eschbach

A New Vision for Chemical Manufacturing:

TOOLS FOR THE SMART PLANT

A NEW VISION FOR CHEMICAL MANUFACTURING

Chemical manufacturing is entering a new era of smart, connected operations. As complexity, cost, and safety demands rise, success depends on turning vast amounts of process data into real-time insight. Visual intelligence is the key—giving chemical plants the clarity to act faster, operate safer and perform better than ever before.

1 THE NEW REALITY OF CHEMICAL MANUFACTURING

Chemical manufacturing is defined by scale, complexity and risk. Plants run continuously, with energy-intensive processes and hazardous materials that demand absolute precision. Operations leaders must juggle competing priorities in an environment where safety, reliability and efficiency are non-negotiable.

In this new era:

- **Automation is everywhere**, but when it falters, the cost of downtime is measured not just in lost production but in safety risks, environmental incidents and millions of dollars in wasted energy and feedstock.
- **Integration costs** often rival the cost of the physical asset itself, as plants struggle to knit together DCS, SCADA, MES, maintenance and safety systems into a consistent operational view.
- **Automation is reshaping human roles**, taking on routine monitoring tasks while pushing people toward higher-value activities such as troubleshooting, optimization and decision-making under pressure.
- **Data is abundant**, yet without the right tools it is fragmented, delayed and underutilized, making it hard to separate noise from signal in a 24/7 operating environment.

Data has been treated for years as the key to **unlocking efficiency and reliability**. While the potential is real, the promise hasn't been fully realized. Vast amounts of information flow automatically from process units, equipment sensors and control systems, but this stream often lacks the context that makes it actionable. Crucial details are still passed along in shift handovers, scattered in spreadsheets or buried in maintenance logs. Without context, even the best data can't deliver the clarity leaders need.

To meet these challenges, operations leaders require more than access to information-they need clarity. This means moving beyond fragmented spreadsheets, siloed dashboards and disconnected notes to embrace tools that provide real-time insight and shared understanding. Combining AI-driven intelligence with intuitive visual tools makes complex production data clear, connected and actionable.

2 THE DATA DILEMMA IN CHEMICAL PLANTS

Chemical plants generate enormous volumes of data every day, from control systems and sensor networks to inspection reports, maintenance records and operator logs. But having data is not the same as being able to use it.

The problem is fragmentation. Most chemical manufacturers rely on **multiple systems** to manage different parts of the process, including DCS, SCADA, MES, maintenance systems and data historians. Add in **spreadsheets**, **paper logs** and **handwritten shift notes**, and the result is a messy, inconsistent and often **inaccessible data landscape**. For large, global organizations, the challenge is even greater. Legacy systems vary widely from plant to plant and region to region, especially in companies that have expanded through mergers and acquisitions. Aligning data, processes and training across such diverse infrastructures is extremely difficult.

Process data lives in silos, making it difficult to trace relationships between equipment conditions, process performance and safety indicators.

Context is often missing, as crucial details remain trapped in operator notes, shift handovers or maintenance logs that never reach broader visibility.

Different systems define KPIs differently, preventing a consistent, plant-wide view of performance.

Legacy infrastructure creates barriers, with older systems and workarounds slowing down integration and modernization.

For operations leaders, this patchwork of information creates blind spots. It slows decision-making, undermines coordination and makes it difficult to distinguish leading indicators from noise. Teams know that small improvements in yield, energy efficiency or reliability can deliver massive gains in profitability and safety—but the insights they need are often buried in disconnected systems.

To overcome these obstacles, chemical manufacturers need a centralized platform for data management, such as a Plant Process Management solution like Shiftconnector® that gathers data—both machine and human—across multiple plant systems, ensuring data integrity and making it universally available.

But integration is only the first step. The next question is: **How do you turn that sea of data into something useful**?

3 THE NEW SMART PLANT: PUTTING VISUAL INTELLIGENCE TO WORK

The Smart Plant represents a new way of working in chemical manufacturing. It's not just about dashboards; it's about creating a digitally connected, decision-ready environment where people and systems operate in harmony.

Human beings are optimized for visual processing. We can interpret charts, color cues and spatial patterns far faster than we can sift through raw data tables or lengthy reports. In a high-stakes chemical plant, where conditions shift rapidly and risks are real, visual dashboards provide at-a-glance awareness of performance, issues and priorities. They help teams see what is happening now, where problems are emerging and what needs immediate attention.

For chemical operations, visual intelligence makes it possible to:

Unifying data from DCS, Historian, SCADA, MES, maintenance and safety systems into a single, real-time operational view.

Visualizing performance in intuitive, role-specific dashboards that support fast, confident decisions on the plant floor and in the control room.

Enabling structured collaboration across shifts, units and leadership tiers, ensuring alignment around shared priorities.

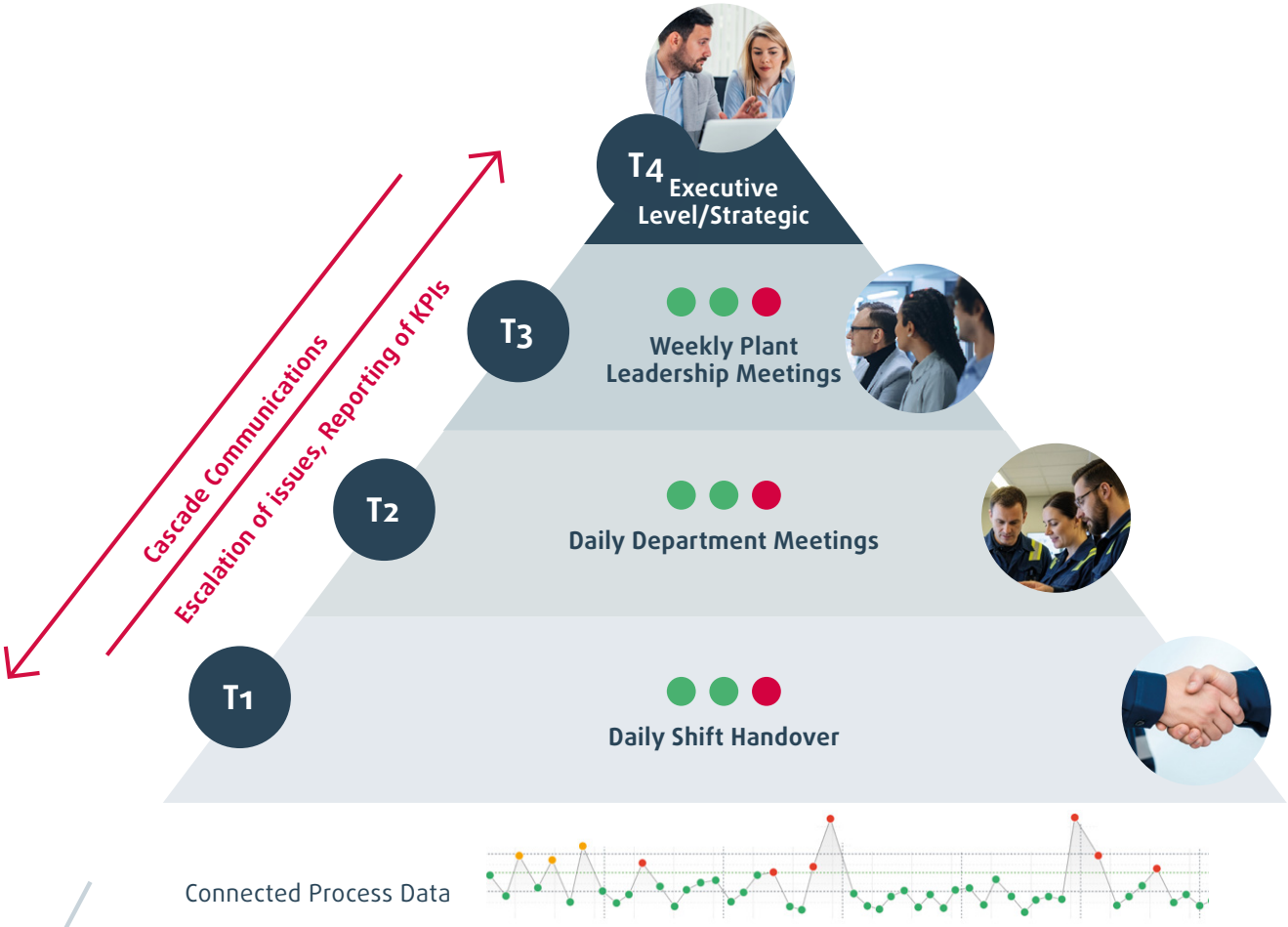
Support process efficiency and safety through standardized workflows, escalation protocols and AI-powered insights.

To drive real value, visualizations must evolve beyond basic charts and graphs. While many software platforms offer standard production visuals for quick interpretation, today's smart manufacturing environments demand visualization that is **actionable, contextual, role-specific** and grounded in **real-time KPIs**—empowering teams to make informed decisions at every level.

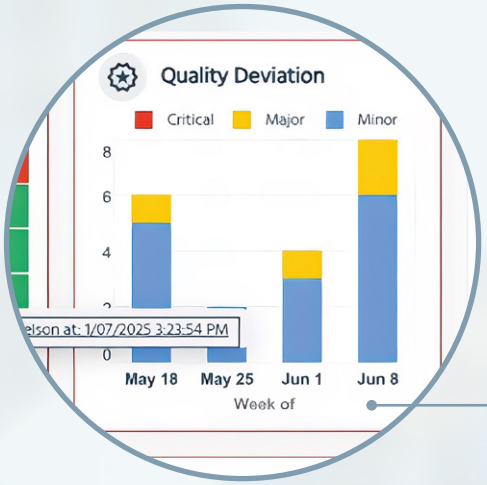
Visual Intelligence delivers exactly that, surfacing the metrics that matter most (such as batch status, yield and safety events) precisely when and where they're needed. In this model, visualization becomes the operational interface, enabling situational awareness, structured collaboration and timely responses. Shiftconnector® Tier Collaboration Dashboards bring this vision to life by transforming complex data into clear, actionable dashboards tailored to the needs of frontline workers, supervisors and leadership alike.

In a true Smart Plant, collaboration is not left to chance. Interactive dashboards provide a **shared digital workspace** that supports **structured communication** across shifts, units and organizational levels. By standardizing how information is shared and escalated, **tier boards break down silos** and ensure that everyone—from operators responding to alarms in the control room to executives tracking performance across sites—is **aligned around the same real-time data and operational priorities**.

Continuous improvement in chemical plants depends on **visibility, accountability and insight**. The Smart Plant delivers this by embedding standardized workflows and escalation protocols directly into daily operations. With **AI-powered tools** like Shiftconnector Artificial Manufacturing Intelligence (SAMI), teams can **identify root causes, analyze trends** and **receive solution suggestions** based on historical data. This combination of real-time visualization and intelligent insight empowers teams to proactively solve problems, reduce variability and drive sustainable performance improvements.



Shiftconnector® Tier Collaboration Dashboards provide a real-time visual snapshot of organizational metrics and KPIs, enabling fast, informed decision-making at a glance. Dashboards can be personalized based on user roles and responsibilities.



Configurable tier dashboard widgets provide deeper insights into plant performance with clear, intuitive visuals. Each widget offers drill-down capability, allowing users to spot trends, click for detailed context and take informed action quickly.

Widgets make it easy to drill down into anomalies and deviations by clicking directly on the data to reveal detailed context, root causes and observations.

Tier Dashboards link directly to Shiftconnector® event entries, allowing teams to quickly investigate incidents, near misses and deviations. With just one click, users can access detailed notes, corrective actions and historical context, streamlining root cause analysis and supporting a proactive safety culture.

4 AI AND DATA VISUALIZATION: TURNING INSIGHT INTO ACTION

Visualization provides a shared, real-time view of plant performance. But in chemical operations, where processes are highly interconnected and risks are significant, teams also need help interpreting that data and deciding what to do next. This is where artificial intelligence becomes essential.

AI and visualization go hand in hand: visualization enables rapid pattern recognition and shared understanding, while AI adds the context, insight and recommendations needed to support confident decision-making. AI helps teams go beyond what's happening to understand why it's happening and what to do next.

eschbach delivers AI-driven content via its Shiftconnector Artificial Manufacturing Intelligence (SAMI), a **context-aware AI assistant** that works in tandem with tier dashboards to support **process monitoring**, **root cause investigations** and **performance improvement**. SAMI enables users to:

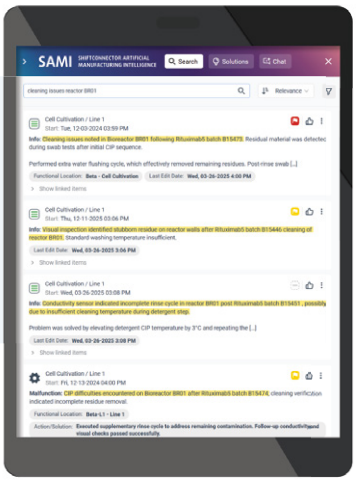
- **Identify issues visually**, then drill down into the associated data, event logs and historical trends using AI-based tools.
- **"Chat with their data"** using natural language queries to explore contributing factors, prior history and useful context.
- **Receive solution suggestions** based on historical knowledge accumulated in shift notes, maintenance logs and other structured and unstructured data.

By embedding intelligence directly into the Shiftconnector dashboard interface, SAMI helps operations teams **respond faster** to process upsets, identify and resolve recurring equipment and reliability issues, and maintain compliance with stringent safety and environmental regulations. The result is a **safer, more efficient**, and **more responsive Smart Plant**, where plant data serves as a real-time decision support system.

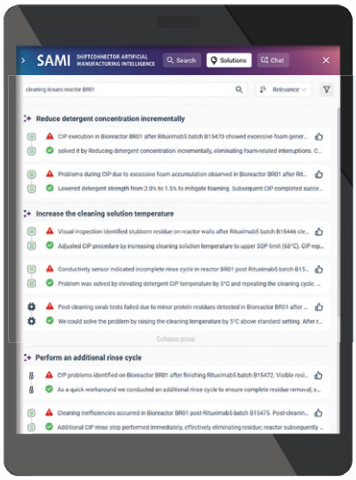
eschbach

SAMI: AI-Powered Insight for the Smart Plant

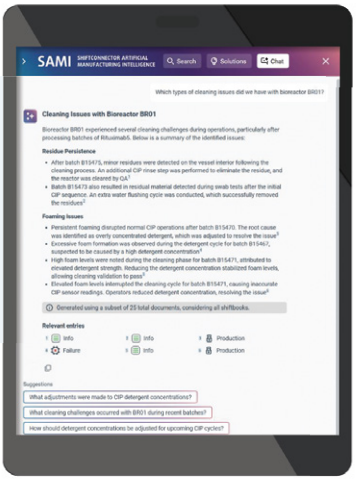
SAMI (Shiftconnector® Artificial Manufacturing Intelligence) is the built-in AI assistant in Shiftconnector®, designed to work alongside tier dashboards to support faster, smarter decisions in chemical operations. Here's how SAMI helps your people:



Smart Search lets you ask questions in plain language and instantly find the most relevant information hiding in your data, reducing search time from hours to seconds.



Smart Solutions analyzes historical data to identify likely root causes and proven fixes, so you can solve problems faster.



Chat with SAMI introduces a conversational interface that gives you a natural, conversational way to explore your data: ask follow-ups, drill down into specifics and get clear answers in real time.

A Day in the Smart Plant with SAMI

Ravi
Control Room Supervisor,
Ethylene Unit

Ravi manages daily operations in the control room. Tier dashboards give him a live view of furnace, reactor and compressor conditions. SAMI helps him prioritize and respond to alarms by pulling up related histories, highlighting possible causes and pointing to proven fixes, keeping the cracker stable and safe.

How Ravi uses SAMI:

- Monitors dashboards for early warning signs, such as abnormal furnace temperatures or compressor vibration.
- Uses Smart Search to find past deviations and see how they were handled.
- Relies on Smart Solutions to review recommended corrective actions drawn from maintenance logs.
- Prepares for shift handover with SAMI's context-rich summaries of open issues and escalations.

Maria
Reliability Engineer,
Site Reliability Team

Maria tracks equipment performance across the site. She uses tier dashboards to follow reliability KPIs. SAMI connects this data with process context, helping her identify patterns, compare with historical cases and recommend proactive interventions and predictive maintenance actions.

How Maria uses SAMI:

- Reviews predictive maintenance insights to identify emerging risks in pumps, compressors and heat exchangers.
- Uses Smart Search to retrieve historical cases of recurring vibration or wear patterns.
- Applies Smart Solutions to compare corrective actions used across different units and their outcomes.
- Uses Chat with SAMI to explore likely causes and prioritize maintenance actions.

James
Operations Manager,
Multi-Unit Site

James oversees the entire complex, from ethylene to utilities and downstream plants. In tier meetings, dashboards consolidate throughput, yield, energy and safety KPIs. SAMI helps him spot trends, compare performance across units and prioritize improvements that balance production with safety and sustainability.

How James uses SAMI:

- Tracks consolidated KPIs in daily tier meetings to stay aligned with site performance targets.
- Uses Smart Search to investigate deviations in energy use, throughput or safety metrics.
- Leverages Smart Solutions to uncover proven improvement strategies across the operation.
- Relies on SAMI's contextual analysis to guide investment in reliability, maintenance and efficiency initiatives.

5 BUILDING THE SMART PLANT:

A 360° APPROACH TO MODERN CHEMICAL OPERATIONS

Today's chemical plants operate in a high-stakes environment defined by complexity, safety risk and constant pressure to improve efficiency. To thrive, manufacturers must evolve beyond fragmented systems and reactive workflows. The Smart Plant is the blueprint for this transformation—a digitally connected, AI-augmented environment where data, people and processes are unified to drive smarter, faster decisions.

1 Centralize Operational Data in a Daily Management System

AI and visualization tools are only as effective as the data on which they are built. The foundation of the Smart Plant is its ability to integrate information across the plant's digital ecosystem, creating a single source of truth for operations.

- Integrate structured data from DCS, SCADA, MES, ERP and data historians to ensure real-time visibility across systems.
- Capture unstructured inputs like shift handovers, logbooks and maintenance records to preserve institutional knowledge and context.
- Ensure traceability with accurate timestamps, role-based access and alignment to safety and environmental compliance requirements.
- Break down silos by merging IT and OT data into a unified operational view that supports cross-functional collaboration.

2 Standardize and Digitize Plant Workflows

Standardizing and digitizing workflows ensures that data is not only captured but also usable by AI and visualization tools.

- Convert paper-based logs into structured digital entries using platforms like Shiftconnector.
- Apply consistent KPI definitions and taxonomy across all visualization layers to ensure comparability and clarity.
- Establish audit trails and validation protocols to support safety and environmental compliance.
- Enable structured collaboration across shifts, units and leadership tiers through standardized escalation and communication workflows.

3 Configure AI and Visualization Tools for Site-Specific Context

Generic dashboards and off-the-shelf AI models often fall short in complex, continuous-process environments like chemical manufacturing. The Smart Plant requires tools that are tailored to your plant's unique processes, terminology and data history.

- Train AI models on historical plant data to support root cause detection, pattern recognition and predictive insights.
- Build role-specific dashboards for operators, engineers and managers to deliver the right data at the right time.
- Configure alert logic based on process-critical thresholds to prioritize action and reduce noise.
- Link dashboards to context-aware tools like SAMI and Shiftconnector to enable fast, informed responses.

4 Embed AI for Real-Time Decision Support

Visualization enables awareness. AI enables action. Together, they transform how teams operate.

- With tools like SAMI, teams can "chat with their data," explore root causes and receive solution suggestions based on historical plant knowledge.
- AI helps teams understand not just what is happening, but why and what to do next, reducing downtime and improving response times.
- SAMI integrates directly into tier dashboards, enabling seamless access to insights during daily operations, shift handovers and incident investigations.
- The result is a smarter, more responsive Smart Plant, where data becomes a real-time decision support system.

5 Implement Governance and Drive Adoption Through Change Management

Technology alone does not drive transformation: people do. Sustained success requires clear governance, training and cultural alignment.

- Define accountability for dashboard maintenance, data input and issue escalation.
- Deliver tiered training tailored to user roles, from frontline operators to engineers to site leaders.
- Monitor adoption and outcomes to continuously refine tools and workflows.
- Engage leadership and floor-level teams in daily Tier meetings to reinforce alignment and drive continuous improvement.

eschbach

READY TO GET STARTED?

The Smart Chemical Plant is no longer a vision of the future. With Shiftconnector® Tier Collaboration Dashboards and SAMI, it is here right now. Together, they enable teams to monitor performance, detect issues early, investigate root causes and respond quickly. The result is a more agile, aligned and accountable operation, from the production floor to senior leadership. Intelligent visualization drives higher efficiency, stronger compliance, and smarter decision-making—every shift, every day.

Ready to build your Smart Plant?

With Shiftconnector® Tier Collaboration Dashboards and SAMI, you can unlock true operational intelligence—today. Connect teams, accelerate decisions and elevate performance across every shift.
Let's start shaping your Smart Plant together.
Contact us at **info@eschbach.com** or visit **eschbach.com** to schedule a demo.

eschbach.com

eschbach

Europe HQ: eschbach GmbH
Steinbrückstr. 10
79713 Bad Säckingen, Deutschland
+49 (0)7761 55959-0

North America: eschbach North America, Inc.
One Marina Park Drive - Suite 1460
Boston, MA 02210, USA
+1 (617) 618-5261

www.eschbach.com
info@eschbach.com

About eschbach and Shiftconnector®

eschbach, headquartered in Germany, with a U.S. subsidiary in Boston, MA, develops plant process management software solutions. Shiftconnector® provides a new level of team communication to ensure safety, increased performance and improved operational effectiveness. The award-winning solution is trusted worldwide by leading pharmaceutical manufacturing companies such as Johnson & Johnson, AbbVie and Roche. For more information, visit www.eschbach.com.

We inspire industrial teams to work smarter.