Leveraging Asset Framework for Product Traceability

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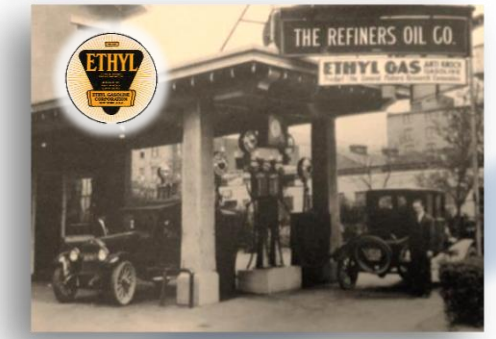
Outline

- What is Traceability?
- Why do we need Traceability?
- Why use Asset Framework (AF)?
  - Why use Custom Data References?
- Solution Walkthrough
- Next Steps
- Q&A

Afton Chemical

1924
Ethyl Gasoline Corporation formed



2004
NewMarket Corporation formed

2019
Afton today

A key player in the lubricant and fuel additive industry for more than 90 years.

$2.3 B turnover;
~1900 employees

Afton CHEMICAL

AftonChemical.com

Afton CHEMICAL
Passion for Solutions®

A Broad Range of Technical Solutions

Driveline Additives

- Automotive Gear
- Automatic Transmission Fluid
- Continuously Variable Transmission (CVT)
- Dual Clutch Transmission (DCT)
- Manual Transmission
- Off-Road Additives
- Power Steering

Engine Oil Additives

- Four Stroke Motorcycle Engine Oils
- Heavy Duty Engine Oil
- Passenger Car Motor Oil
- Medium Speed Diesel (Railroad)

Industrial Additives

- Grease
- Hydraulic
- Industrial Gear
- Slideway
- Turbine, Compressor and Circulating Fluids
- Wind Turbine

Lubricant Components

- Couplers
- Detergents and Corrosion Inhibitors
- Dispersants
- Extreme Pressure Agents and Anti-Wear Agents
- Foam Inhibitors
- Friction Modifiers
- Pour Point Depressants
- Seal Swell Additives
- Tackiness Additives

Fuel Additives

- Heavy Duty Vehicle Performance
- Home-Heating Oil Fuel
- Light-Duty Vehicle Performance
- Octane Additives
- Refinery and Distribution Fuel

Viscosity Modifiers

- Olefin Copolymer (OCP)
- Polymethacrylates (PMA)
- Hydrogenated Styrene-Butadiene Copolymer (HSB)
- Thickeners

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Stone Technologies

Stone Technologies was founded in 1996 and is a national system integrator(SI) providing automation/control, information (MES) and operational consulting solutions. Stone is based in St. Louis, MO with resources in 17 states.

OSIsoft® Select Partner

- 75 full time employees
- Average 13% year over year growth for past 10 years
- www.stonetek.com

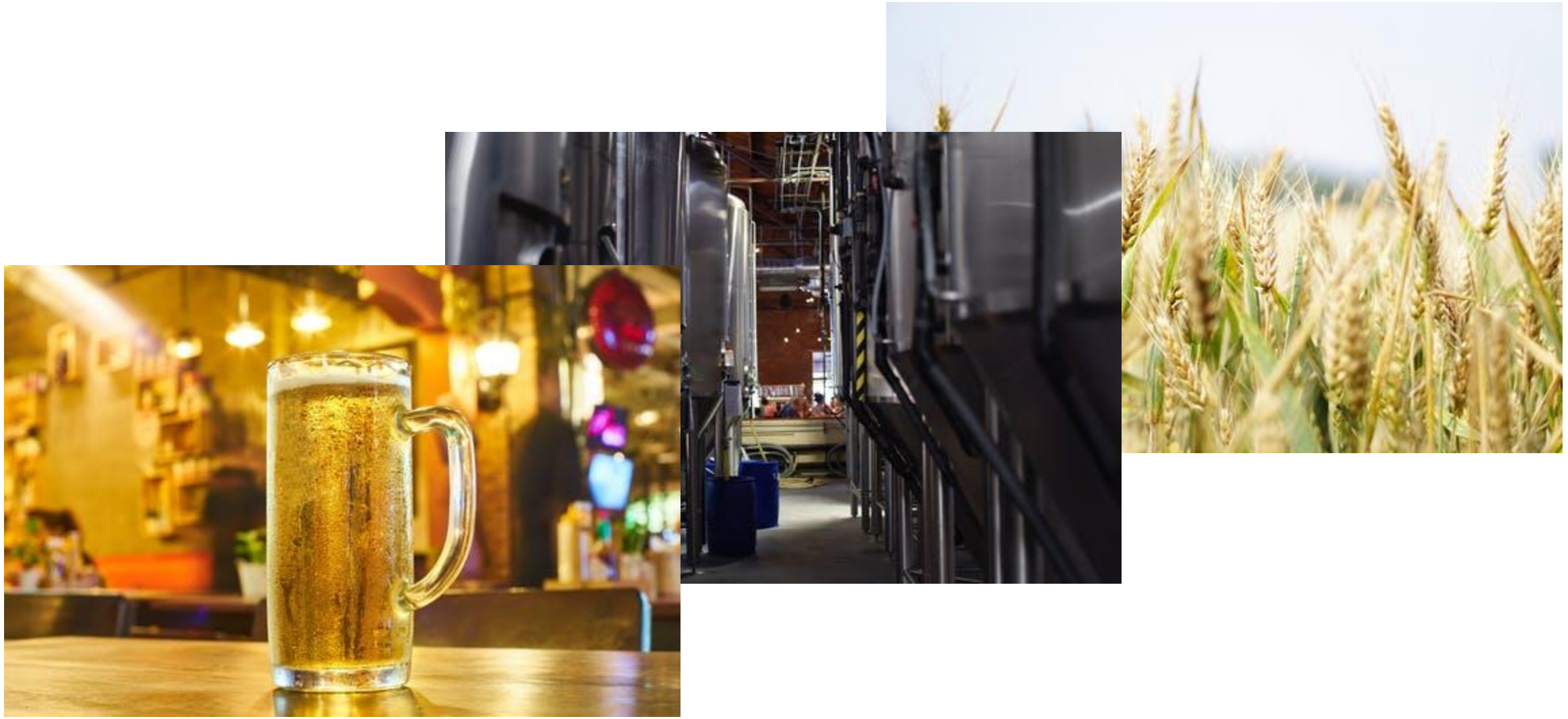
Employee	Business
Satisfied people deliver successful projects and provide long term continuity	Stone Technologies' long-term relationships are built on performance, trust and keeping promises
▪ Over 95% employee retention rate for the last 10 years ▪ The technical staff has an average of 22 years of experience	▪ Of our top 20 clients (by services revenue) since the inception of the company over **20** years ago: we are doing business with ALL of them today ▪ Average adding 2 – 3 new clients a year

Stone Technologies, Inc.

What is Traceability?

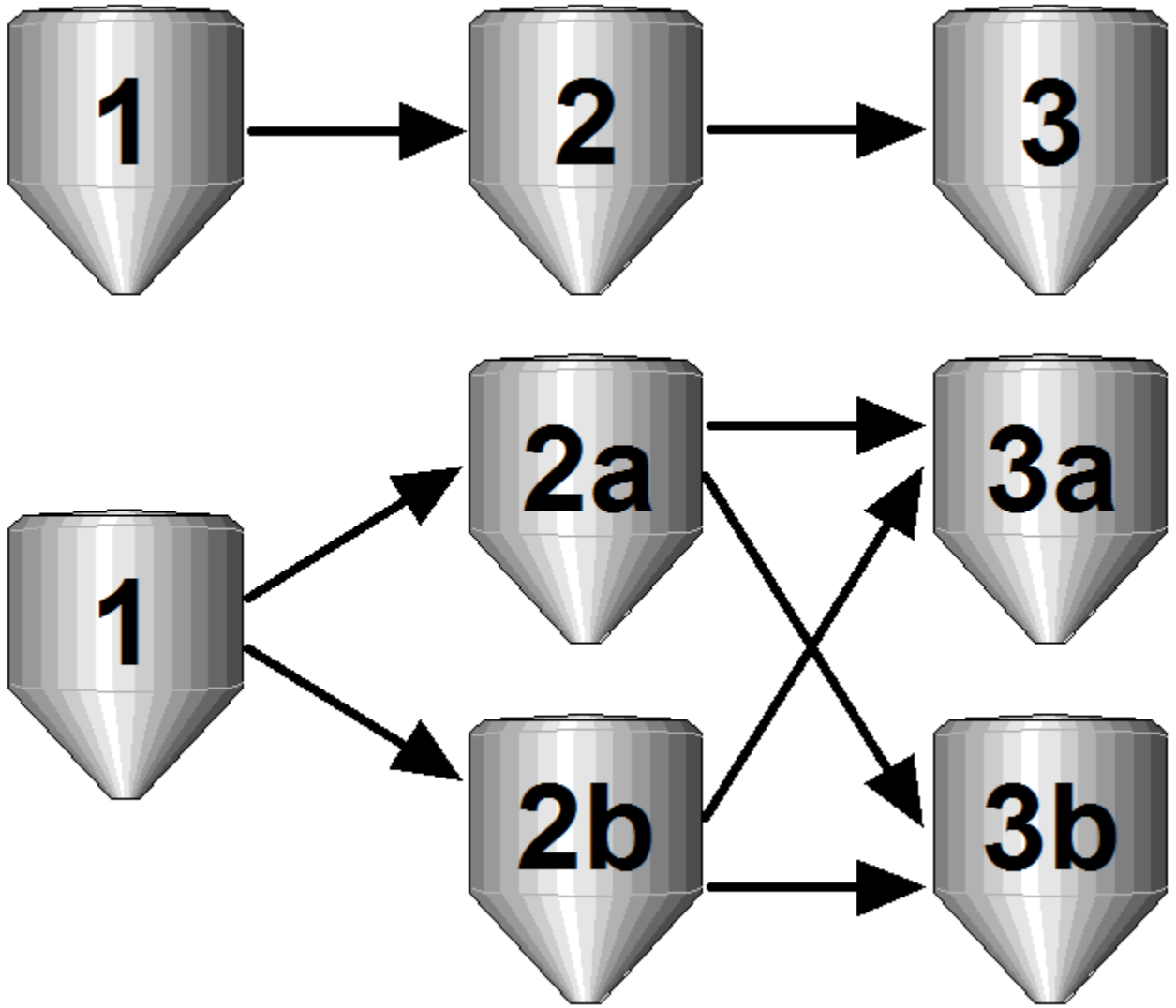
Field to Table

Table to Field



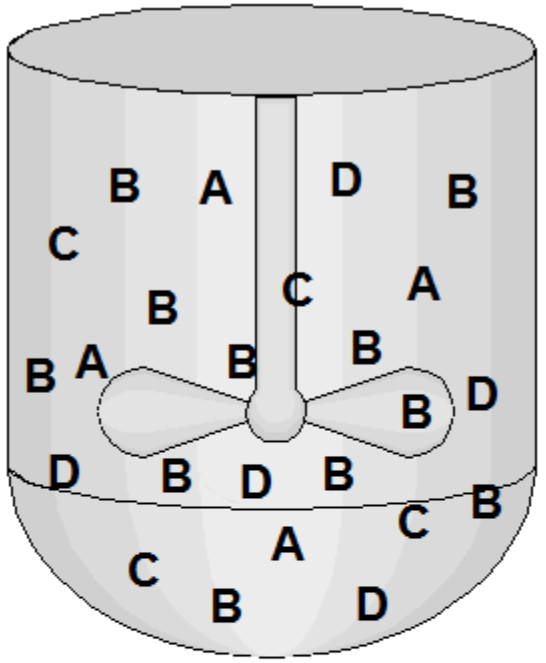
Transfer Scenarios

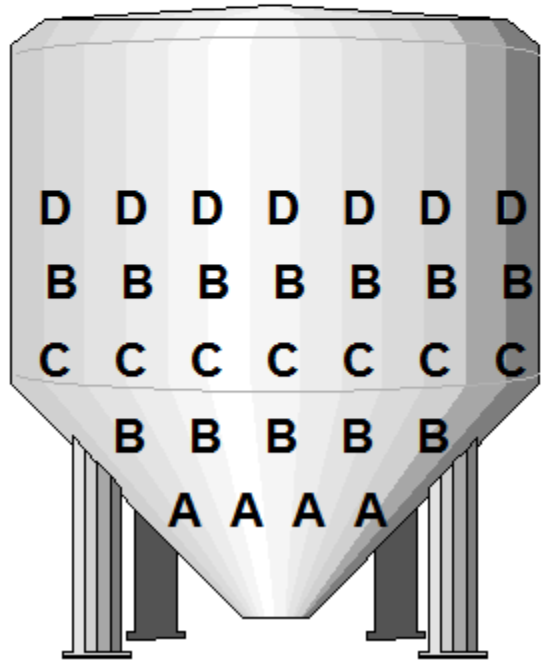
- One-to-One
- One-to-Many



States of Matter

- Liquid (evenly mixed material)
- Solid (layers of material)





Why do we need Traceability?

Why Traceability?

- **A better understanding of process production performance and what impacts performance and quality characteristics**
- **Retrieve data to investigate quality upsets in ½ day**
- **IATF 16949 – Automotive quality management standard**
  - *"The purpose of traceability is to support identification of clear start and stop points for product received by the customer or in the field that may contain quality and/or safety-related nonconformities."*
  - *"… identify nonconforming and/or suspect product, enable the organization to segregate nonconforming and/or suspect product, ensure the ability to meet the customer and/or regulatory response time requirements …"*

2018 FDA Recall Statistics

- 1874 total records
- Class I, II and III
  - **Class I recall (549):** a situation in which there is a reasonable probability that the use of or exposure to a violative product will cause serious adverse health consequences or death.
  - **Class II recall (1180):** a situation in which use of or exposure to a violative product may cause temporary or medically reversible adverse health consequences or where the probability of serious adverse health consequences is remote.
  - **Class III recall (145):** a situation in which use of or exposure to a violative product is not likely to cause adverse health consequences.

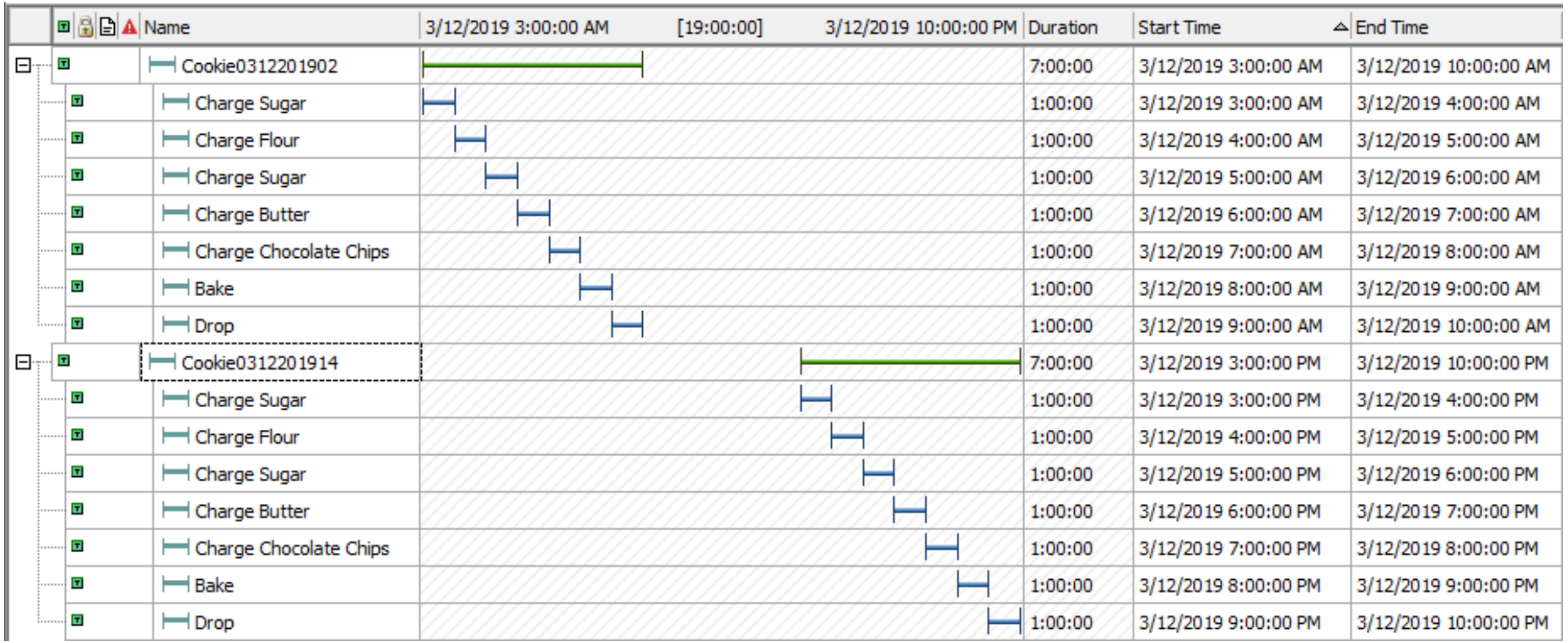
Source: FDA Recall Information Search, https://www.accessdata.fda.gov/scripts/ires/index.cfm#tabNav_advancedSearch

Other Value Opportunities

Golden Batch – our finished lot AYZ was the best, how did we make it?

- Process Optimization
- Yield and Cost

Background - Batch Processes



Name	3/12/2019 3:00:00 AM [19:00:00] 3/12/2019 10:00:00 PM	Duration	Start Time	End Time
Cookie0312201902		7:00:00	3/12/2019 3:00:00 AM	3/12/2019 10:00:00 AM
Charge Sugar		1:00:00	3/12/2019 3:00:00 AM	3/12/2019 4:00:00 AM
Charge Flour		1:00:00	3/12/2019 4:00:00 AM	3/12/2019 5:00:00 AM
Charge Sugar		1:00:00	3/12/2019 5:00:00 AM	3/12/2019 6:00:00 AM
Charge Butter		1:00:00	3/12/2019 6:00:00 AM	3/12/2019 7:00:00 AM
Charge Chocolate Chips		1:00:00	3/12/2019 7:00:00 AM	3/12/2019 8:00:00 AM
Bake		1:00:00	3/12/2019 8:00:00 AM	3/12/2019 9:00:00 AM
Drop		1:00:00	3/12/2019 9:00:00 AM	3/12/2019 10:00:00 AM
Cookie0312201914		7:00:00	3/12/2019 3:00:00 PM	3/12/2019 10:00:00 PM
Charge Sugar		1:00:00	3/12/2019 3:00:00 PM	3/12/2019 4:00:00 PM
Charge Flour		1:00:00	3/12/2019 4:00:00 PM	3/12/2019 5:00:00 PM
Charge Sugar		1:00:00	3/12/2019 5:00:00 PM	3/12/2019 6:00:00 PM
Charge Butter		1:00:00	3/12/2019 6:00:00 PM	3/12/2019 7:00:00 PM
Charge Chocolate Chips		1:00:00	3/12/2019 7:00:00 PM	3/12/2019 8:00:00 PM
Bake		1:00:00	3/12/2019 8:00:00 PM	3/12/2019 9:00:00 PM
Drop		1:00:00	3/12/2019 9:00:00 PM	3/12/2019 10:00:00 PM

Why Use Asset Framework?

Leveraging Custom AF Data References

Software Evaluation

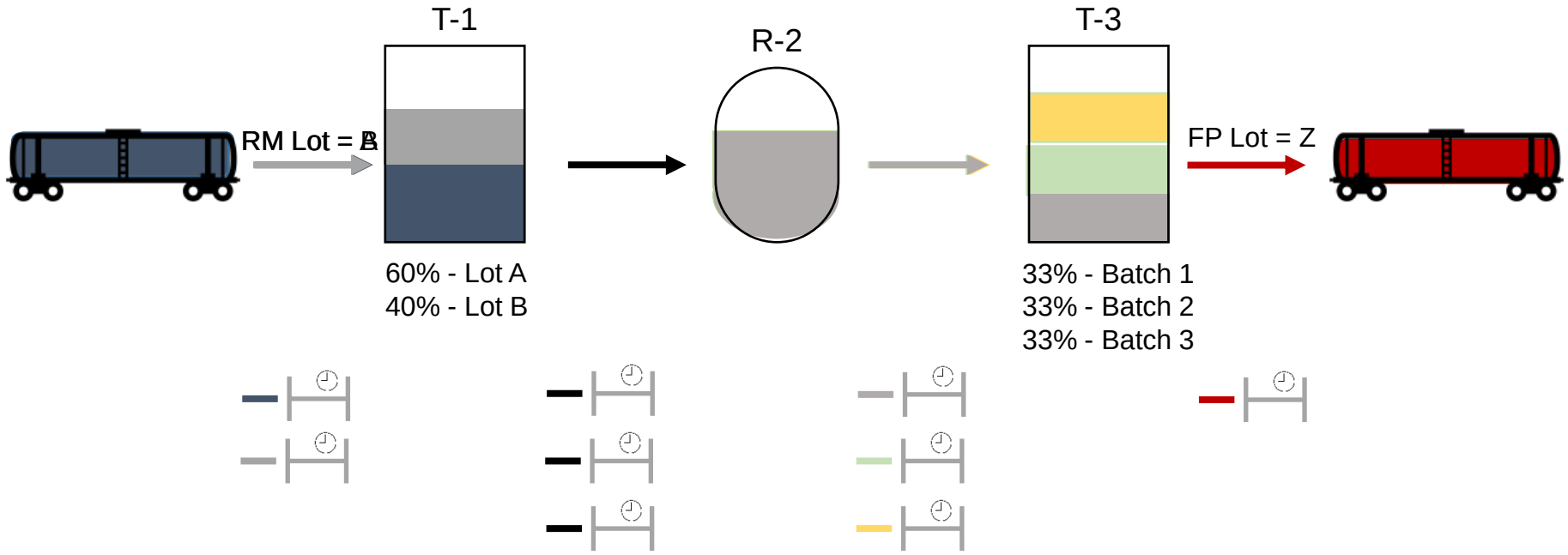
- Many companies already have large investments in the OSIsoft PI System
- Regulatory Compliance
- Food and Beverage and other industries have the need for Traceability
- Can we do Traceability with PI? YES!

Traceability Solution in AF

- AF Modeling of Tank Elements and Attributes (PI DA/AF)
- ***Custom AF Data References*** to model Tank-to-Tank transfers (AF/AFSDK)
- Custom Windows Service to calculate lot quantities, percentages, and flow totals (AF/AFSDK)
- Event Frames to store records of material transfer events (AF/EF)
- SSRS Reports to link Event Frames together in Genealogy reports (OLEDB Enterprise)

Solution Walkthrough

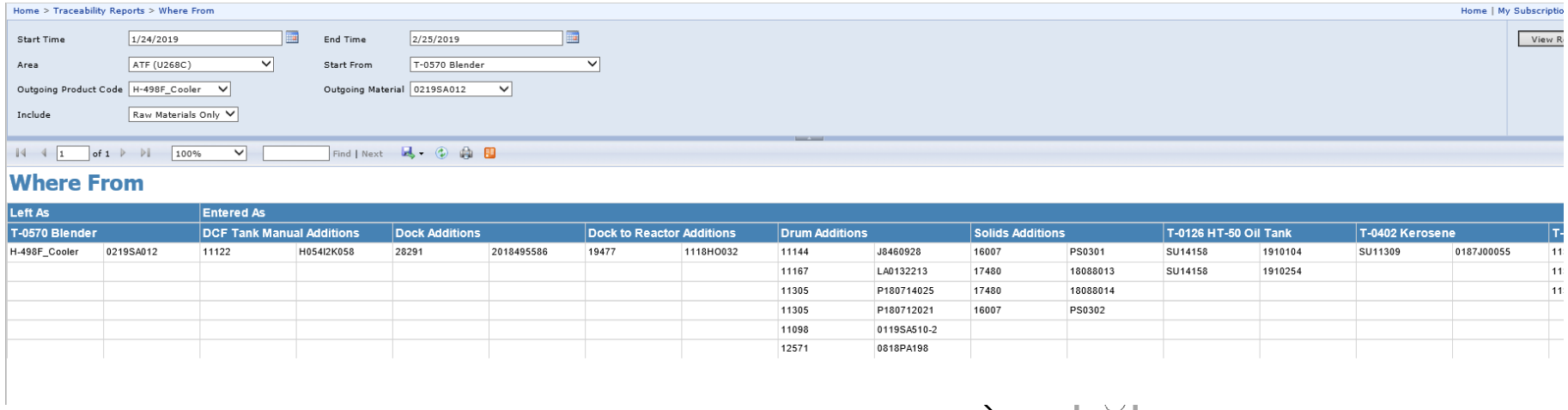
Material Lot Genealogy Tracking



Each event frame has a source/destination genealogical id and lot transfer amounts

Material Lot Genealogy Tracking Cont.

What raw material lots ended up in finished product lot Z?



Left As		Entered As													
T-0570 Blender		DCF Tank Manual Additions		Dock Additions		Dock to Reactor Additions		Drum Additions		Solids Additions		T-0126 HT-50 Oil Tank		T-0402 Kerosene	
H-498F_Cooler	0219SA012	11122	H054I2K058	28291	2018495586	19477	1118HO032	11144	J8460928	16007	PS0301	SU14158	1910104	SU11309	0187J00055
								11167	LA0132213	17480	18088013	SU14158	1910254		
								11305	P180714025	17480	18088014				
								11305	P180712021	16007	PS0302				
								11098	0119SA510-2						
								12571	0818PA198						

Lot B

Lot A

Lot B

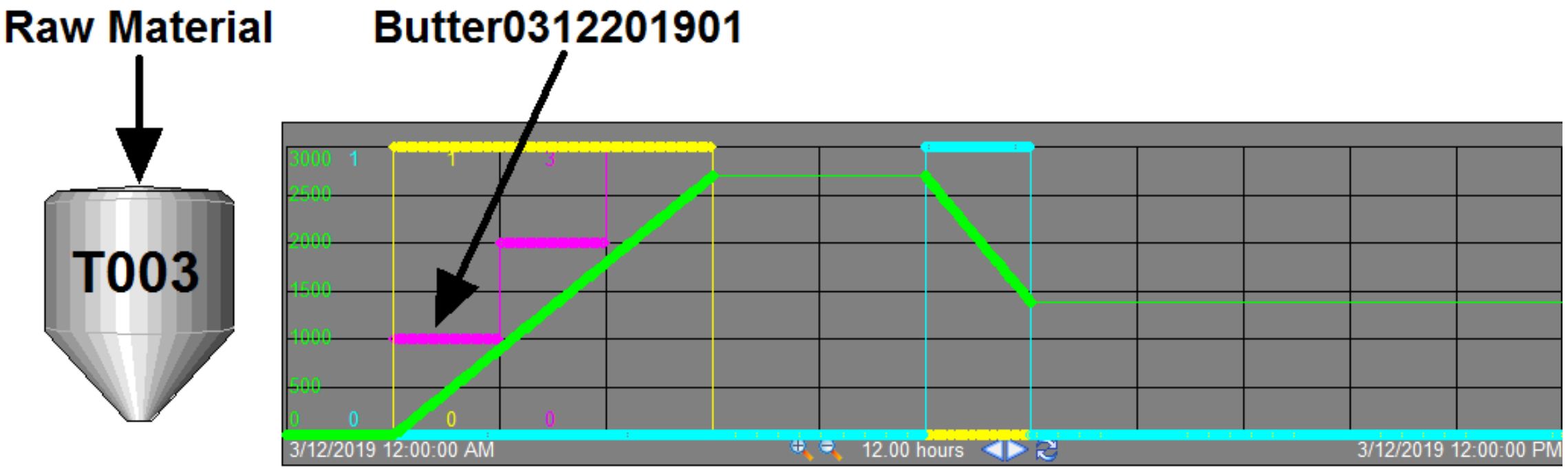
Report Example

Start Time	2/27/2019	End Time	3/28/2019
Areas	Cookie Area	Start From	T003 Butter Tank
Incoming Material	Butter0312201901	Include	Detail

Where Used

Entered As	Left As	Left As	Left As
T003 Butter Tank	T003 Butter Tank	R005 Cookie Reactor	T010 Holding Tank
Butter0312201901	MixedButter0312201903	Cookie0312201902	FinishedCookies0312201922
	MixedButter0312201915	Cookie0312201914	

Report Example Data

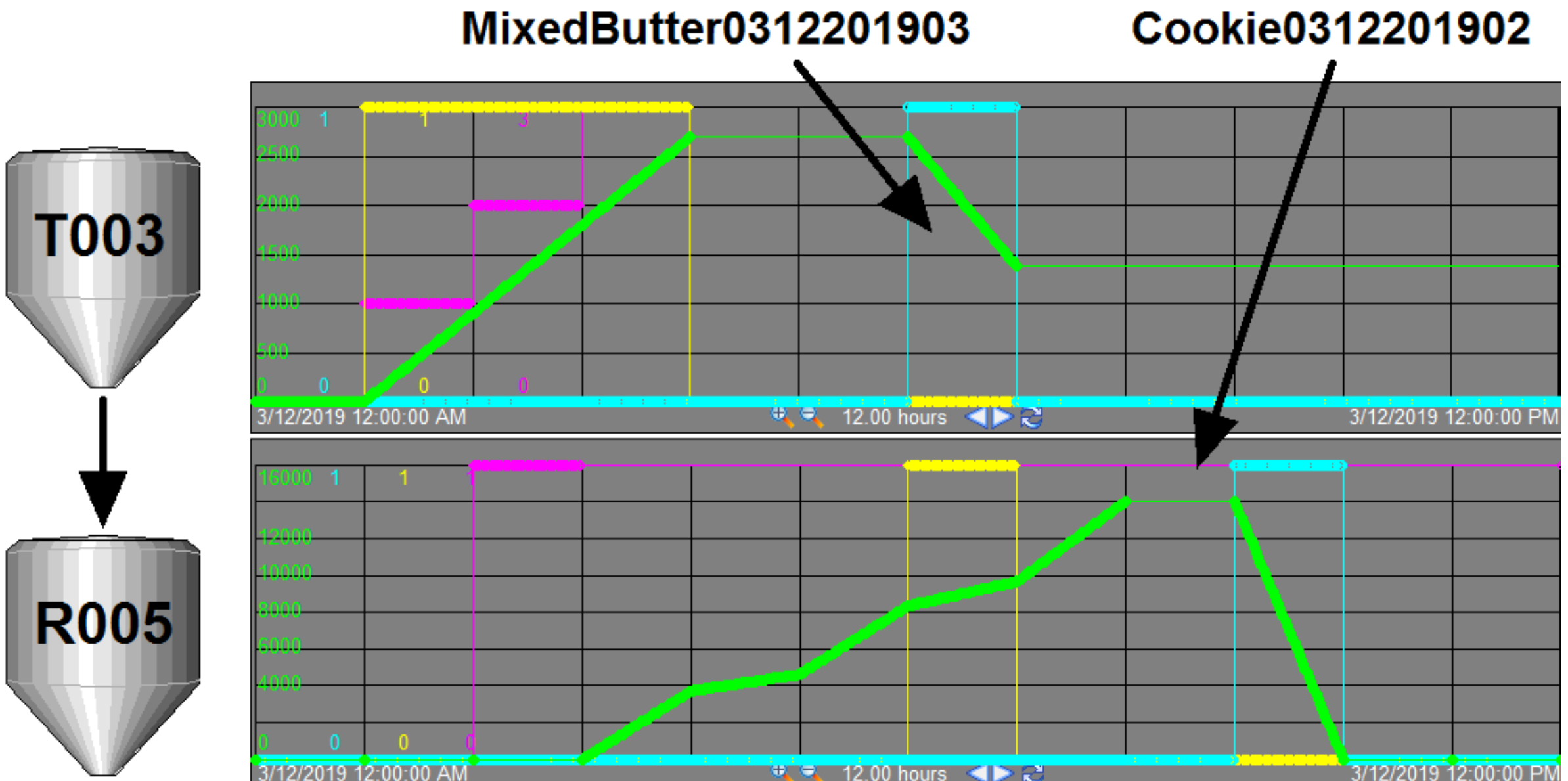


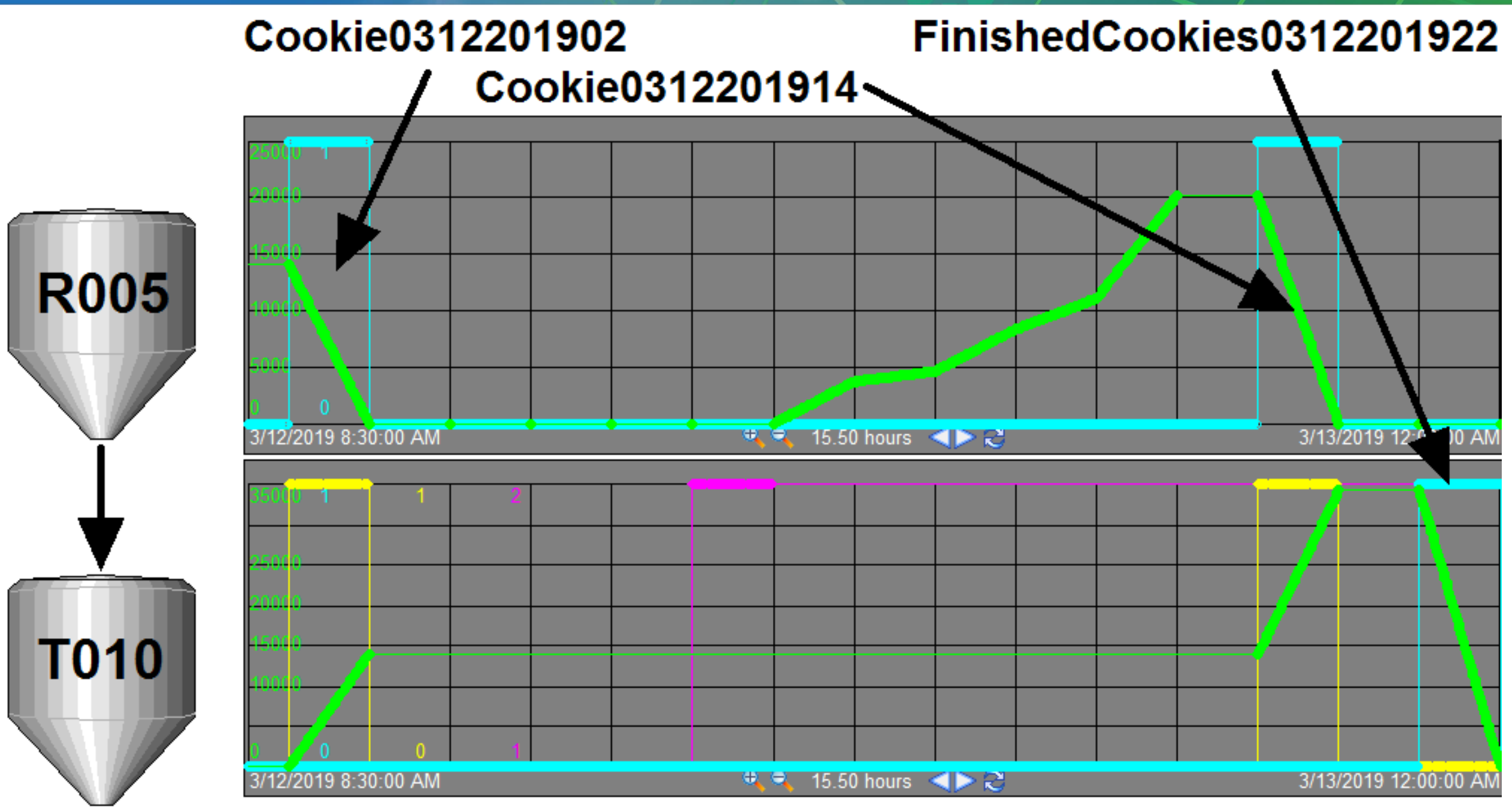
Green = Tank Mass

Yellow = Consuming (status)

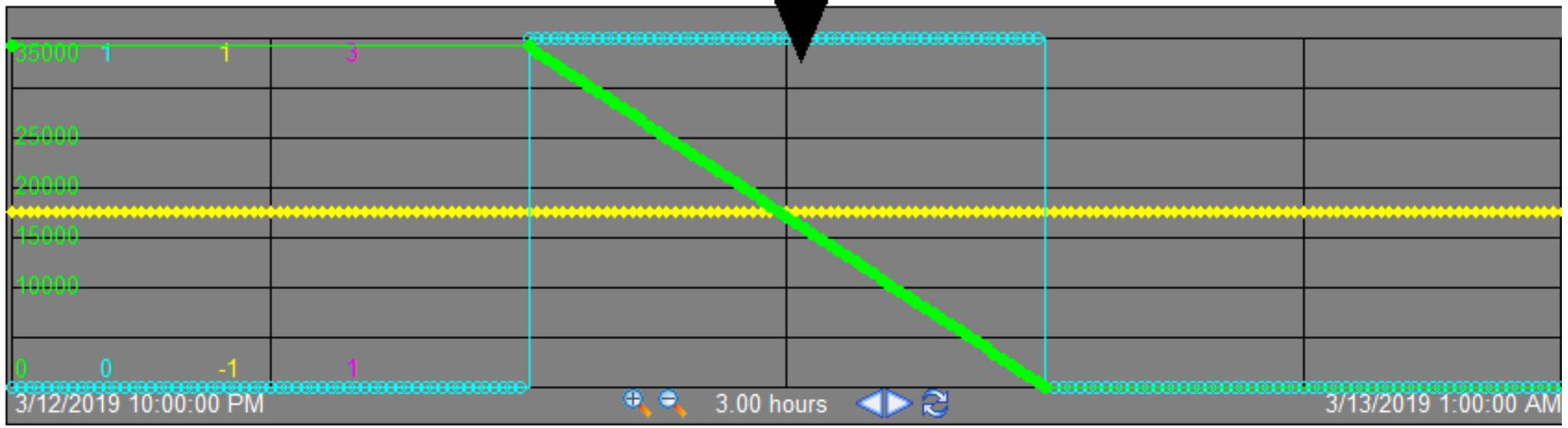
Blue = Producing (status)

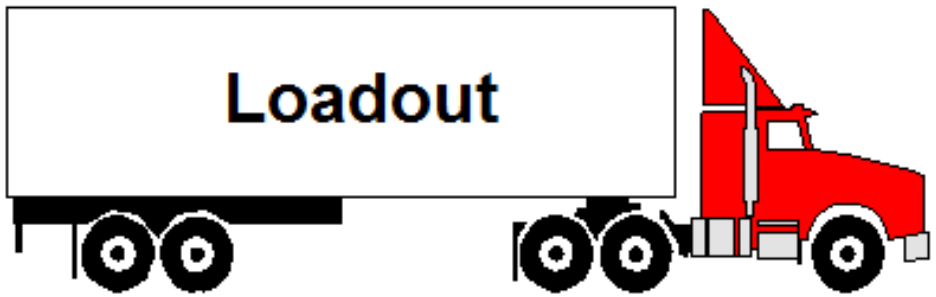
Magenta = Incoming Lot ID





FinishedCookies0312201922





Report Example

Start Time	2/27/2019	End Time	3/28/2019
Area	Cookie Area	Start From	T010 Holding Tank
Outgoing Material	FinishedCookies0312201922	Include	Raw Materials Only

Where From

Left As	Entered As			
T010 Holding Tank	T001 Flour Tank	T002 Dilute Sugar Tank	T003 Butter Tank	T004 Chocolate Chip Tank
FinishedCookies0312201922	Flour0312201901	DiluteSugar0312201901	Butter0312201901	ChocolateChipz0312201901
	Flour0312201913	DiluteSugar0312201903	Butter0312201902	ChocolateChipz0312201902
		DiluteSugar0312201904	Butter0312201903	ChocolateChipz0312201903
		DiluteSugar0312201905	Butter0312201913	ChocolateChipz0312201913
		DiluteSugar0312201913	Butter0312201914	ChocolateChipz0312201914
		DiluteSugar0312201915	Butter0312201915	ChocolateChipz0312201915
		DiluteSugar0312201916		
		DiluteSugar0312201917		

Report Example

Start Time	2/27/2019	End Time	3/28/2019
Area	Cookie Area	Start From	T010 Holding Tank
Outgoing Material	FinishedCookies0312201922	Include	Detail

Where From

Left As	Entered As	Entered As	Entered As				Entered As			
T010 Holding Tank	T010 Holding Tank	R005 Cookie Reactor	T001 Flour Tank	T002 Dilute Sugar Tank	T003 Butter Tank	T004 Chocolate Chip Tank	T001 Flour Tank	T002 Dilute Sugar Tank	T003 Butter Tank	T004 Chocolate Chip Tank
FinishedCookies0312201922	FinishedCookies0312201922	Cookie0312201902	MixedFlour0312201903	MixedDiluteSugar0312201903	MixedButter0312201903	ChocolateChipz0312201901	Flour0312201901	DiluteSugar0312201901	Butter0312201901	ChocolateChipz0312201901
		Cookie0312201914	MixedFlour0312201915	MixedDiluteSugar0312201905	MixedButter0312201915	ChocolateChipz0312201902	Flour0312201913	DiluteSugar0312201903	Butter0312201902	ChocolateChipz0312201902
				MixedDiluteSugar0312201915		ChocolateChipz0312201903		DiluteSugar0312201904	Butter0312201903	ChocolateChipz0312201903
				MixedDiluteSugar0312201917		ChocolateChipz0312201913		DiluteSugar0312201905	Butter0312201913	ChocolateChipz0312201913
						ChocolateChipz0312201914		DiluteSugar0312201913	Butter0312201914	ChocolateChipz0312201914
						ChocolateChipz0312201915		DiluteSugar0312201915	Butter0312201915	ChocolateChipz0312201915
								DiluteSugar0312201916		
								DiluteSugar0312201917		

What the Application Delivers

- Calculations emphasize looping constructs
- Dynamic arrays of complex objects
- Bad Data, Error Handling, Debugging
- Link together and transpose Event Frames (transfer records) onto web-based report
- Built on Standard Technologies including:
  - AF SDK
  - .NET
  - SQL Server
  - SSRS

Stone Technologies Traceability Solution

CHALLENGE

Full product traceability using tools native to the PI System

- Complex product transfer needs
  - Comingle and FIFO
  - Concurrent transfers
- Mass balance needs

SOLUTION

OSIsoft Developer Technologies to augment the PI System's capabilities

- Event Frames
- Custom Data References
  - Asset Framework SDK
- OLEDB Enterprise / SSRS

RESULTS

Full product traceability

- Forward & Backward Genealogy
- Comingle and FIFO compatible
- Confidence in data

What Steps to Take…

Challenges to Traceability Deployment

Process sufficiently instrumented for traceability

- Enforce operators enter necessary information before introducing new raw materials
- Concurrent tanks require inlet/outlet flow and level

Triggers for all material transfers exist in PI

- Add/modify control system sequences

Availability of raw material lot numbers

- Recorded in laboratory management software
- Available to operator on container (drum) or shipment paperwork (truck/rail)

Wrap Up

If you are interested in Traceability, start thinking about…

- Proper instrumentation and data collection
- Collecting instrument data in PI (levels, flows, valves)
- Collecting Events, Sequencer Steps and Triggers
- Capturing lot numbers and other identification of raw materials and in process mixtures

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Questions?

Please wait for the **microphone**

State your **name & company**

Please remember