OCTOBER 25, 2023

Maple Leaf Foods

Accelerating the Digital Manufacturing Journey from MES to Advanced Analytics (AI/ML)

Andy Thorne, Maple Leaf Foods

Blair Hembruff, Cygnus Consulting

Agenda

- Introductions
- Maple Leaf Heritage
- Heritage IoT Project
- Delivery Approach
- Use Cases
- Benefits
- Lessons Learned

MAPLE LEAF FOODS

"The most sustainable protein company on earth is digital"

Who we are

Canada's leading branded protein company, employing more than 11,000 people, we are:

- Canada's largest prepared meats and poultry producer
- Vertically integrated to facilitate strategic supply scale and enable Raised Without Antibiotics (RWA)
- Top 10 pork producer in North America, largest in pork raised without antibiotics
- Leading refrigerated plant-based protein player in the U.S.
- Leader in sustainability including sustainable meat

MAPLE LEAF | RAISE THE GOOD IN FOOD

to be the most sustainable protein company on earth

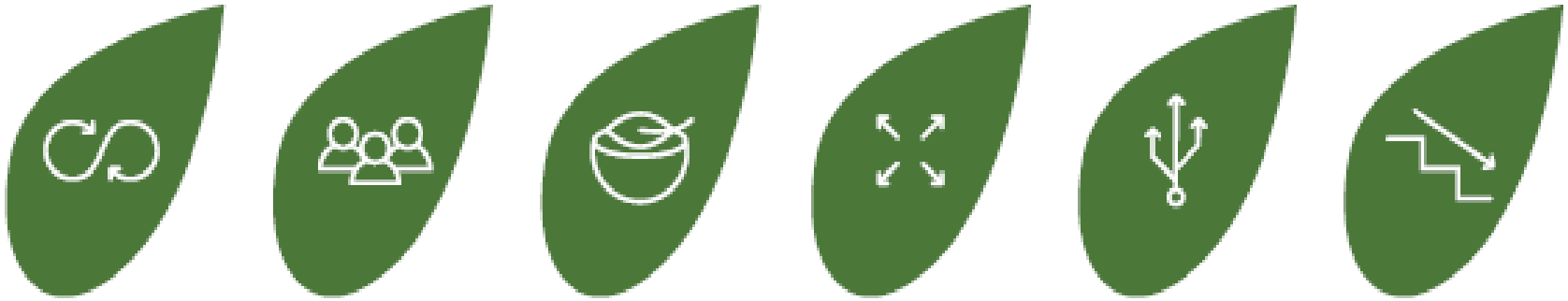
Market-leading brands

MAPLE LEAF · SCHNEIDERS EST. 1890 · Swift EST. 1903

PRIME · GREENFIELD NATURAL MEAT CO. · Lightlife

Our six core strategies fuel our vision

MAPLE LEAF | RAISE THE GOOD IN FOOD



Lead in sustainability

Invest in our people

Make great food

Broaden our reach

Build a digital future

Eliminate waste

THE VISION

FIRST 3 PILLARS

MLF DIGITAL ECOSYSTEM

New Ways of Working

New Ways of Running Operations

New Ways of Engaging Consumers

FEED

FARM

PROCESSING

DISTRIBUTION

RETAIL

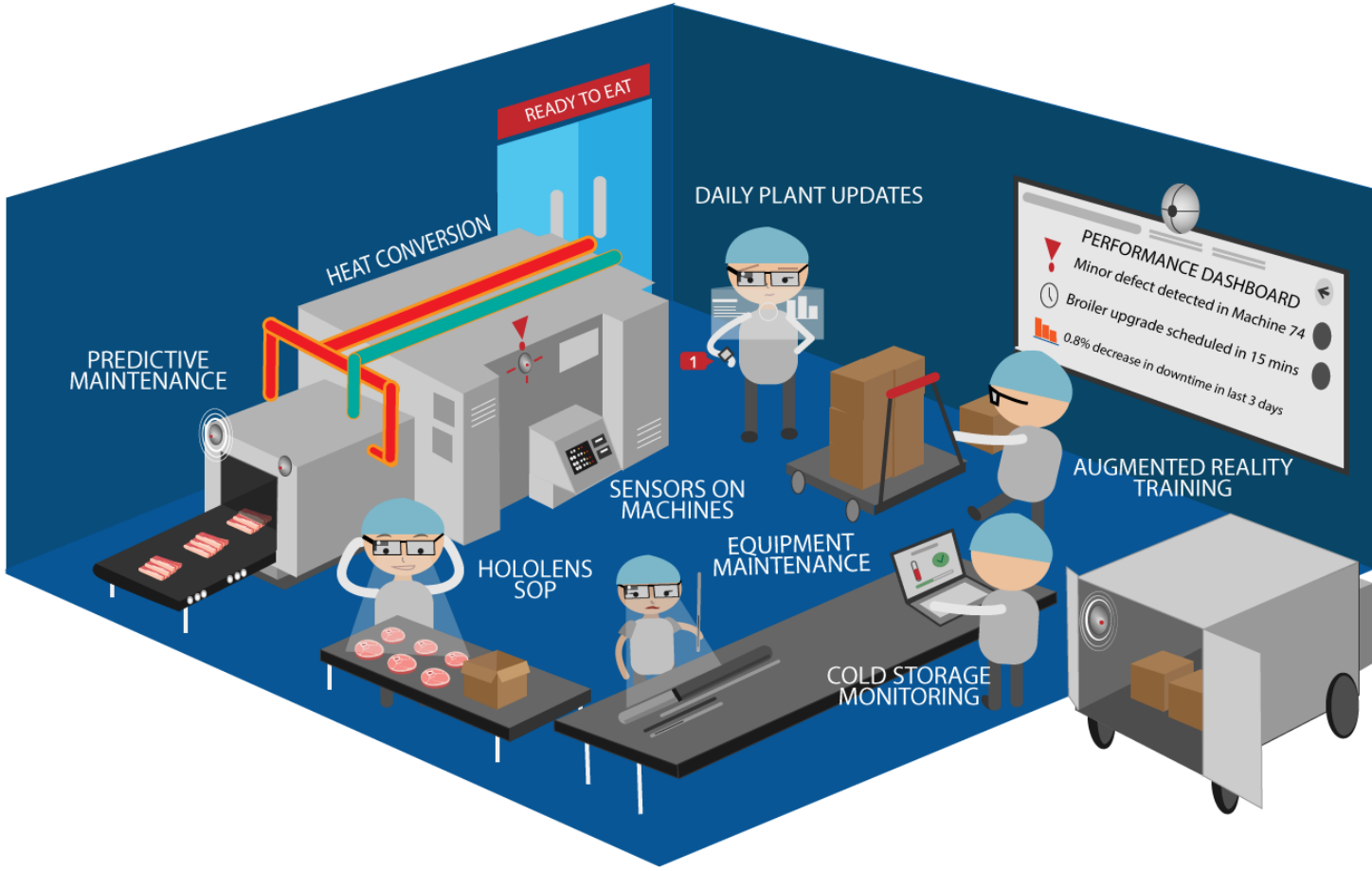
CONSUMER

New Ways Of Running Operations

PRIYA PATEL
Operations Leader

Highly trained & standardized workforce working safely and efficiently using **interactive digital solutions**.

World class performance on equipment downtime through connected operations, **predictive maintenance** and technology enabled technical team members.

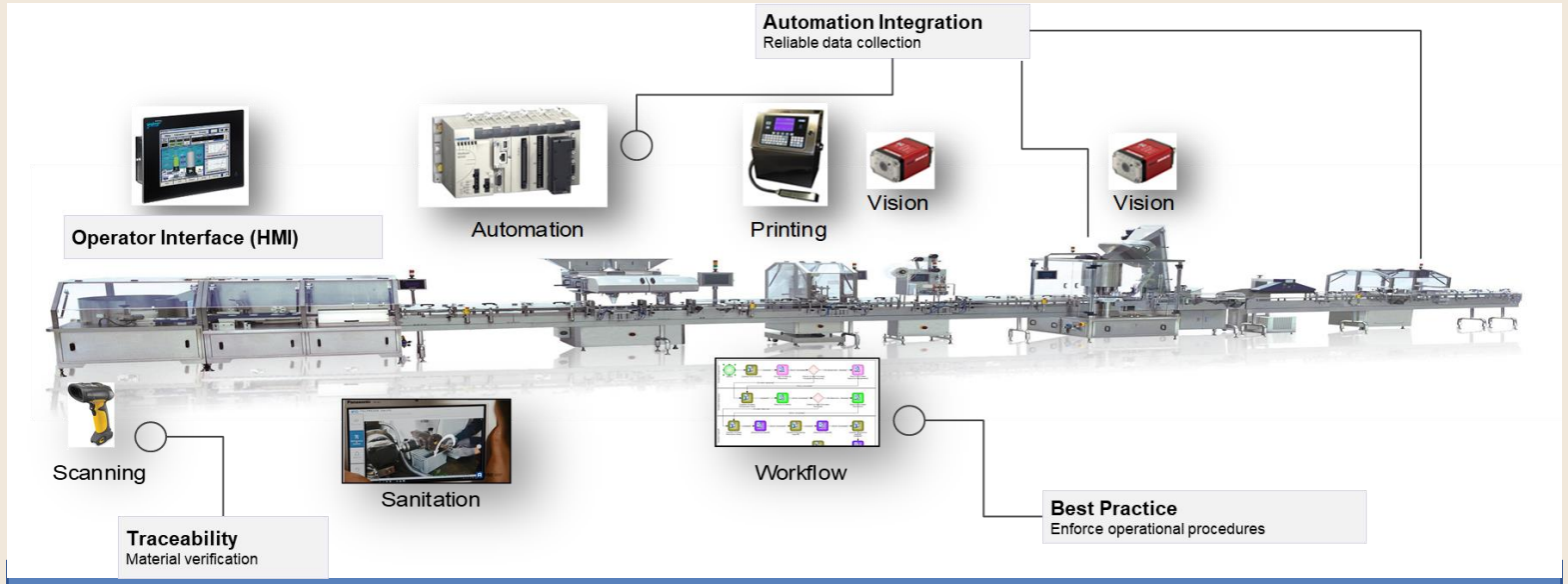


Manufacturing Process Automation with Digital Line Performance Visualization

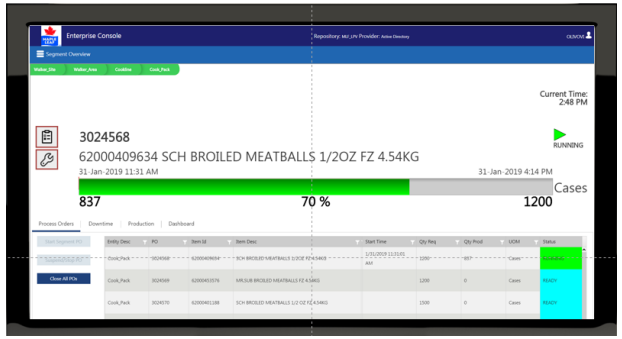
OBJECTIVE REVIEW

Implement scalable and cost-effective technology solutions to address strategic operational priorities:

- **Line Management** – OEE to Maximize Asset Utilization
- **Operating Rhythms** – Production Progress, Short Interval Controls, Downtime Annunciation and Response
- **Performance Metrics** – Near Real Time Digital Dashboards
- **Plant Analytics** for Sustainable Continuous Improvement



Line side HMI, TV + Mobile tools for near real time Awareness and Response, driving Operational Excellence on the production floor



Production Order Progress

Line Status, OEE, Waste

Production Efficiency

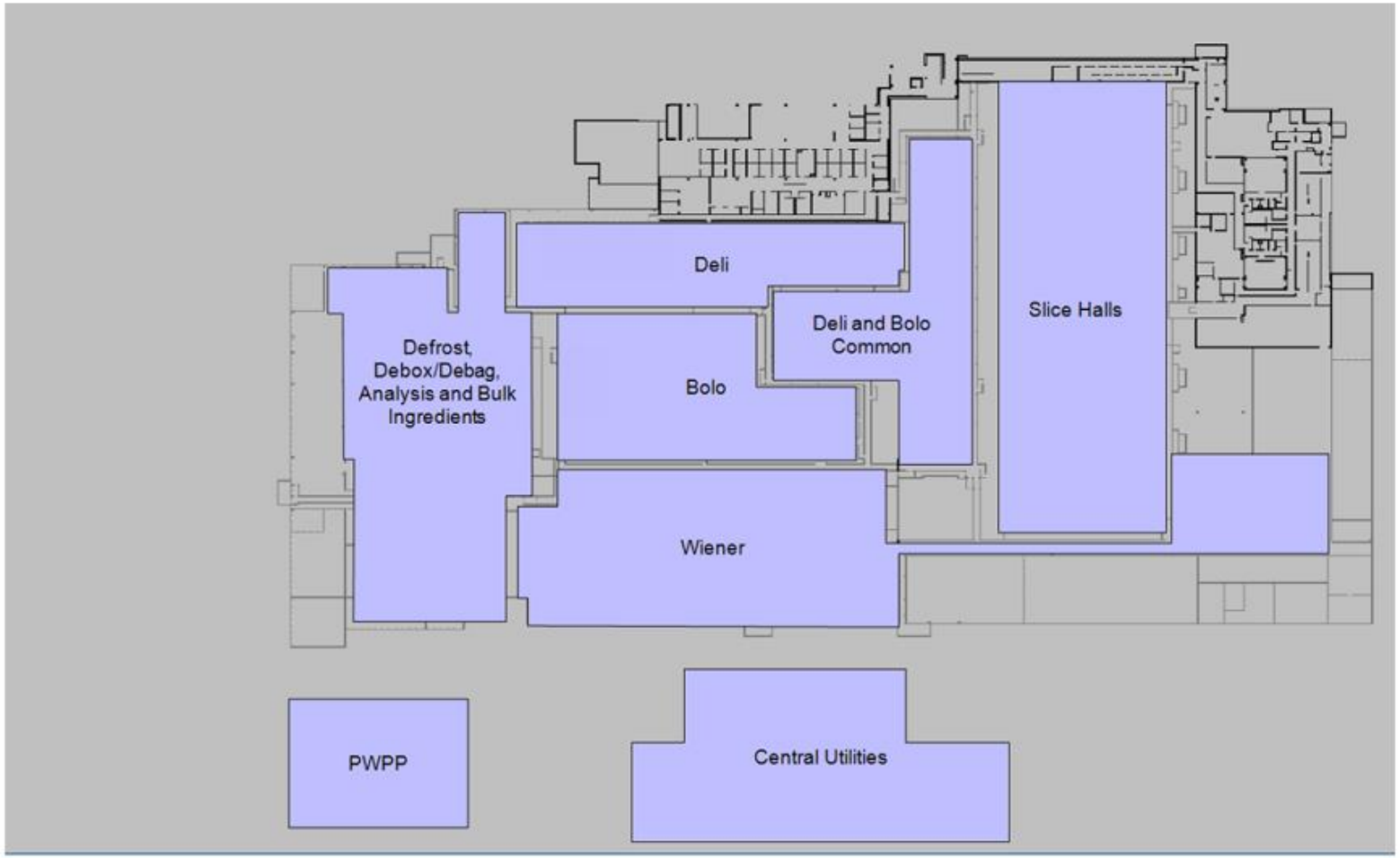
Downtime Analysis

Heritage Plant Facts

- 1000 employees
- 500,000 sq ft
- Produce 60 million kgs of deli meats and wieners
- Wiener operation produces 800,000,000 hot dogs per year
- Winner of the BRCGS as the Site of the Year for the Americas in 2022
  (BRCGS: Brand Reputation Compliance Global Standard)

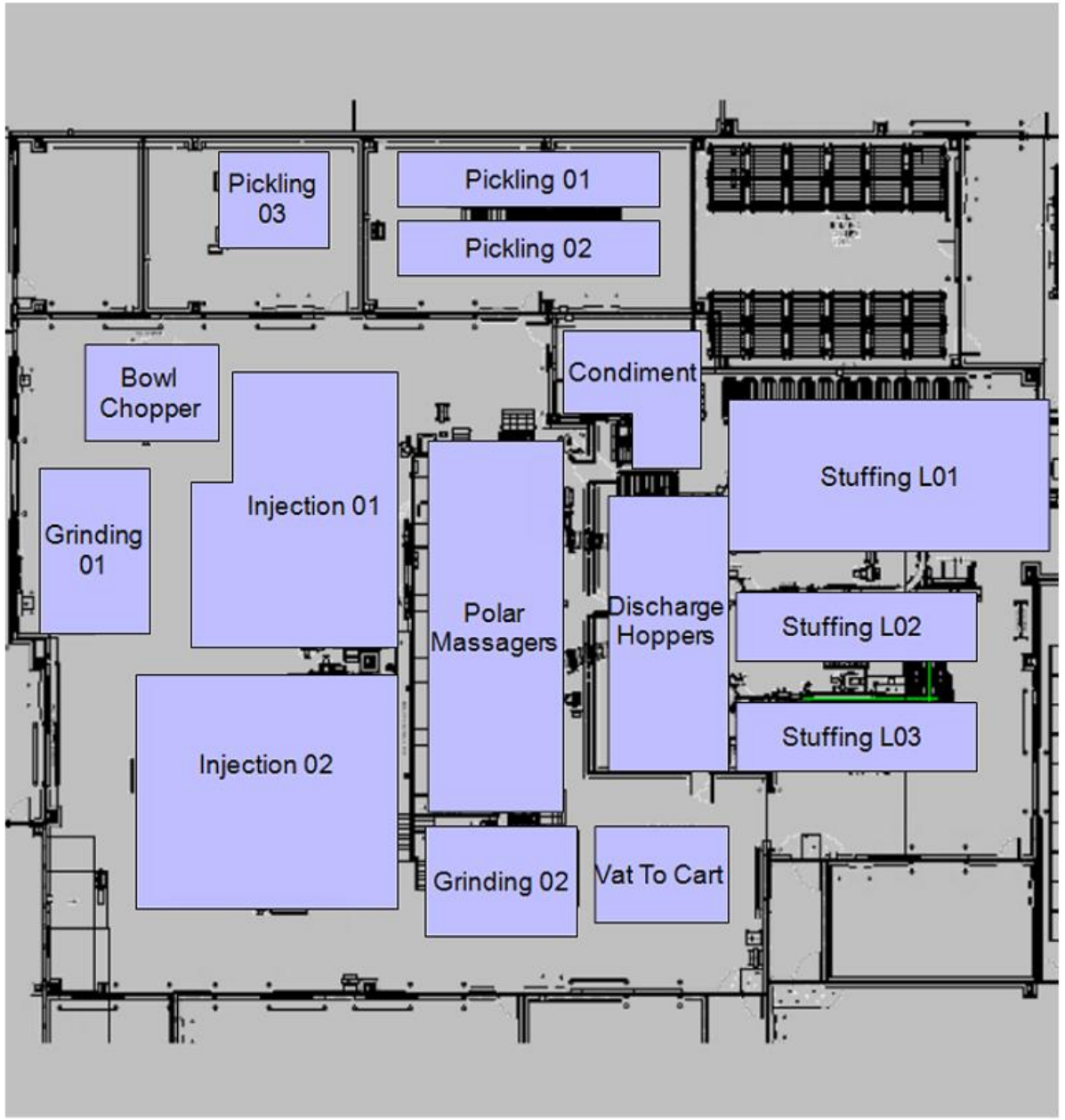
Plant Layout

Plant View



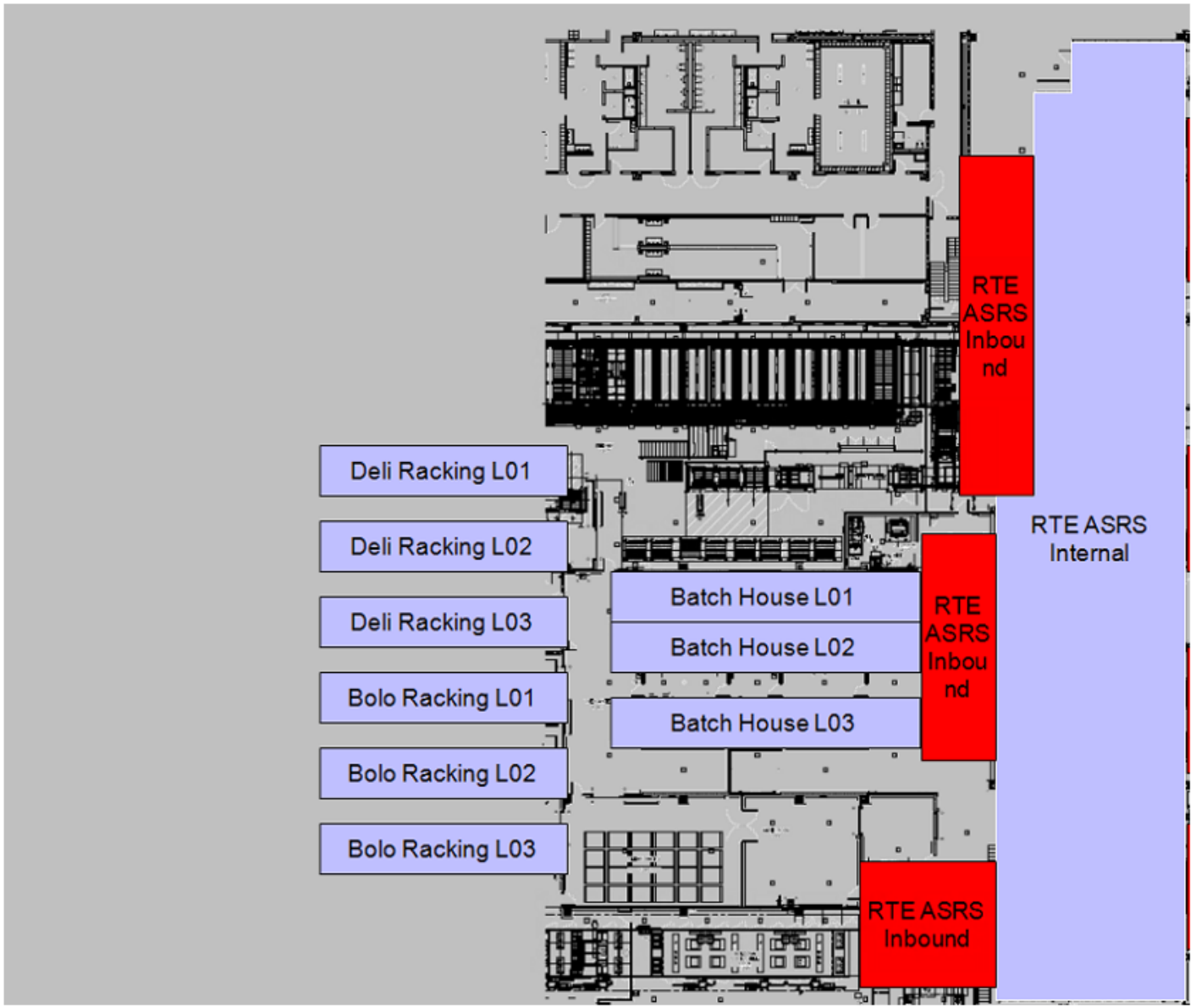
Plant Layout

Deli Formulation and Stuffing



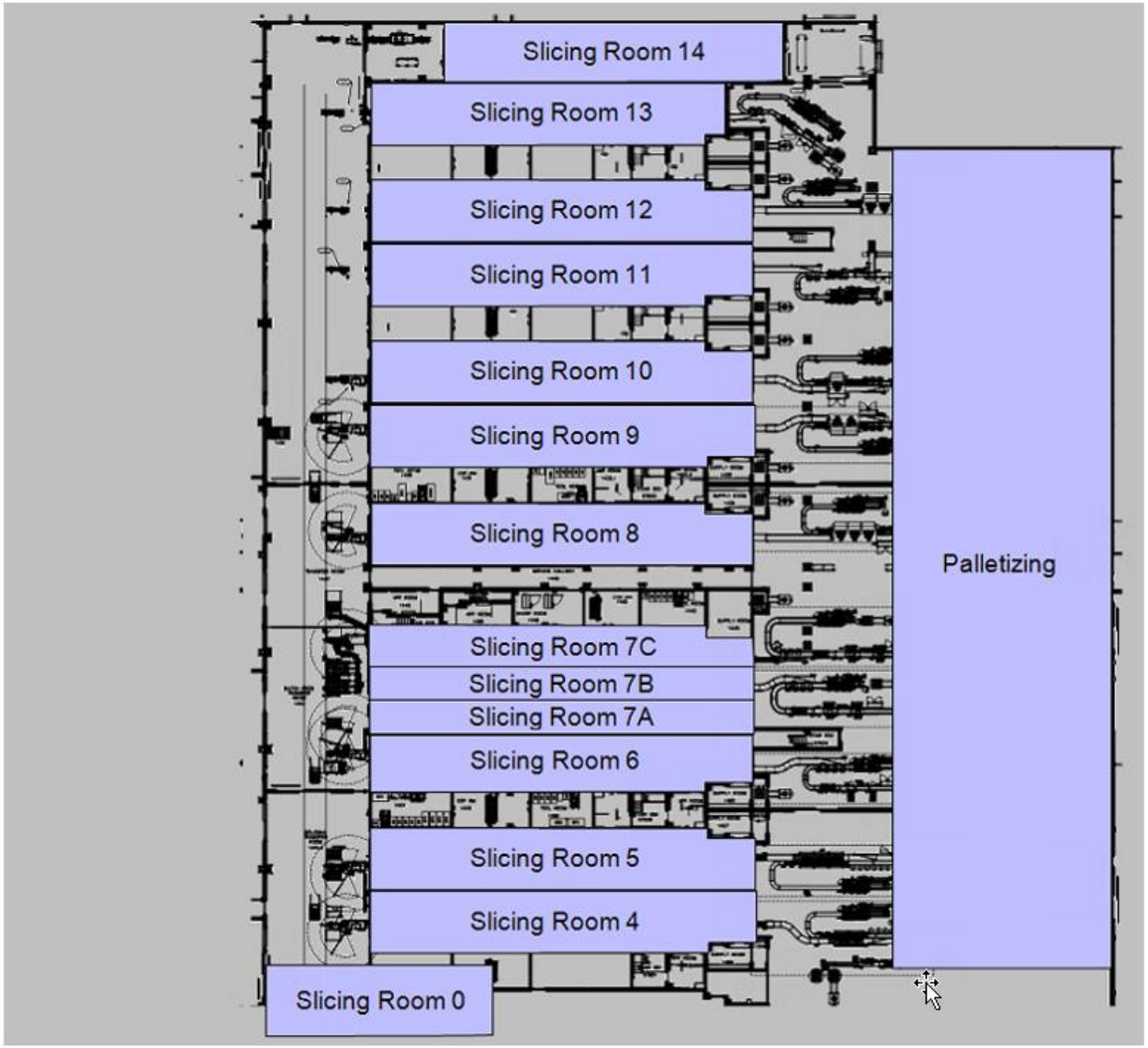
Plant Layout

Batch Houses

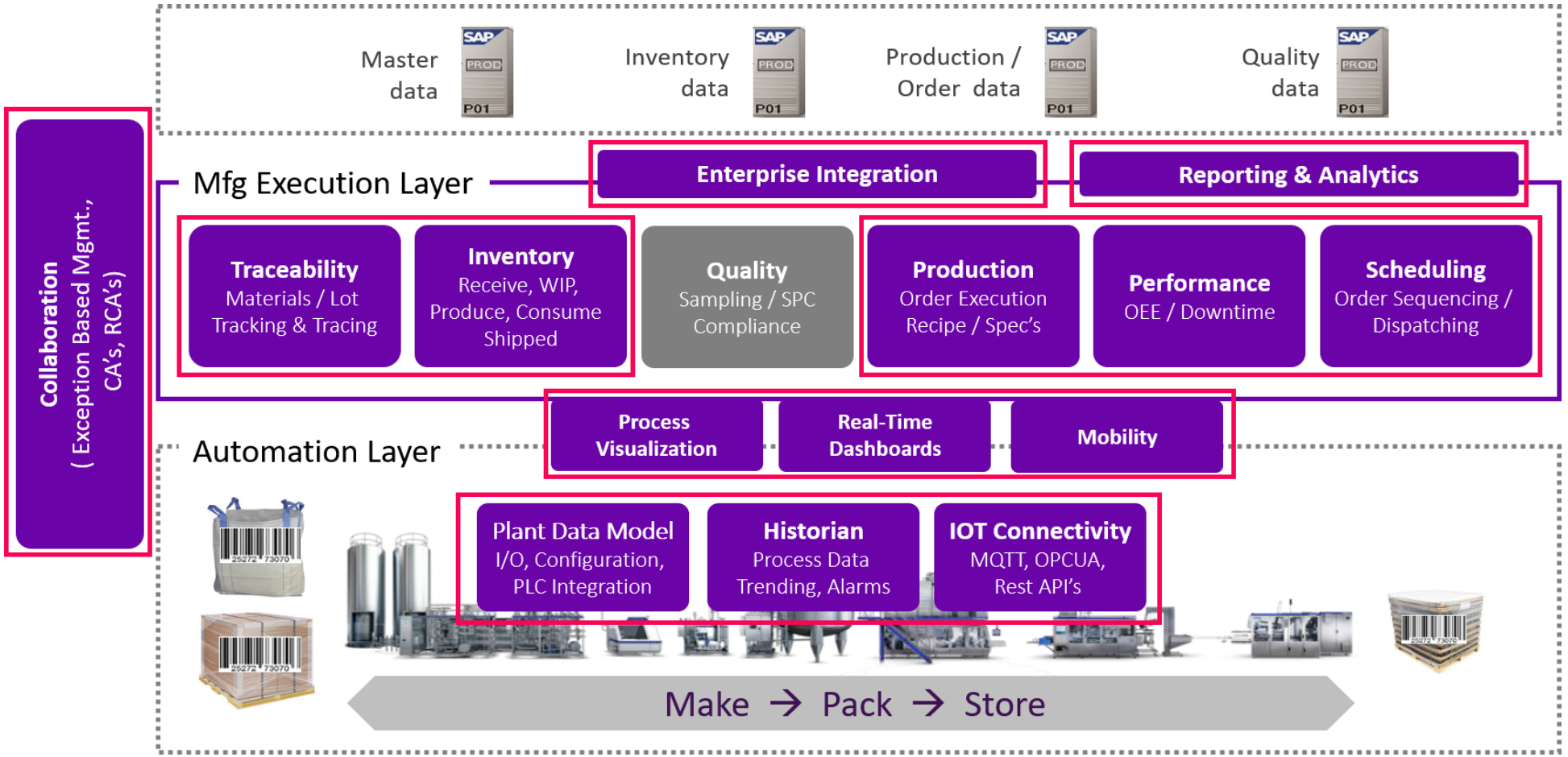


Plant Layout

Slice Halls

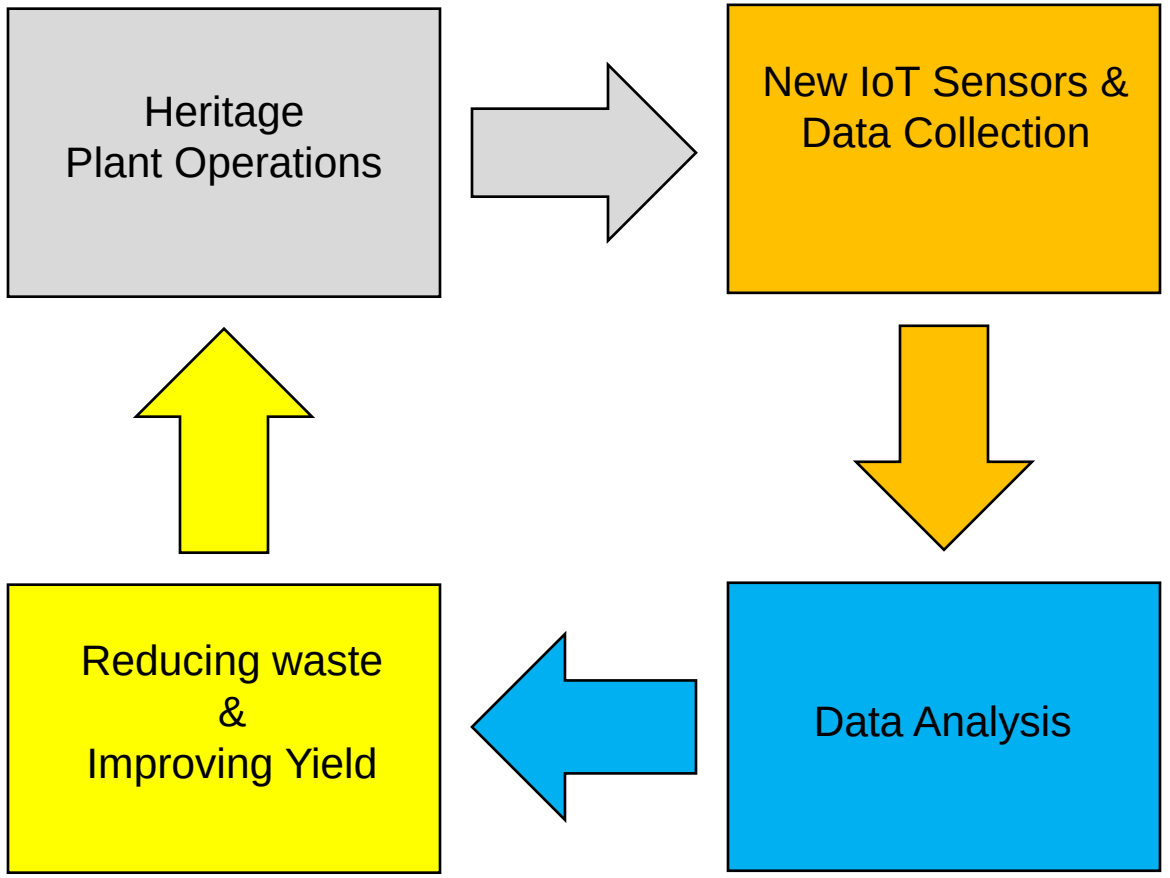


Heritage Plant - AVEVA (MES / SCADA) Landscape



Heritage Plant - IoT project

- Objective: Yield Improvement (reduce waste / loss)
- IoT: Internet of Things
  - New IoT Sensors & Data Collection
  - Advanced Data Analysis
- Leverage existing AVEVA footprint
  - MES / SCADA



Heritage Digital Operations Use-Cases

New

★ Change Impact

7. Minimize Pickle Changeover Losses ★★
- Avoid draining end of run by metering actual usage

Pickle Production

Pickle Hopper

Holding tank Level sensors

8. Visual management for Pickle
- Monitor WIP, Schedule, Scrap to improve efficiencies

1. Ensure Log Length, Width, Shape Consistency ★
- With camera, measure length, width, shape with 100% sampling; Feedback if not in-control

5. Analysis to Optimize Batch House Thermal Profile
- Data Science work to investigate affect of consistent logs on thermal control scheme

3. RTE Yield Tracker and Predictor ★
- Project end-of-day yield to assist with resource assignment and daily ops planning

Stuffer

Batch House Cookers

Chillers

ASRS Storage

Slicer

Pack

6. Ensure Stuffing Operating Performance ★
- Monitor operating parameters for deviations from vs. best demonstrated and vs. recipe setpoints

4. Batch House Schedule Optimizer and Visual Indicators
- Support BH scheduling with optimizer tool (ensure utilization and no exit conflicts)
- Provide visual cues for when Cook cycle is complete ★★

2. Ensure Slicing Operating Performance
- Notify on deviation on operating parameters vs. best demonstrated
- Provide advice on directional weight settings

Raw Supervisor

RTE Supervisor

CI Step Change to influence end to end value chain.

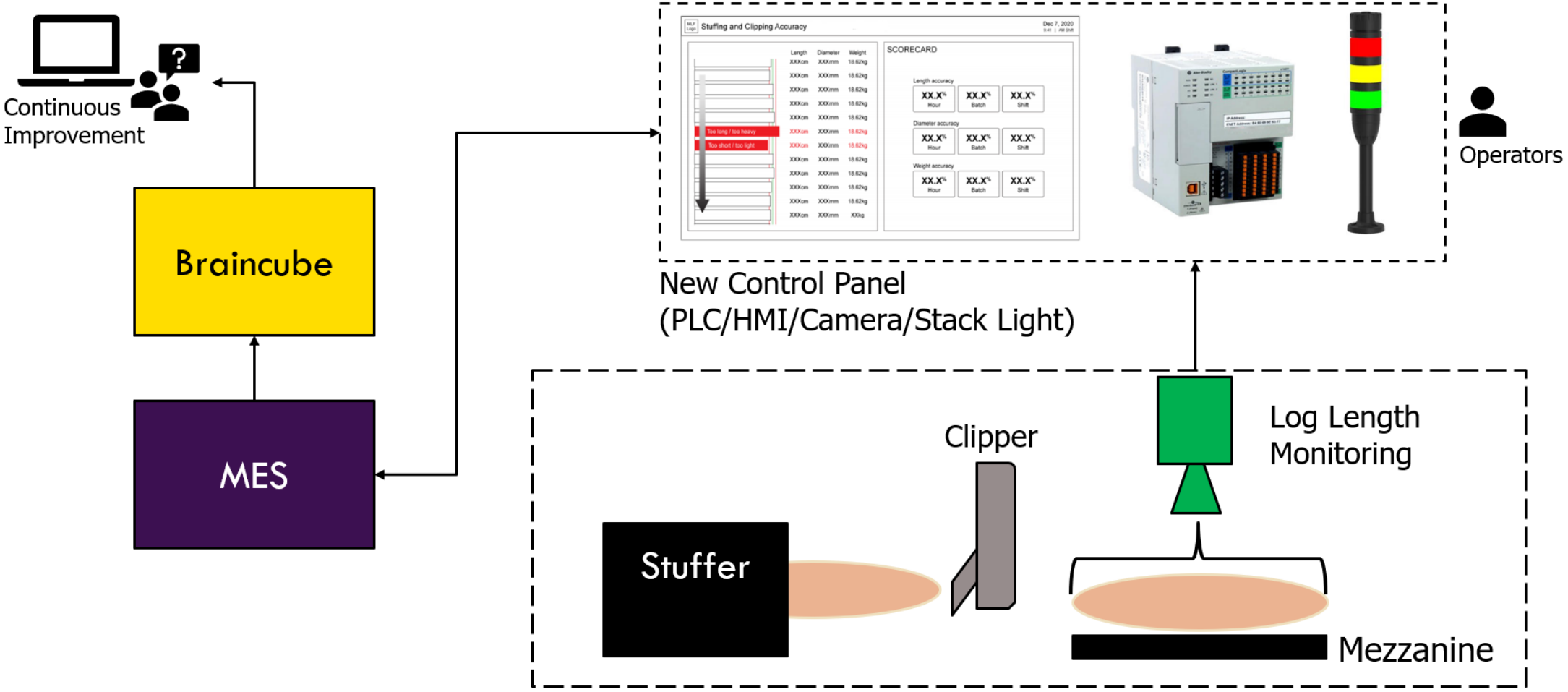
Delivery Team

- Cygnus Consulting
  - Design, Engineering, Installation (IoT Sensors), MES modifications, Commissioning, Startup (Site Work)
- Braincube
  - Data Analytics

Use Case 1: Log Lengths

- Use Case 1
  - Objective: Improve slicing yield by reducing ends loss
  - Primary requirement: Monitor all logs for length, width, shape and provide indication that correction is required

Use Case 1: Solution Architecture



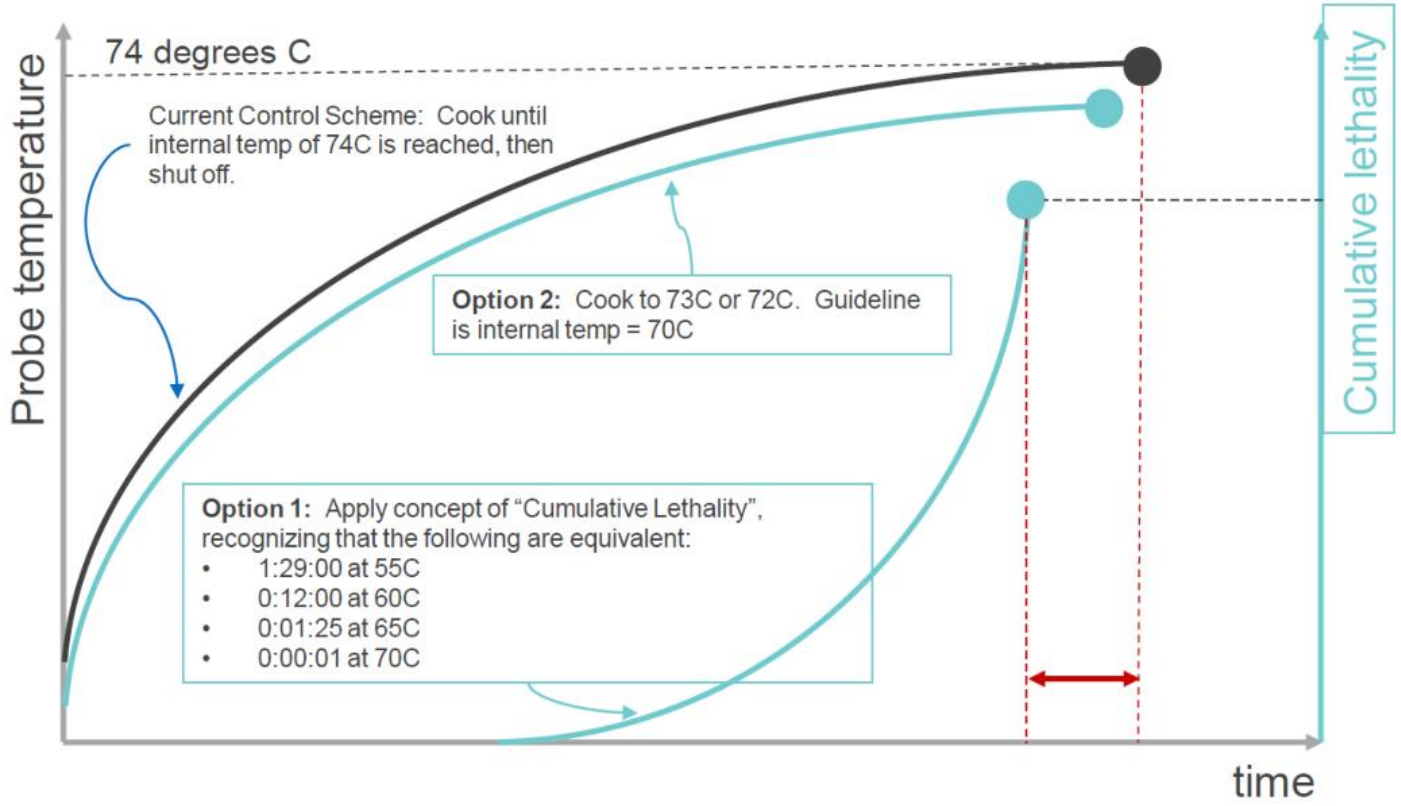
Use Case 5: Batch House Thermal

- Problem
  - Thermal loss is the biggest contributor to yield loss

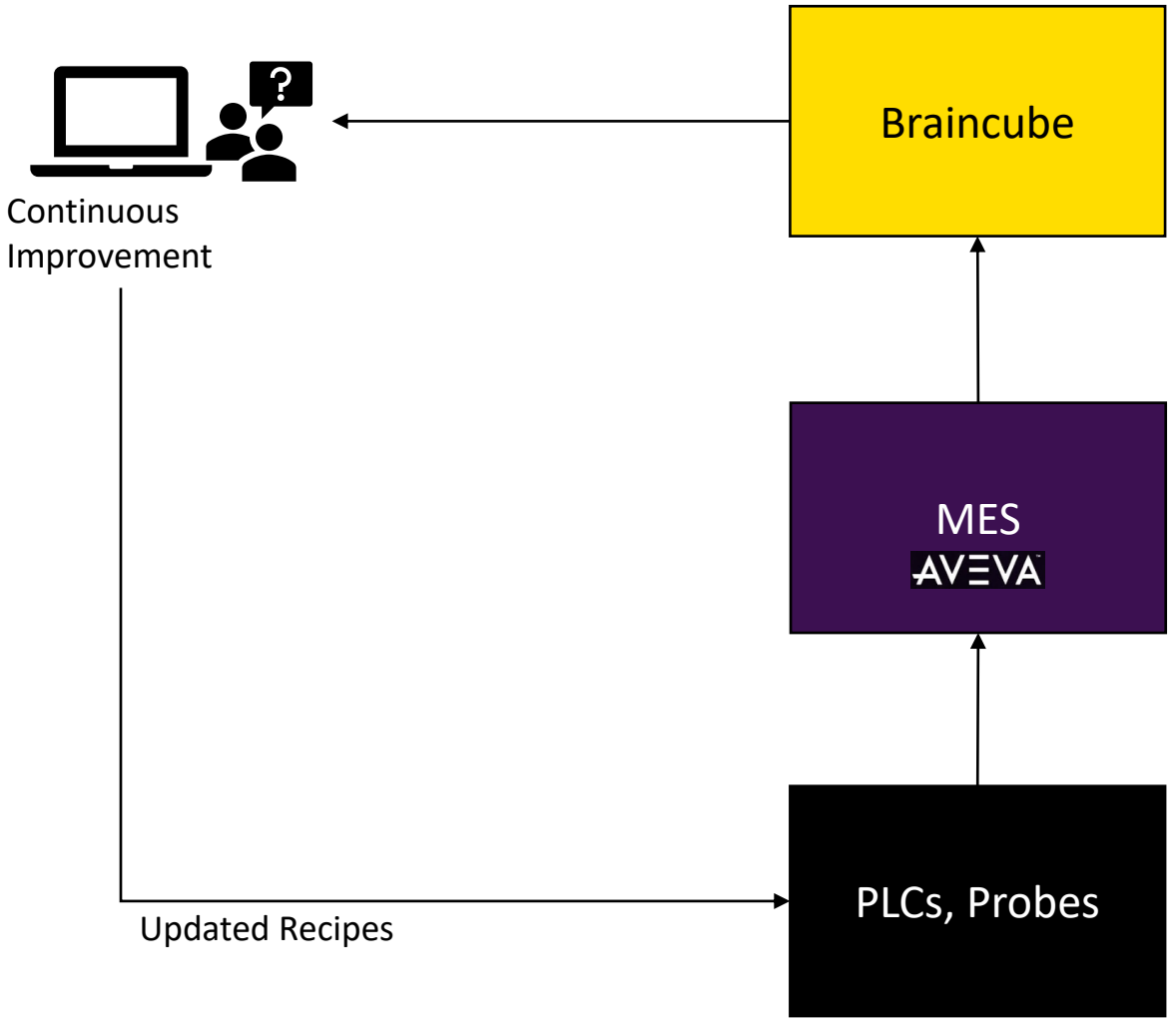
- Primary Requirement
  - Integrate temperature probes and oven data to determine optimum temperature profile for each SKU

Use Case 5: Batch House Thermal Profile

- Benefit Realization
  - Overcooking reduced through detailed temperature profile and updated cook times



Use Case 5: Solution Architecture

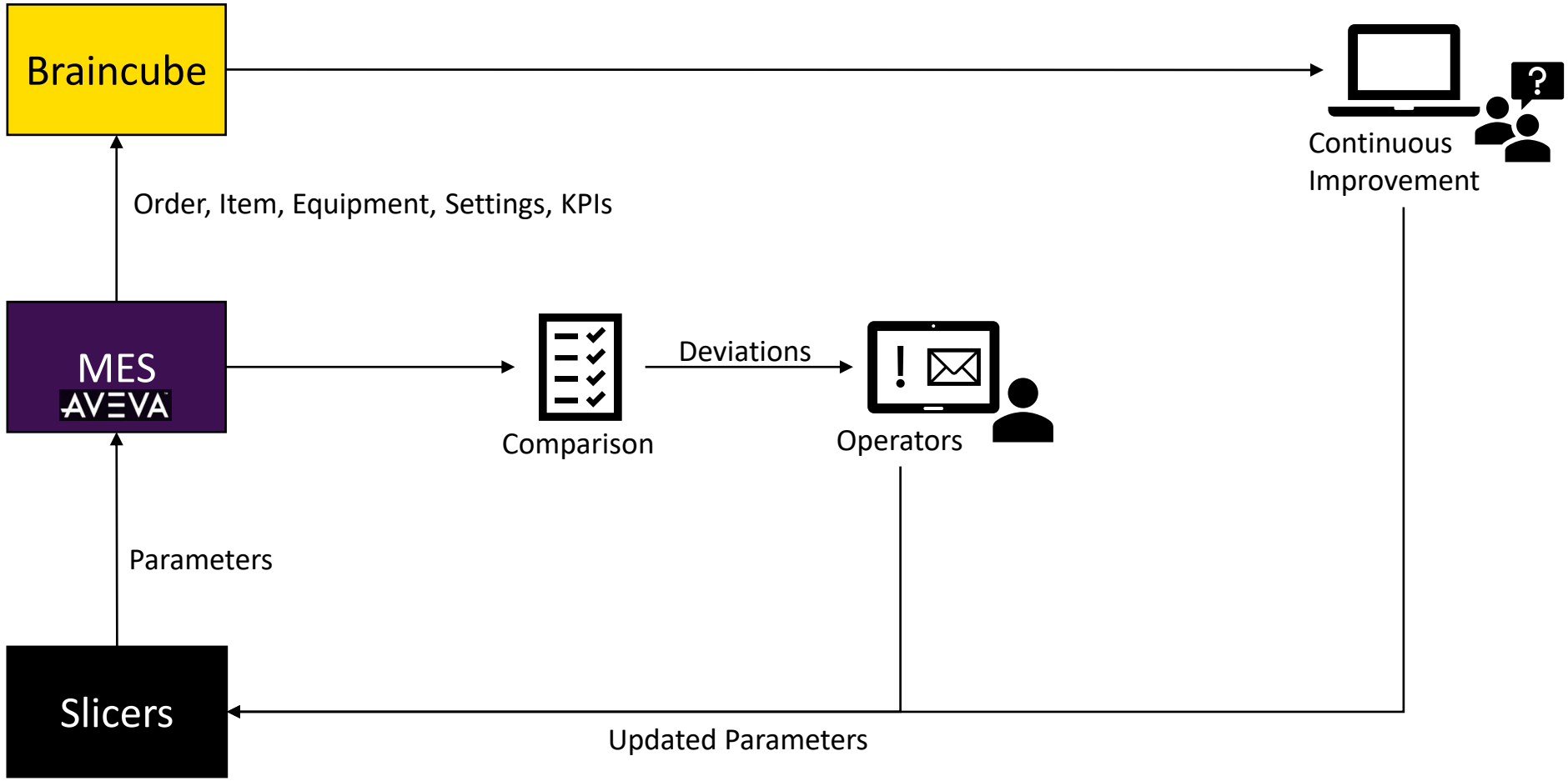


Use Case 2: Slicing Parameters

- Objective: Increase yield by reducing giveaway and ends loss

- Primary requirement: Monitor current parameters and notify on deviation from best demonstrated

Use Case 2: Solution Architecture



Operator & Supervisory Dashboards

- Provide real-time and actionable Information to Operators and Supervisors
- Color coding for easy visuals on Large screen monitors

Slice Hall Summary 2022-08-05 10:38:15 AM

Name	Description	Yield (%)	Variance ($)	Giveaway (%)	Throughput (kg/hr)	Slicer Status	Scale Status
Hall 04	GRNFL USA ABF SLC OR TURKEY 8X7OZ	78.3	-3,086	1.2	0		
Hall 05	BURNS SLICED BOLOGNA 12X500G	85.0	-1,260	0.4	1,006		
Hall 06	COMP SUB VARIETY PACK 12X375G	0.0	0	0.0	0		
Hall 07A	ML NAT SEL SHAVED TURKEY FP 6X375G	189.5	61,362	1.3	0		
Hall 08	DELI EXPR SMKD TURKEY BR 10X200G	0.0	0	0.0	0		
Hall 09	GRNFLD CDN RWA TURKEY 12X175G	156.6	20,993	0.5	648		
Hall 10	KIRKLAND SIG VARIETY PACK 8X3X300G	100.7	1,071	0.4	894		
Hall 11	MR.SUB SLICED TURKEY RWA 12X900G	182.1	11,565	5.2	0		
Hall 12	KIRKLAND SIG XLEAN SLC CK HAM	91.3	-377	0.0	1,494		
Hall 13	SCH MSD ROAST BEEF 6X500G	16.2	-9	0.0	0		

Batch House Visual Indicators 2022-08-05 12:35:59 PM

Line 01 Cook	Line 02 Cook	Line 03 Cook
Process Stop	Running	Process Stop
PO	PO 7578302	PO
Material	Material NAT SEL HAM D47	Material
Next PO 7578310	Next PO 7578311	Next PO 7578303
Next Mat NS CURE FREE OR	Next Mat NS CURE FREE OR	Next Mat NAT SEL HAM D47
Temp	Temp 35.7	Temp
	00:40:43	

Line 01 Chill	Line 02 Chill	Line 03 Chill
Process Stop	Process Stop	Process Stop
PO	PO	PO
Material	Material	Material
Next PO 7578310	Next PO 7578302	Next PO 7578303
Next Mat NS CURE FREE OR	Next Mat NAT SEL HAM D47	Next Mat NAT SEL HAM D47
Temp	Temp	Temp

Plant Name: Heritage Facility Plant ID: 5041

Current Schedule

MES Reports

Publish Time: 08/05/2022 12:14:38 PM

Line	Item Preference	PO	SKU	Material	Oven Scheduled Start Time	Oven Scheduled End Time	Chiller Scheduled Start Time	Chiller Scheduled End Time
Line 1	DELI	7578310	1014393	NS CURE FREE OR CKN SML D LOG (BH COOK)	8/5/2022 2:01:00 PM	8/5/2022 7:06:00 PM	8/5/2022 7:31:00 PM	8/5/2022 11:31:00 PM
		7578312	1014393	NS CURE FREE OR CKN SML D LOG (BH COOK)	8/5/2022 9:53:00 PM	8/6/2022 2:58:00 AM	8/6/2022 3:23:00 AM	8/6/2022 7:23:00 AM
		7578315	1014393	NS CURE FREE OR CKN SML D LOG (BH COOK)	8/6/2022 8:27:00 AM	8/6/2022 1:32:00 PM	8/6/2022 1:57:00 PM	8/6/2022 5:57:00 PM
Line 2	DELI	7578302	1008993	NAT SEL HAM D47 L119.4 (COOK-CHILL)	8/5/2022 10:51:55 AM	8/5/2022 12:01:55 PM	8/5/2022 12:26:55 PM	8/5/2022 1:56:55 PM
		7578311	1014393	NS CURE FREE OR CKN SML D LOG (BH COOK)	8/5/2022 2:41:00 PM	8/5/2022 7:46:00 PM	8/5/2022 8:11:00 PM	8/6/2022 12:11:00 AM
		7578313	1014393	NS CURE FREE OR CKN SML D LOG (BH COOK)	8/6/2022 12:18:00 AM	8/6/2022 5:23:00 AM	8/6/2022 5:48:00 AM	8/6/2022 9:48:00 AM
		7578314	1014393	NS CURE FREE OR CKN SML D LOG (BH COOK)	8/6/2022 6:55:47 AM	8/6/2022 12:00:47 PM	8/6/2022 12:25:47 PM	8/6/2022 4:25:47 PM
Line 3	ALL	7578303	1008993	NAT SEL HAM D47 L119.4 (COOK-CHILL)	8/5/2022 1:12:00 PM	8/5/2022 2:22:00 PM	8/5/2022 2:47:00 PM	8/5/2022 4:17:00 PM
		7578304	1014047	LM CLEAN VALU TRKY D47 L119 (COOK-CHILL)	8/5/2022 4:28:00 PM	8/5/2022 5:38:00 PM	8/5/2022 6:03:00 PM	8/5/2022 7:33:00 PM
		7578305	1014047	LM CLEAN VALU TRKY D47 L119 (COOK-CHILL)	8/5/2022 7:46:00 PM	8/5/2022 8:56:00 PM	8/5/2022 9:21:00 PM	8/5/2022 10:51:00 PM
		7578306	1009883	BURNS SALAMI D82 L45.7 (COOK-CHILL)	8/5/2022 11:26:00 PM	8/6/2022 1:46:00 AM	8/6/2022 2:11:00 AM	8/6/2022 5:11:00 AM
		7578307	1009883	BURNS SALAMI D82 L45.7 (COOK-CHILL)	8/6/2022 5:04:29 AM	8/6/2022 7:24:29 AM	8/6/2022 7:49:30 AM	8/6/2022 10:49:30 AM

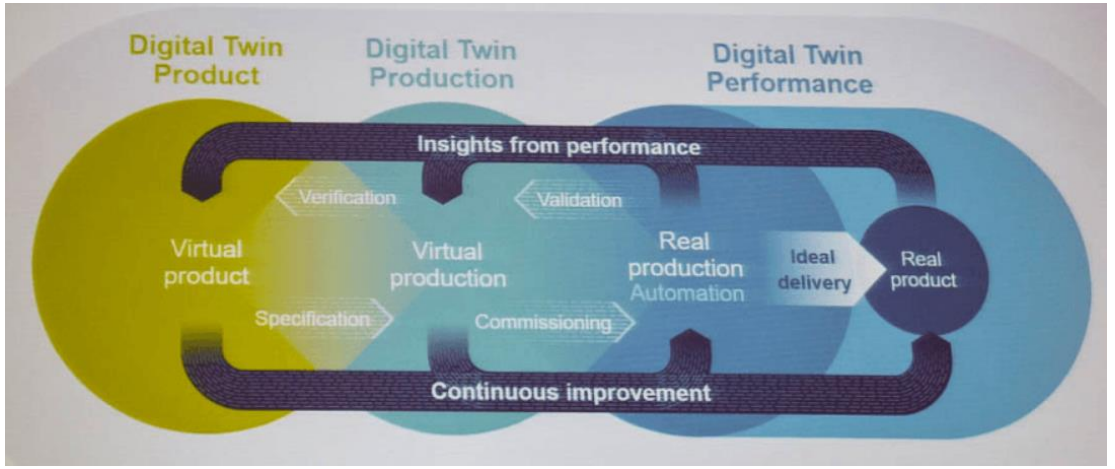
Report Generated On 8/5/2022 12:37:44 PM Page 1 / 1

Pickle Inventory 2022-08-05 10:39:36 AM

Material	Batches	Location	Scheduled	Inventory	Consumed	Remaining
1008311	1	VAT/TANK	1150	4040	874	3166
1008535	1	TANK	1800	0	0	0
1008782	1	TANK	900	1211	0	1211
1008972	1	VAT/TANK	1450	2952	0	2952
1012580	3	VAT/TANK	3750	4580	0	4580
1014380	1	TANK	525	879	0	879
1014392	2	VAT/TANK	5600	14397	725	13672
1015460	3	TANK	3275	4541	3267	1274
1016500	1	TANK	2050	934	0	934
1017161	2	TANK	1625	2126	0	2126

Digital Twin Technology for Machine Learning, AI & Advanced Analytics

Raw Data
from people, systems and machines



Contextualized Data Models by Product

Advanced Analytical Apps

Process Map
Data transformation Model

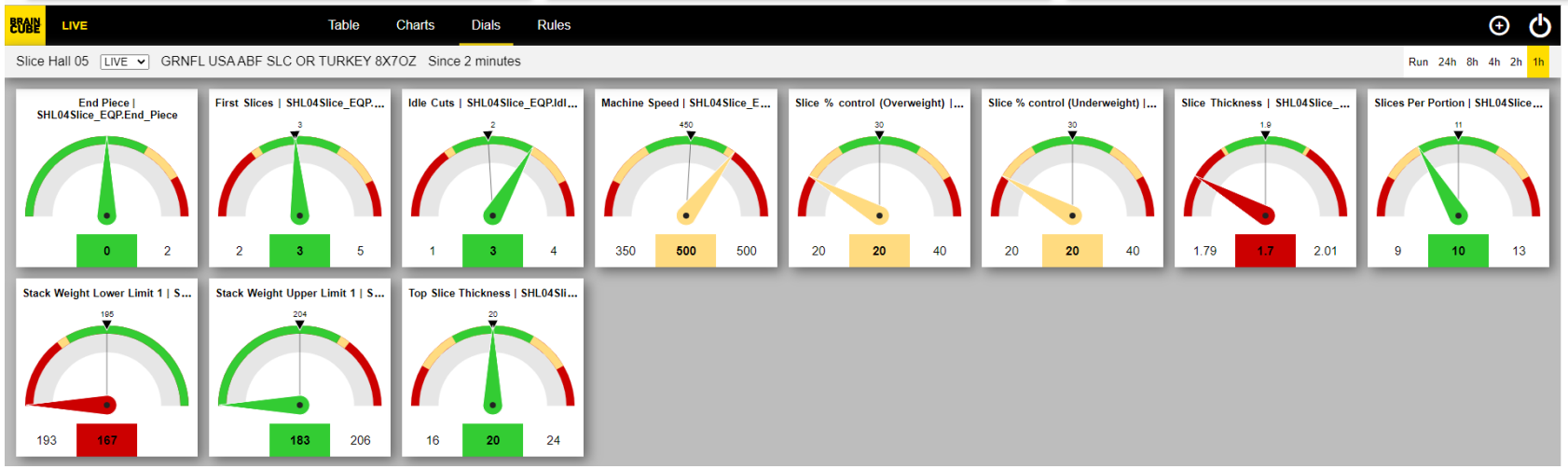
Structured
Digital Twin Builder includes

- ✓ Lag Time
- ✓ SME (human knowledge)
- ✓ Flow

Updated in Real-time
Digital Twin

Real-time Center lining dashboard for Analysis of variance

Live Dashboards with multiple indicators for process control



Benefits

- The slice hall use cases yielded the best results, following by batch house and stuffing use cases

- The slicers are recipe based. Those parameters vary by SKU and tribal knowledge was the best source before IOT system. We would run better yield on one shift and bad on the other for same product. Due to frequent turnover, new operators needed to learn the settings over time. Also, the key metrics from the slicers were only available on the slicer HMI.

- With IOT and Braincube, we were able to narrow down ideal settings based on best output days per product. Those are displayed via a dashboard to supervisors and operators. We also contextualized key machine metrics with data from MES (Yield etc.) to give actionable information to supervisors.

- The project resulted in an increase of gross profit by 10-12% by reducing waste in the following areas.
  - Consistent WIP log Length – reduced large end piece losses.
  - Consistent Log cook – reduced over cook and quality Losses in the ovens.
  - Improved Weber Slice parameters, increasing yield and minimizing losses at finished good slicing.

Lessons Learned

- Focus on business objectives not technology
  - IoT and AI are hot topics but do not deliver returns in themselves
  - Focus was on yield
  - Benefits were identified for each use case and measured post implementation
- Involve the end user early
  - UX workshops, requirements sessions
- Vision is hard
  - Prototype and experiment before implementation
- Leverage existing infrastructure
  - With IoT it can be tempting to re-invent the wheel

Andy Thorne

I.S. Architect, Manufacturing Execution Systems

- Maple Leaf Foods
- andy.thorne@mapleleaf.com

Blair Hembruff

President & Chief Engineer

- Cygnus Consulting, Inc.
  (an AVEVA Certified MES Systems Integrator)
- bhembruff@cygnusconsulting.ca

AVEVA

Questions?

Please wait for the microphone.

State your name and company.

Please remember to…

Navigate to this session in the mobile app to complete the survey.

Thank you!

linkedin.com/company/aveva

@avevagroup

ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com

AVEVA