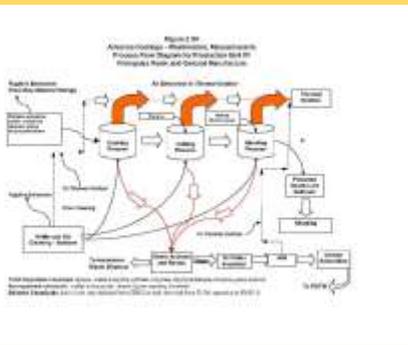
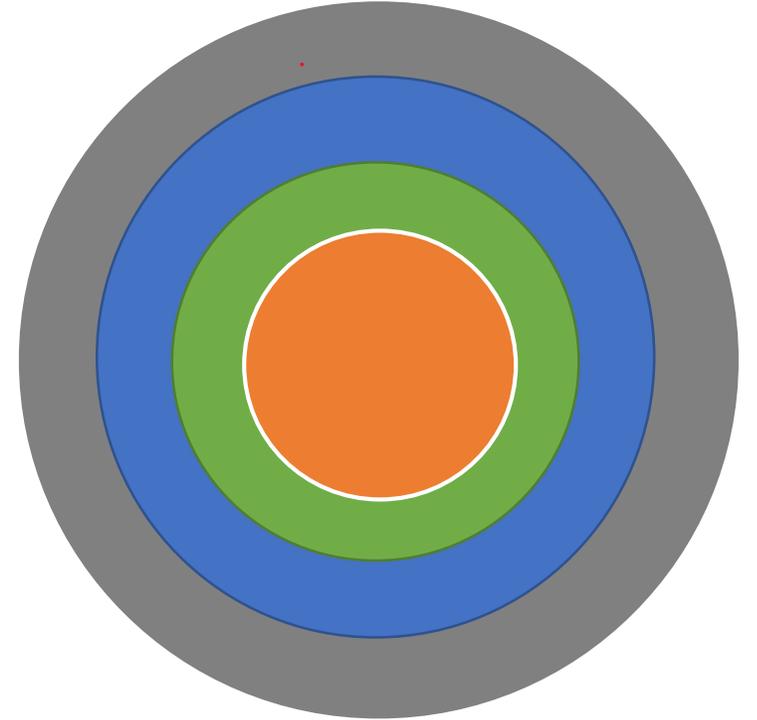


Process Characterization

Creating Process Flow Diagrams

A quick review and some practical experience.



Process Characterization

**My job
here Today**

- Review the basics of Process Characterization
- Explain my take on the value of Process Characterization and the Process Flow Diagram (PFD)
- Tell you how I go about doing Process Characterization and PFDs
- Provide some examples of my experience in Process Characterization and PFDs
- Provide some areas I find challenging

Process Characterization

Reviewing
the basics:

Definition: The method by which a process or series of processes are broken down into smaller components

- Identification of inputs and outputs
- Degree of dissection dependent on the needs of the analysis
- "PROCESS FLOW DIAGRAM"

In Simplest terms – all the goes intos and all the goes out ofs

Process Characterization

What's Involved?

Reviewing
the basics:

Process Mapping

- *Identify processes*
- *Define WHERE inputs enter*
- *Define WHERE outputs leave*
- *Chemical pathways analysis*

Process Characterization

Reviewing
the basics:

Production Unit

“ A process, line, method, activity, or technique or a combination or series thereof, used to make a product”

Process Characterization

Reviewing
the basics:

Unit of Product

A measure that reflects the level of production associated with use of toxic OR generation of toxic as a byproduct

Toxics use reduction must be normalized against the level of production

Select a measure of facility production that closely reflects activities involving toxics

REMEMBER: it's a unit of *PRODUCT*,
not of toxics use!

Process Characterization

Reviewing
the basics:

Why Do Process Characterization?

Pinpoints where wastes originate

Helps determine true costs of toxics

Helps to identify TUR opportunities

Provides basic "unit of analysis" for TUR

Process Characterization

Why Do Process Characterization?

My take on
the value
of this
process

Learn a whole lot about something

Get to ask a bunch of questions

Helps to really get your head around what is going on

It sets the fundamental base for everything else you will do

It gives you credibility

Process Characterization

Why Do Process Characterization

My take on
the value
of this
process

It provides an opportunity to see the plant in a different way

Gives you an opportunity to talk to people

Gives you an opportunity to address other regulatory issues

Gets you away from your desk

Process Characterization

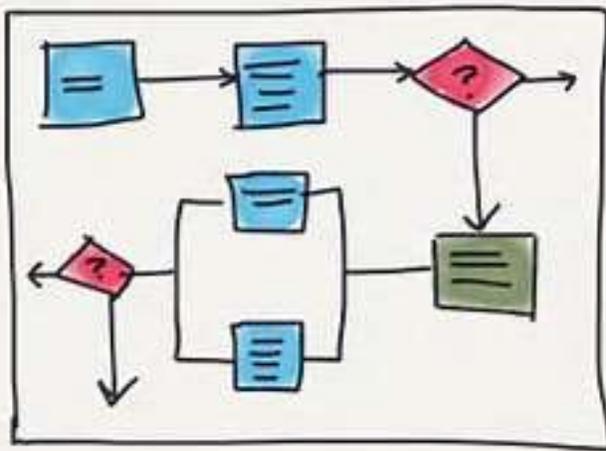
How Do You Do Process Characterization?

How do
you go
about it?

Do some pre-site visit research – read, website, industry search, image search, materials from the plant.

Have an opening meeting with Plant Manager/
Production Manager/Ops Manager/Maintenance
Mgr/EHS Mgr

Ask for a verbal description of the process – and ask
some basic questions: what is the product?
Write things down, draw pictures, write down
questions. Try to get a basic block sketch of the
process.



Process Characterization

The Walk Around

How do
you go
about it?

Do a walk-around

- Start at the beginning of the process where raw materials come in and proceed through the end
- Identify points/steps where utilities (water, fuels etc.) and process materials are entering or leaving process

You already know to look for:

- Fugitive, Point, and Area emissions to all media
- Byproduct flows to pollution control units
 - fume scrubbers
 - wastewater treatment
 - on-site recycling
 - etc.
- Leaks, spills, evaporative losses, maintenance activities



Process Characterization

The Walk Around

How do
you go
about it?

Try to take pictures
or draw sketches

Also pay close attention to:

- How materials are being handled
- How many times materials are being handled
- Manual or automatic transfers, pumps, timers, regulators, monitors
- Raw material and product contamination
- Open or closed vessels, containment, control devices
- Odors, visible emissions or vapors (or not 😊)
- Look for labeling and signage
- Observe people wearing safety equipment

Process Characterization

The Walk Around



Not so good



Pretty good



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How do
you go
about it?



Process Characterization

How do
you go
about it?

The Walk Around

- Be curious
- Ask questions about what you see in an attempt to really understand the process
- At this point, you are not trying to solve anything - just gathering data
- Try to talk to operators, maintenance staff, I&C Tech, process engineers, etc.

Process Characterization

**Pulling it
Together**

**Process
Flow
Diagrams:
Use Existing
Data**

- Operational Data
- Piping diagrams
- Operating manuals
- Workflow diagrams
- Architect's plans

Do Not Re-Invent The Wheel!

Process Characterization



Process Flow Diagram

Schematic depiction of essential processes required to operate the plant.

Should Include for each Production Unit:

Production Unit Number or Name

Unit of Product

Process Flow Diagram with:

Each step including treatment and recycling

Movement of each reportable chemical through process including all points of entry and exit as product, byproduct or emission

Process Characterization



**Pulling it
Together**

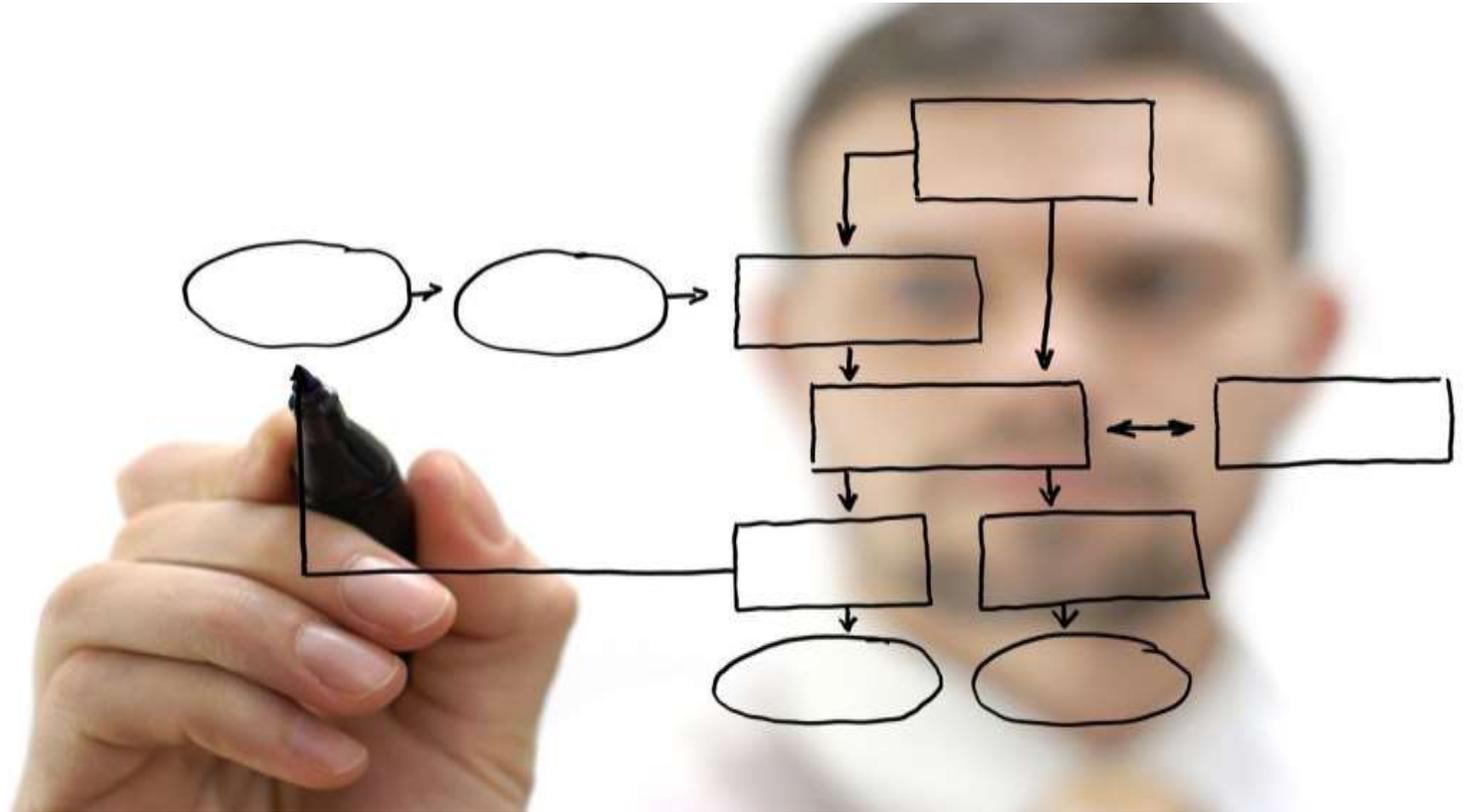
Process Flow Diagram

- Get the details on the chemical volumes, concentrations mixtures etc.
- Make sure the calculations are good – document how you came up with the numbers and look for consistency with other reporting. Use actual measured data whenever you can.
- Maintain a supporting spreadsheet of calculations
- Cultivate a good reviewer or two – someone who can verify the numbers and someone who can verify the process flow.

Process Characterization

Process Flow Diagram

Pulling it
Together

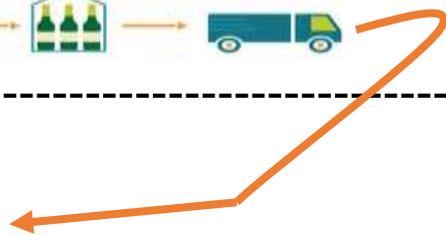
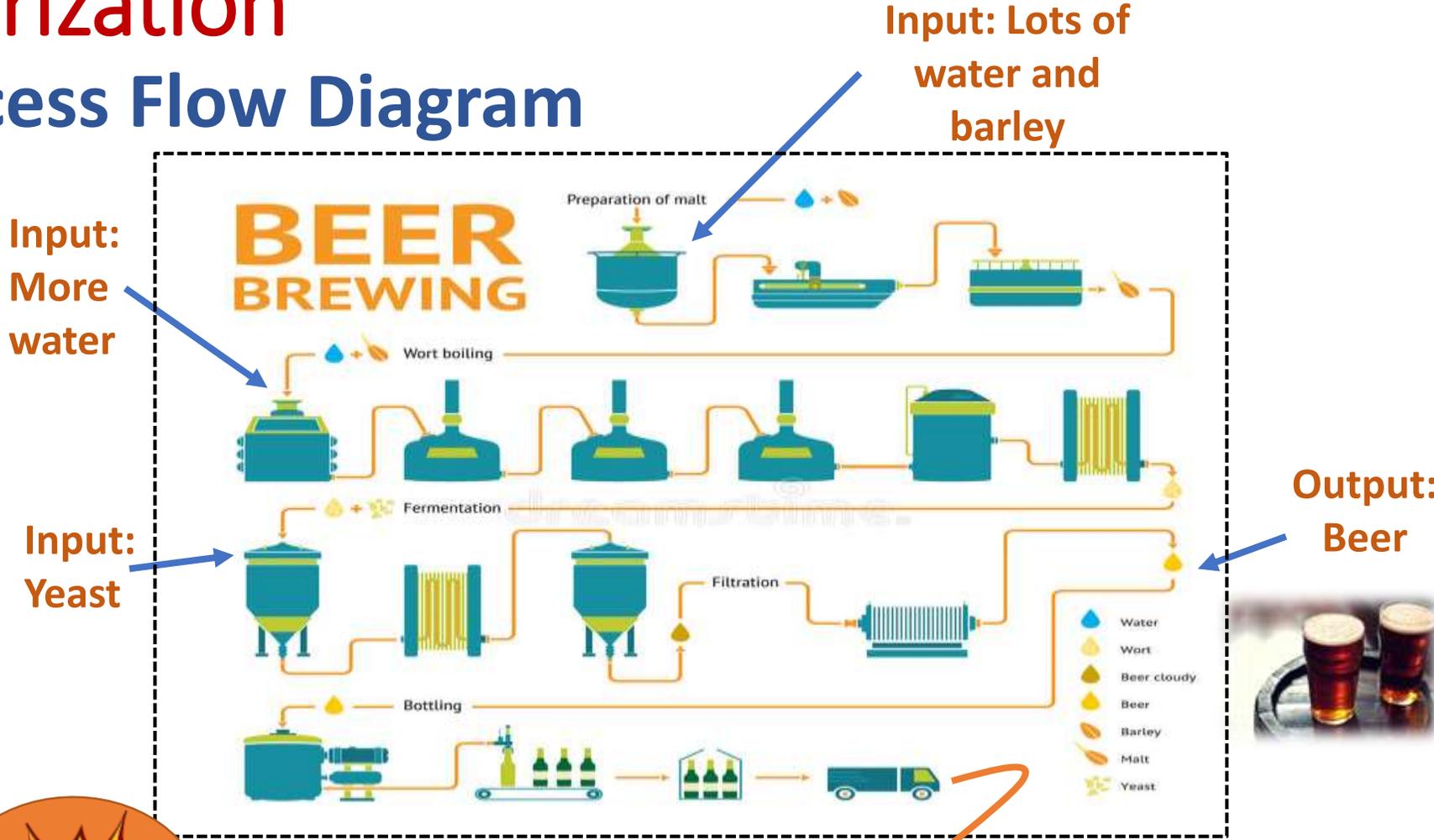


Sketch the PFD out by hand or use a drawing program.

Process Characterization

Process Flow Diagram

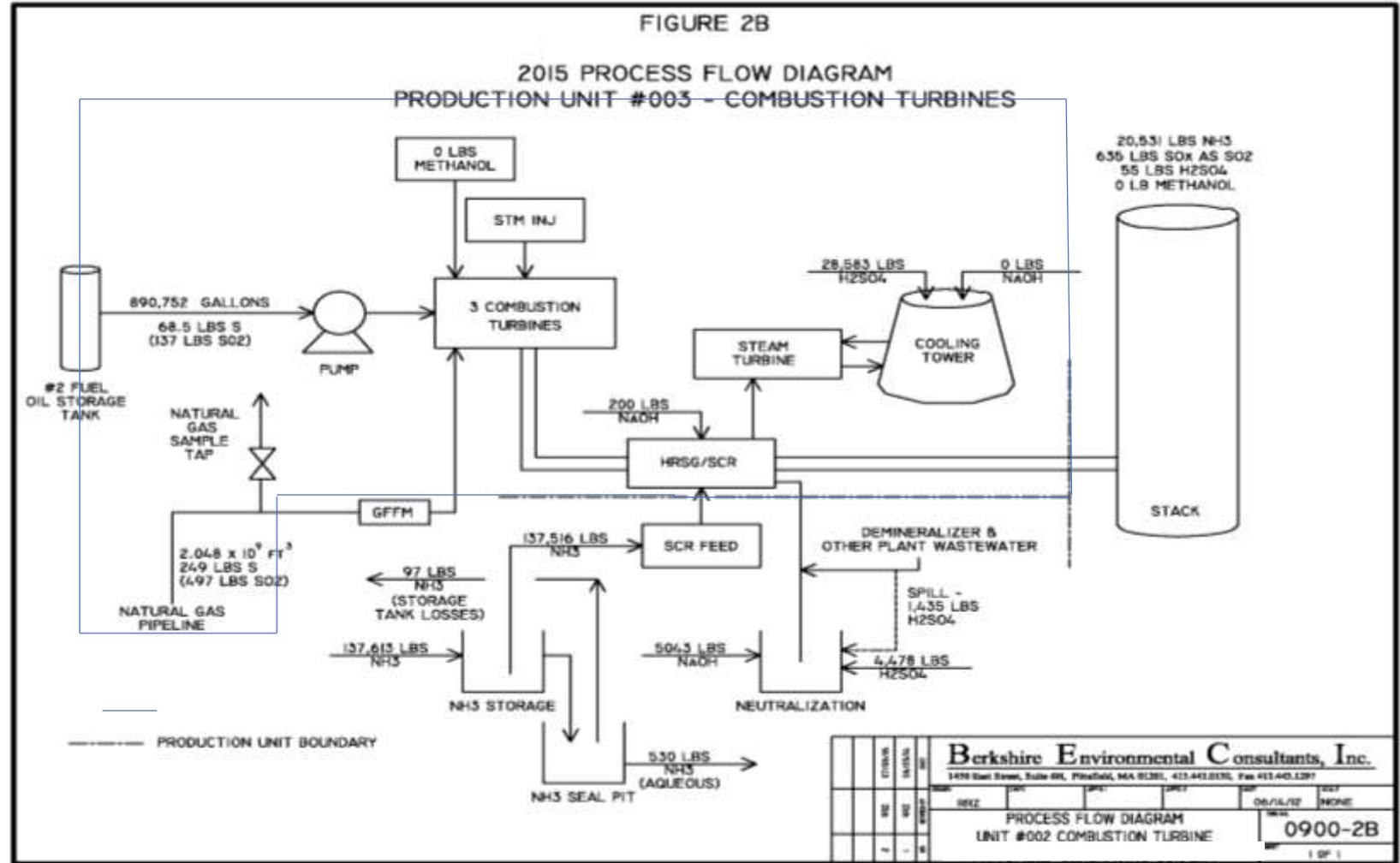
Pulling it Together



Process Characterization

Process Flow Diagram

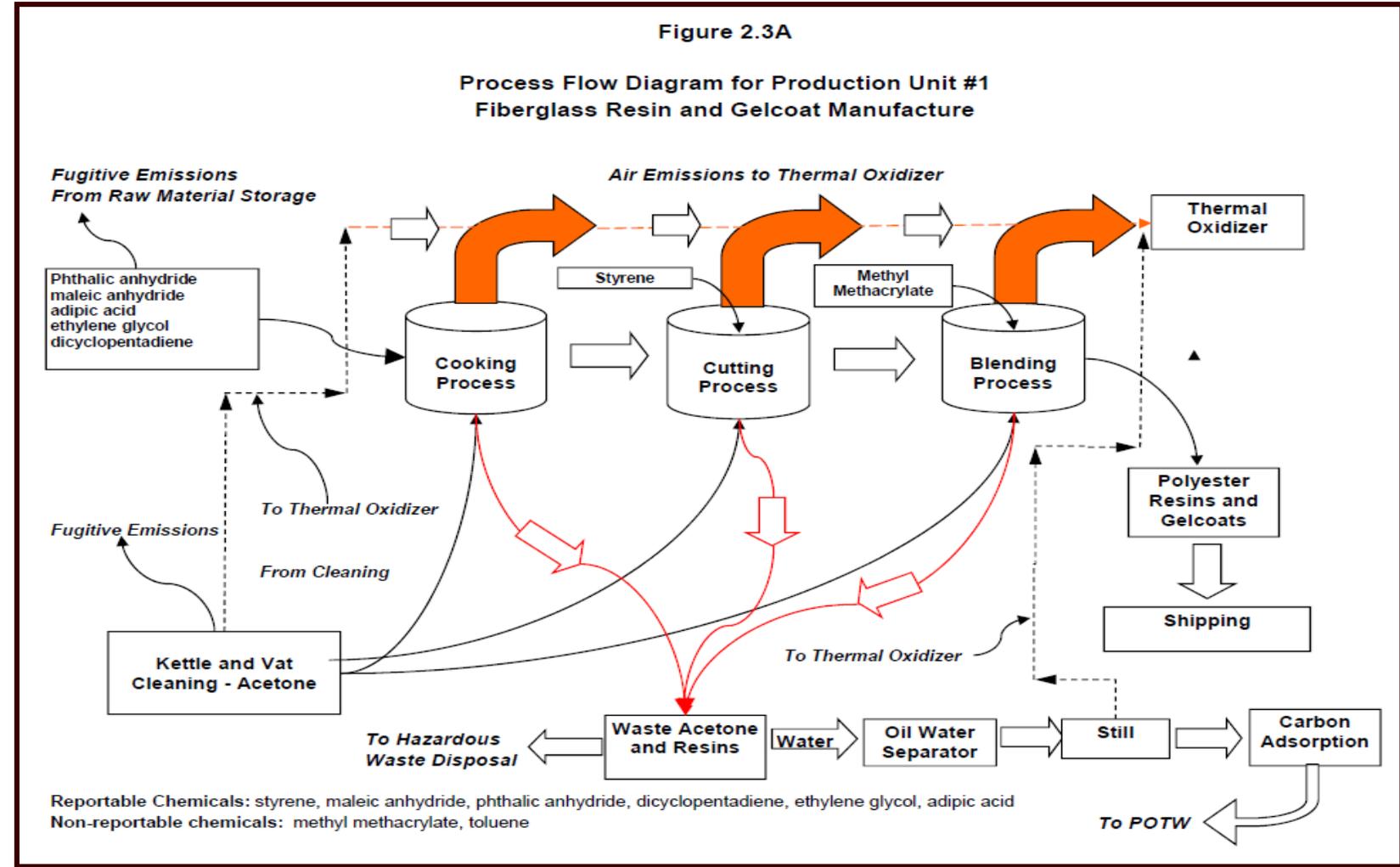
Pulling it Together



Process Characterization

Process Flow Diagram

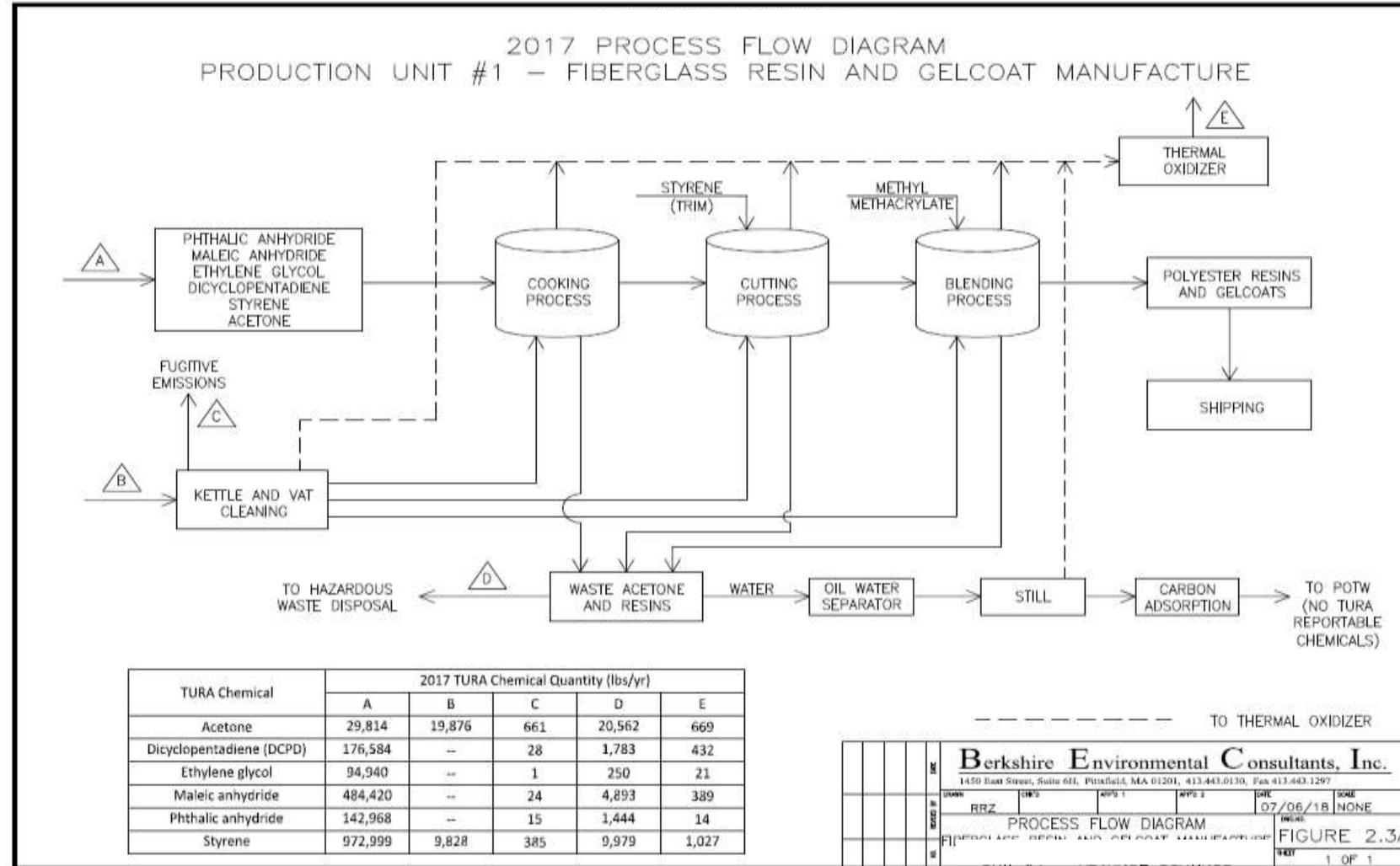
Pulling it Together



Process Characterization

Process Flow Diagram

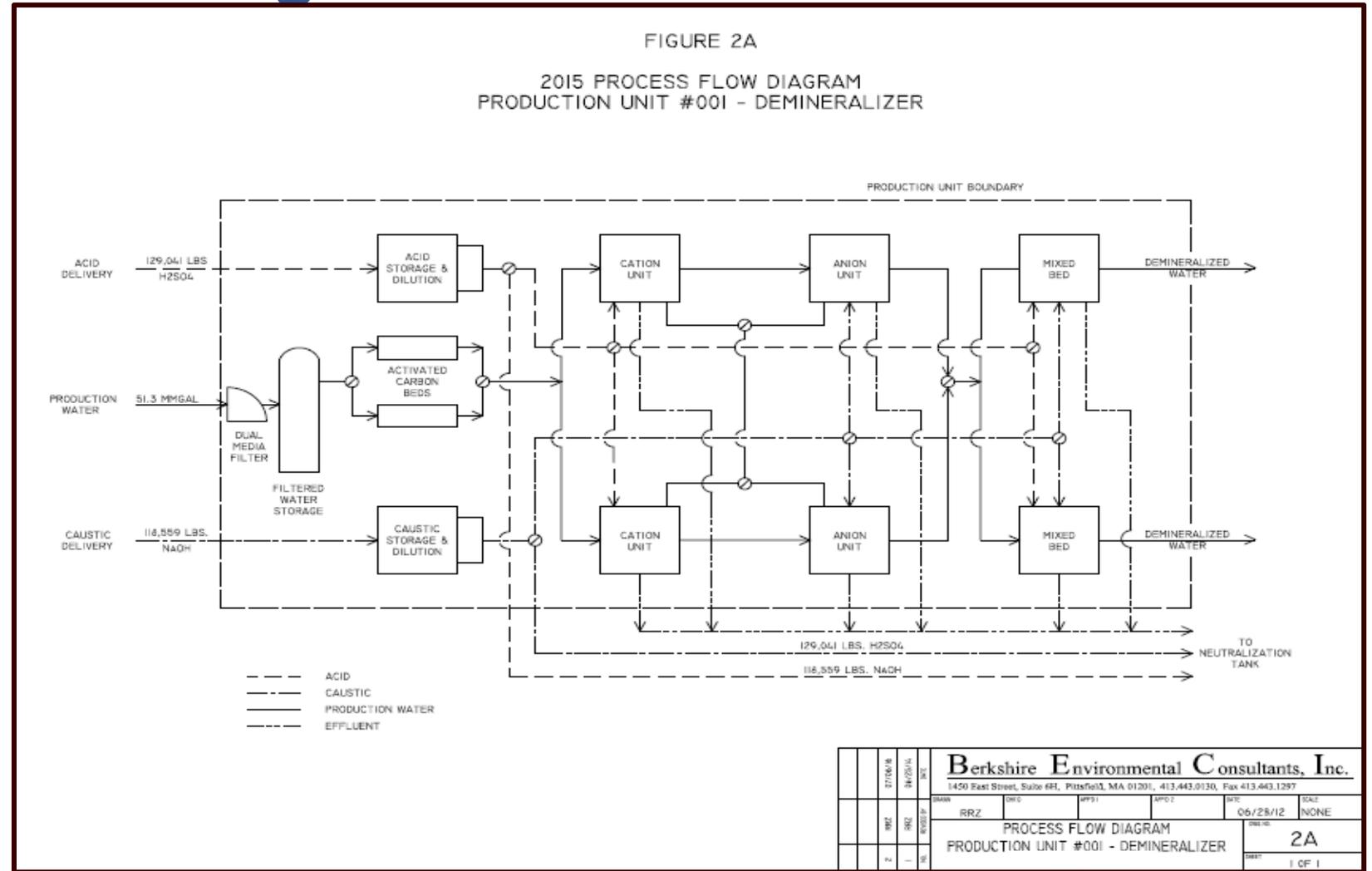
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Process Characterization

Process Flow Diagram

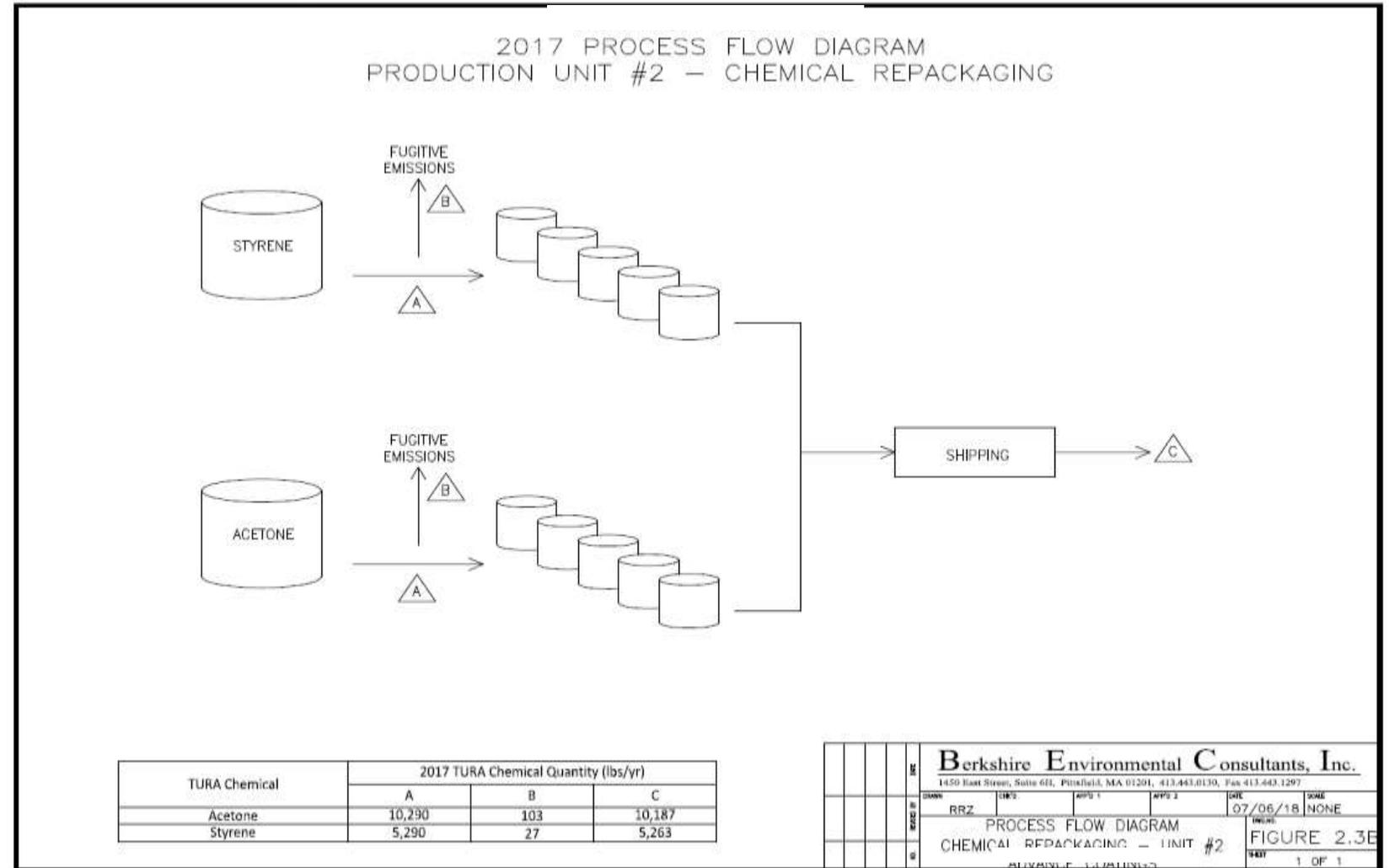
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Process Characterization

Process Flow Diagram

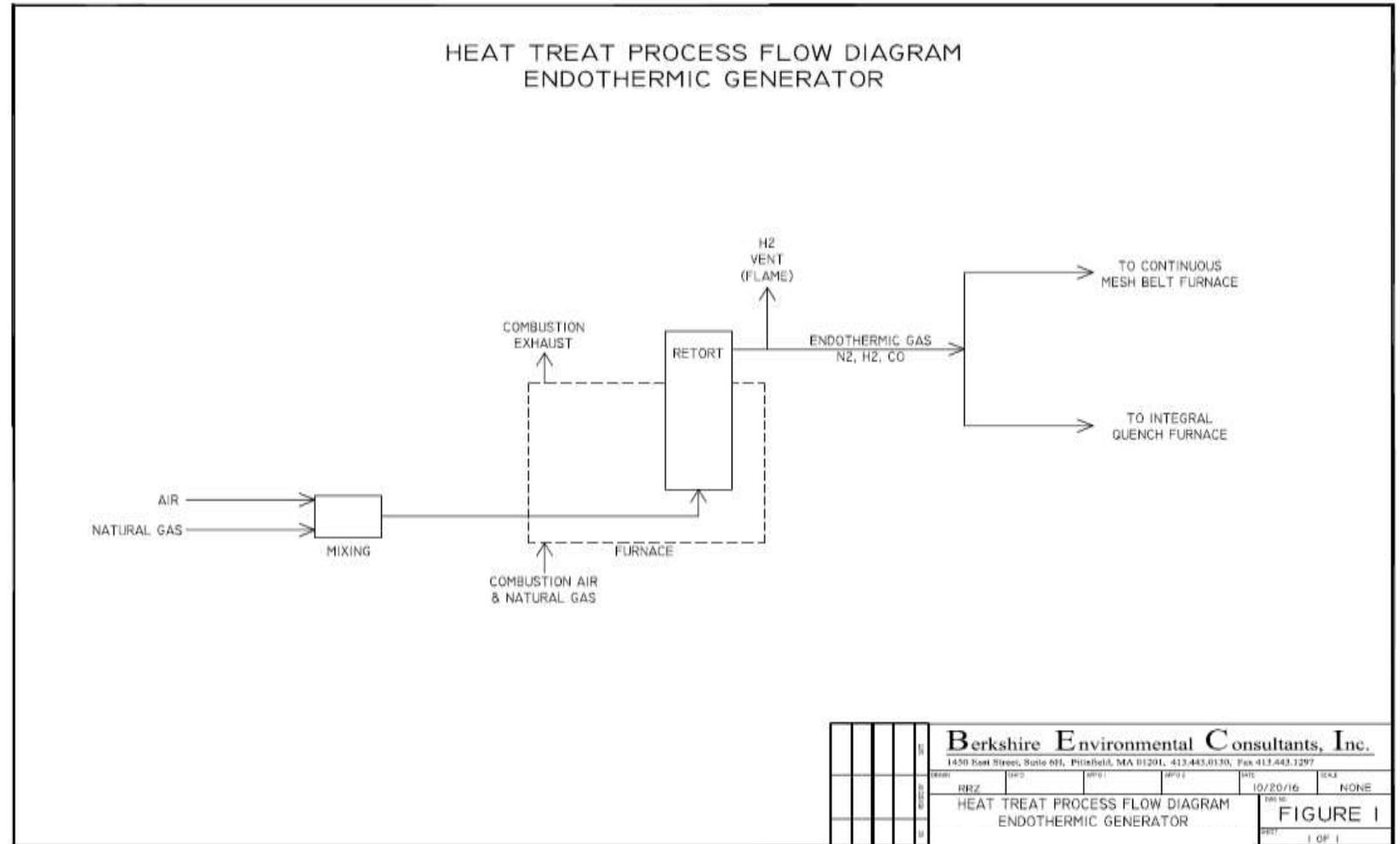
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Process Characterization

Process Flow Diagram

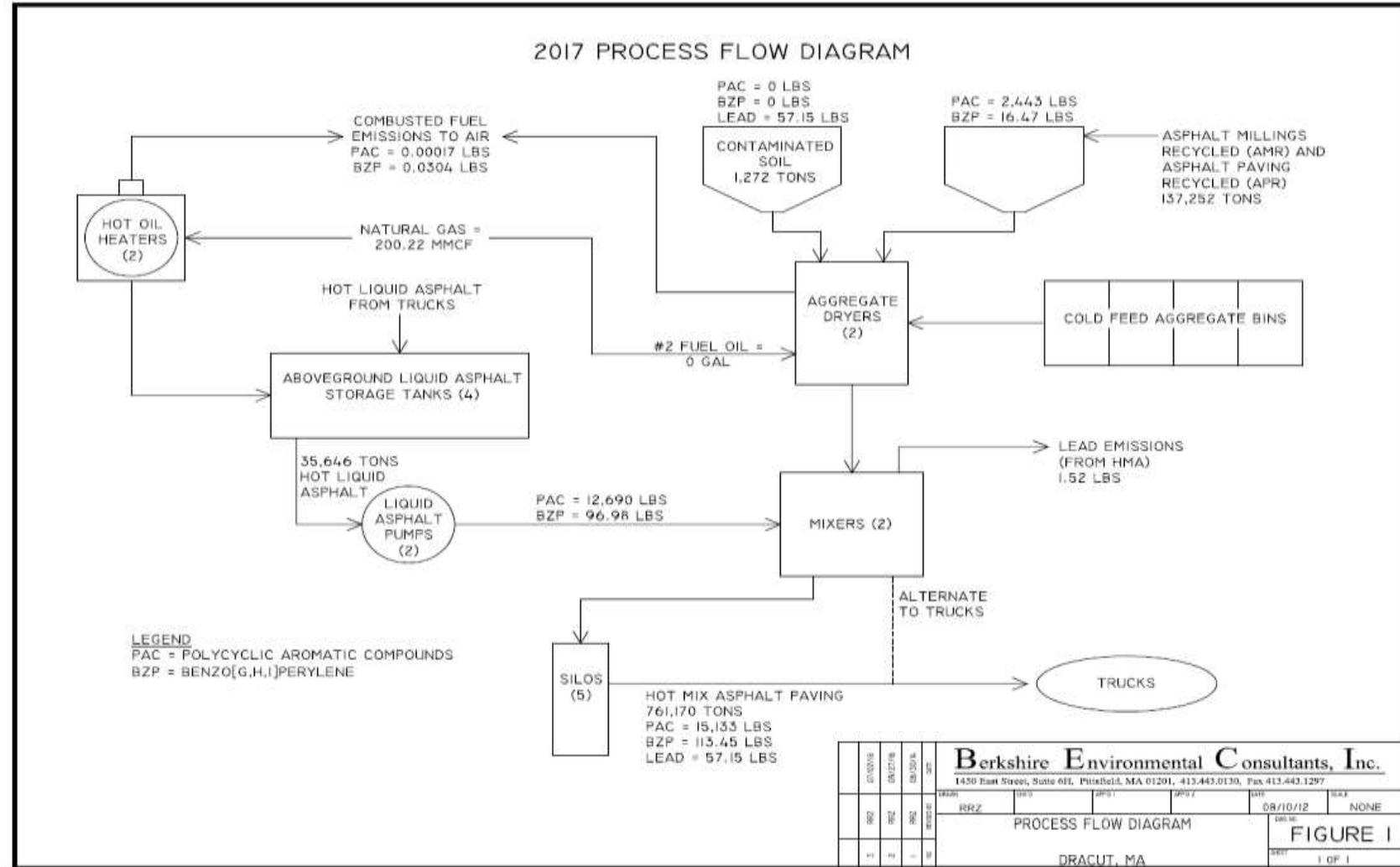
Pulling it Together



Process Characterization

Process Flow Diagram

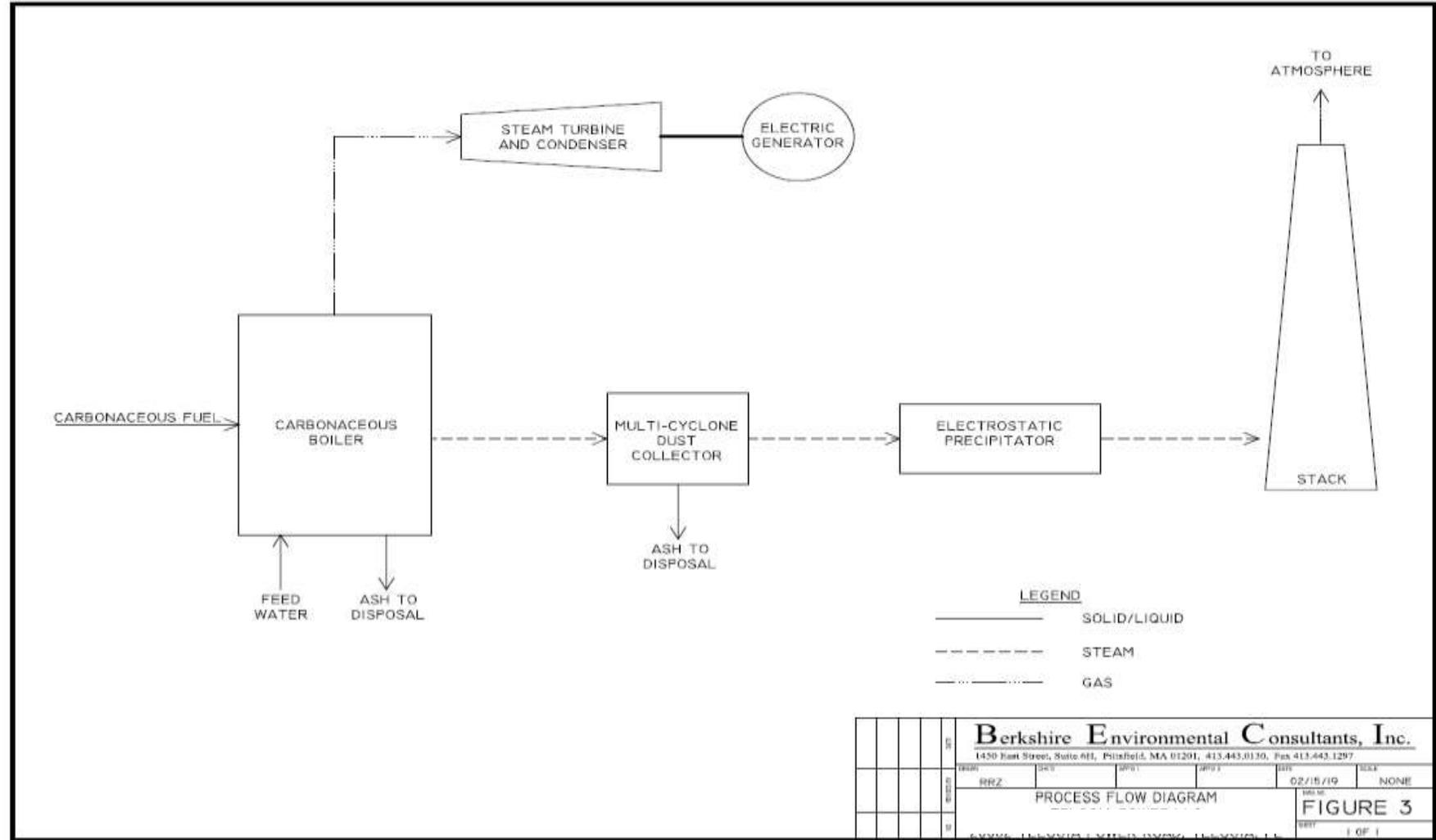
Pulling it Together



Process Characterization

Process Flow Diagram

Pulling it Together



Process Characterization



Challenges

- Getting the process steps down
- Getting the correct the information – for a variety of reasons
- Finding a really good reviewer
- Running out of time or rushing the process
- Simplifying
- Reminding myself that there are going to be changes

Q&A

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