

connect

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Topical Breakout Tracks



SeeQ®



Enabling Simplified Creation of Complex Formulas with Seeq's Formula AI Assistant

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Nourishing the world

As a big company, we feel its Cargill's responsibility to help the world - we do this through nourishing the world in a safe, responsible and sustainable way.

cargill.com

We are...



155K+
Employees



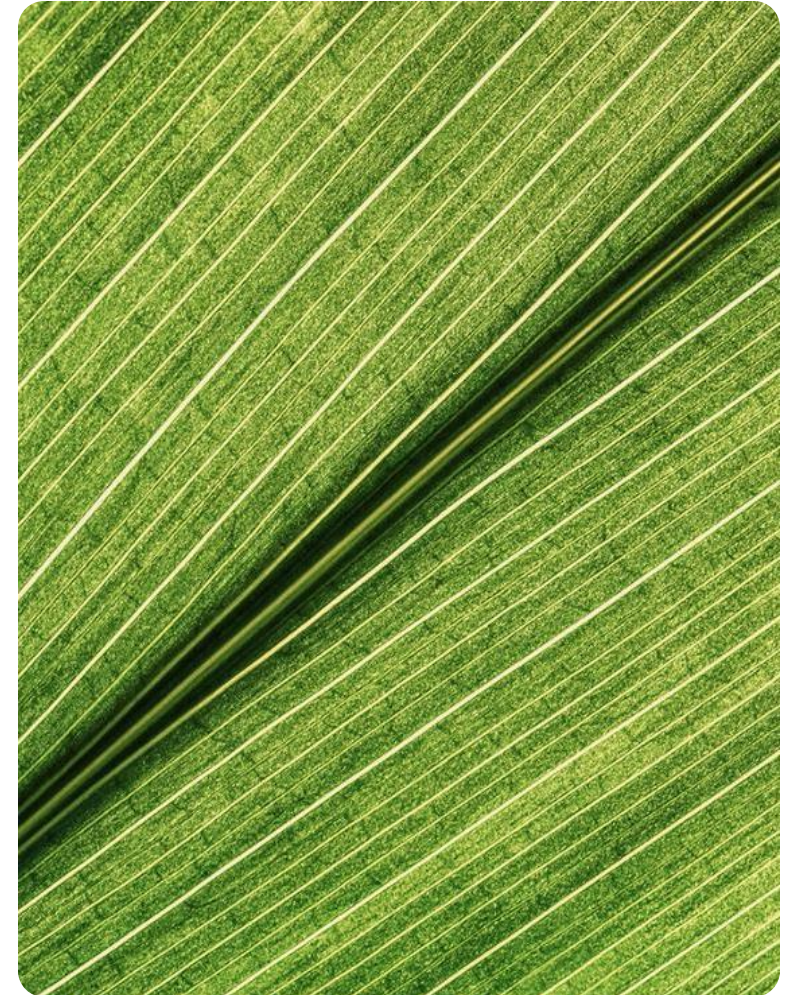
70
Countries



125
Markets



160
Years old



Cargill Cocoa and Chocolate Brands



Ambrosia®



Gerkens®



Merkens®



Peter's®



Wilbur®

Brief Background

Aaron Schmidt

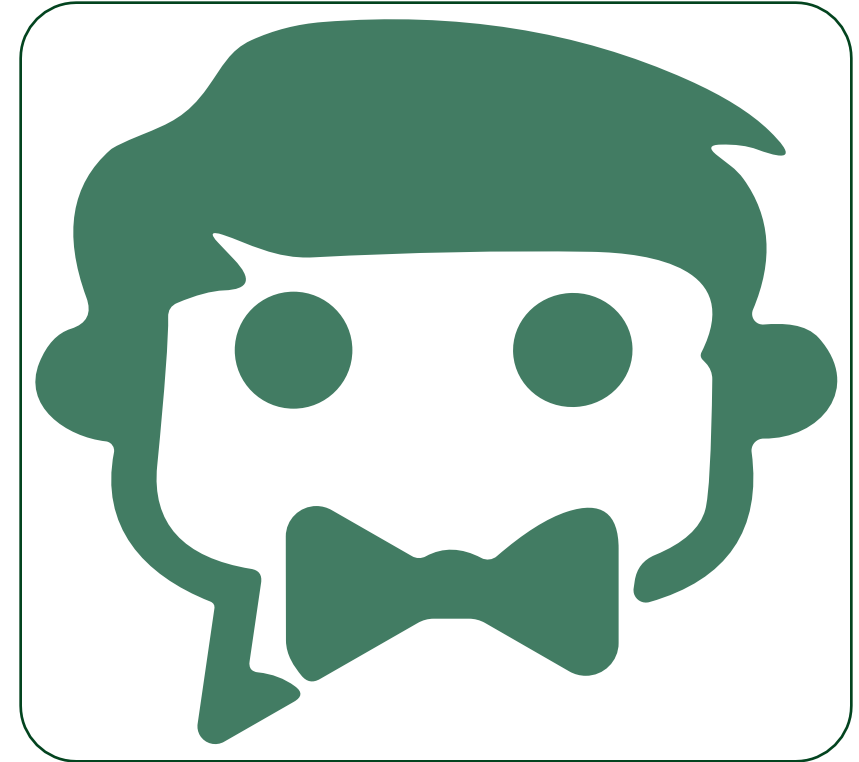


- Brief Background
 - Bachelors in Mechanical Engineering from UC-Irvine
 - Completing Masters of Science in Engineering Management at UARK this July
 - Based out of Lancaster, PA area
 - Currently in a role that blends Food Safety Quality and Regulatory (FSQR) and Engineering
- The “FSQR Engineer”
 - Process Improvement Specialist – FSQR, Cargill Cocoa and Chocolate NA
 - Engineer Associate – BOSC, Cargill Cocoa and Chocolate NA
 - Engineer Intern – BOSC, Cargill Protein NA - Beef
- Experience
 - Automation and Data Analytics
 - Project Engineering
 - FSQR Method Design and Troubleshooting
 - Process Improvement

Complex Formulas and Seeq's Formula AI Assistant

Presentation Objectives:

- **My experience using Seeq's Formula AI Assistant.**
 - **What has worked well for me**
 - **What can be tricky in use**
- **Some general concepts that can be applied to simplify complex formula creation using this AI Assistant for almost any data analyzing task**



Source: SEEQ Workbench

Experience Using Seeq's Formula AI with My Level of Training

- Was asked by my manager when starting to learn about the Seeq program because some guy from the data team kept pushing him to learn about it.
- Completed the Seeq training path, going over basic and advanced use of Seeq Workbench and Organizer
- Progressed into me looking at the Seeq Library for explanations of available formula functions
- Eventually turned into me asking the Formula AI agent about how functions interact with each other



Conventional vs AI Assisted Formula Creation



Conventional Formula Creation

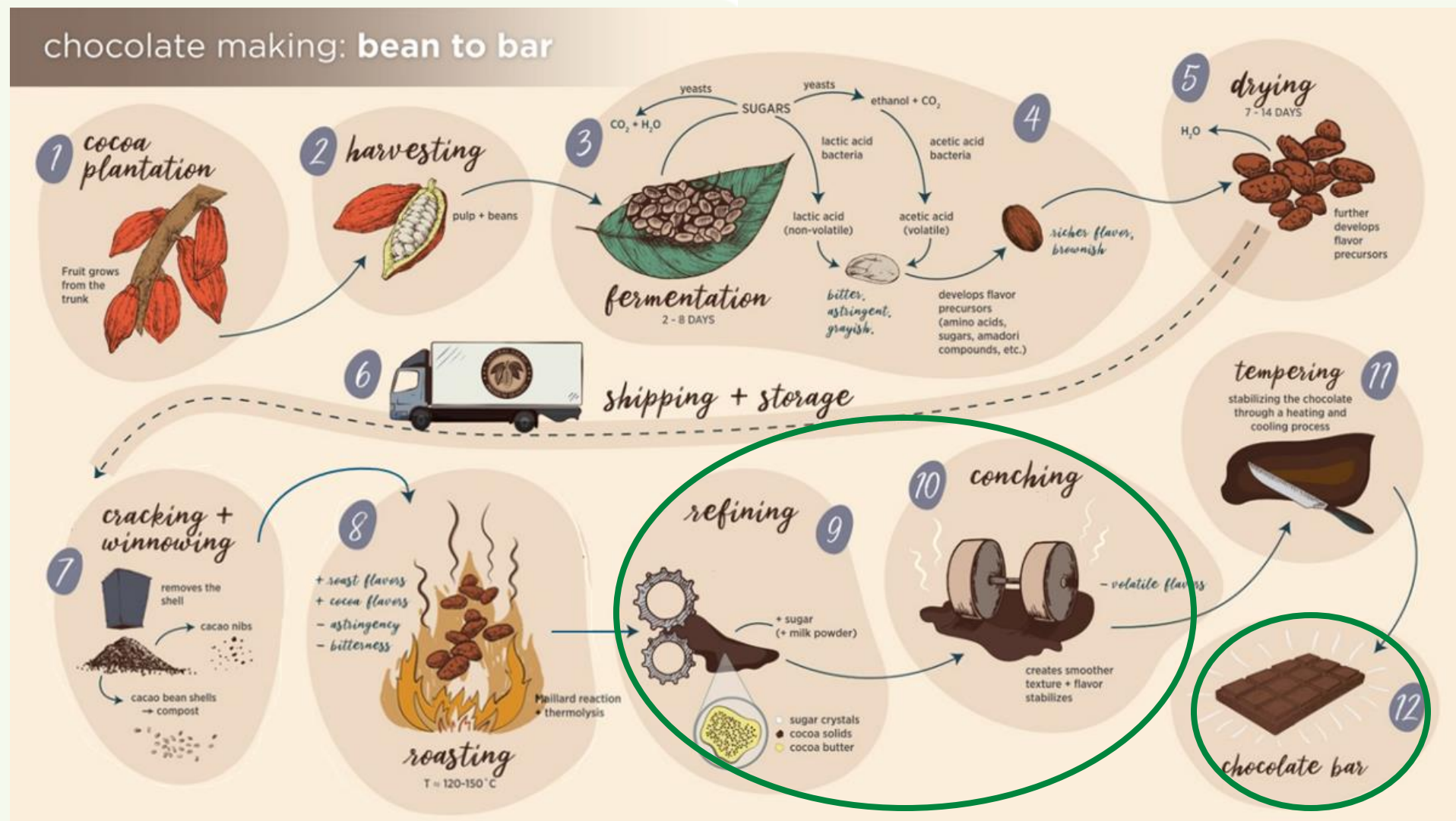
- Understand the formula functions and how they work together to create variables
- Manually troubleshoot each formula created
- Review of formula errors will be up to you, no other support unless consulting a peer.



AI Assisted Formula Creation

- Guided Creation of Variables
- Simple Formulas Quickly Created
- Prompts to Create Formula Structures
- Needs to be Reviewed to Show Desired Results

High Level Chocolate Manufacturing Process



Chocolate Moulding Basics

Cooling Tunnels

- Conveyance belt on which molded chocolate products are allowed to cool down
- Running too fast results in loss of temper and messes
- Running too slow reduces production rates

Boxing Weights

- Box filler settings impact product overpack and under pack
- Filling too fast can result in high weight variations
- Filling too slow can result in product backups



Example Scenario 1:

Context:	Production on some chocolate moulding lines has been behind schedule at a chocolate plant. As a result, customers are not receiving products at their expected times.
Problem:	Identify products that are underperforming based on expected rates and yields.
Solution:	Using Seeq's Formula AI Assistant, develop a formula to trend product performance in terms of yield loss and rate loss.

Simplified Compound Formula Approach with Seeq:



How can it be done?



Organize your data



Prompt Seeq's Formula AI Assistant



Adjust AI Assistant output as needed

1. How Can I Measure Yield:

$$\text{Yield} = (\text{Box Count} * \text{Average Box Weights}) / \text{Tank Weight}$$

2. Organize your data ... by Creating Variables to Use

Box Count

Variables

Name	Item
\$I20b3	 L20 Batch Box Condition
\$I20b	 L20 Box Weight Signal (lb)

Formula



```
1 // Count the number of samples in the L20 Box Weight Signal  
2 $count_per_batch = $I20b.aggregate(count(), $I20b3 , duration'
```

Box Count

- Box counts if box weight is recorded

Average Box Weight

Variables

Name	Item
\$I20b3	 L20 Batch Box Condition
\$I20b	 L20 Box Weight Signal (lb)

Formula



```
1 // Count the number of samples in the L20 Box Weight Signal dur  
2 $Avg = $I20b.aggregate(Average(), $I20b3 , durationKey())
```

Average Box Weights

- Average Box weights must fall within product run duration



Tank Weight

- Starting tank weight is used as total product for yield

1. How Can I Measure Yield:

$$\text{Yield} = (\text{Box Count} * \text{Average Box Weights}) / \text{Tank Weight}$$

2. Organize your data ... by Creating Variables to Use



Box Weight

- Box weights define rate weight

L20 Depositor Product Code Condition

Variables

Name	Item
\$r20d	L20 Cleansed Dep Product Code Signal
\$a	LN20 Not Running

Formula

```
1 // Step 1: Convert $r20d to a condition and filter caps
```

Product Run Time

- Time is measured by product run duration

Target Pack Rate Variable

Variables

Name	Item
\$r20l	rptLN20_Line.ProductDesc

Formula

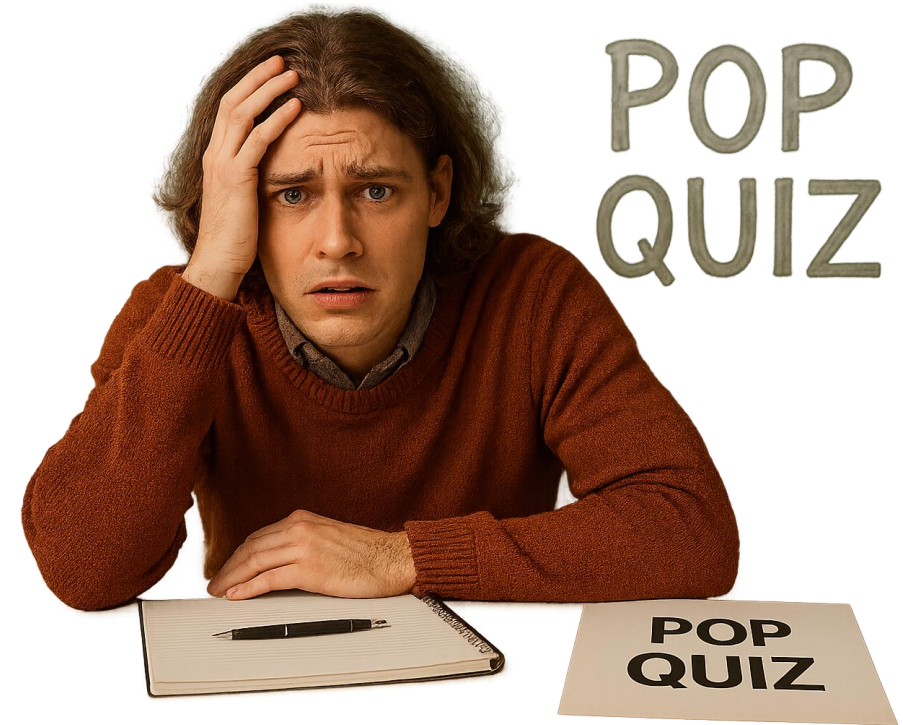
```
1 $table = lookupTable(  
2 "[ ...]
```

Target Rate

- Target rates must be defined

Pop Quiz!

What do I do, if I do not know how to organize a step in my data?



Source: Microsoft Copilot

Answer:

Ask Seeq's Formula AI Assistant!

How can I capture the amount of times a box weight occurs while a product is running



Formula

Thanks for your question! To address this, I'll break it down into two main parts:

1. **Identifying when a product is running** (likely using a condition such as a product code or a “running” signal/condition).
2. **Counting the occurrences of each box weight during those running periods.**

Let me review foundational knowledge on event comparisons, condition calculations, and property setting, and then search for relevant documentation on counting occurrences of a value (box weight) during a condition (product running). This will help ensure I provide you with the most accurate and Seeq-appropriate approach.

✔ **Exploring** Documents >

Here's how you can capture the number of times a specific box weight occurs while a product is running in Seeq:

3. Prompt Seeq's Formula AI Assistant ... by Telling it What You Would Like to Do.

Creating a Prompt:

- Factors to create a good Prompt:
 - Identified Target Outputs (Yield and Rate)
 - Gathered Useful Variables and Data
 - Generic formula format understanding
- Using “defined variables/data” please create a “condition” to output a value of “target outputs” by using “defined method to determine target”

Item
 Average Box Weight (lb)
 Box Count
 L20 Box Weight Signal (lb)
 L20 Depositor Product Code Condition Man Tech » Moulding » Drop/Wafer » Line 20 » Line 20 Depositor
 Target Pack Rate Variable
 Weight in Tank (lb) Moulding Lines » Line 20
 rptLN20_Line.ProductDesc

3. Prompt Seeq's Formula AI Assistant ... by Telling it What You Would Like to Do.

Prompt:

“Given the following variables for this Formula, please create a condition where the product description (\$r20l2), outputs a capsule with the values of the "Yield" and "Rate", where yield is defined as the value of box count (\$bc) multiplied by average box weights (\$abw) divided by the capsule starting weight in tank (\$wit). And where rate is defined as the sum of box weight (\$l20b) in the capsule, divided by the time duration of the product run (\$l20d), divided by the products matching target rate (\$tprv).”

Item
 Average Box Weight (lb)
 Box Count
 L20 Box Weight Signal (lb)
 L20 Depositor Product Code Condition Man Tech » Moulding » Drop/Wafer » Line 20 » Line 20 Depositor
 Target Pack Rate Variable
 Weight in Tank (lb) Moulding Lines » Line 20
 rptLN20_Line.ProductDesc

3. Prompt Seeq's Formula AI Assistant ... by Telling it What You Would Like to Do.

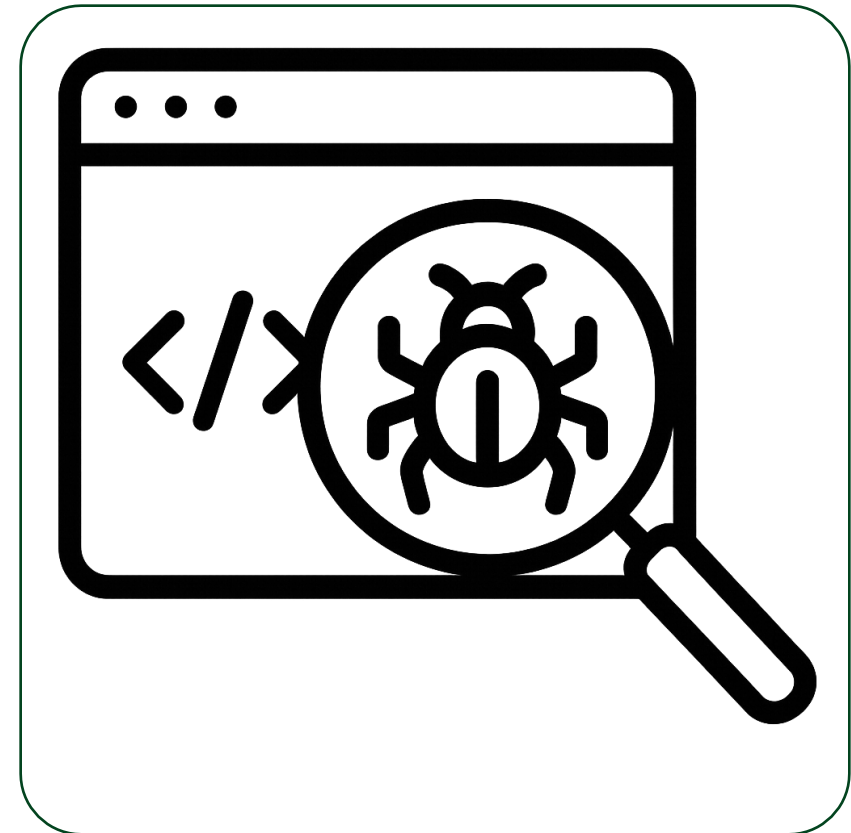
Formula Created by AI Assistant:

AI Comment	AI Code
// Step 1: Bound the product run condition to 1-week max duration 	// Step 6: Calculate the sum of box weights during each product run 
// Step 2: Calculate the sum of box count during each product run 	// Step 7: Calculate the duration of each product run in hours 
// Step 3: Calculate the average box weight during each product run 	// Step 8: Get the average target pack rate during each product run 
// Step 4: Get the starting value of weight in tank for each product run 	// Step 9: Calculate Rate property 
// Step 5: Calculate Yield property 	// Step 10: Set the Yield and Rate properties on the product run condition 

4. Adjust AI Assistant output as needed ... Using Guided Debugging Insight

What is Debugging?

- In the context of this presentation, debugging refers to any troubleshooting required after the formula structure was created
- **Code Focused = Literal Code Debugging**
- **Objective Focused = Formula Modification to Achieve a Desired Output/Result**



4. Adjust AI Assistant output as needed ... Using Guided Debugging Insight

- Line 20 and 23 issues were resolvable with the Debug With AI feature.
- Line 1's error required manual review of the code to debug it, still using the AI Assistant for explanation
- After Debugging manually and with AI, the formula outputted the image below with values for Yield and Rate

```
20 $duration_hr = $product_run_bounded.transform($capsule -> $capsule.duration().convertUnits('h')).toS
```

Lambda return type of Scalar does not match return type of Capsule required by parameter [Debug With AI](#)

```
23 $duration_hr = $product_run_with_duration.toSignal('Duration')
```

Modifying property Duration is not allowed [Debug With AI](#)

```
1 // Step 1: Bound the product run condition to 1 week max duration
```

Only string Scalars can have a UOM of string [Debug With AI](#)

```
2 $product_run_bounded = $l20d.removeLongerThan(1wk)
```

☒	Start	Duration	Yield	Rate
☐	Apr 18, 2026 1:31 AM	07:34:24.000		
☐	Apr 16, 2026 1:22 AM	08:13:30.000		
☐	Apr 20, 2026 8:26 AM	00:49:44.000		
☐	Apr 16, 2026 9:37 AM	03:28:03.000		
☐	Apr 13, 2026 6:27 AM	10:18:54.000		

4. Adjust AI Assistant output as needed ... Using Guided Debugging Insight

- Additional adjustments may be needed based on objective results
- For example, if I had a concern with product codes carrying over at the start of a new production run, I would change the `startValue()` condition assignment to an `endValue()` condition assignment

```
// Step 10: Set the Yield  
and Rate properties on the  
product run condition
```

```
$product_run_with_properties = $product_run_bounded  
.setProperty('Yield', $yield, startValue())  
.setProperty('Rate', $rate, startValue())
```

Chocolate Market Review



Volatility is now structural, not cyclical



Cocoa price swings are extreme and unpredictable



Cost uncertainty extends beyond cocoa prices



Business models are actively adapting



Volatility is shaping long-term strategy

Chocolate Refining and Conching Basics

Mixing and Refining

- Mix dry and wet chocolate ingredients
- Mixture is grinded to a smaller particle size
- Too much wet ingredients can cause a wet mess in refining
- Too much dry ingredient can burn when being refined

Conching

- Refined product is stirred around to get it from dry powder to a liquid
- Additional liquids can be added to affect viscosity
- Too much liquids can make it a low viscosity
- Too little liquids can result in a high viscosity



Example Scenario 2:

Context:	System transactions of multiple ingredients have been inconsistent with the actual inventory of these ingredients on site.
Problem:	Identify the amount of ingredients being consumed per batch of a chocolate refining production.
Solution:	Using Seeq's Formula AI Assistant, develop an export to identify all the ingredients consumed in a production batch

1. How can it be done? By Defining Desired Outputs

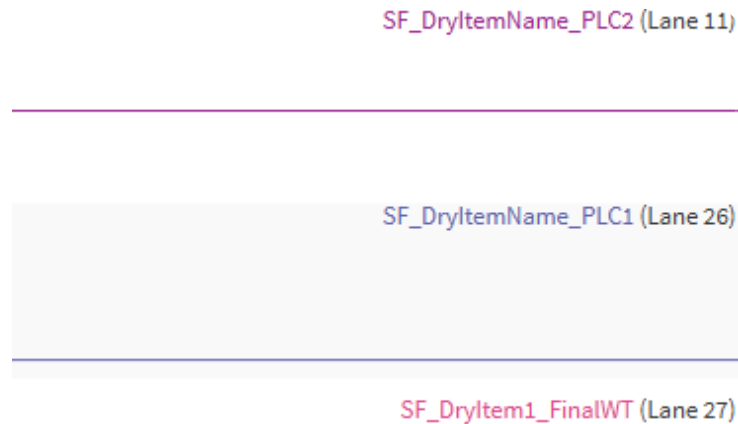
Measuring Dry Ingredients

- Track dry ingredient additions during batching
- Would consider over duration of a batch being created

Measuring Wet Ingredients:

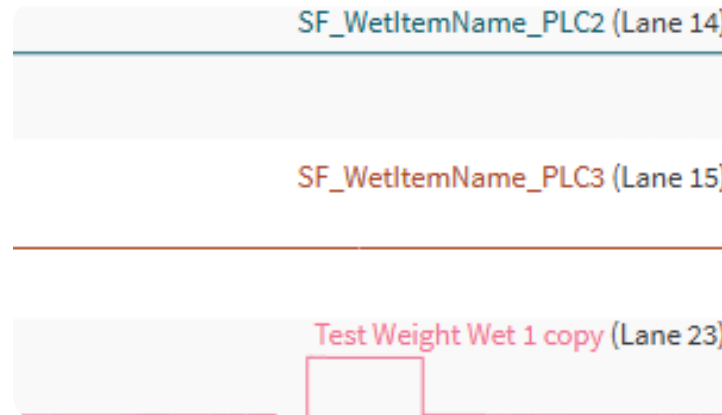
- Track liquid additions to processing equipment
- Would consider over duration of a batch being created

2. Organize your data ... by Identifying Variables to Use



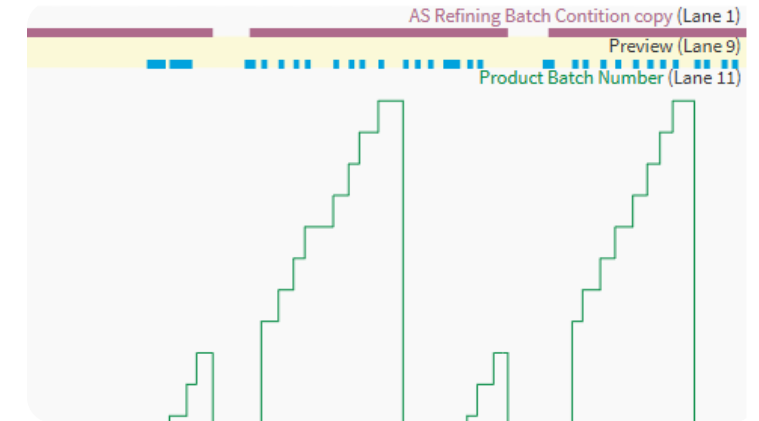
Dry Ingredients and Weights

- Tracking weights of dry ingredients used



Wet Ingredients and Weights

- Tracking weights of wet ingredients used



Product Batch Condition

- Identifying duration of times to measure for dry and wet ingredient weights

3. Prompt Seeq's Formula AI Assistant ... by Telling it What You Would Like to Do.

Prompt:

“Given the following variables for this Formula, please create a capsule assignment where the corresponding dry item descriptions and weights are assigned to the capsule. In addition to the wet ingredient descriptions and weights being assigned to the capsule. Where the capsule is defined by the AS Refining Batch Condition Copy”

Variables			+ Add variable
Name	Item		
Sarbc	 AS Refining Batch Contition copy Man Tech » White Chocolate & Compound » 5-Roll Refining » White Refining Line » Refining Mixer 1	Lane 1	▼
Sp	 Product Man Tech » White Chocolate & Compound » 5-Roll Refining » White Refining Line » Refining Mixer 1	Lane 10	▼
Spbn	 Product Batch Number Man Tech » White Chocolate & Compound » 5-Roll Refining » White Refining Line » Refining Mixer 1	Lane 11	▼
Ssd1f	 SF_DryItem1_FinalWT	Lane 27	▼
Ssd2f	 SF_DryItem2_FinalWT	Lane 28	▼
Ssd3f	 SF_DryItem3_FinalWT	Lane 11	▼
Ssdp1	 SF_DryItemName_PLC1	Lane 26	▼
Ssdp2	 SF_DryItemName_PLC2	Lane 11	▼
Ssdp3	 SF_DryItemName_PLC3	Lane 11	▼
Sswp1	 SF_WetItemName_PLC1	Lane 13	▼
Sswp2	 SF_WetItemName_PLC2	Lane 14	▼
Sswp3	 SF_WetItemName_PLC3	Lane 15	▼
Stww1	 Test Weight Wet 1 copy Man Tech » White Chocolate & Compound » 5-Roll Refining » White Refining Line » Oil Pre-Weigh Hopper 1	Lane 23	▼
Stww2	 Test Weight Wet 2 copy Man Tech » White Chocolate & Compound » 5-Roll Refining » White Refining Line » Oil Pre-Weigh Hopper 1	Lane 24	▼
Stww3	 Test Weight Wet 3 copy Man Tech » White Chocolate & Compound » 5-Roll Refining » White Refining Line » Oil Pre-Weigh Hopper 1	Lane 25	▼

3. Prompt Seeq's Formula AI Assistant ... by Telling it What You Would Like to Do.

Formula Created by AI Assistant:

AI Code Comments	AI Code Comments
// Step 1: Bound the batch condition to ensure capsules are not too long ✓	// Wet ingredient descriptions 📁
// Step 2: Assign dry and wet ingredient descriptions and weights as properties to each capsule ✓	// Wet ingredient weights ⚖️
// Dry ingredient descriptions 📁	// Output 📦
// Dry ingredient weights ⚖️	

4. Adjust AI Assistant output as needed ... Using Guided Debugging Insight

- The Formula code worked, but it is not outputting the batch information ...
- Now what?
 - Go back to step 1
 - Include context on how to define product during capsule batch
 - Ask the AI assistant how to include it into my current formula

Start ▾	Dry Item 1 Name ▾	Dry Item 1 Weight ▾	Dry Item 2 Name ▾	Dry Item 2 Weight ▾	Dry Item 3 Name ▾	Dry Item 3 Weight ▾	Wet Item 1 Name ▾	Wet Item 1 Weight ▾	Wet Item 2 Name ▾	Wet Item 2 Weight ▾
Jun 11, 2025 11:16 AM										
Jun 11, 2025 10:55 AM										
Jun 11, 2025 10:20 AM										
Jun 11, 2025 10:02 AM										
Jun 11, 2025 9:19 AM										
Jun 11, 2025 8:54 AM										
Jun 11, 2025 8:29 AM										
Jun 11, 2025 8:00 AM										
Jun 11, 2025 7:25 AM										
Jun 11, 2025 6:56 AM										
Jun 11, 2025 6:21 AM										
Jun 11, 2025 6:01 AM										
Jun 11, 2025 5:14 AM										
Jun 11, 2025 3:26 AM										
Jun 11, 2025 2:53 AM										
Jun 11, 2025 2:33 AM										
Jun 11, 2025 1:46 AM										
Jun 11, 2025 1:16 AM										
Jun 11, 2025 12:51 AM										
Jun 11, 2025 12:27 AM										
Jun 10, 2025 11:38 PM										
Jun 10, 2025 11:01 PM										
Jun 10, 2025 10:40 PM										
Jun 10, 2025 10:09 PM										
Jun 10, 2025 9:13 PM										
Jun 10, 2025 8:51 PM										
Jun 10, 2025 8:21 PM										

AI Code Comments	AI Code Comments
// Step 1: Bound the batch condition to ensure capsules are not too long	// Wet ingredient descriptions
// Step 2: Assign dry and wet ingredient descriptions and weights as properties to each capsule	// Wet ingredient weights
// Dry ingredient descriptions	// Output
// Dry ingredient weights	

Key Takeaways from Example Use Cases

Product Moulding Yield and Rate:

- Identified opportunities to reduce overpack
- Provided data to inform on current pack settings and opportunities for setting improvements.

Batch Ingredient Consumption Tracker

- Identified dosing variance reduction opportunities.
- Validated system variance in weights when compared to actual inventory

Key Takeaways for Use of Formula AI Assistant

Where Seeq's Formula AI Assistant can help:

- Creating simple formulas
- Explaining how to create target measures for a complex formula
- Building a template for a complex formula
- Basic formula troubleshooting

Where manual setup comes into play:

- Decide what values to use
- Deciding how to measure values in a way that represents your process
- Prompting the Formula AI Assistant to create your desired formula
- Asking questions to the Formula AI Assistant to clarify formula issues.

Thank You!



Q&A

