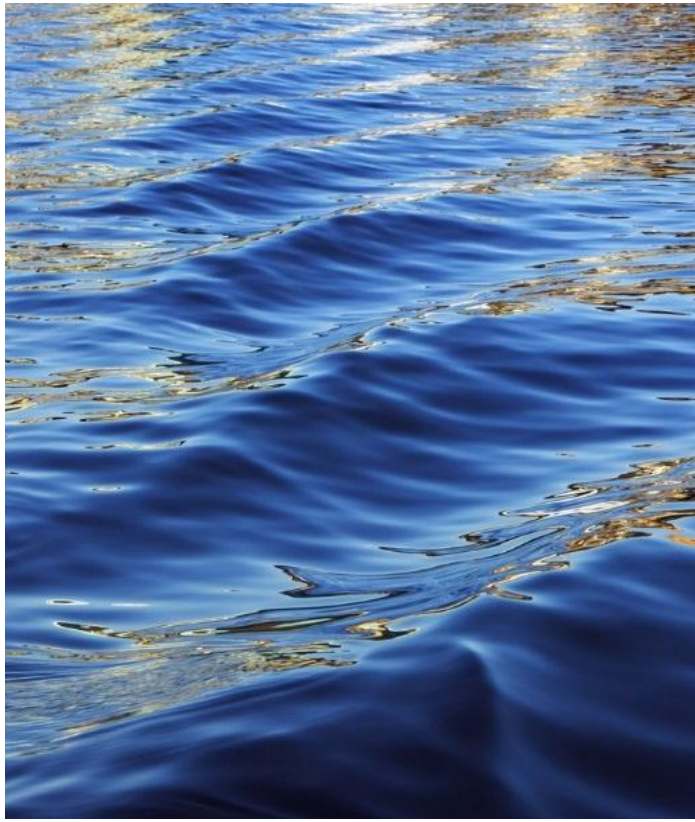
Toxics Use Reduction Conference

Process Characterization – TUR Planning Fundamentals

April 8, 2026



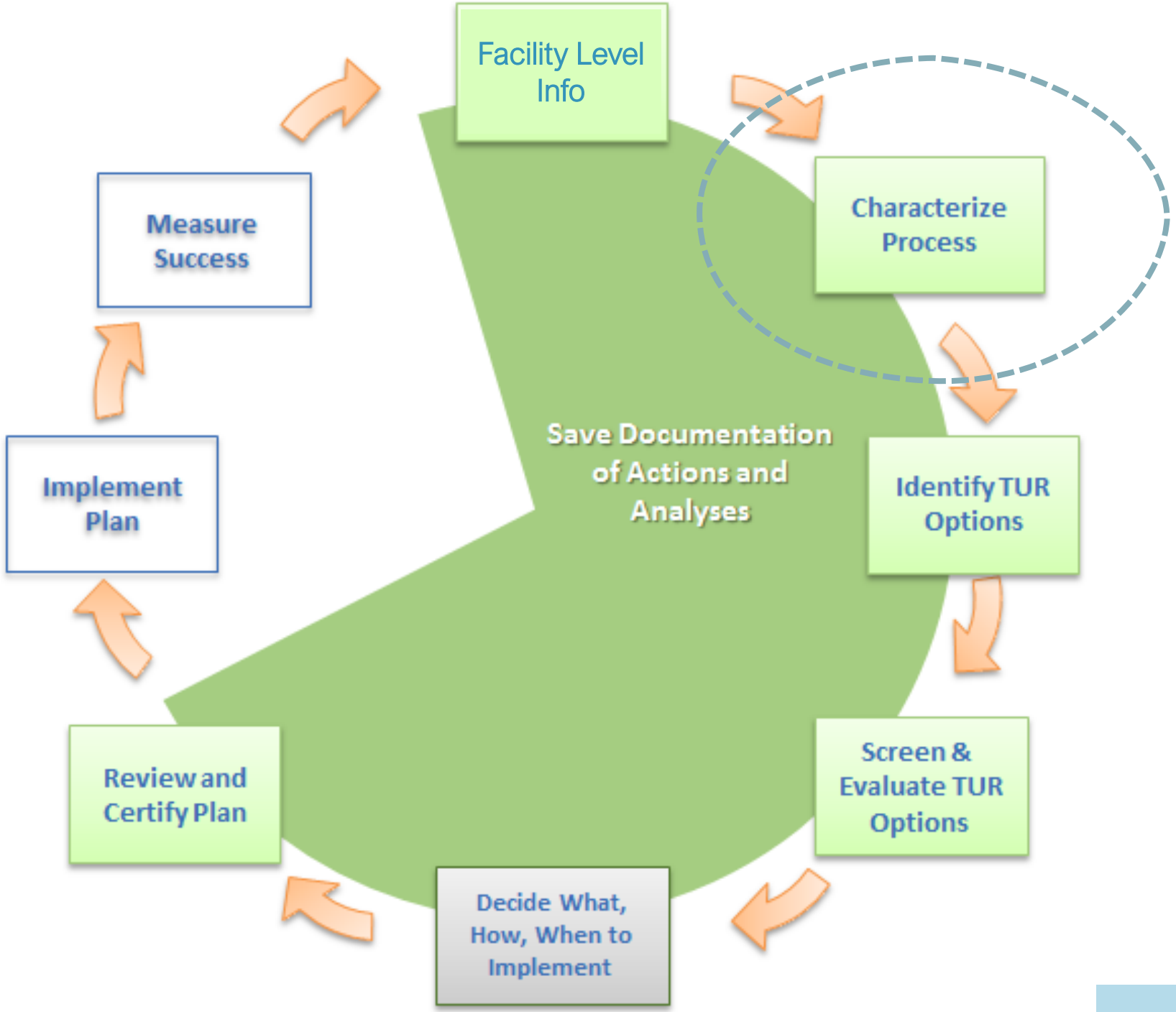
TUR planning standards

As TUR Planners, you are in essence "deputized" by the MassDEP to ensure that TUR planning is done correctly, completely and in accordance with these standards:

Good engineering practices

Standard accounting practices

Completing the plan in good faith


Facility Level Info
Characterize Process
Identify TUR Options
Screen & Evaluate TUR Options
Decide What, How, When to Implement
Review and Certify Plan
Implement Plan
Measure Success
Save Documentation of Actions and Analyses

Process Characterization

310 CMR 50.44

- Conducted for EACH production unit
- Identifies inputs and outputs of all covered toxics
- Creates visual representation from which key information required in the TUR Plan can be drawn
- Establishes the basis for the rest of the TUR planning process

Both quantitative (materials accounting) and qualitative (process flow diagrams and descriptors) elements are involved in process characterization

Required Quantitative Materials Accounting Information

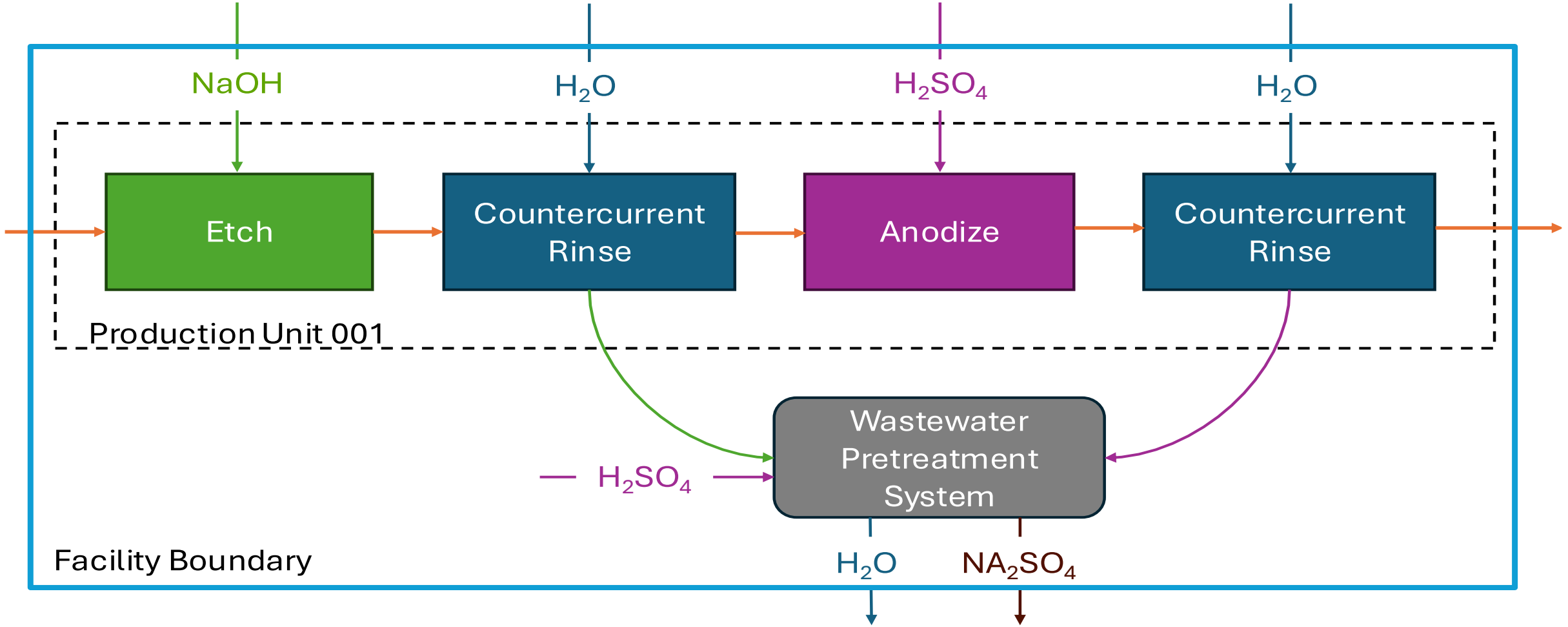
- Amounts and a statement of the estimation methods used to determine:
  - Total AND amount per unit of product of each covered toxic ***used***
  - Total AND amount per unit of product of each covered toxic ***generated as byproduct***
  - Total AND amount per unit of product of each covered toxic ***released or transferred off site as an emission***
- Cost of the use of each covered toxic

Materials accounting numbers should align with what is depicted on the process flow diagram.
Include this information on your PFD!

Process Flow Diagrams Must Include:

- Flow of covered toxics through each production unit (chemical pathway analysis), including where used and where associated byproducts or emissions are generated
- Production unit number (same as used in annual toxics reporting)
- Each manufacturing/process step, including associated waste treatment and recycling activities
- May also represent movement of other chemicals/materials not covered under TURA

Example Process Flow Diagram

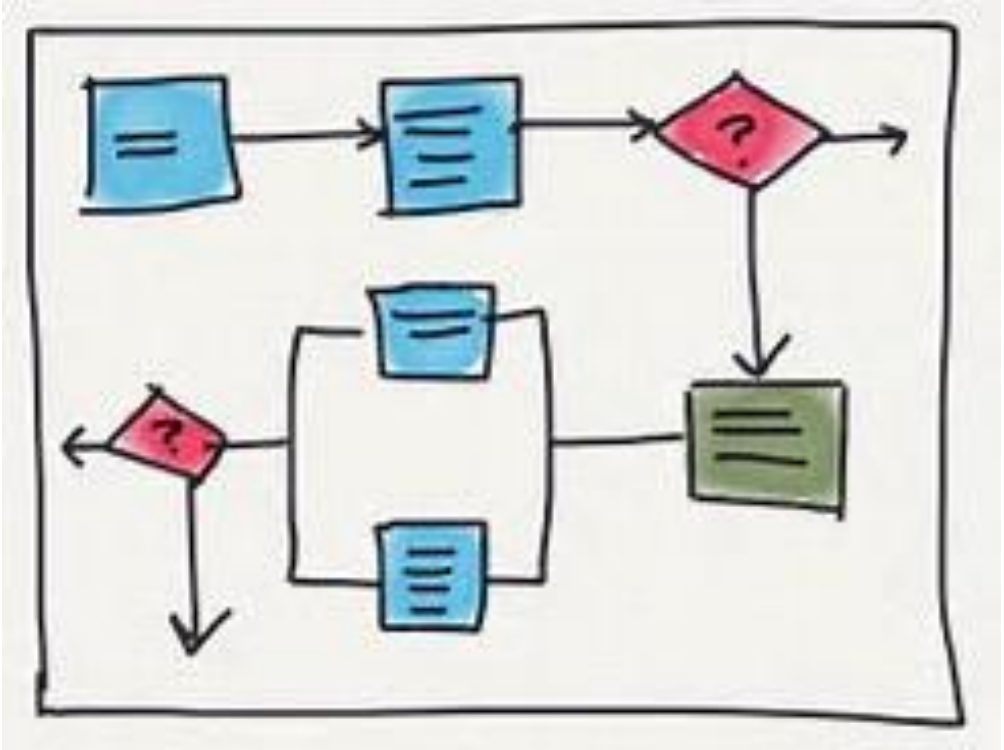


Other Required Qualitative Elements of Process Characterization

Production Units	A process or multiple processes used to make a product
	Includes processes, inputs/outputs of covered toxics, other materials or elements of production, and product
	Must have a distinct identifier that matches what is used in annual toxics reporting
	Process codes for steps within the production unit must be defined when reporting
Other Information	**Purpose**: Plan must include explanation of ***how*** each covered toxic is used in the production unit. This can help you identify opportunities for TUR. Consider if the toxic chemical necessary.
	Product: Could be discrete, family of products, intermediate, desired result, or byproduct that can be used as product (without treatment)
	Unit of Product: A measure that reflects level of production

Characterizing the Process

- Do some pre-site visit research
  - Company website
  - Industry benchmarks
  - Image search
  - YouTube videos
  - Facility-provided information
- Conduct opening meeting
  - Could be remote or in person
  - Determine the right people to meet with
  - Ask for a verbal description of the process
  - Demonstrate that you've done the pre-visit research
- Sketch a basic block diagram based on your understanding



Can you create a PFD without seeing the process?

Conducting a Walk Through

- Follow your host's process
- Look for:
  - How materials are handled
  - Opportunity for leaks or contamination
  - Vessel configurations (open, closed, contained, control devices, etc.)
  - Odors, emissions, vapors
  - Labelling and signage
  - People and their use of PPE
- Be Curious!
  - Take pictures (with permission)
  - Draw sketches
  - Talk to operators, maintenance staff, instrumentation/control tech, process engineers, etc.
  - Ask clarifying questions
  - Gather as much data as you can
- Be humble!

Creating your Process Flow Diagram

- ***Must* include:**
  - Production Unit identifier
  - Major process steps
  - Associated waste treatment or recycling activities
  - Movement of chemical and other materials/assets (as appropriate) through production unit, including byproduct and emissions

310 CMR 50.44 (1)

- **Best practices:**
  - Start from existing materials (e.g., process schematics, architectural diagrams)
  - Include information needed for annual reporting
    - Chemical CAS and volumes or other pertinent quantifying data
    - Process codes
    - Unit of Product
  - Delineate Production Unit AND facility boundaries
  - Include the revision date

Cultivate a good reviewer (or two) to check your information

Hearing from MassDEP

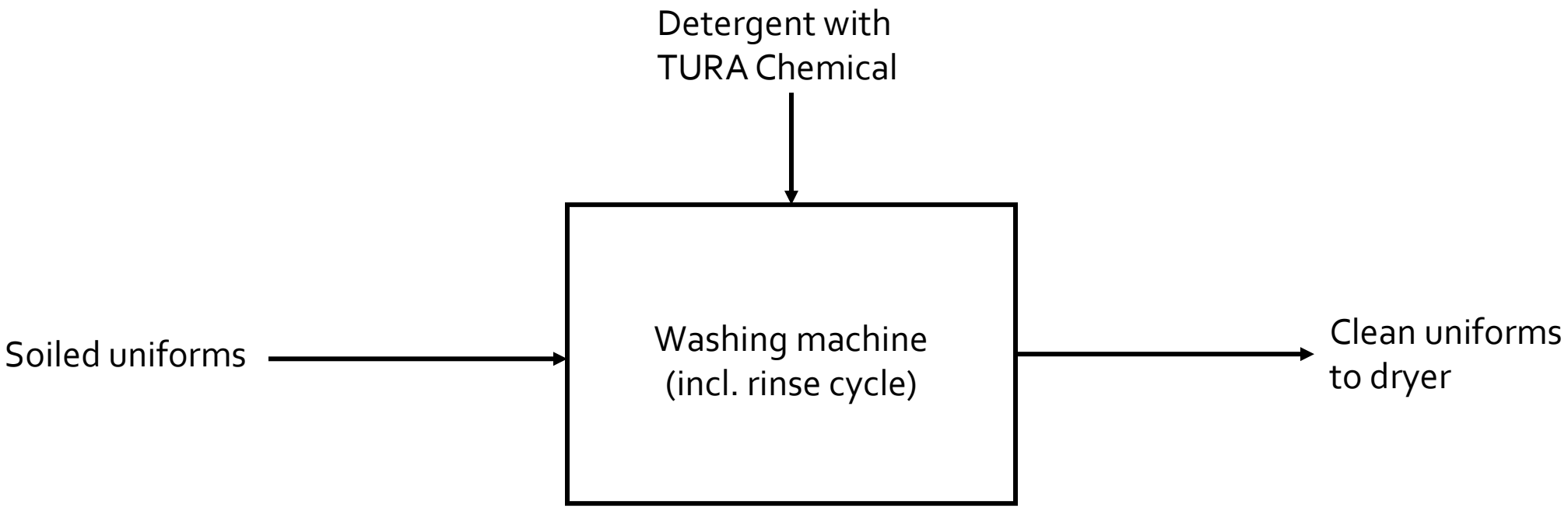
Leoni Desai

- Common issues MassDEP sees with process characterization
- MassDEP recommendations for better process characterization

Process Flow Diagrams: Common Errors

Leoni Desai, MassDEP

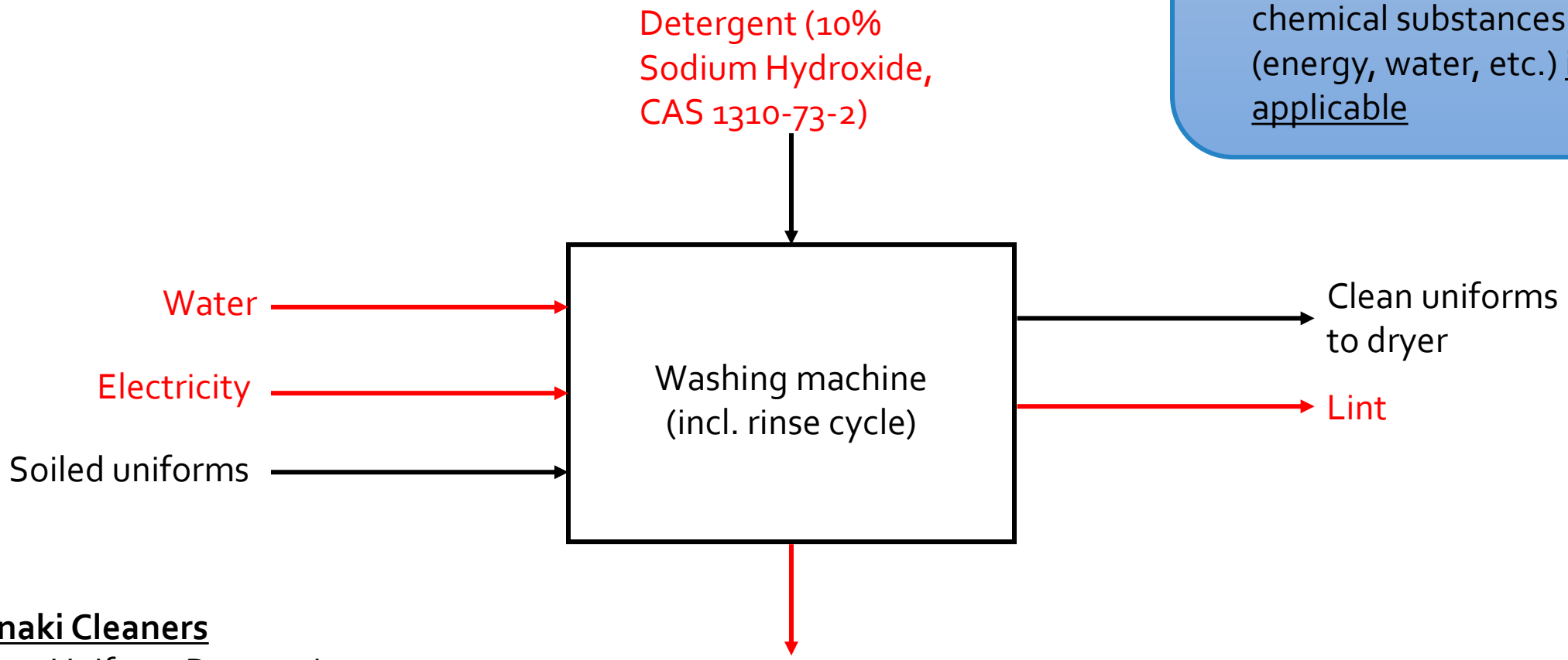
Example #1



Abnaki Cleaners
Uniform Degreasing

Example #1

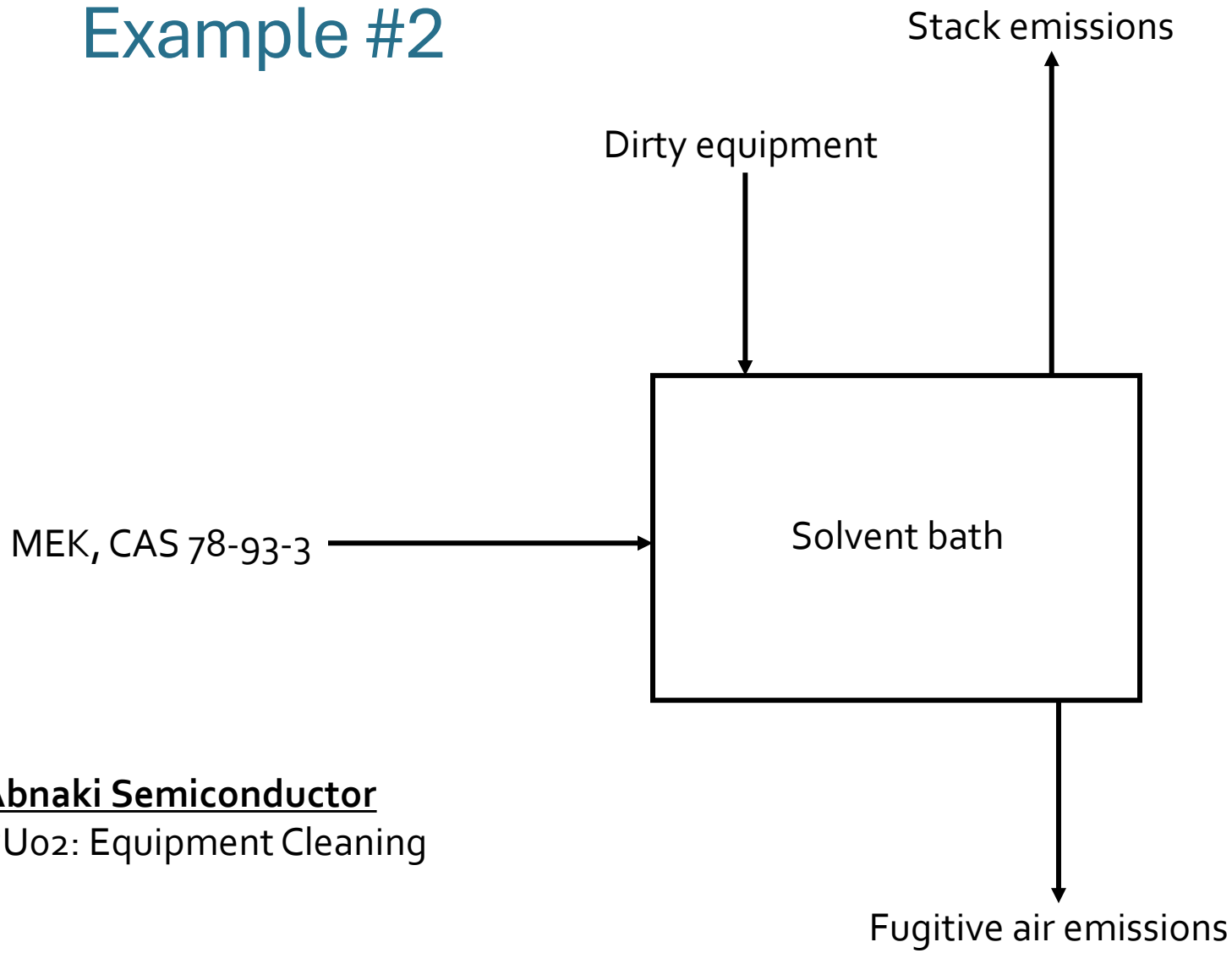
Common Errors
- Missing PU numbers
- Missing chemical names
- Missing flow of other non-chemical substances (energy, water, etc.) if applicable



Abnaki Cleaners

PU01: Uniform Degreasing

Example #2

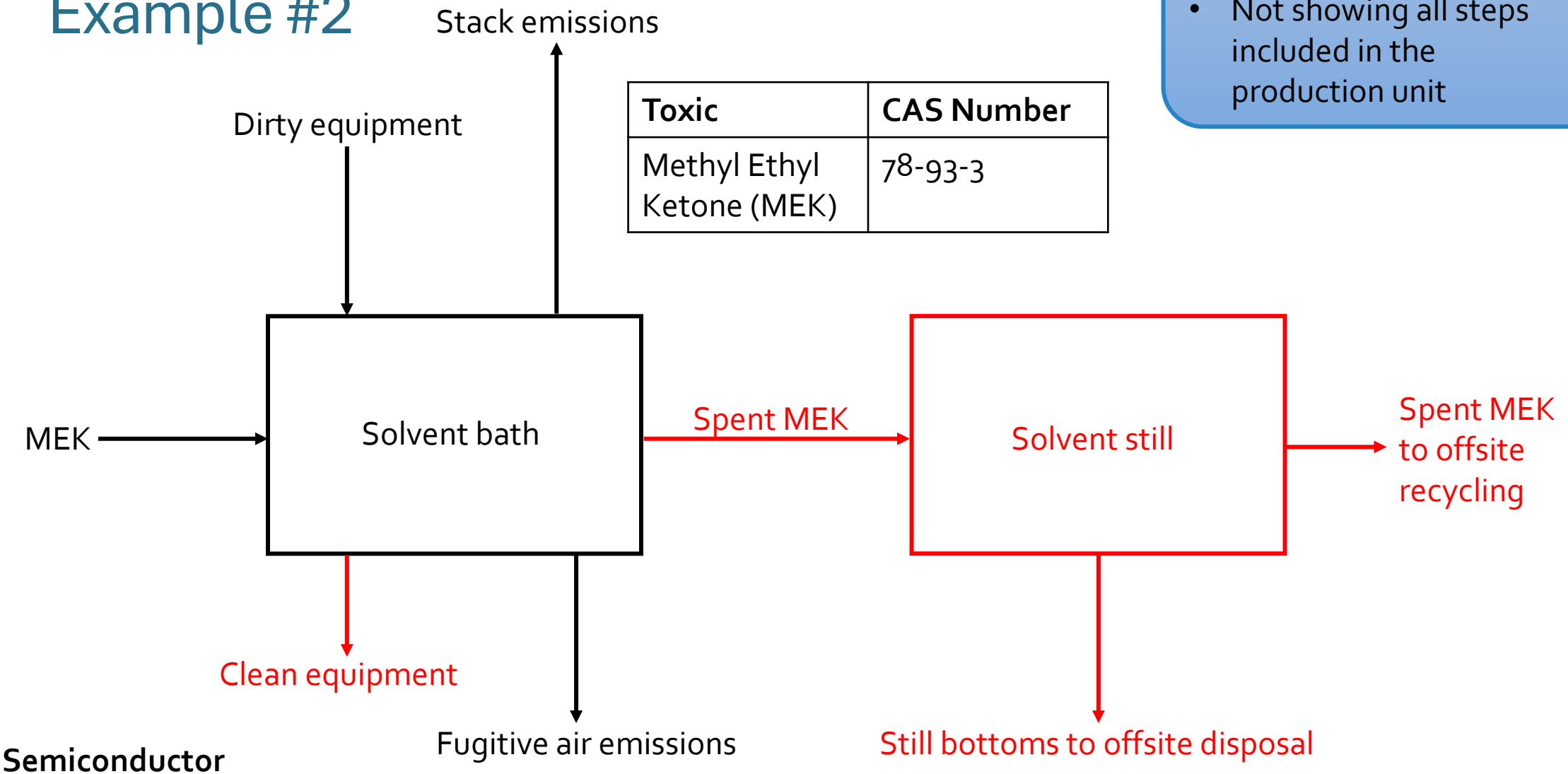


Abnaki Semiconductor
PU02: Equipment Cleaning

Example #2

Common Errors cont.
- Missing inputs/outputs
- Not showing all steps included in the production unit

Toxic	CAS Number
Methyl Ethyl Ketone (MEK)	78-93-3



Abnaki Semiconductor

PU02: Equipment Cleaning

DEP's Recommendations

- Always check the MassDEP Chemical List.
- Always list the Production Unit number.
- Include CAS numbers in your diagram.
- One PFD per production unit, not one per chemical!
- Ensure PFDs show each toxic's flow in and out of the processes.
- Make sure your PFDs are consistent with the written portion of your plan. These sections should support each other and together enhance the inspector's understanding of the process.
- If you choose to incorporate elements to supplement your PFDs, such as keys/legends, they should be complete and easy to follow.
- Adding a revision date to your PFD can help the discussion between TUR Planner and Facility on process line changes, facility footprint modifications, new chemicals, etc.

Let's practice our TUR planning skills …

- Luke Truman
  - Senior Program Manager
  - Sustainability Coordinator for the Craft Beverage Sector
  - New England Environmental Finance Center