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CertainTeed's People-Centric Approach to Digital Manufacturing

Craig Ferry
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Saint Gobain

AVEVA

- CertainTeed® is North America's leading brand of exterior and interior building products, including roofing, siding, fence, decking, railing, trim, insulation, gypsum and ceilings

- A subsidiary of Saint-Gobain, one of the world's largest and oldest building products companies, CertainTeed and its affiliates have more than 6,300 employees and more than 60 manufacturing facilities throughout the United States and Canada.

Craig Ferry

Director of Advanced Manufacturing Gypsum – USA

Role:

Leads Gypsum US Division of CertainTeed in Advanced Manufacturing built on the foundation of Industry 4.0 and in the spirit of Continuous Improvement. Also responsible for the Division Capital portfolio and Strategic Engineering.

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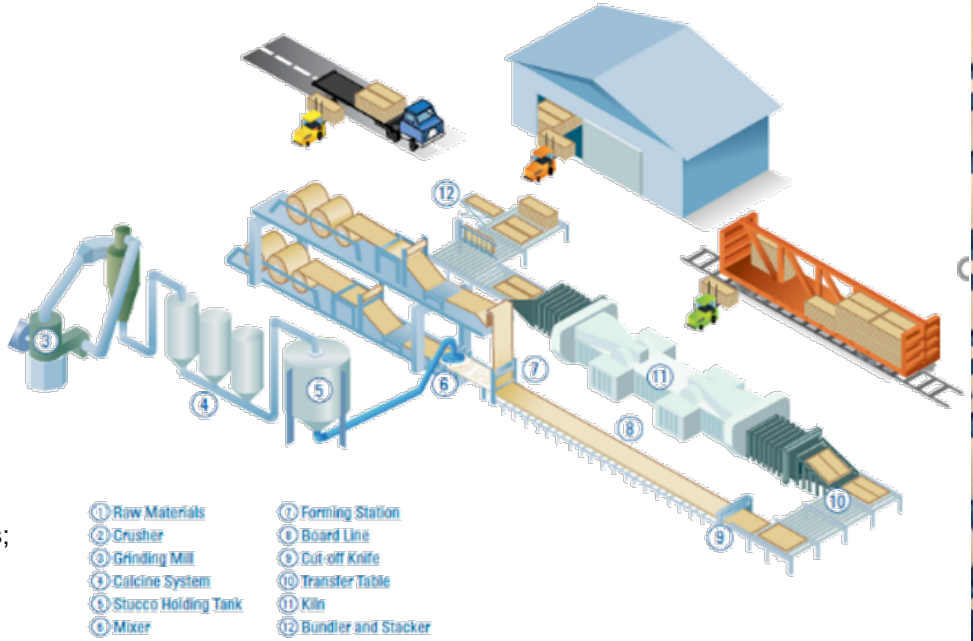
Simplified Wallboard Plant

Typical Process of Manufacturing Gypsum Board



PROFILE

- 1-2 Lines per plant
- Continuous process; 24x7 operations
- 100 - 200 total employees / plant

Our Journey

Pre - 2017

Continental Building Products (CBP)

- Lacked a coherent Manufacturing Information System
- Islands of information; inability to visualize, analyze, and contextualize the combined data
- Lacked a foundation to leverage the increasing availability of automation and other current and future technologies

2017-2018

- Due diligence of MES solutions in market
- Functional Requirements, Design, and Build

2019

- Architecture: Central cloud hosted in AWS
- Integration to JD Edwards Financials
- AVEVA MES solution deployed as pilot to 1st site in FL, USA
- Two (2) additional plant sites: KY in July and NY in October

2020 - Current

CertainTeed (Saint Gobain) acquires CBP;

- 6 plants added to the network (11 lines total)
- Migration of AVEVA MES solution to SAP
- Migration of solution to host in CertainTeed central data center

MES Program Drivers for Operations (2017)

Expected Outcomes

Tangible / Quantifiable

- Yield (Waste)
- Machine Efficiency (Downtime)
- Raw Material Reduction
- Energy Usage (Gas)
- Reduce COGS & Monthly Variances

Intangible / Qualitative

- Real-time Information visibility to make better decisions, faster
- Significantly improved access to data at all levels
- Operations Governance
- Exception Based Management
- Build Foundation for future (Predictive Analytics, Machine Learning, etc.)

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Operations Gaps & Goals

Positive, Changing Culture

- New operators dilutes experience levels.
- Democratize tribal knowledge
- Aware waste “leaks’ exists, lack tools & visibility to improve

Data rich, Information poor

- “Swimming in data”, silo’s
- Lack of drill down & multi program access; root cause analysis is difficult
- Plant to Plant Comparisons difficult

Lack Visibility to Production & Inventory Status / Availability

- Real time update of finished goods to ERP for better customer service
- Better planning with real time plant production visibility

Reactive rather than Proactive / Control

- “Operating Blind” lack real-time KPI’s and metrics
- Variances – Month End vs. Real Time
- Cost impact of real-time actions; deviations
- Energy/Material waste due to process not running in centerline
- Reduce Adjustments to recipe and process: Remove the art, work with facts

Inconsistent Follow-up & Accountability

- Governance for follow up on event deviations
- Difficult to enforce compliance to best practices
- Lack of accountability in meetings due to firefighting efforts, previous meeting issues

Paper Based Recipes & Spec’s

- Compare target / tolerance to Actual

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Key 4.0 Guiding Principles

People Engagement

- Exception Management - only what is important and needs attention. Avoid information overload.
- Closed Loop Structured Management Processes - guide the employee to desired behaviors, processes, and outcomes.
- Create Ownership - Involving the end user in design and improvements. Bottom Up!
- Build a support system to push continued engagement of the technology (ex. HELIX Embedded)
- Push to the User

Open & Accessible Systems

- Data access and connectivity is a requirement
- Target technology to the end user. A simple and easy to use tool that is utilized is better than a complicated high-tech tool that is not.

Drive Value to the Business

- Significant opportunity exists how decisions are made at all levels and functions of the organization
  - Informed versus uninformed decisions making
  - Speed of identification (awareness) and resolution of issues – Time critical with continuous processes
- Reduce human error or induced variation
  - Define and guide centerline and lanes
  - Automate both manufacturing processes and management processes where it makes sense

Look Outward and Leverage Partnerships

- Gain benefit from partnerships with outside vendors; worldwide customer base to draw from.
  - Example: Able meet and see Colgate's international MES platform and visited the Maple Leaf Foods plant to see their adaption of Intelligence and MES software in action.
- Gain access to and influence emerging products

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Manufacturing Vision & Mission

Vision

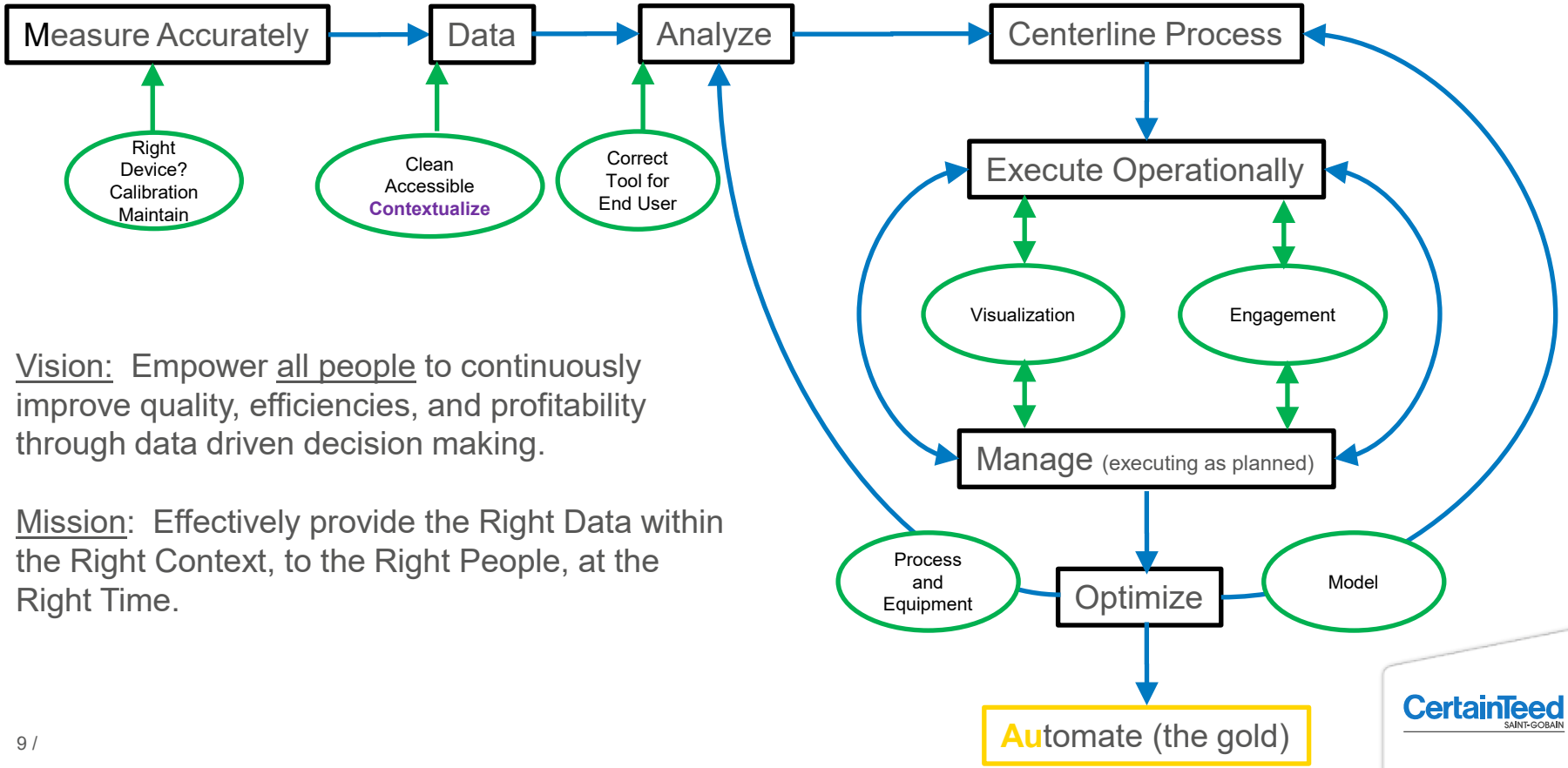
Empower all people to continuously improve quality, efficiencies, and profitability through data driven decision making.

Mission

Effectively provide the Right Data within the Right Context, to the Right People, at the Right Time.

- **Real-Time Visualization & KPIs**
  Easy access to information in one place
  All data sources (Historian, ERP)
  Deviations, exceptions highlighted
  Action/ response triggers
- **Workflow-based Operations**
  Enforced SOPs
  Closed loop exception/deviation management
  Audit trail of all actions taken
  Reusable process templates across sites
- **Platform approach for Scalability**
  Common definition of plant & equipment; materials, WIP, Quality, SPC, Downtime/OEE, Recipes & specs, ERP integration, Work process Management, Maintenance/CBM
- **Operations Analytics**
  Summarized roll-ups
  Key comparisons

CertainTeed IPG I4.0 Paradigm



Vision: Empower all people to continuously improve quality, efficiencies, and profitability through data driven decision making.

Mission: Effectively provide the Right Data within the Right Context, to the Right People, at the Right Time.

The Foundation

Key Functionality

Advanced Process Historian

- Condition Based Alert Monitoring
- Machine Learning Anomaly Detection (in development)
- Mobile Access

MES (Manufacturing Execution System

- Visualized and Contextualize Reporting
- Quality Management System with Statistical Process Control (SPC)
- Raw Material Consumption Monitoring and Reporting
- Product Formulation Management System
- Plant Floor Work Order Management
- OEE Performance Management
- Manufacturing Intelligence Analytics
- Workflow Structured Automated Business Processes
- Examples:
  - Quality Exception Notification and Management
  - Formulation Exception Notification and Management
  - Root Cause Analysis and Corrective Actions
- ERP Integration

Data

- Location for all Discrete and Continuous Manufacturing Data for leveraging with current and future technologies

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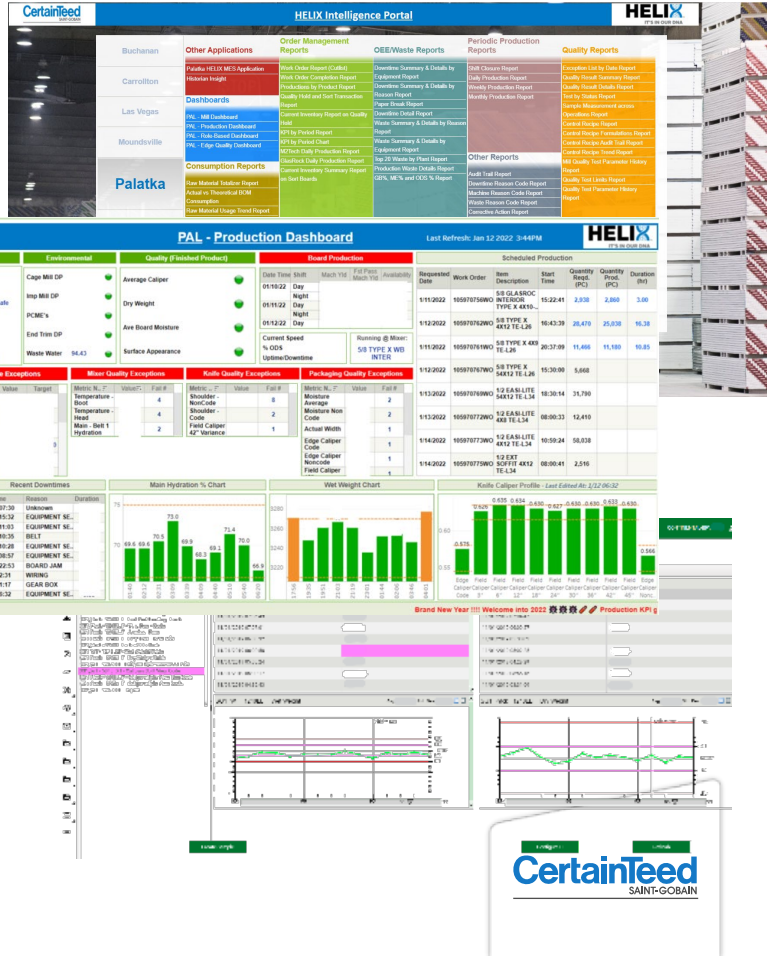
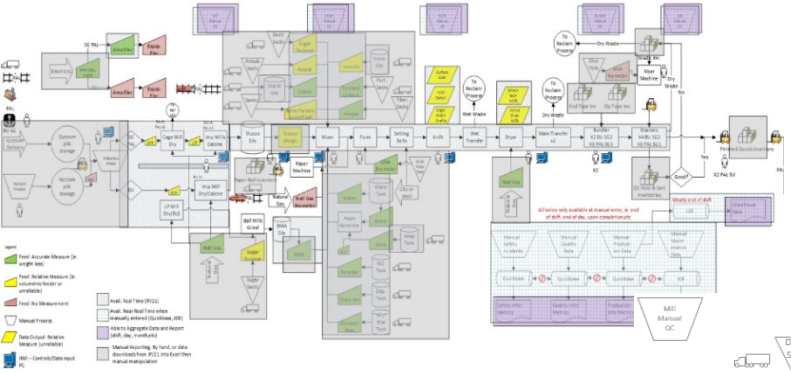
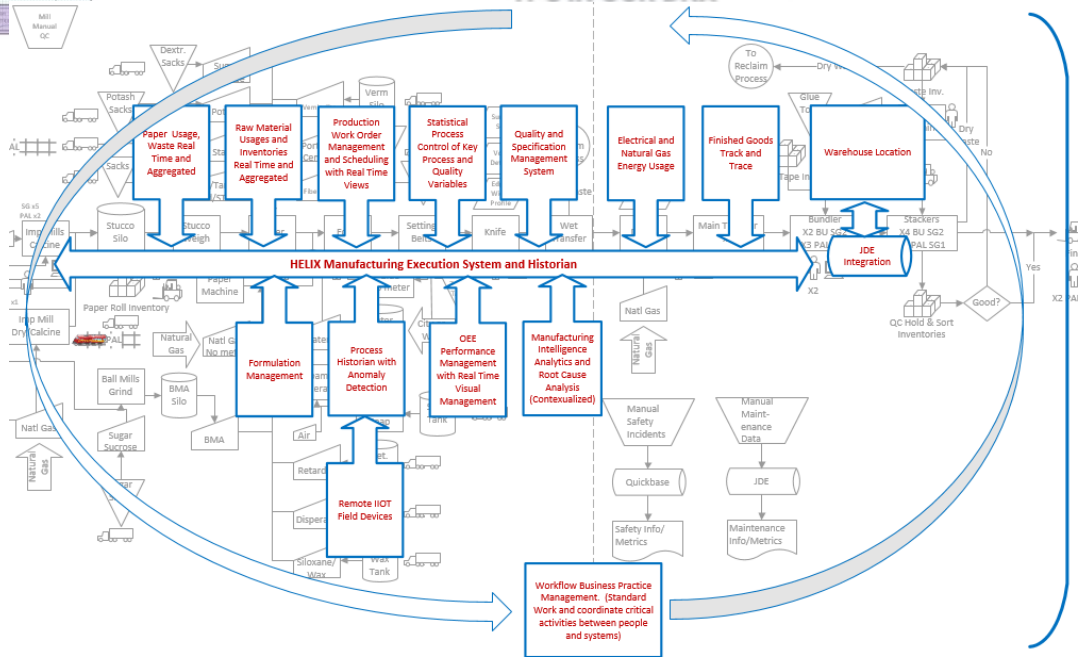


Disconnected and Fragmented … to One Ecosystem

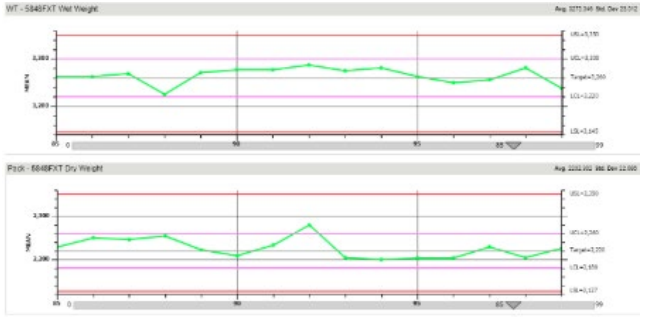


HELIX
IT'S IN OUR DNA



Plant Active Data-Driven Decision Making

- **Operator: Maintain the Centerline**
  - Continued development and leveraging HELIX SPC in MES
  - Plant floor visualization through Dashboards
  - Continued Workflow development to push data and future expansion with decision trees, troubleshooting guides, etc.
- **Management: Data Driven Decision Making**
  - HELIX Intelligence Tableau (BI Tool) at each site that includes custom reporting, dashboards, and access to data
- **Corporate: Support and Expectations to Drive Cultural Change**
  - WCM provides plant improvement project based platform
  - Industry 4.0 assessments from plant floor to plant manager
    - Evolve current HELIX Assessments to broader context



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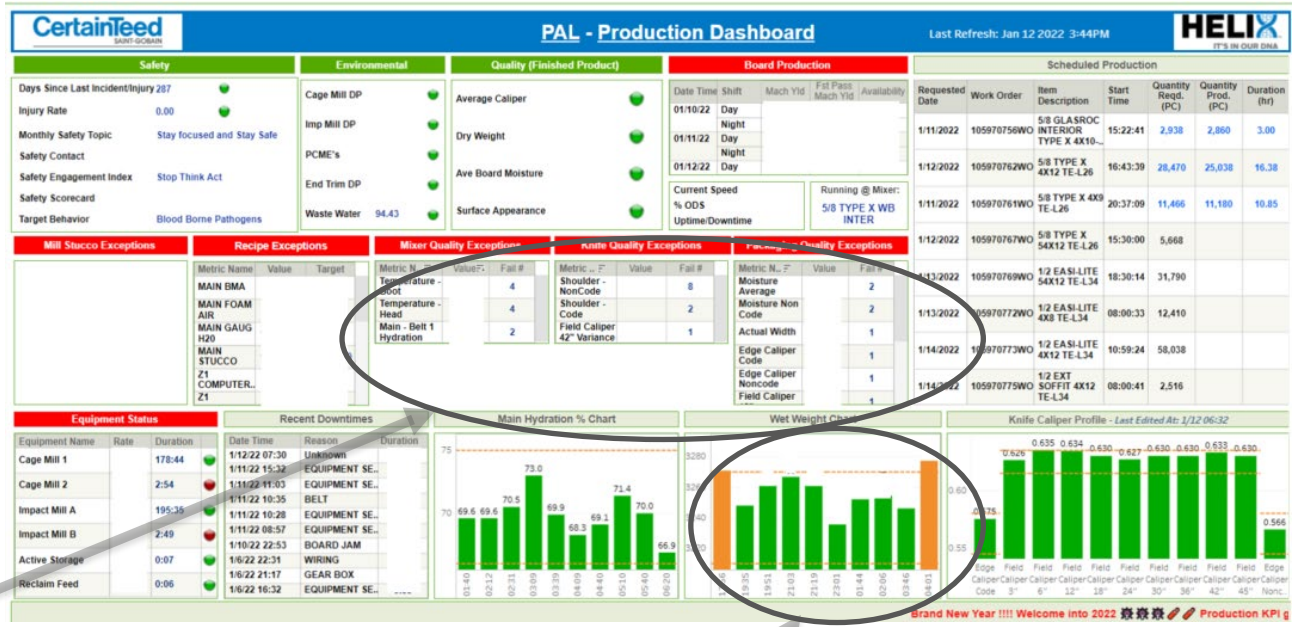
Real Time Visualization and Notification

All workstations will have large monitors with a Dashboard that communicates key metrics and Process and Quality Exceptions.

Walk in to a workstation area and know where the current issues are right now. If no issues, then blank.

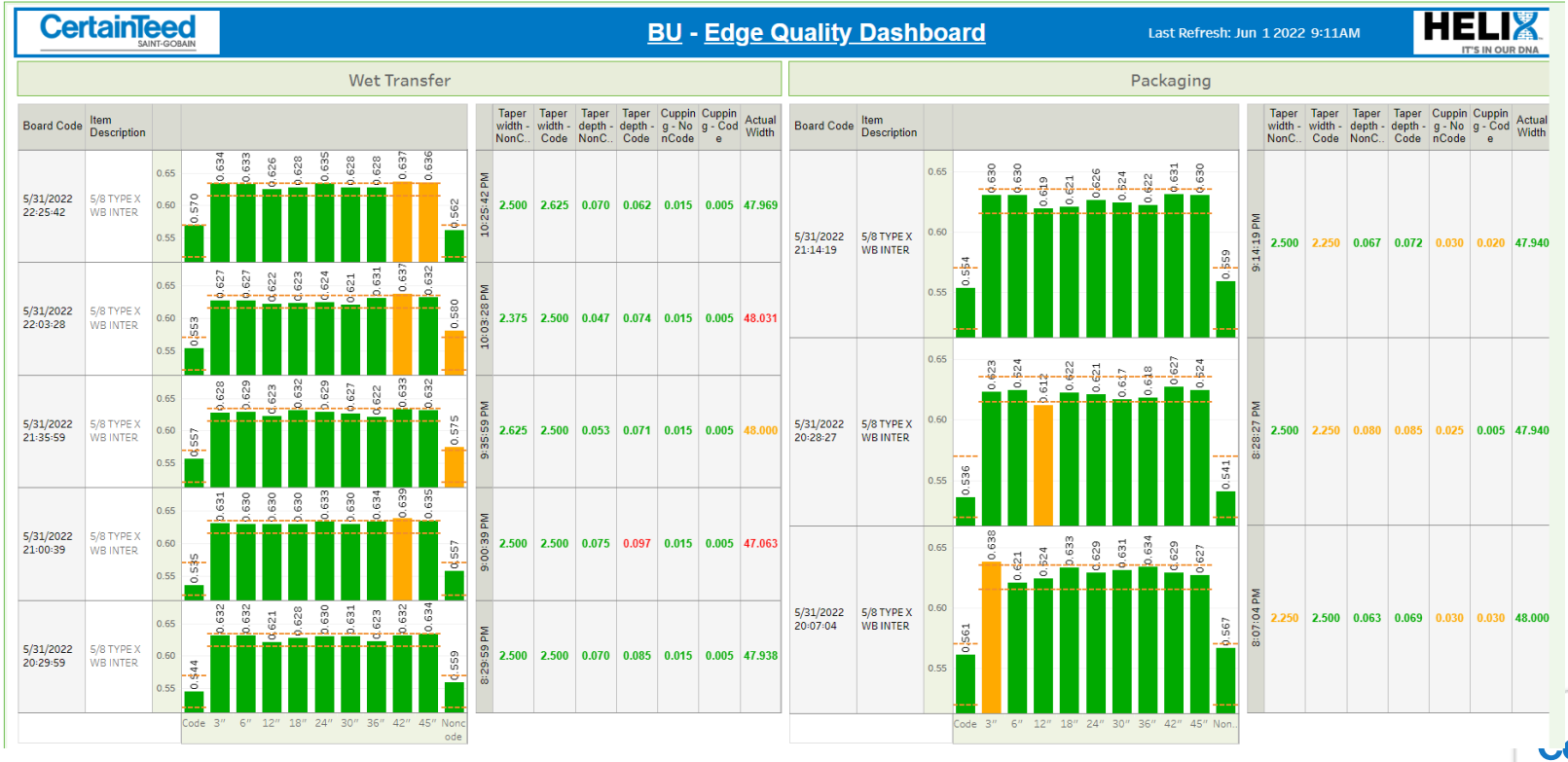


Process, Quality, Formulation results have exception based notification. Take immediate ACTION to understand why and manage the exception.

Color coding of Action Limits and Specification (or Reject) Limits

Real Time Visualization and Notification

Operator Driven Idea – Edge Quality Dashboard mounted over board line to allow quick access to quality data while doing their rounds



Embedded (I4.0 People Engagement)

- In the end, technology is only a tool. It is people that will make it a success or failure.
- Partnered with InSource Solutions to support training, implementation, and culture adaptation at each plant.
- All training is one on one with operators at their workstations at their speed. Full coverage of all shifts. Two weeks 24hrs training. One week Go Live 24 hr. coverage. Three weeks post Go Live adaptation. 60 day follow up assessment.
- Champion at each plant. Typically, Production or Continuous Improvement Manager

Category	Benchmark	Score	Percentage
1.0 Team Meeting	10.0	9.1	91%
2.0 Floor Engagement	11.0	9.9	90%
3.0 Work Orders	10.0	9.0	90%
4.0 Quality	14.0	12.0	86%
5.0 Leadership	13.3	12.5	94%
6.0 Reports / Supervisor Duties	11.0	10.2	93%
7.0 Continuous Improvement	10.0	9.0	90%
Overall	**11.3**	**10.2**	90%
8.0 Historian	13.0	12.0	92%

Key Learnings

- Need to fill gaps in PLC, measuring devices, and other data source gaps at plants requiring additional costs.
- Additional Plant obsolescence, security, and reliability opportunities being addressed in Industrial Network and ISA95 Level 2 through additional capital expenditures
- Just because you bring the horse to water does not mean it will drink.
    - Need to show users, from Plant Floor to Management, “what is in it for them”.
    - We are asking employees to adapt to changing role expectations.
    - Significant investment in training and engagement.
    - The plant cultural and people elements are the determining factors of engagement and tool utilization.
    - Continuous engagement is needed. Increasing HELIX Embedded Actions (People Engagement Project)

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