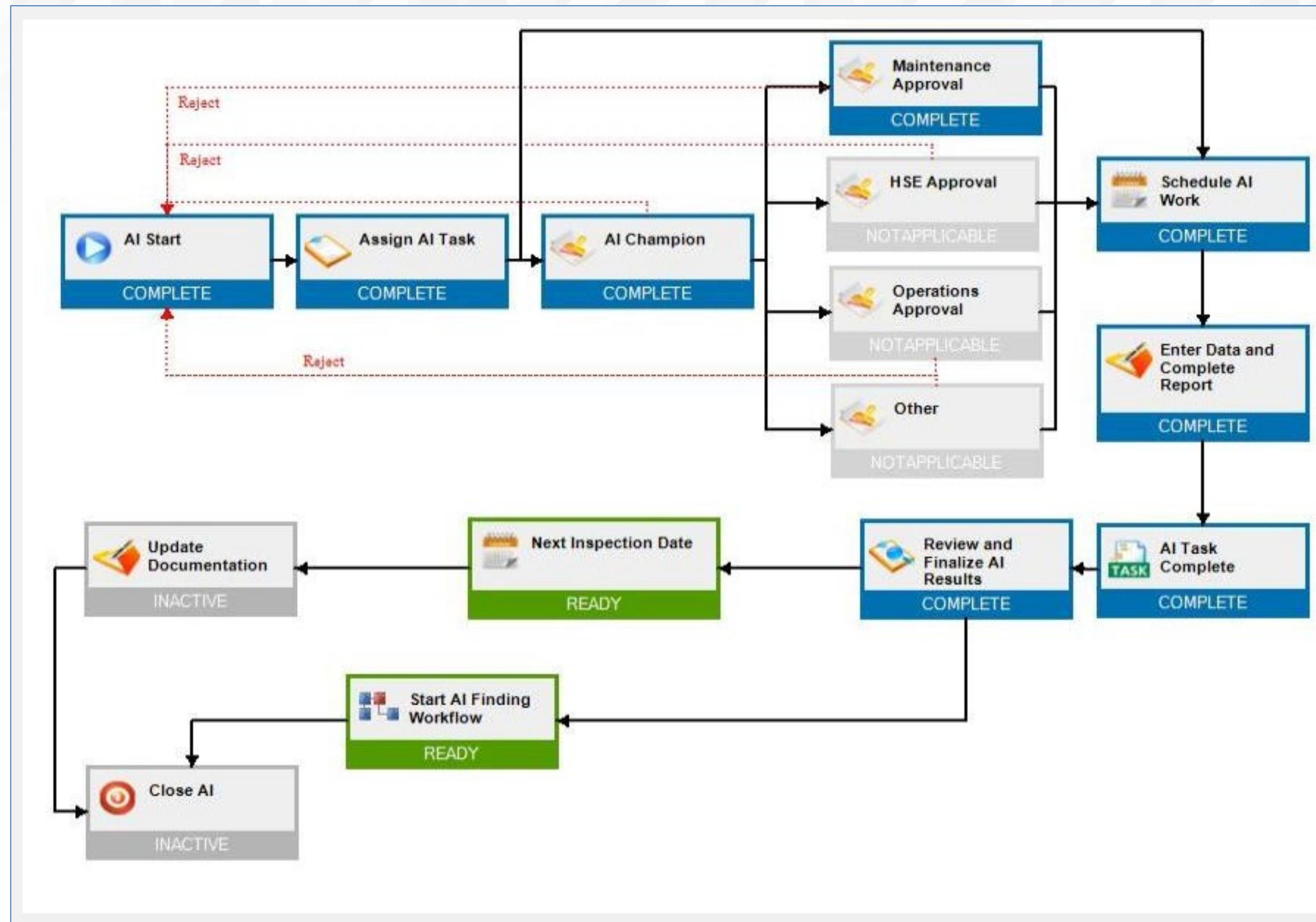
Source: Process Safety Enterprise® - ioMosaic Corporation

AIMS – Pressure Vessel Basic Remaining Life Calculation



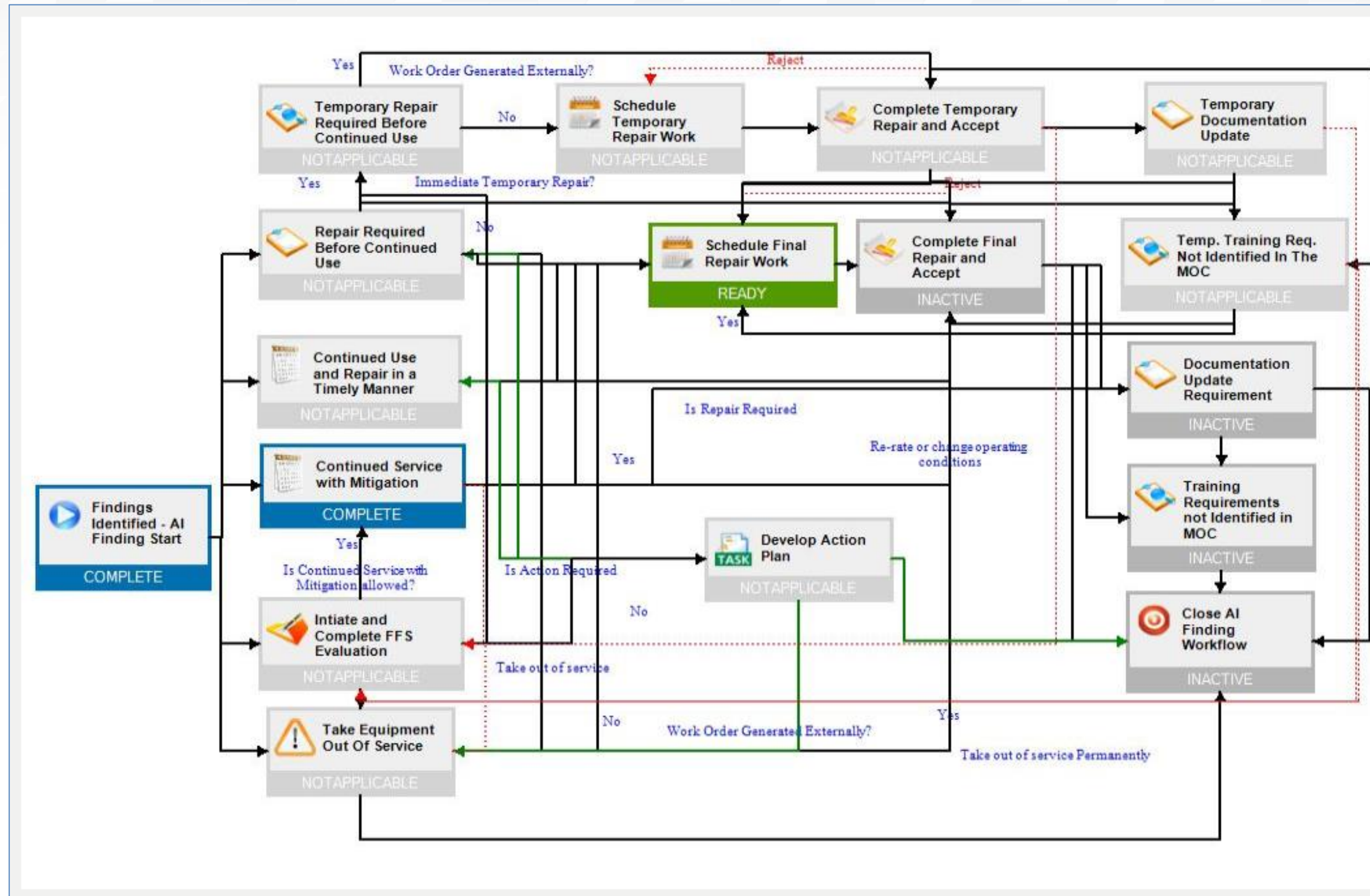
Source: Process Safety Enterprise® - ioMosaic Corporation

PSE – AI Workflow



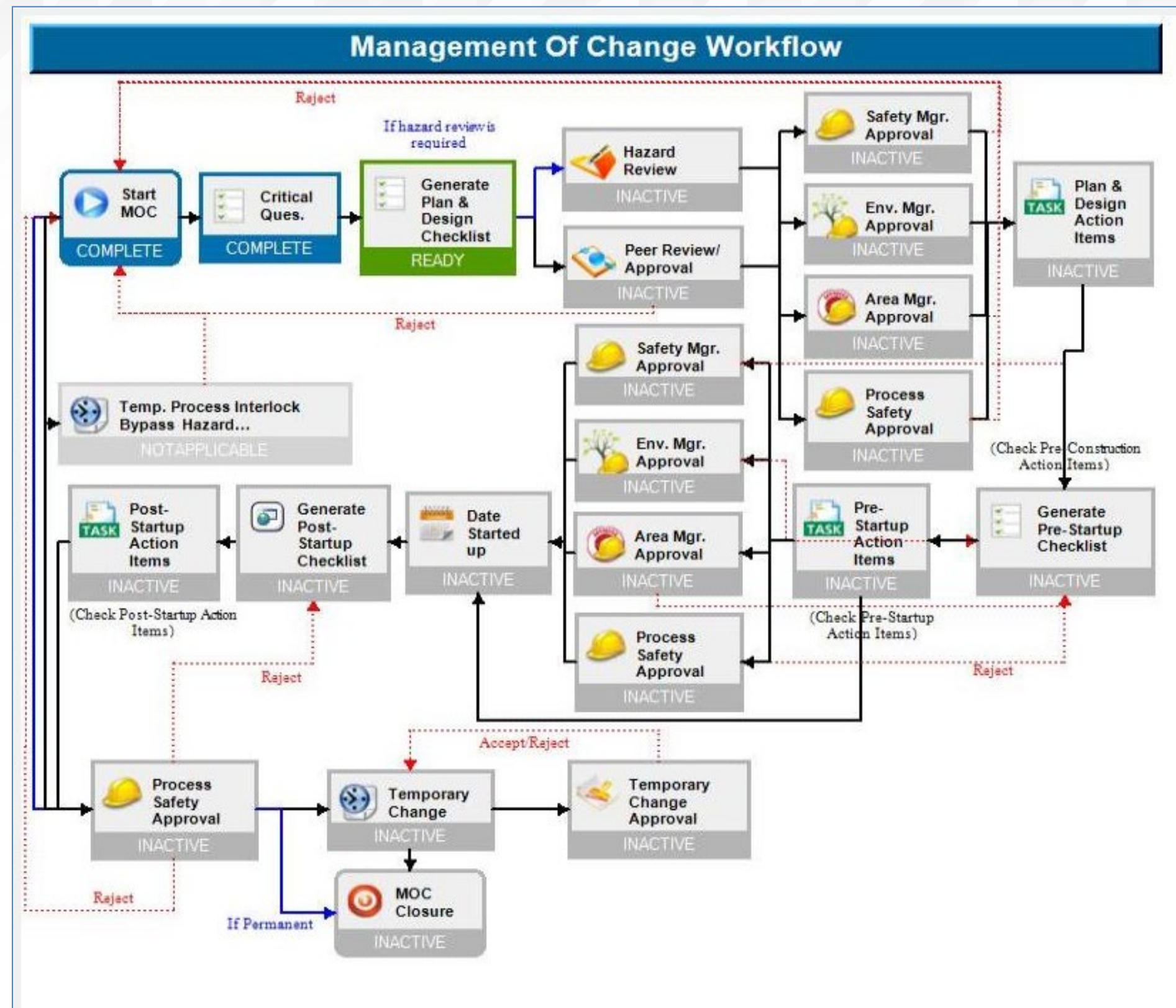
Source: Process Safety Enterprise® - ioMosaic Corporation

PSE – AI Finding Workflow



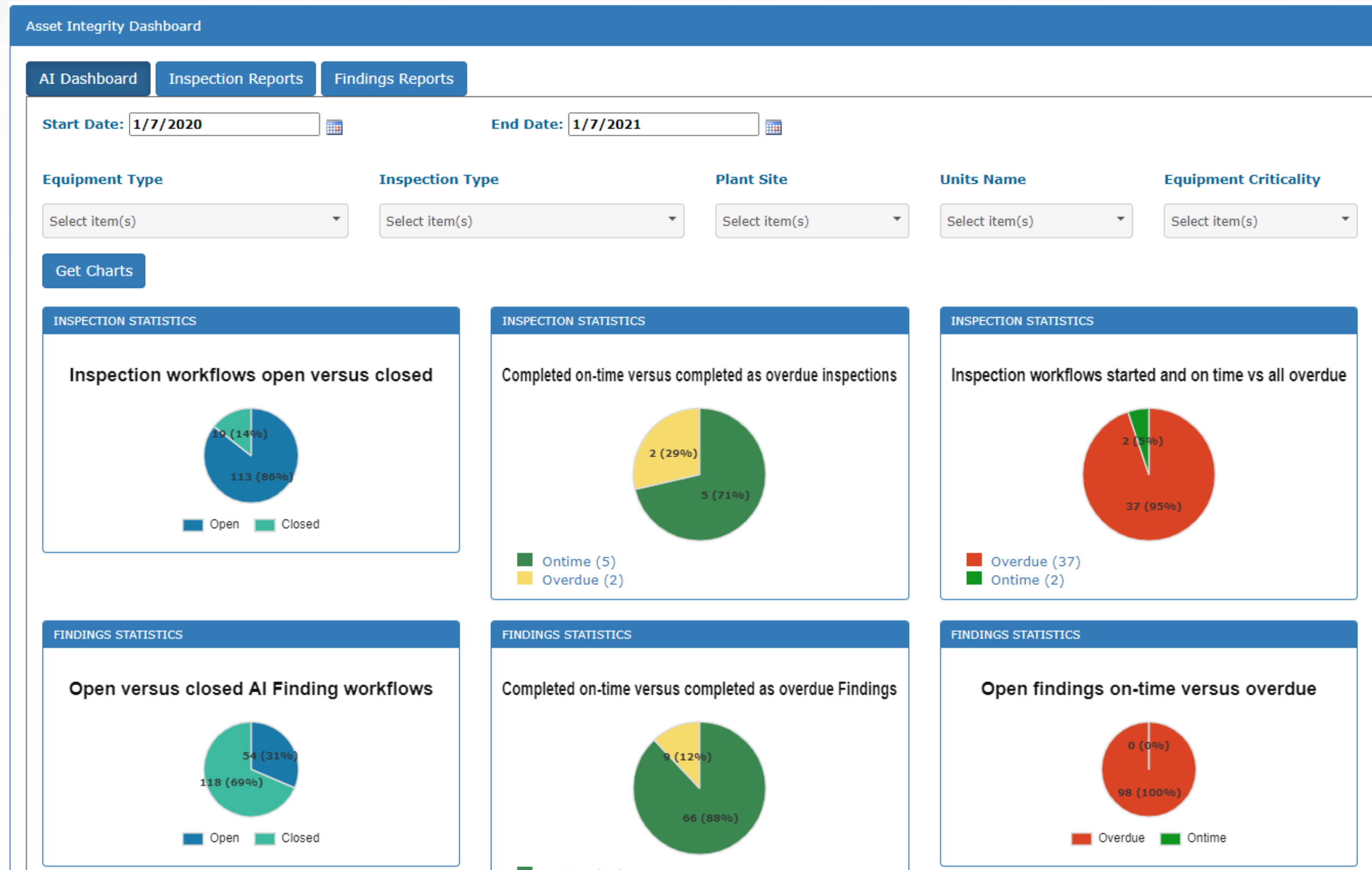
Source: Process Safety Enterprise® - ioMosaic Corporation

PSE – MOC Workflow



Source: Process Safety Enterprise® - ioMosaic Corporation

PSE – AI Dashboard



Source: Process Safety Enterprise® - ioMosaic Corporation

PSE – AI Dashboard

Asset Integrity Dashboard

AI Dashboard | Inspection Reports | Findings Reports

Start Date: End Date:

Equipment Type: Inspection Type: Plant Site: Units Name: Equipment Criticality:

Inspection Due Report Display Per Page

Equipment Number	Form Name	Equipment Type	Inspection Type	Next Inspection Date	Plant Site	Unit Name	Equipment Criticality	PMI?	Operation Status	Inspection workflow started?	AI Due Date
444	14687 / AI - Pressure Vessel	Column - Packed	Thickness	1/13/2021	Hard Resin Flaker/bagger	B and G	C- Medium	No	Full production	No	N/A
PV-1234	13281 / AI - Pressure Vessel	Reactor	Formal Visual Internal	2/10/2021	Hard Resin Kettles	Lignin Production	B- High	Yes	Equipment de-energized	No	N/A

Page 1 of 1 | 1 Total Records: 2

Inspection OverDue Report Display Per Page

Equipment Number	Form Name	Equipment Type	Inspection Type	Next Inspection Date	Plant Site	Unit Name	Equip Criticality	PMI?	Operation Status	Inspection workflow started?	AI Due Date
R-9321	12788 / AI - Pressure Vessel	Reactor		6/9/2013	Salem	Polymerization	A - Very High	No		No	N/A
A-123	15120 / AI - Agitator	Agitator	Vibration	1/18/2020	Hard Resin Kettles	B and G	B- High	No	Full production	AI Workflow 15122	08/27/2020
R-9321	12788 / AI - Pressure Vessel	Reactor		3/5/2020	Salem	Polymerization	A - Very High	No		No	N/A
P-234	14839 / AI - Piping Circuit	Piping Circuit	Thickness	7/1/2020	Post Refinery Kettles	Asphalt Plant	C- Medium	No	Full production	No	N/A
444	14687 / AI - Pressure Vessel	Column - Packed	Electrical PM	7/1/2020	Hard Resin Flaker/bagger	B and G	C- Medium	No	Plt SD & de-energized	No	N/A
HX-123	14922 / AI - Heat Exchanger - Shell and Tube	Heat Exchanger - Shell and Tube	Thickness	8/3/2020	CTO/Hill track	CTO Plant	B- High	No	Plant shutdown & energized	AI Workflow 14926	08/28/2020
PSV-222	14932 / AI - Relief Valve	Other	Pull for inspection	8/5/2020	Post Refinery Kettles	B and G	A - Very High	No	Equipment energized & idle (not producing material)	No	N/A
SB-444	15473 / AI - Scrubber	Scrubber	Formal Visual Internal	8/11/2020	Dispersed Size	Dispersed Size	B- High	No	Equipment energized & idle (not producing material)	No	N/A
444	14687 / AI - Pressure Vessel	Column - Packed	Formal Visual Internal	8/12/2020	Hard Resin Flaker/bagger	B and G	C- Medium	No	Equipment de-energized	No	N/A
22	14814 / AI - Pressure Vessel	Reactor	Formal Visual Intl	8/12/2020	Post Refinery Kettles	B and G	B- High	No	Energized & idle (equip not producing material)	No	N/A

Page 1 of 4 | 1 2 3 4 Total Records: 37

Source: Process Safety Enterprise® - ioMosaic Corporation

PSE – AI Dashboard

Asset Integrity Dashboard

AI Dashboard | Inspection Reports | Findings Reports

End Date:

Equipment Type: Plant Site: Units Name: Equipment Criticality:

Asset Integrity Findings Open Report Display Per Page

Equipment Number	Equipment Type	Description	Disposition	Ready Task	Current Responsible Person	Final Resolution Date	Criticality	Findings Workflow Link	Plant Site	Unit Name
No page selected. Total Records:										

Asset Integrity Findings Overdue Report Display Per Page

Equipment Number	Equipment Type	Description	Disposition	Ready Task	Current Responsible Person	Final Resolution Date	Criticality	Asset Integrity Finding Form Name	Plant Site	Unit Name
5	Column - Trayed		Not Applicable	Continued Use and Repaire in a Timely Manner, Schedule Final Repair Work		5/8/2017	33	1446 / Asset Integrity Finding	CTO/Hill track	CTO/Hill track
14	Column - Trayed		Repair Required Before Continued Use	Repair Required Before Continued Use, Continued Service with Mitigation, Intiate and Complete FFS Evaluation, Take Equipment out of service		5/27/2017	14	1451 / Asset Integrity Finding	Post Refinery Kettles	Post Refinery Kettles
123	Column - Trayed		Repair Required Before Continued Use	Repair Required Before Continued Use, Continued Service with Mitigation, Intiate and Complete FFS Evaluation, Take Equipment out of service		6/6/2017	test1	1462 / Asset Integrity Finding	Dispersed Size	Contractors
123	Column - Packed	test	Continued Service With Mitigation	Continued Service with Mitigation		6/17/2017	13	1481 / Asset Integrity Finding	CTO/Hill track	CTO/Hill track
R-908	Reactor	Cracks in the reactor walls	Fit-For-Service Evaluation	Continued Service with Mitigation, Documentation Update Requirement		6/30/2017	4	1519 / Asset Integrity Finding	Refinery	Refinery
R-468	Reactor	Found cracks in the walls of reactor	Fit-For-Service Evaluation	Continued Service with Mitigation, Take Equipment out of service, Documentation Update Requirement		6/30/2017	3	1521 / Asset Integrity Finding	Refinery	Resinates
T-308	Storage Tank	Tank has a leak on the floor to wall weld	Repair Required Before Continued Use	Documentation Update Requirement		7/7/2017	2	1520 / Asset Integrity Finding	Refinery Shipping	Tank Farm
R-907	Reactor	Cracaks found in the walls of reactor	Fit-For-Service Evaluation	Continued Service with Mitigation, Schedule Final Repair Work		7/7/2017	4	1523 / Asset Integrity Finding	Refinery	Post Refinery Kettles
R-385	Reactor	Cracks found in the walls of the reactor	Fit-For-Service Evaluation	Continued Service with Mitigation, Documentation Update Requirement		7/7/2017	2	1522 / Asset Integrity Finding	Plant General	Hard Resin Kettles
456	Blower	test	Take Equipment Out Of Service	Take Equipment out of service		7/9/2017	456	1482 / Asset Integrity Finding	Contractors	Contractors

Page 1 of 10 | 1 2 3 4 5 6 7 8 9 10 | Total Records: 98

Source: Process Safety Enterprise® - ioMosaic Corporation

PSE – Asset Integrity Management and Service

Services

- Asset Integrity policy and procedure development to align with company goals and RAGAGEP
- Identification of equipment to be included in the program
- Determination of equipment criticality
- Identification of equipment inspections type and frequency per requirements
- Risk Based Inspection implementation

Training

- Asset Integrity policy and procedure development to align with company goals and RAGAGEP
- In-person (open enrollment)
- In-person at your location
- Virtual/Remote
- On-line using Process Safety Learning(PSL) Platform



Software and Workflows

- Platform to document equipment design, specializations and operating condition using Equipment Forms for easy access and retrieval
 - Can be user configured
 - Assistance in populating data
- Platform to store and easily retrieve inspection information

PSE Dashboard



PSE Dashboard – Client Dashboard Requirements

▶ MOC Module

- ▶ Being able to search MOC's by date started up (Implementation Date). It is ideal to have a visual chart available in the system displaying monthly % closure rate (Closure under 60 days)

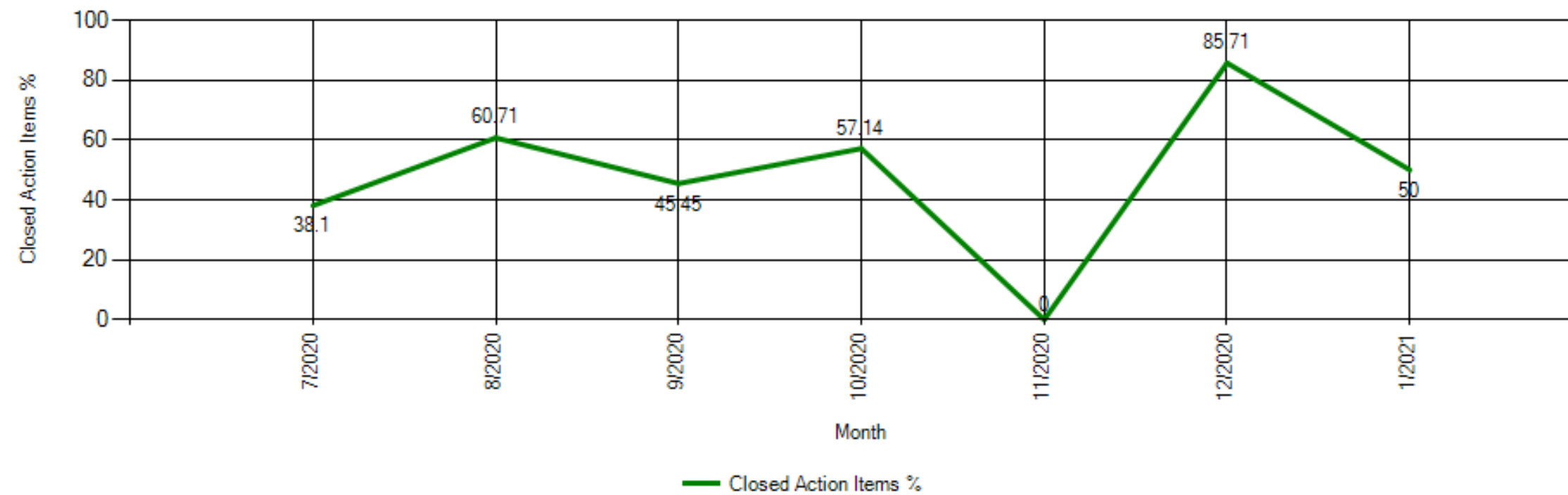
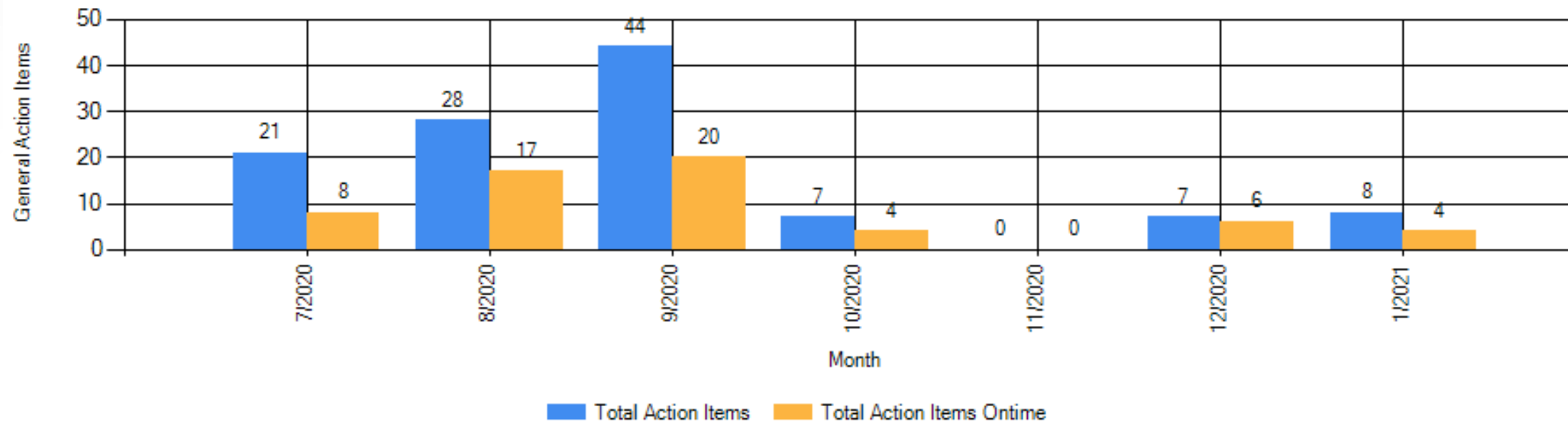
▶ Action Items

- ▶ Build a comprehensive report for action item status
 - ▶ One report that summarizes all action items including RCFA-AL's and other module generated action items
 - ▶ It is ideal to be able to display all open action items
 - Each individual general action item and RCFA-AI tab provides a complete list of outstanding (open) action items whose due dates fall within the specified date range. This applies for both site wide and at individual assignee levels
 - ▶ Individually, we would like to be able to visualize monthly % on-time completion. We should also be able to generate a customizable range report for open vs closed action items. The system should be able to generate an action item list by specified due dates.
 - ▶ For system Admin, we would like to have a site-wide action item on-time completion rate and be able to drill down individual level
 - Definition of on-time completion: # of action items closed/Total action items assigned. (This definition must be applied to both RCFA-AI and general action items)

PSE Dashboard - Action Items

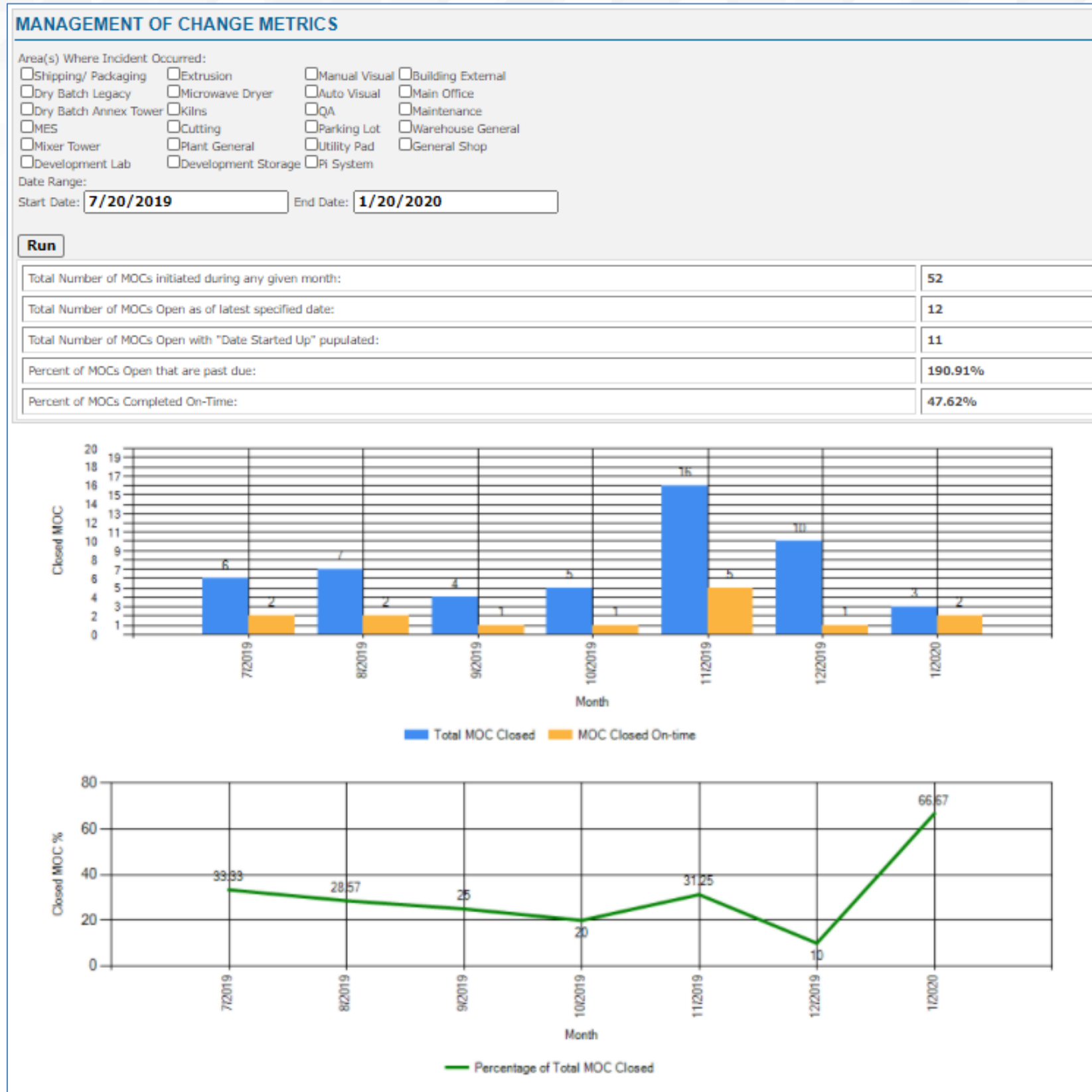
Start Date: End Date:

General Action Items



Source: Process Safety Enterprise® - ioMosaic Corporation

PSE Dashboard - MOC



Source: Process Safety Enterprise® - ioMosaic Corporation

PSE Dashboard - Presets

CHART CONTENT SOURCE INFORMATION

CHART CONTENT SOURCE INFORMATION

CHART CONTENT SOURCE INFORMATION

Data Source

Action Items

Content Preset

Select item(s)

Filter

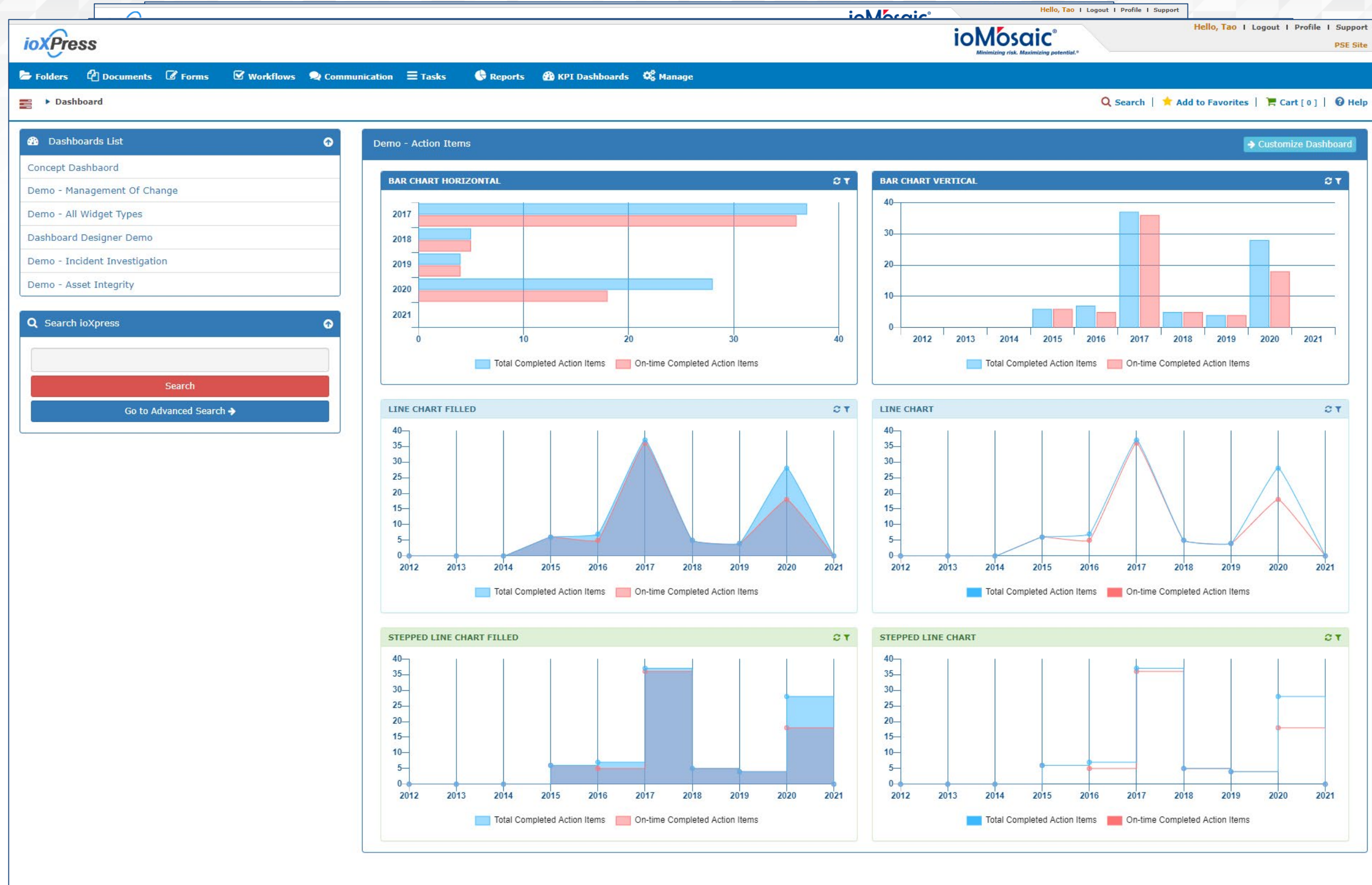
Summary of Due Action Items

Total Completed vs Ontime Completed Action Items

Previous Next Cancel

Source: Process Safety Enterprise® - ioMosaic Corporation

PSE Dashboard – Sample Dashboards



PSE Dashboard: Salient Features

- ▶ Unlimited number of custom dashboards can be created as per client requirements
 - ▶ Will support Staging and Publishing versions for minimized affect on existing dashboards
- ▶ KPI Dashboard Viewer
 - ▶ Each dashboard can be displayed in a separate browser window/tab.
 - ▶ Each Widget supports Refresh and Filter Criteria operations; Will support Auto Refresh.
 - ▶ Will support Near-Full Screen Experience
- ▶ KPI Dashboard Designer
 - ▶ Drag and drop enabled, easy to use tool
 - ▶ Unlimited number of widgets of various color themes, sizes, and flexible position on a dashboard
 - ▶ WYSIWYG experience: real time changes to widgets and contents visible
 - ▶ Widget Types: **Chart** (*Pie, Bar, Line & Radar*), **Table**, **Metric/Metric List** (*Title-Value Pairs*), **Text**
 - ▶ Data Sources: **Action Items, Documents, Forms Subsystem and Workflow Subsystem**
 - ▶ Library of pre-programmed widget configurations known as Presets for simple and quick widgets
 - ▶ **Presets Designer** will be available for advanced users having many additional features

DEMO



PSE White Paper Links

- [PSM Compliance Made Easy with Process Safety Enterprise®](#)
- [Effectively Manage Changes to Processes, Chemicals, Equipment, and Personnel Using PSE](#)
- [Effectively Manage Mechanical Integrity in PSE](#)

About ioMosaic Corporation

Through innovation and dedication to continual improvement, ioMosaic has become a leading provider of integrated process safety and risk management solutions. ioMosaic has expertise in a wide variety of areas, including pressure relief systems design, process safety management, expert litigation support, laboratory services, training, and software development.

ioMosaic offers integrated process safety and risk management services to help you manage and reduce episodic risk. Because when safety, efficiency, and compliance are improved, you can sleep better at night. Our extensive expertise allows us the flexibility, resources, and capabilities to determine what you need to reduce and manage episodic risk, maintain compliance, and prevent injuries and catastrophic incidents.

Our mission is to help you protect your people, plant, stakeholder value, and our planet.

For more information on ioMosaic, please visit: www.ioMosaic.com