

Deloitte.

***Smart Process
Manufacturing***
Integrated Operations



THE CHALLENGE

Chemicals and Materials Manufacturers are struggling with **siloe**d systems and **lack of visibility** across their value chain, leading to delayed response to deviations, operational inefficiencies, reduced margins, revenues and increased costs.

THE SOLUTION

Integrated Operations (IO)

What is it?

AI-powered collaborative solution designed to **integrate the manufacturing operations value chain** with proactive predictions, and enhanced decision-making to improve end-to-end performance from planning and production to shipping.

IO dynamically aggregates, and analyzes real-time operations data vs. planning & scheduling targets to make predictions, identify deviations, recommend actions to respond collaboratively to improve performance

Who is it for?

Stakeholders across the **manufacturing operations** and **supply chain management** value chain.

Production Supervisors, Engineers & Operators, Operations Planners & Schedulers, Supply Chain Managers can utilize the predictive outcomes and actionable insights from IO to collaboratively make timely decisions.

What is the value?

Increased **operational performance, asset efficiency, enhanced production, inventory, shipping** and **reduced costs**.

Up to 1/3rd of the optimal planned value is lost due to gaps in execution. IO will enable "execution as planned" to realize the full potential of your operations assets by achieving optimal revenue and profitability and improved HSE.

SOLUTION FEATURES

Integrate a Disparate Value Chain

Reduce disruptions by integrating siloe

d IT, OT & IoT systems & data sources across the value chain, improving speed and quality of decision-making

Real-Time Deviation Insights & Alerts

Visualize plan vs. actual progress and deviations in near real time using role-based alerts and insights, improving execution efficiency and HSE compliance

Collaborative Problem Resolution & Traceability

Perform case management and root-cause analysis by collaborating across roles using unified data with context providing traceability and quicker problem resolution

Scenario Based Decision Making

Simulate various solution options, collaboratively select and implement the most effective resolution

Future: AI Optimized Decision-Making

Recommend actions by analyzing and learning from prior incidents resolution and process data repository to increase operational efficiency

OVERALL IMPACT



End to End Visibility into Operations

Real-time end-to-end value chain visibility of plan vs. actual



Plug & Play Ease of Implementation

Ability to quickly install and connect IO to existing systems



Operational Case Management

Intelligent workflow, escalation & collaboration across roles and function



Informed Decision Making

Internal & external data to dynamically react to operational, supply chain, & market conditions



Solution Learning Over Time

Previous incidents provide more informed insights for the next challenge

IO Modules

IO offers a wide suite of modules*, each geared at resolving a particular challenge in the operations lifecycle. The initial solution will include four modules with three remaining modules being added in future iterations.

Deviation Management

Real-time monitoring of actual production, inventory, shipping, and consumption vs. optimal plan to recognize & resolve issues faster via alerts notification and analyses.

Collaborative Issue Resolution

Capability to collaboratively respond & resolve adverse events, problems and inefficiencies utilizing role-based case management to increase productivity and efficiency.

Simulation and Optimization

Simulate various scheduling and operations scenarios to meet planned targets and collaboratively determine the best option considering profitability, cost, quality and speed.

Performance Management

Monitor the operational performance at real-time through role and function based KPIs calculated using OT/IoT and IT data to know asset health & status leading to increased uptime and utilization.

Intelligent Process Automation

Utilize role based intelligent workflows and robotic process automation to respond to routine deviation events and escalate to stakeholders as needed.

AI Assistant

Use AI/ML pattern recognition and analytics to recommend resolutions using operations and supply chain data and learning from previous incident resolutions.

Products Traceability

Trace back from the shipping and inventory products quality issues to production and consumed raw materials quality analyzing the process conditions that lead to nonconformance.

EHS Monitoring & Management

Monitor Environment, Health and Safety performance KPIs and events of connected assets, workers and operations. Proactively and collaboratively respond to safety and ESG deviations and incidents.

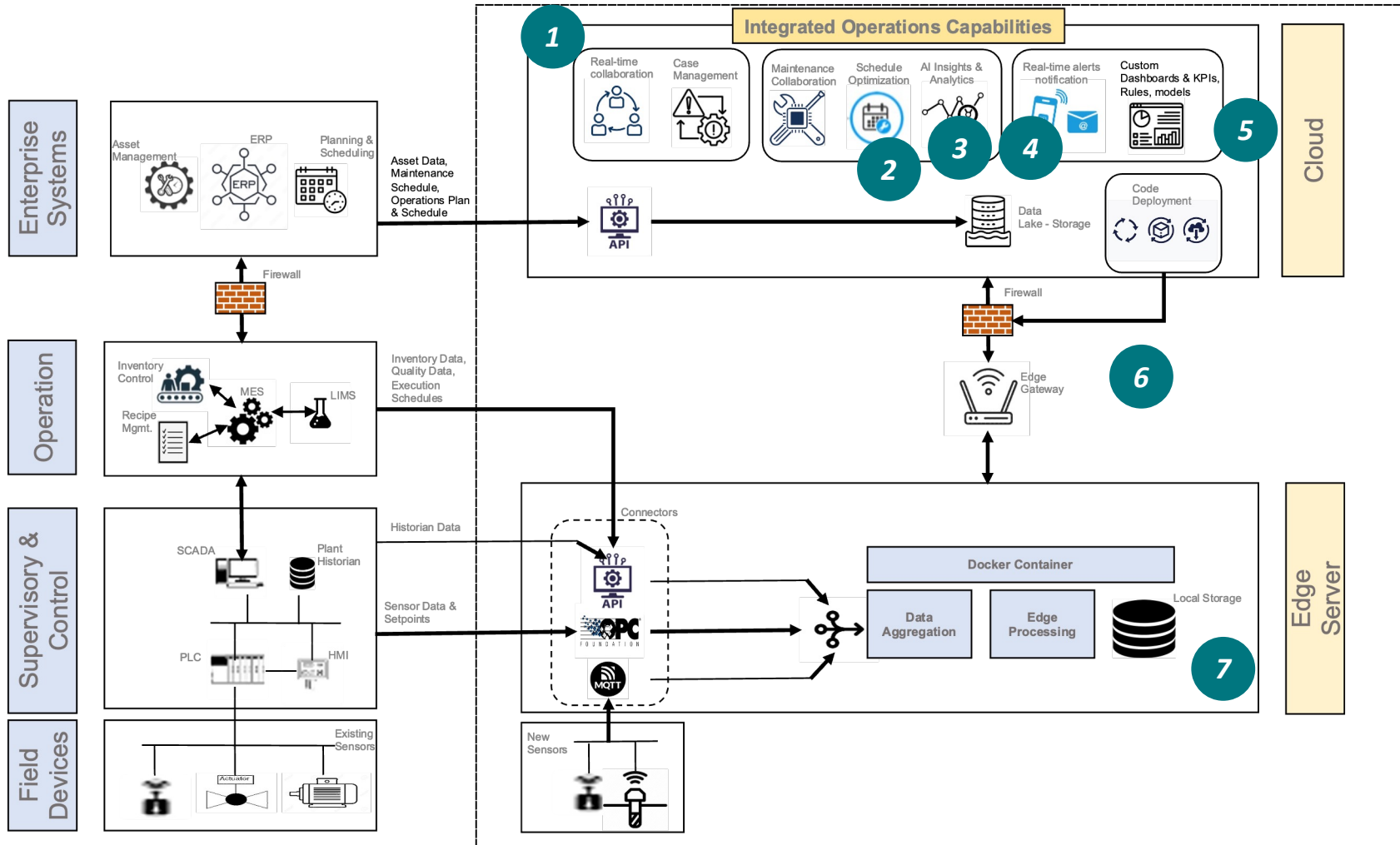
Key

Current Prototype

Future Roadmap

Visualizing IO: Technical Architecture

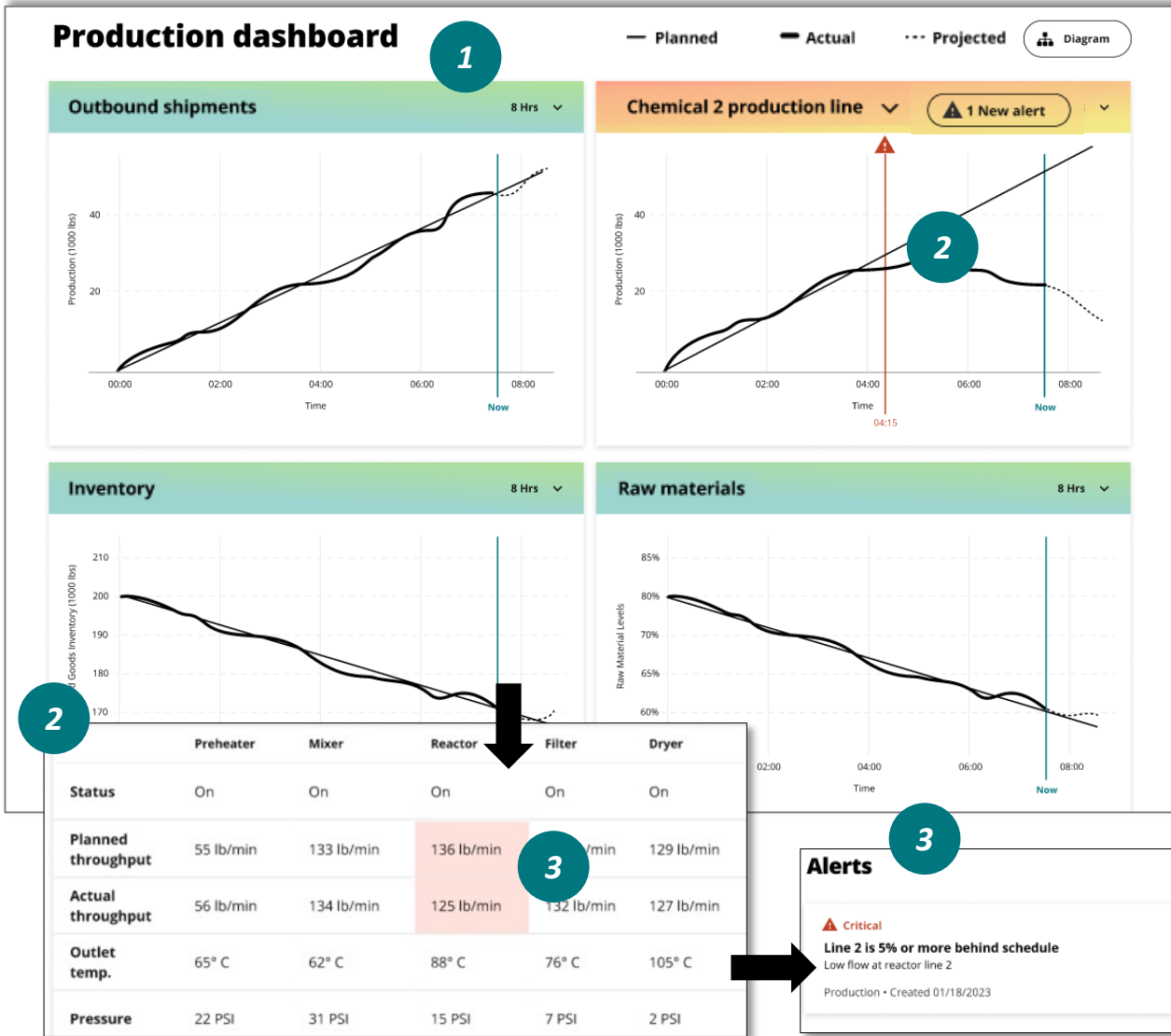
IO is an integrated solution that readily connects to existing clients OP, IoT and IT systems and applications across the manufacturing value chain and delivers value through collaboration, predictive analytics, and AI-optimized decision-making.



- 1** Collaborative problems resolution utilizing case management and intelligent workflows
- 2** Maintenance requests and impact of maintenance schedule on operations
- 3** Optimize planning & scheduling and simulate scenarios to select the solution to implement
- 4** Ability to use AI/ML models for learning from operational incidents and predict adverse events
- 5** Role based dashboards, KPIs and alerting based on operational rules
- 6** OT & IoT data pushed to cloud to enable investigation and RCA
- 7** OT & IoT data gathering via standard protocols with context and analytics at the edge

IO Provides End-to-End Visibility and Alerting Across Operations

IO gathers data from sensors and provides real time insights into plant conditions and deviations.



Capability

- IO dashboard gathers data from sensors and provides **end-to-end visibility** into plant operations in **real time**
- IO allows to drill down on plant conditions and provides insights into deviations from production plan
- IO dashboard displays key parameters for the plant and triggers alerts when conditions deviate from planned targets or exceed limits



IO Enables Collaborative Problem Resolution

IO enables creation, assignment and end-to-end management of cases collaboratively to drive timely resolution.

Alerts

1 Critical
Line 2 is 5% or more behind schedule
Low flow at reactor line 2
Production • Created 01/18/2023
Create case

Alerts

Search
Start typing an alert ID, keyword, etc...

ID	Category	Description	Created on	Location	Assigned to	Priority	Actions
C001	Production	Deviation to schedule detected	01/12/2023	CAL 2	Olu Taiwo (Scheduler)	Critical	...
L001	Inventory	Deviation to planned inventory	01/12/2023	CAL 2	Jane Doe (Ops Mgr)	Low	...

Cases

1

Overall
4 Open, 4 New, 12 Avg. new, 4 Avg days to close

Status
4 Open, 2 On hold, 0 Closed today, 0 Overdue

Categories
1 Production, 1 Inventory, 1 Material con.

Search
Start typing a case ID, keyword, etc...

Status: Open cases
Assigned to: All
Priority: All

ID	Type	Category	Description	Created on	Status	Assigned to	Priority
0123	Deviation	Production	Deviation to schedule detected	01/12/2023	Open	Sam Adamsworth (Me)	Critical
0124	Deviation	Inventory	Deviation to planned inventory	01/12/2023	Open	Jane Doe (Ops Mgr)	Low
0125	Deviation	Material consum...	Deviation to planned raw material con...	01/12/2023	Open	Jane Doe (Ops Mgr)	Low
0126	Deviation	Outbound Ship...	Deviation to shipments	01/12/2023	Open	Jane Doe (Ops Mgr)	Low

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Step 1: Review case details

Here is a list of common factors that impact the case. Please do your due diligence and look into these areas.

Process conditions

	Preheater	Mixer	Reactor	Filter	Dryer
Status	On	On	On	On	On
Planned throughput	55 lb/min	133 lb/min	136 lb/min	126 lb/min	129 lb/min
Actual throughput	55 lb/min	134 lb/min	125 lb/min	132 lb/min	127 lb/min
Outlet temp.	65° C	62° C	88° C	76° C	105° C
Pressure	22 PSI	31 PSI	15 PSI	7 PSI	2 PSI

Case ISS-123
Deviation to schedule
Open

Step 2: Conduct investigation

Conduct investigation

Review

Please log your findings below.

Open messenger

Start typing to add a comment

Review

Conduct investigation

Provide solution

Close case

3

Search

Jane Doe
You do you happen to have that data that I requested...

Sam Adamsworth
Call with Fred Steward to Fred updated with the file proceed with adding an...

Regina Flannigan
@samadams please con increased.

Line 1 Control
January 20th should be the target date.

Rachel Smith
Do you happen to have that data that I requested...

Did you get the chance to take a look at the deviation on Line 2?

Yeah, it seems like there may be some blockage. We'll get the maintenance crew to clear it out.

Speaking of which, Peter really wants you to come in on Saturday to help make up the lost productivity.

Capability

1

Cases to address alerts can be created and assigned to personnel.

2

IO provides end-to-end management of alerts and cases. IO displays each alert & case, status, who it is assigned to etc.

3

IO enables collaborative resolution of cases. Personnel can track issues, review, investigate, communicate, log details, and provide solutions.

Collaborative Issue Resolution Performance Management

IO Provides Enhanced Production Response Based on Scenarios

Scheduler tool

Add weekend overtime to move up production shortfalls due to clogged line.

System recommendation

Weekend overtime scenario 1

Budget change	Production line	Projected throughput	Budget impact
0.5%	Line 1	130 kg/min	SI-00030

Select Preview

[More recommendations](#)

Preview ● Current ● Recommendation

	Thursday	Friday	Saturday	Sunday
Pre-heater	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>
Mixer	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>
Reactor	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>
Filtration	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>
Drying	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>	<div style="width: 100%; height: 10px; background-color: #e0f2f1;"></div>

an optimal response.

Capability

1

Production and economic **impact of each scenario** can be analyzed to evaluate response to deviations

2

Multiple scenarios to address the deviations can be simulated and an **optimal production response** can be collaboratively selected

Simulation and Optimization

Thank You

Please contact us with any questions

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