



Materials Accounting

TURA Virtual Conference
Session B
April 8, 2021



Welcome!



Slides and handouts are available at turi.org/ContinuingEducationConferenceSpring2021



Webinar will be recorded – recording available at same location of TURI's website



Use chat box for questions at any time – we will answer Qs immediately when possible, and we'll find time at the end to answer the rest

- If you are experiencing technical challenges during this session, you can send a chat directly to the moderator (noted as such in the participant list) or email Brenda@turi.org

TUR Continuing Education Credits

- This session has been approved for 3 credits
- To be awarded credits from MassDEP you must:
 - Register and pay for this session
 - Participate in polls and/or breakout room discussions
 - Complete and submit the post-conference survey for this session
- You will receive a certificate of completion once you have met these requirements
 - Please be patient – this will take about a week for us to process

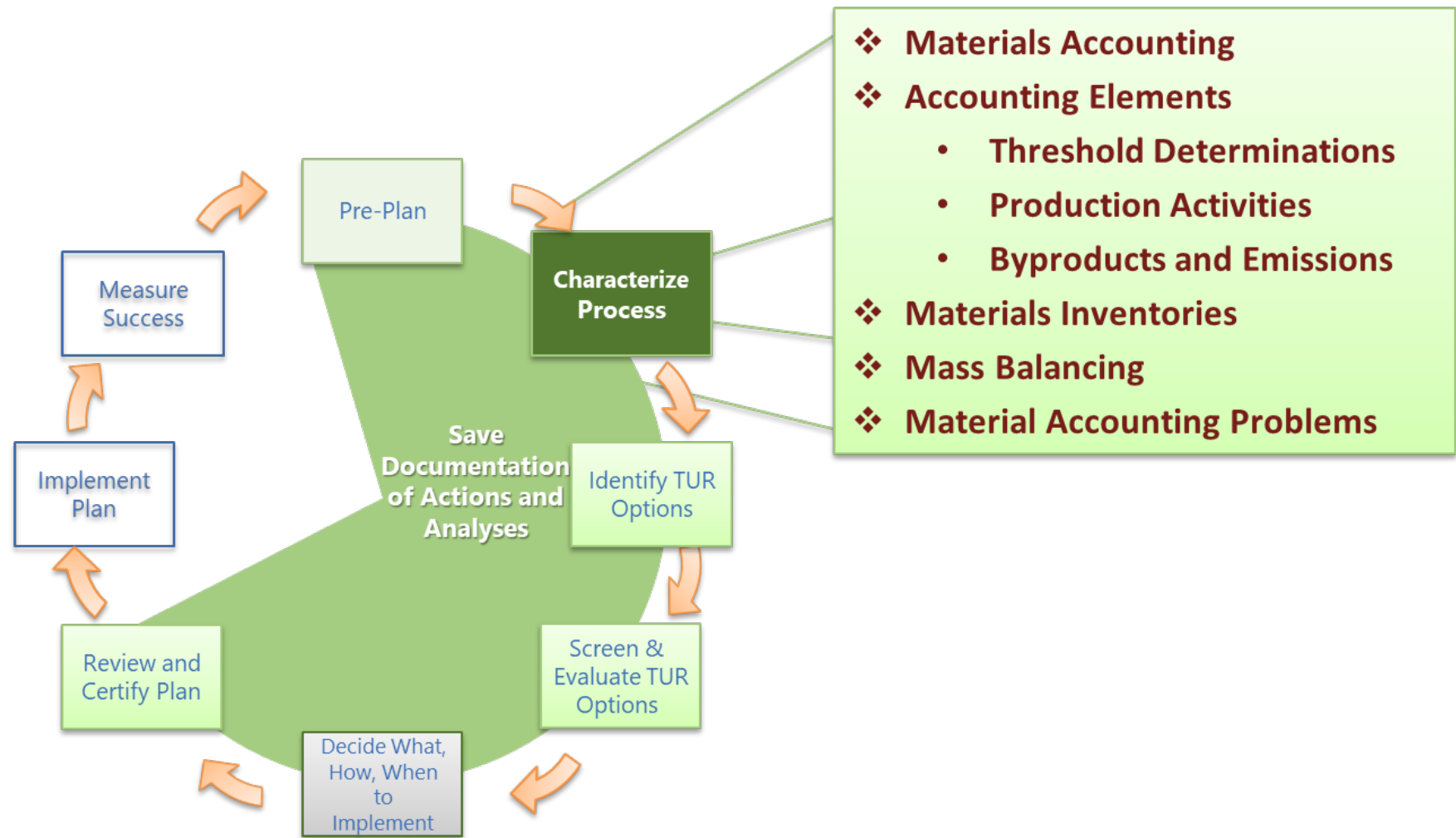
Introductions



Dan Forsythe,
CHMM and
TUR Planner



TUR PLANNING PROCESS



TUR Planning- Materials Accounting

Data Quality/Validation

- Simple checks to ensure your data is accurate and representative

Consistency Between Reporting and Planning

- Don't reinvent the wheel!

Unit of Product

- Choose a Unit of Product that will show TUR improvements!

Integral Recycling

- Ensure your integral recycling meets the definition, so you can take credit for it!

Data Quality/Validation

Simple checks to ensure your data is accurate and representative

Data quality/validation

Data Clarity

Don't guess at what the data means

A phone call can be all it takes to clarify

Reasonable Data

Compare to previous years

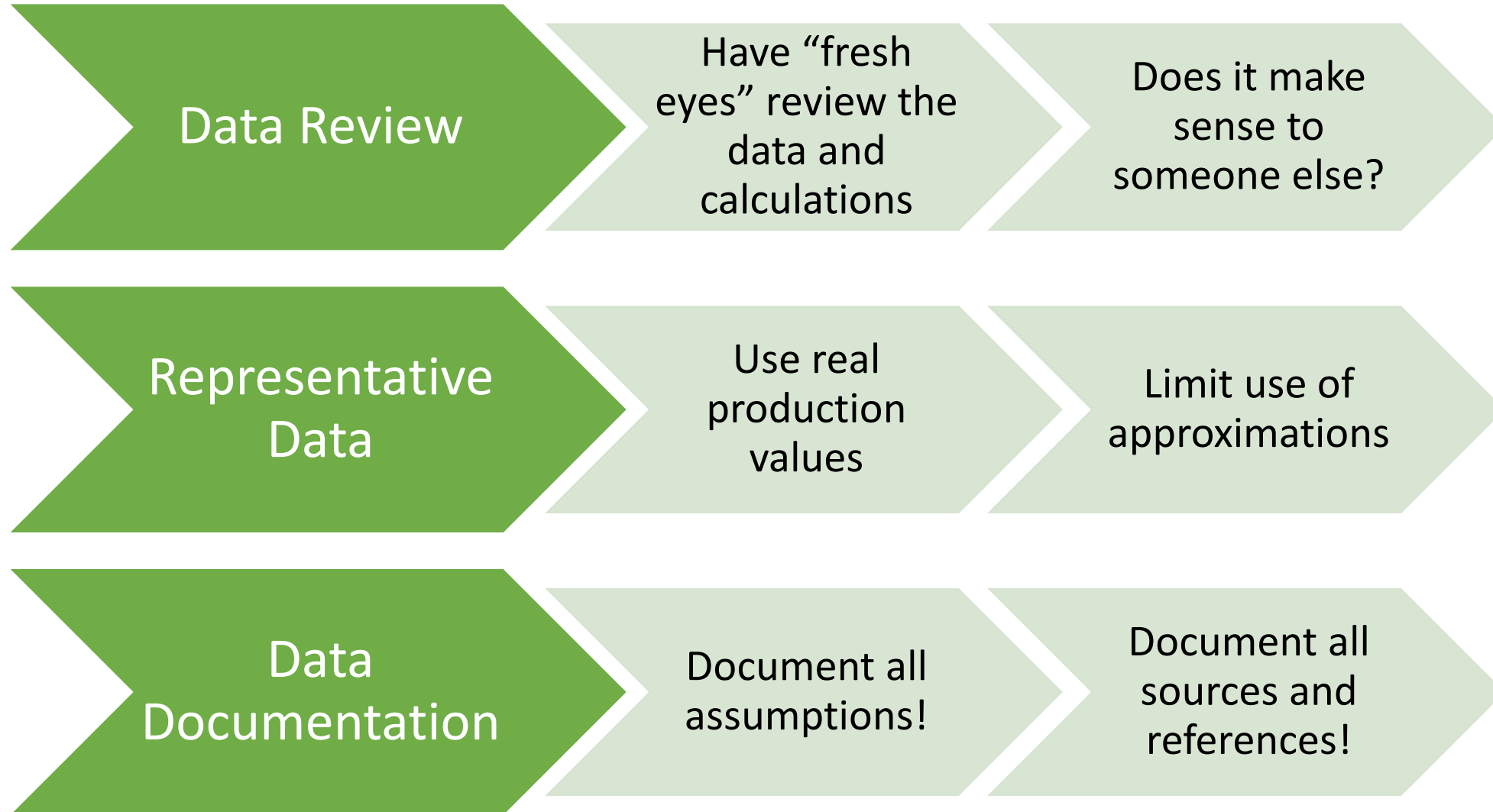
Critical thinking- does this makes sense?

Data Consistency

Use the same SDS data each year

consider a database of SDS data, so only the usage amounts change each year

Data quality/validation



Data quality/validation

Detailed PFD	Detailed process flow diagram describes the inputs and outputs
Mass Balance	Use a mass balance on calculations to check that inputs = outputs
Match	Match the mass balance in calculations with flow of materials through process diagram
Forms!	The forms don't know if your data is accurate! Use a PFD and mass balance first!



How often do
you update
your Process
Flow Diagram?

Polling Question



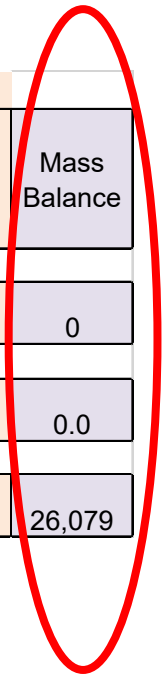
Consistency Between Reporting and TUR Planning

Don't reinvent the wheel!

Mass Balance = Inputs-Outputs

- Data integrity
- Checks and balances
- If Mass Balance IS NOT ZERO, then we know we have missed an emission
- Can use the mass balance to identify or calculate unknown values

	INPUTS									OUTPUTS						
CHEMICAL	TURA Otherwise Used (Lbs)	TURA Manu- factured (Lbs)	TURA Processed (Lbs)	Generated as Byproduct	Air (Fugitive)	Air (Stack)	POTW	HW	Total Emissions	Total Shipped in Product	Consumed	Amount of Chemical Compound	Total Used to Treat	Total Other Off-Site Disposal	Total Treated Off-Site	Mass Balance
Nitrate Compounds	0	68,576	37,789	31,406	0	0	31,406	0	31,406	0	0	74,958	0	0	31,406	0
Silver Compounds	0	48,524	37,789	1,134	0	0	0.9	1,133	1,134	22,859	48,524	13,797	0	0.9	1,133	0.0
Hydrochloric Acid	26,757	0	0	26,079	0	0	0	0	0	0	0	0	678	0	0	26,079



What's the difference?

Byproduct

- ANYTHING that is NOT going into the product
- EMISSIONS, *and also...*
- Nonproduct outputs of toxic or hazardous substances generated by a production unit, before handling, transfer, treatment or release
- For example: materials recycled on site are byproduct but not emissions

Emissions

- Releases of toxic or hazardous substances *to the environment*
- or
- a transfer of a toxic or hazardous substance in waste to an off-site location

Mass Balance Considerations

INPUTS:

Manufactured, Processed, and Otherwise Used

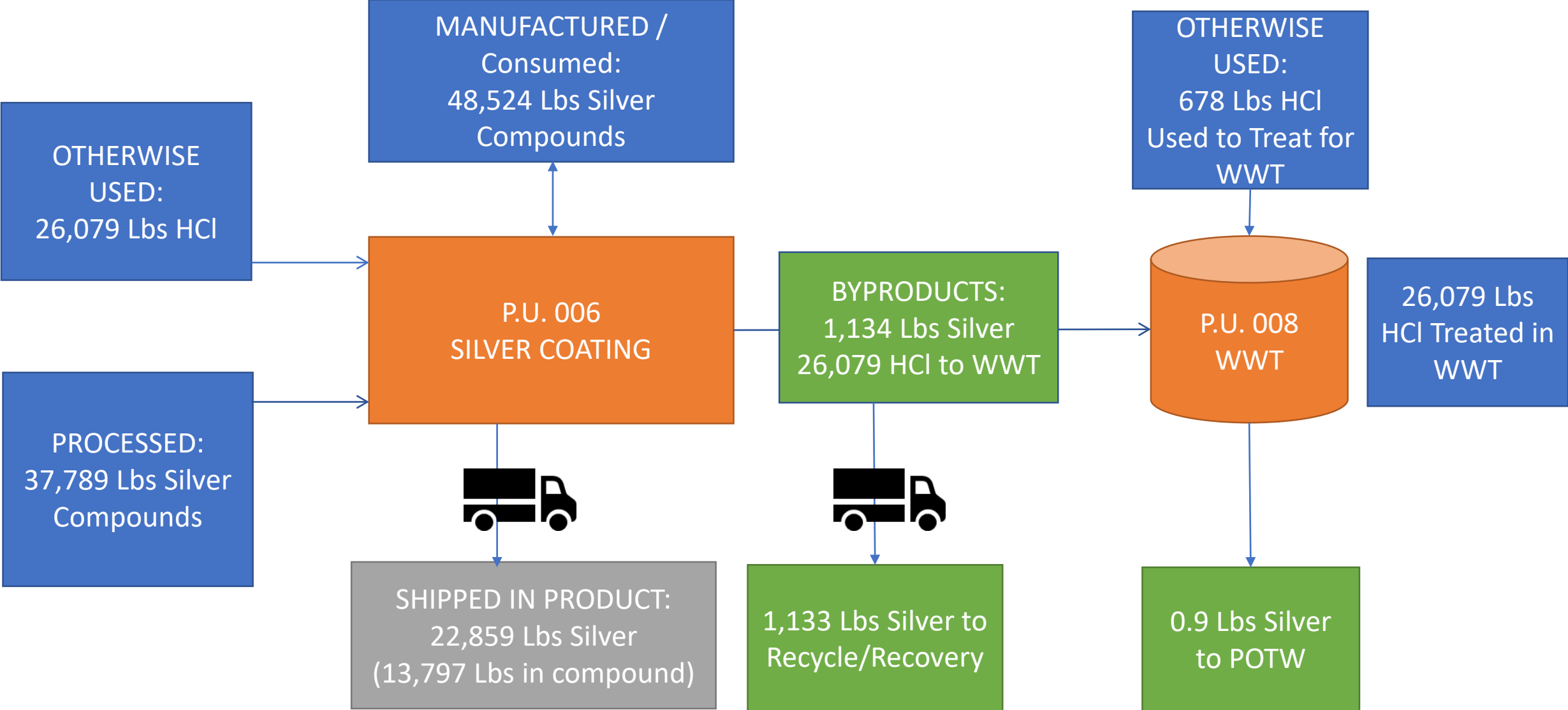
Chemical Compound	Chemical	Total POUNDS Used	Manufactured	Processed	Otherwise Used
Nitrate Compounds	Silver Nitrate			37,789	
	Ammonium Nitrate		14,834		
	Silver Ammonium Nitrate		45,351		
	Sodium Nitrate (formed in WWT)		8,391		
Total:		106,365	68,576	37,789	
Silver Compounds	Silver Nitrate			37,789	
	Silver Ammonium Nitrate		45,351		
	Silver Selenide		3,172		
Total:		86,313	48,524	37,789	
	Hydrochloric Acid	26,758			26,758

OUTPUTS:

Byproduct, Compounds, Shipped in Product

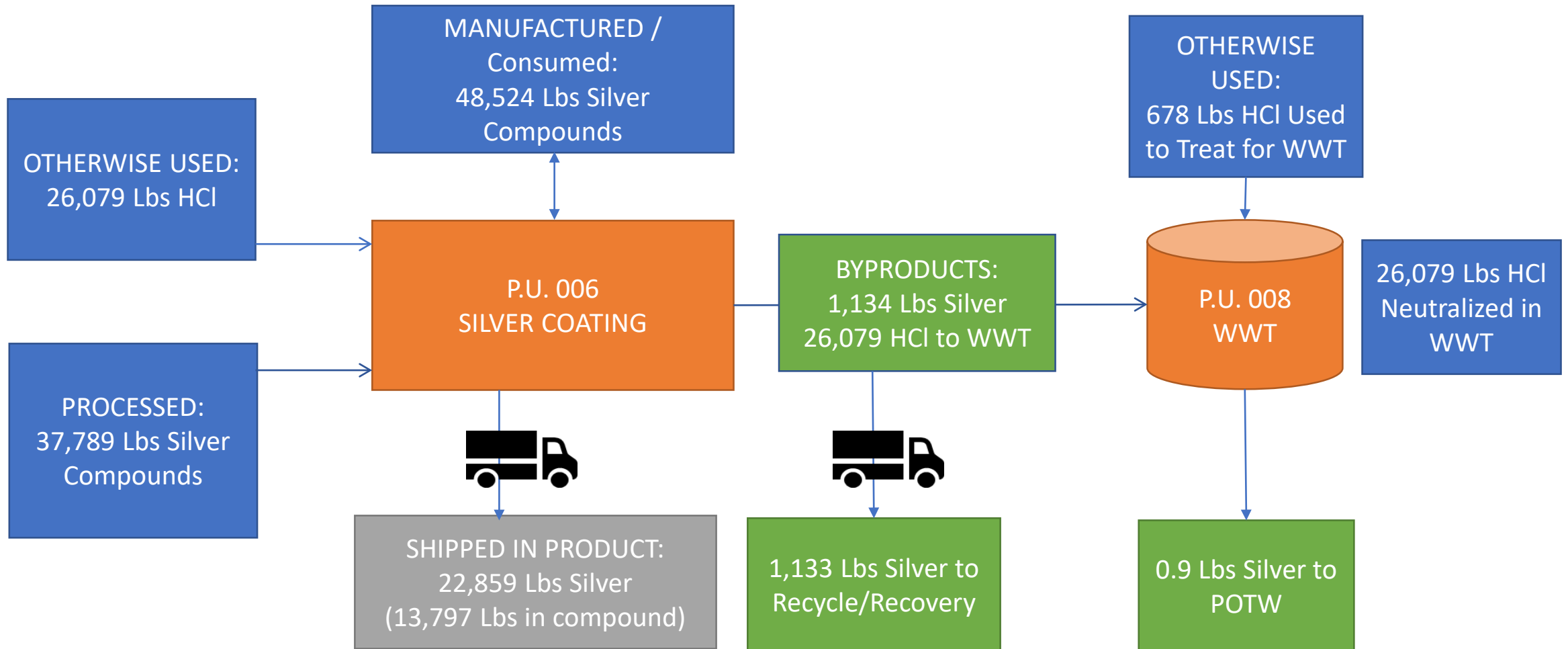
Silver Compounds:	
Silver Compounds Manufactured	48,524
Silver Compounds Processed (AgNO3)	37,789
Silver generated as byproduct	1,134
Silver shipped in product	22,859
Consumed in process	48,524
Chemical is a compound	13,797
Nitrate Compounds:	
Nitrate Compounds - Manufactured	68,576
Nitrate Compounds - Processed	37,789
Nitrate Compounds - Byproduct	31,406
Chemical is a compound	74,958
Hydrochloric Acid:	
Otherwise Used:	26,757
Used in Production/Treated on Site	26,079
Used in WWT	678

Mass Balance & Process Flow Diagram



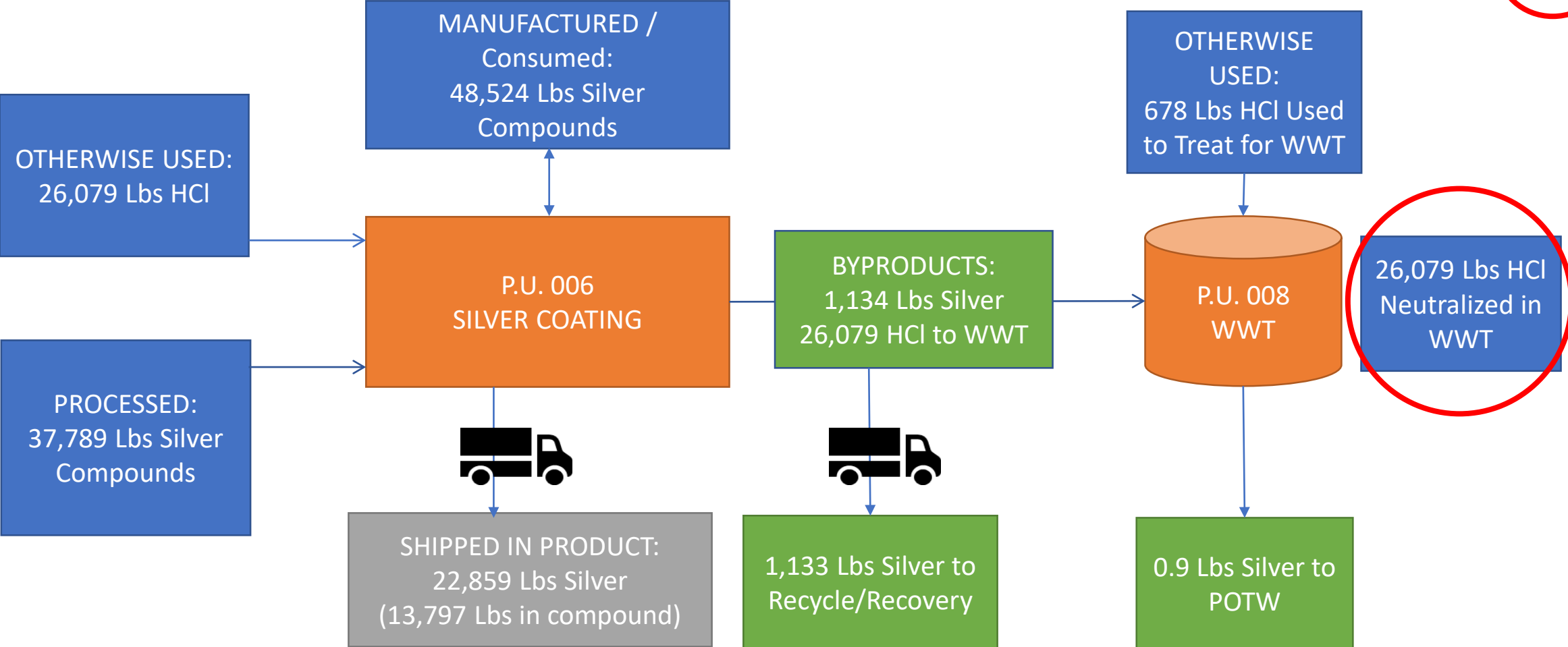
Mass Balance & Process Flow Diagram – Exercise 1

CHEMICAL	TURA Otherwise Used (Lbs)	TURA Manufactured (Lbs)	TURA Processed (Lbs)	Generated as Byproduct	Air (Fugitive)	Air (Stack)	POTW	HW	Total Emissions	Total Shipped in Product	Consumed	Amount of Chemical Compound	Total Used to Treat	Total Other Off-Site Disposal	Total Treated Off-Site	Mass Balance
Hydrochloric Acid	26,757	0	0	26,079	0	0	0	0	0	0	0	0	678	0	0	26,079



Exercise 1 – Answer

CHEMICAL	TURA Otherwise Used (Lbs)	TURA Manufactured (Lbs)	TURA Processed (Lbs)	Generated as Byproduct	Air (Fugitive)	Air (Stack)	POTW	HW	Total Emissions	Total Shipped in Product	Consumed	Amount of Chemical Compound	Total Used to Treat	Total Other Off-Site Disposal	Total Treated Off-Site	Mass Balance
Hydrochloric Acid	26,757	0	0	26,079	0	0	0	0	0	0	0	0	678	0	0	26,079



Mass Balance Critical Thinking – Exercise 2

SUMMARY OF REPORTED RESULTS FOR SARA 313 & TURA FORM S REPORTS RY 2019												
CAS NO.	CHEMICAL	TURA Otherwise Used (Lbs)	Max Amt On Site (Code)	Generated as Byproduct	Air (Fugitive)	Air (Stack)	Total Emissions	Total Used to Treat	Total Treated On-Site	Total Balance	CHECK	Production Ratio for RY2019
7647010	Hydrochloric Acid	26,758	03	26,080	0.001	0.070	0.071	678	26,079	26,758	0	1.05
SUMMARY OF REPORTED RESULTS FOR SARA 313 & TURA FORM S REPORTS RY 2018												
CAS NO.	CHEMICAL	TURA Otherwise Used (Lbs)	Max Amt On Site (Code)	Generated as Byproduct	Air (Fugitive)	Air (Stack)	Total Emissions	Total Used to Treat	Total Treated On-Site	Total Balance	CHECK	Production Ratio for RY2018
7647010	Hydrochloric Acid	35,124	03	34,686	0.037	0.250	0.287	438	34,686	35,124	0	0.95

Do the chemical usage
patterns make sense?

How would you find out?

5-minute breakout discussion

Exercise 2 - Answer

SUMMARY OF REPORTED RESULTS FOR SARA 313 & TURA FORM S REPORTS RY 2019												
CAS NO.	CHEMICAL	TURA Otherwise Used (Lbs)	Max Amt On Site (Code)	Generated as Byproduct	Air (Fugitive)	Air (Stack)	Total Emissions	Total Used to Treat	Total Treated On-Site	Total Balance	CHECK	Production Ratio for RY2019
7647010	Hydrochloric Acid	26,758	03	26,080	0.001	0.070	0.071	678	26,079	26,758	0	1.05
SUMMARY OF REPORTED RESULTS FOR SARA 313 & TURA FORM S REPORTS RY 2018												
CAS NO.	CHEMICAL	TURA Otherwise Used (Lbs)	Max Amt On Site (Code)	Generated as Byproduct	Air (Fugitive)	Air (Stack)	Total Emissions	Total Used to Treat	Total Treated On-Site	Total Balance	CHECK	Production Ratio for RY2018
7647010	Hydrochloric Acid	35,124	03	34,686	0.037	0.250	0.287	438	34,686	35,124	0	0.95

Mass Balance & TUR Planning

- Don't reinvent the wheel!
- Use your TUR Plan to point to the materials calculations you have already done for reporting

3.0 Materials Accounting

Materials accounting for calendar year 2019 was performed for TUR reporting and planning purposes. The chemical use, byproduct, and emissions for each reportable TUR chemical is summarized in **Attachment 3.0** of this plan.

Unit of Product

Choose a Unit of Product that will show TUR improvements!

Unit of Product

- Should be representative of processes
- *Polling question:* Is it possible to have more than one Unit of Product at your facility?

Production Unit (PU)	PU Description/ Purpose of the Chemicals Used	TUR Chemical(s)	2019 Unit of Product (UOP) (Square Feet of Pieces)
001	Rinsing of plastic pieces in Hydrochloric Acid	Hydrochloric Acid	6,369,340
002	Mixing of Hydrochloric Acid and other chemicals to form a coating catalyst for plastic pieces	Hydrochloric Acid	6,369,340
003	Application of Silver chloride to surface of plastic pieces	Hydrochloric Acid	6,369,340
006	Sensitized plastic pieces tumbled in a mixture of silver nitrate and other chemicals to add a silver coating	Silver Compounds, Nitrate Compounds, Formaldehyde	6,369,340
008	Wastewater Treatment – pH Neutralization of Wastewater Prior to Discharge to the POTW	Sodium Hydroxide, Hydrochloric Acid, Nitrate Compounds	6,369,340

Unit of Product and Toxics Use Reduction

Does this Unit of Product help evaluate effectiveness of TUR efforts?

TUR Plan 2020

TUR Plan 2018

	R _Y 2019		R _Y 2017	
Production Ratio	1.01		0.95	
Unit of Product (Sq. Ft. of Parts)	6,369,340		5,098,770	
Silver Compounds:		Normalized to 1000s of Sq. Feet		Normalized to 1000s of Sq. Feet
Silver Compounds Manufactured	48,524	7.6183	40,959	8.0331
Silver Compounds Processed (AgNO ₃)	37,789	5.9330	31,989	6.2739
Silver generated as byproduct	1,134	0.1780	622	0.1220
Silver shipped in product	22,859	3.5889	19,688	3.8613
Consumed in process	48,524			
Chemical is a compound	13,797	2.1661	11,679	2.2906

Unit of Product and Toxics Use Reduction

*Does this Unit of Product help
evaluate effectiveness of TUR efforts?*

TUR Plan 2020

TUR Plan 2018

	RY 2019		RY 2017	
Production Ratio	1.01		0.95	
Hours Operated (8 hrs/4 days/ 47 weeks)		1504		1504
Silver Compounds:		Normalized to Hours Operated		Normalized to Hours Operated
Silver Compounds Manufactured	48,524	32.26	40,959	27.23
Silver Compounds Processed (AgNO3)	37,789	25.13	31,989	21.27
Silver generated as byproduct	1,134	0.75	622	0.41
Silver shipped in product	22,859	15.20	19,688	13.09
Consumed in process	48,524			
Chemical is a compound	13,797	9.17	11,679	7.77

Which Unit of Product(s) Do You Use?

Polling Question

Unit of product	Example units of product	Example toxics use per unit of product
Area	square (feet, yards, meter)	lb (of toxic) per square area
Labor hours/ Hours of Operation	hours	lb (of toxic) per hour
Kilowatt - hours	kWH	lb (of toxic) per kWH
Length	feet, meters, yards	lb (of toxic) per length
Number	number widgets manufactured	lb (of toxic) per number widgets
Volume	gallon, liter, cubic feet	lb (of toxic) per volume
Weight	pounds, kilogram, ton	lb (of toxic) per weight
Dollars/ Revenue	dollars	lb (of toxic) per Dollars/ Revenue

Integral Recycling

Ensure your integral recycling meets the TUR definition, so you can take credit for it!

Integral Recycling



The material must be recycled or reused, not treated

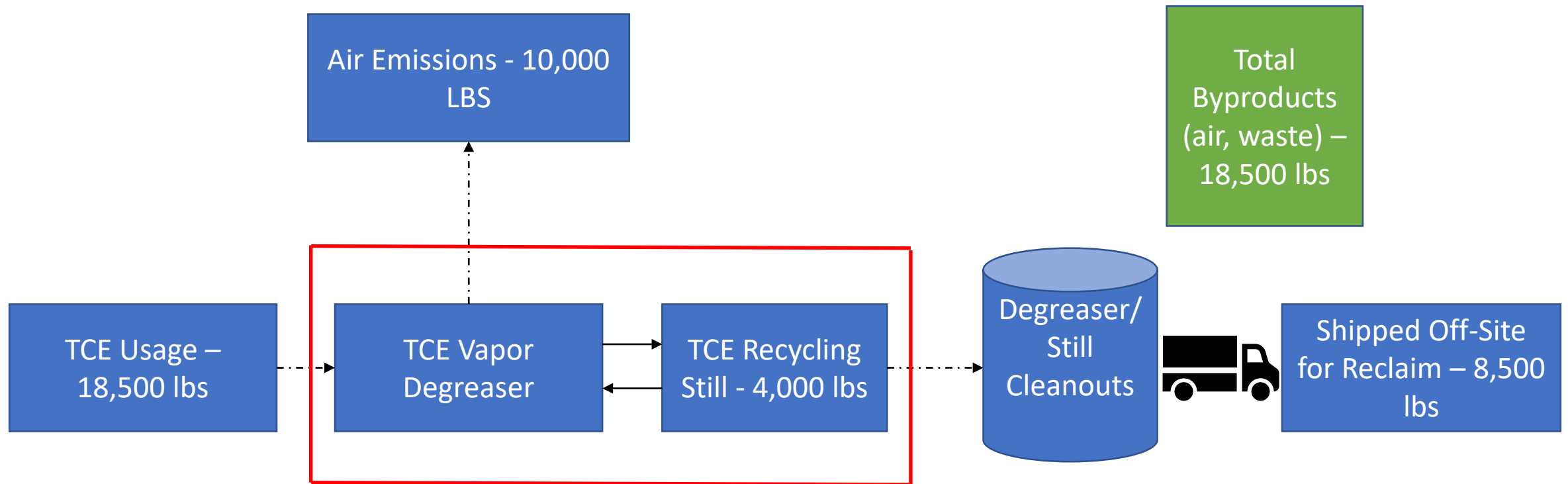


Recycling equipment and piping are permanently (or via detachable hoses) connected to a single production unit

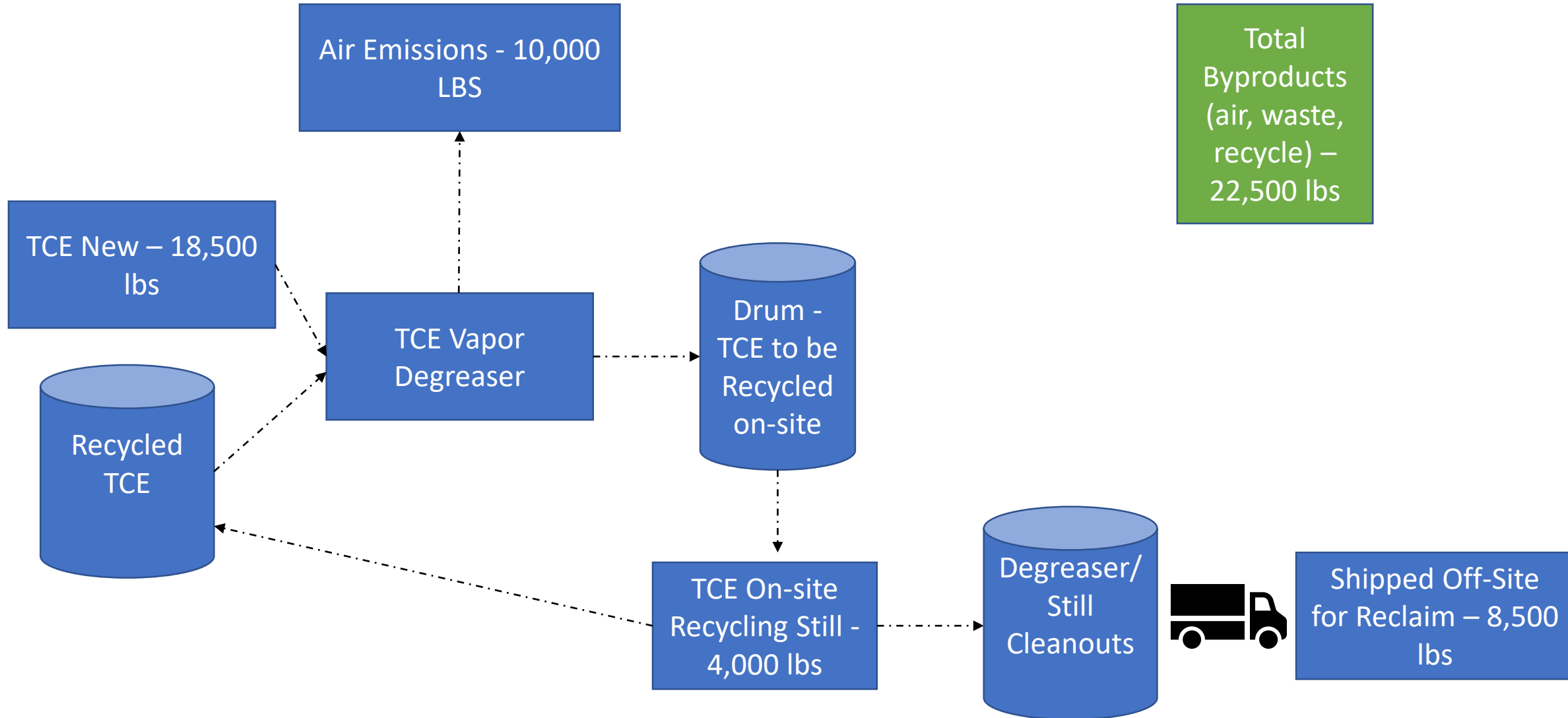


Directly connected holding tank to single production unit and the recycling unit is directly connected to the tank

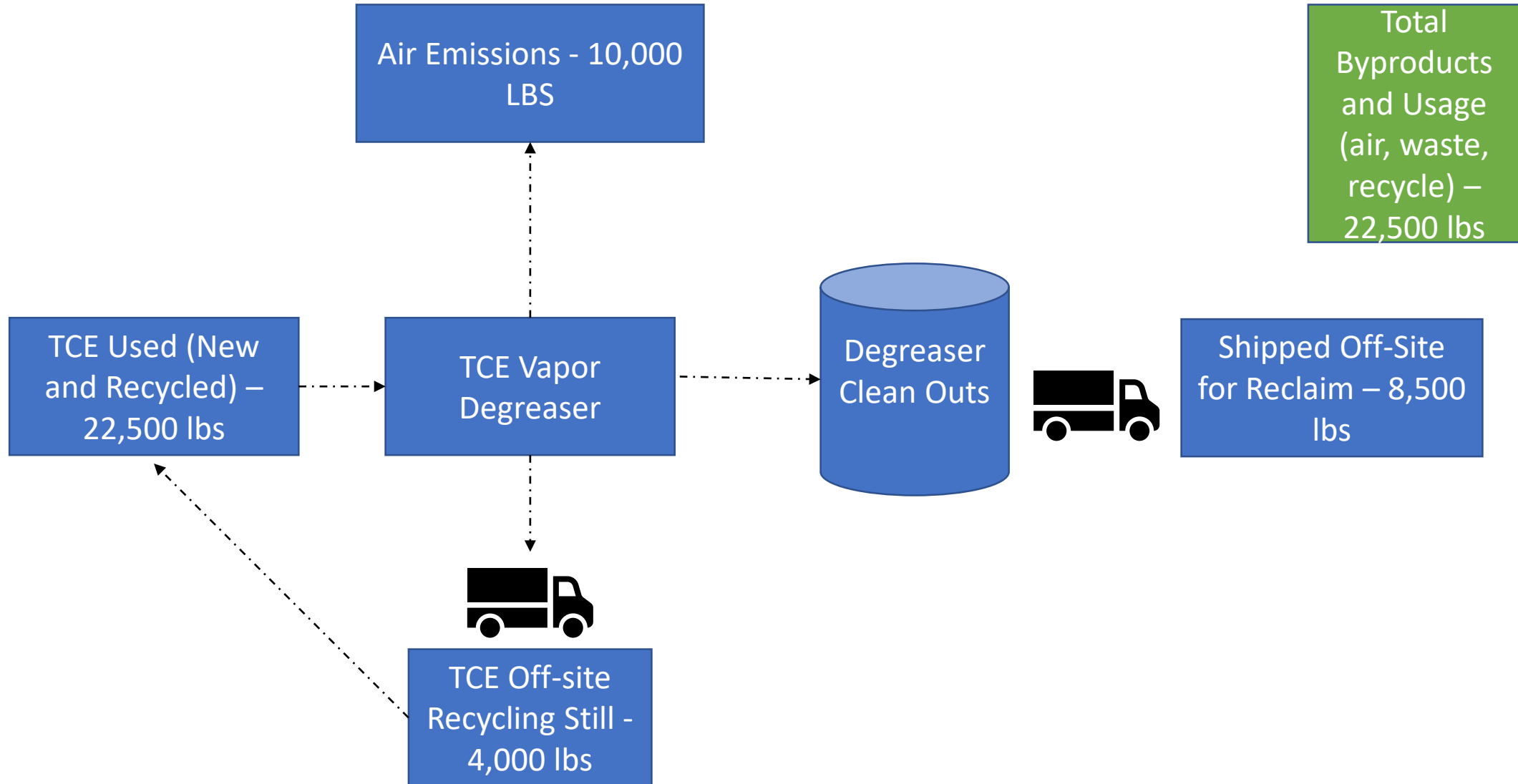
Process flow diagram: Integral Recycling



Process flow diagram: Non-Integral Recycling On-Site



Process flow diagram: Non-Integral Recycling Off-Site



Do you Do
Recycling/Integral
Recycling?

Polling Question



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Data Quality/Validation

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Consistency Between Reporting and Planning

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Questions?

Contact us!

Visit our Capaccio website: www.capaccio.com

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