Chemical Data Reporting Byproducts, Impurities, and Recycling Scenarios

U.S. Environmental Protection Agency
Office of Pollution Prevention and Toxics

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Introduction

First published for the 2012 CDR, this document addresses a series of industry scenarios and questions related to EPA's Chemical Data Reporting (CDR) rule. The scenarios were provided to EPA by Bergeson and Campbell (B&C) for industry, in a document titled "Chemical Data Reporting (CDR): Case Studies for Byproduct/Recycling Reporting." In July 2020, this document was updated to incorporate changes due to the CDR Revisions rule, published in April 2020, and includes additional information and new scenarios. In December 2022, this document was updated to reflect dates for the 2024 CDR.

The primary goal of this document is to help the regulated community comply with the requirements of the CDR rule. This document does not substitute for that rule, nor is it a rule itself. It does not impose legally binding requirements on the regulated community or on the U.S. Environmental Protection Agency (EPA).

To assist the reader, the Discussion contains selected definitions and other information that are relevant to the general understanding for CDR regarding the need to report a byproduct, how to properly characterize a byproduct (mixture or UVCB substance), what is an intermediate, and how to determine if a byproduct or other chemical is being recycled or otherwise used instead of being treated as a waste.

Each scenario contains a description of the scenario, including a list of questions; a discussion of that scenario, including any clarifying assumptions or additional information that EPA needed to analyze the reporting requirements; and a summary of the reporting requirements for the companies and chemicals identified in the scenario. In some cases, EPA changed names and terminology in order to avoid confusion and allow for an appropriately detailed response. In addition, the reporting element "Is Chemical Substance Being Recycled or Otherwise Used Instead of Being Treated as a Waste?" is referred to by its shortened form used by the e-CDRweb reporting tool ("Is chemical recycled?"). The original scenarios as provided by B&C are in the Appendix.

In addition to the assumptions identified in the individual scenario discussions, EPA made certain general assumptions in analyzing and determining the reporting obligations for the provided scenarios. These general assumptions included:

- A substance is obtained from domestic sources, unless otherwise stated.
- All substances are listed on the TSCA Inventory, unless otherwise stated.
- Production volumes are sufficient to trigger reporting.
- Remaining portions of a byproduct are disposed of as a waste, unless otherwise stated.

This document also assumes that the reader has familiarity with CDR and the TSCA Inventory. Other guidance documents, training, and user guides are located on the Resources page of the CDR website, at www.epa.gov/cdr.

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Part I: Discussion

This discussion provides background information to help the reader better understand the CDR reporting considerations associated with byproducts, impurities, and substances that are recycled.

Section A. Important Information about Byproducts, Impurities, and Recycling

What is a byproduct?

Byproduct means a chemical substance produced without a separate commercial intent during the manufacture, processing, use, or disposal of another chemical substance(s) or mixture(s). (40 CFR 704.3)

What is a byproduct manufactured for commercial purposes, and who is the manufacturer?

Manufacturer means a person who manufactures a chemical substance. (40 CFR 711.3)

Manufacture means to manufacture, produce, or import, for commercial purposes. Manufacture includes the extraction, for commercial purposes, of a component chemical substance from a previously existing chemical substance or complex combination of chemical substances. A chemical substance is co-manufactured by the person who physically performs the manufacturing and the person contracting for such production when that chemical substance, manufactured other than by import, is:

> (1) produced exclusively for another person who contracts for such production, and
> (2) that other person dictates the specific chemical identity of the chemical substance and controls the total amount produced and the basic technology for the manufacturing process. (40 CFR 711.3)

Manufacture for commercial purposes means: (1) To import, produce, or manufacture with the purpose of obtaining an immediate or eventual commercial advantage for the manufacturer, and includes among other things, such "manufacture" of any amount of a chemical substance or mixture:

> (i) For commercial distribution, including for test marketing.
> (ii) For use by the manufacturer, including use for product research and development, or as an intermediate.

(2) Manufacture for commercial purposes also applies to substances that are produced coincidentally during the manufacture, processing, use, or disposal of another substance or mixture, including both byproducts that are separated from that other substance or mixture and impurities that remain in that substance or mixture. Such byproducts and impurities may, or may not, in themselves have commercial value. They are nonetheless produced for the purpose of obtaining a commercial advantage since they are part of the manufacture of a chemical product for a commercial purpose. (40 CFR 704.3)

When is a byproduct reportable and when is it exempted from reporting?

A byproduct may be reportable when it is manufactured for a commercial purpose.

A byproduct not used for a separate commercial purpose is exempted by 40 CFR 720.30(h)(2). Note that "commercial purpose" refers back to the broad definition in 40 CFR 704.3 ("the purpose of obtaining an immediate or eventual commercial advantage"). It is not synonymous with the narrower definition of "commercial use" at 40 CFR 711.3, which is only intended for further subcategorizing reportable uses between industrial, commercial, and consumer settings.

There are other circumstances where a byproduct may be exempt:

- A byproduct that is used for a separate commercial purpose may be exempt if "its only commercial purpose is for use by public or private organizations that:

  (1) Burn it as a fuel,
  (2) Dispose of it as a waste, including in a landfill or for enriching soil, or
  (3) Extract component chemical substances from it for commercial purposes."
  (40 CFR 720.30(g))

  Note that this exclusion only applies to the byproduct; it does not apply to the component substances extracted from the byproduct. It is possible for these exempt commercial purposes to be achieved through transactions involving exchange of ownership. The relevant consideration is the commercial purpose of the byproduct after any preliminary exchange of ownership: the manufacturer needs a factual basis to reasonably claim that subsequent commercial purposes are limited to exempt commercial purposes.

- For certain industrial processes, the listed byproducts are exempt when recycled or otherwise used to manufacture another chemical substance within an enclosed system, within the same overall manufacturing process, and on the same site as originally manufactured. (40 CFR 711.10(d)(1))

  As of December 2022, the listed industrial processes and related byproduct substances at 40 CFR 711.10(d)(1)(i) are:

  (A) Portland Cement Manufacturing (*i.e.*, CASRN 68475-76-3, Flue dust, Portland cement) and
  (B) Kraft Pulping Process (*i.e.*, CASRN 66071-92-9, Sulfite liquors and Cooking liquors, spent; CASRN 68514-09-0, Sulfite liquors and Cooking liquors, spent, oxidized; and CASRN 471-34-1, Carbonic acid calcium salt (1:1)).

  EPA received no petitions to amend the list of industrial processes and associated byproducts, which were due before January 1, 2022, for the 2024 CDR submission period. For the 2028 CDR submission period, petitions are due before January 1, 2026

(40 CFR 711.10(d)(1)(ii)). For more information, see www.epa.gov/cdr.

- Byproducts that are manufactured solely in certain equipment (i.e., (i) Pollution control equipment or (ii) Boilers used to generate heat or electricity for that site), when that equipment is not integral to the chemical manufacturing processes of the site. (40 CFR 711.10(d)(2))

Figure 1 is a decision logic flow diagram to assist in the determination of whether your byproduct chemical substance is reportable under CDR. The rest of this part of the document provides further detail helpful to understand byproducts, the applications of the byproduct exemptions, and the difference between byproducts and impurities.

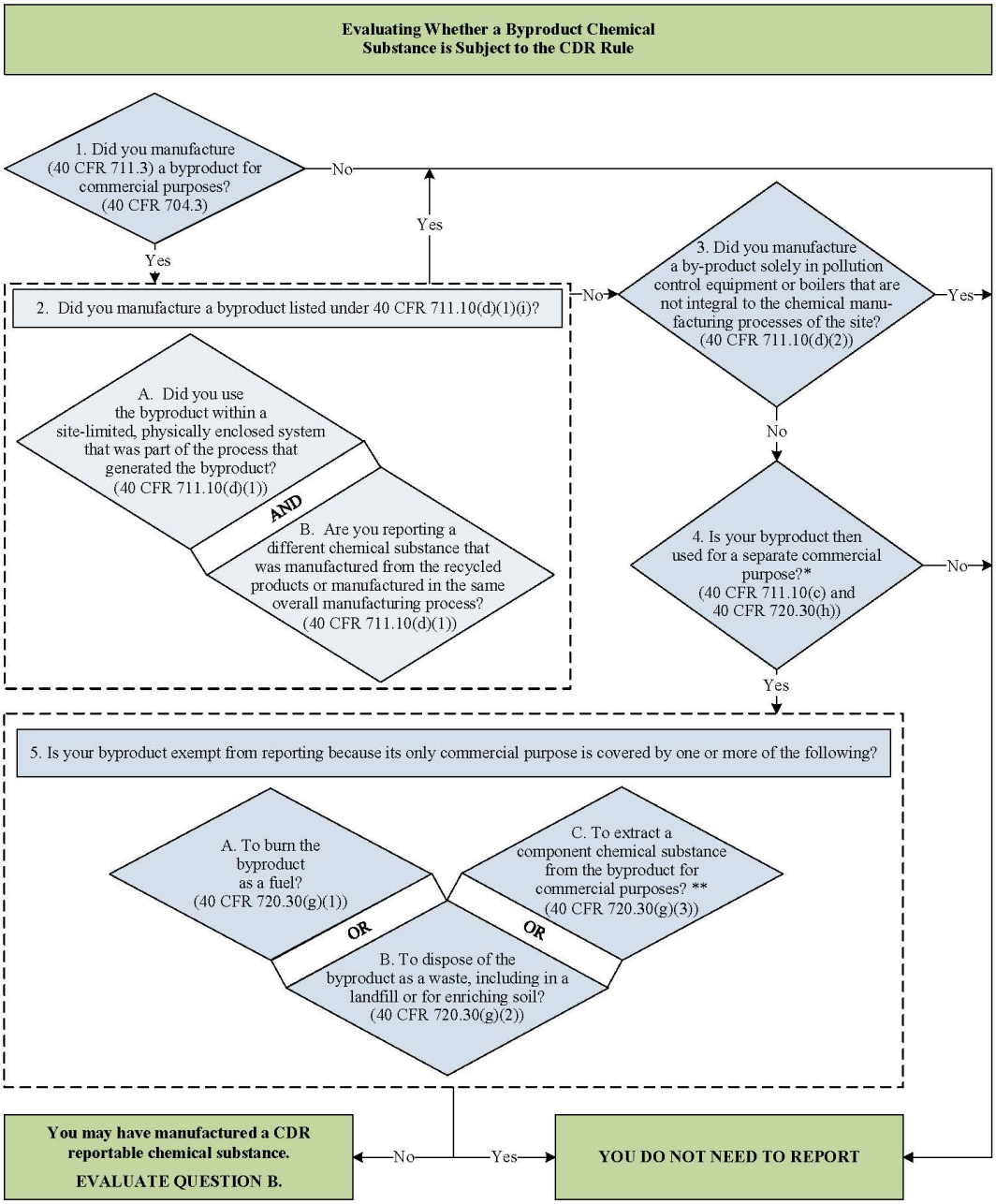

Figure 1. Decision Logic Diagram for Evaluating Whether a Byproduct Chemical Substance is Subject to the CDR Rule Byproduct diagram

How is a byproduct characterized for identification purposes?

Byproducts are formed by a reaction, and generally, EPA considers each combination of substances resulting from a reaction to be either:

1. A mixture, composed of two or more well-defined chemical substances to be named and listed separately; or
2. A reaction product, or combination of chemicals from a reaction, to be listed as a single chemical substance, using one name that collectively describes the products or, if that is not feasible, describes the reactants used to make the products. This type of byproduct is typically complex and is often identified as a single chemical substance using nomenclature for substances of Unknown or Variable composition, Complex reaction products and Biological materials (a "UVCB" substance) to represent what is often a process stream.

What is a mixture?

The term "mixture" is defined by the Toxic Substances Control Act (TSCA) to mean:

> …any combination of two or more chemical substances if the combination does not occur in nature and is not, in whole or in part, the result of a chemical reaction; except that such term does include any combination which occurs, in whole or in part, as a result of a chemical reaction if none of the chemical substances comprising the combination is a new chemical substance and if the combination could have been manufactured for commercial purposes without a chemical reaction at the time the chemical substances comprising the combination were combined. (TSCA Section 3)

Mixtures themselves are not listed on the TSCA Inventory, although the chemical substances that comprise the mixture are.

What if your byproduct is complex, such as is found with a reaction product?

Complex byproducts can be identified as chemical substances of Unknown or Variable composition, Complex reaction products and Biological materials (UVCB). In this manner, the byproduct can be identified as a single UVCB chemical substance that represents the process stream. There are many thousands of UVCB substances listed on the TSCA Inventory.

Note that if a substance is recovered via chemical reactions carried out on the byproduct or compounds contained within the byproduct (in a UVCB for instance), but the chemical structure of the yielded substance is left unchanged, this would qualify as a component chemical substance that is being extracted from the byproduct and the exemption at 40 CFR 720.30(g)(3) would apply to the byproduct. The volume of the byproduct associated with the recovery of the component chemical substance would not be reportable for CDR. The component itself that is further used for a commercial purpose (reentered into commerce) is, however reportable to CDR.

The following two documents provide further information about UVCB chemical substances and complex reaction products:

- Chemical Substances of Unknown or Variable Composition, Complex Reaction Products and Biological Materials: UVCB Substances and
- Combinations of Two or More Substances: Complex Reaction Products

A special note for consideration as a mixture for purposes of CDR:

In certain circumstances, it may be appropriate to treat a product combination as a mixture of chemical substances (rather than as a single UVCB chemical substance) even though there are uncharacterized components to the mixture. Specifically, where the submitter has a factual basis to reasonably conclude that the uncharacterized components are exempt from CDR irrespective of their chemical identity, a lack of information about the chemical identity of those exempt components is not an obstacle to treating the remainder of the product combination as a mixture for CDR purposes. Thus, for example, where a submitter reasonably concludes (after considering all the facts known and reasonably ascertainable) that the uncharacterized components of a byproduct will have no subsequent commercial purpose after they are manufactured, for CDR purposes the submitter may treat the byproduct as a mixture of the remaining components.

By contrast, where a submitter has not characterized certain components of a product combination and lacks the basis to conclude that those components are necessarily exempt from CDR, it is not appropriate to treat that product combination as a mixture. For example, if a submitter cannot reasonably assess whether or not an uncharacterized fraction of its byproduct will be subsequently used for a commercial purpose, it is likely that the submitter will need to treat the collective byproduct components as a single UVCB chemical substance for CDR purposes.

What is an impurity?

Note that the term *impurity* has a specific definition when determining reporting obligations under TSCA. *Impurity* means a chemical substance that is unintentionally present with another chemical substance. (40 CFR 704.3).

When considering how to characterize a byproduct, it is not proper to consider as an impurity a component substance that was created as part of the process that created the intended product and byproduct stream. It may be proper, however, to consider as an impurity a substance that was introduced as an impurity as part of one of the raw materials used as an input to the process. If such an impurity reacts during the process, the result is a manufactured substance that does not meet the impurity definition when it is in the byproduct.

When is an impurity reportable and when is it not reportable?

Generally, impurities are exempted from CDR requirements (40 CFR 711.10(c) and 40 CFR 720.30(h)(1)). Impurities are not manufactured for distribution in commerce as chemical substances per se and have no commercial purpose separate from the substance, mixture, or article of which they are a part. If, however, the chemical substance is intentionally retained and does provide a desired purpose, it may not be an impurity and instead is an intentional

component of the mixture. In such a case, the impurity exemption would not apply and the chemical may be subject to reporting under CDR.

How does the company report under the reporting element "Is Chemical Substance Being Recycled or Otherwise Used Instead of Being Treated as a Waste?" (a.k.a., Is chemical being recycled?)

Reporting under CDR is organized around the manufacture of specific chemical substances at a site. Thus, it is necessary to answer this question based on the pertinent substance (i.e., the manufactured chemical substance that is being reported on). The relevant issue for answering this specific data element is whether the manufactured chemical substance was then recycled; the issue is *not* whether the manufacture of the chemical substance entailed recycling some other chemical substance.

For purposes of filling out the data element "Is chemical being recycled?" on CDR Form U, a manufactured chemical substance is being recycled when the chemical substance is being removed from the waste stream and is instead being recycled or otherwise used. EPA generally expects that this data element would apply to many byproduct substances and that product finishing, which does not involve removing a chemical substance from a waste stream, would not qualify as recycling for purposes of this data element.

How does the company report under the reporting element "What Percentage of this Chemical Substance is Being Manufactured as a Byproduct?"

The data element "What Percentage of this Chemical Substance is Being Manufactured as a Byproduct?" (percentage byproduct) may be reported voluntarily, but is not required. If a reporter chooses to report the percentage byproduct for a chemical substance, the reporter must estimate the percentage of the production volume for the principal reporting year of that chemical substance that is being manufactured as a byproduct. Note that the relevant issue for responding to this data element is the percentage of the production volume that is a byproduct versus the percentage that is a product; the issue is *not* the percentage of the substance that contains a byproduct.

There are situations where the same chemical substance is manufactured both as a primary chemical substance and as a byproduct. If a chemical substance that is manufactured as a byproduct is used for a reportable commercial purpose, its volume would be reported along with the volume of the chemical that is separately manufactured at the same site and its volume would be counted as the byproduct portion when calculating the percent manufactured as a byproduct.

For each chemical substance at each site, the reporter selects the percent production volume of the non-exempt portion of the byproduct chemical substance from a list of four "percent by weight" ranges, including: *0 percent by weight*, *greater than 0 but less than 50 percent by weight*, *at least 50 but less than 100 percent by weight*, and *100 percent by weight*. In most cases, the percentage of the production volume that is a byproduct would be *0 percent by weight* or *100 percent by weight*, but there are cases where the other ranges apply.

A special note on the rationale for the byproduct exemptions:
As part of a negotiated rulemaking activity that took place in 2017, EPA was asked several questions relating to some of the byproduct exemptions. Here are some of those questions:

Q: Under 40 CFR 720.30(g)(1), why is the byproduct that is burned as a fuel exempt from reporting to CDR?

A: EPA included this exemption because it is considered that the byproduct is burned for commercial purposes such as energy recovery, not reentered into commerce, and, if necessary under other regulations, is reported as appropriate to another EPA program through air pollution/emission control (e.g., Emergency Planning and Community Right-to-Know Act (EPCRA), Toxics Release Inventory (TRI), or the Clean Air Act (CAA)/Greenhouse Gas Reporting Program (GHGRP)).

Q: Under 40 CFR 720.30(g)(2), why is the byproduct that is disposed of as a waste exempt from reporting to CDR?

A: EPA included this exemption because it is expected that the byproduct is disposed of responsibly, not reentered into commerce, and, if required under other regulations, is reported as appropriate to another EPA program (e.g., EPCRA, TRI, or the Resource Conservation and Recovery Act (RCRA)).

Q: Under 40 CFR 720.30(g)(3), why is a byproduct exempt after a component chemical substance is extracted from it?

A: This exemption is premised on the fact that the component chemical substance that is extracted is the portion of the byproduct that has a separate commercial purpose (e.g., that is known and useful). The remainder of the byproduct is disposed of as a waste – such disposal is regulated under other programs, as appropriate. This approach is consistent with EPA's special note about mixtures, included above – the difference is who reports the known, useful portion of the byproduct. In the case of the mixtures, the manufacturer of the byproduct reports under CDR, whereas if the byproduct manufacturer is taking advantage of the 720.30(g) exemption, then the person extracting the component chemical substance is reporting for the substance that is extracted.

Section B. Applying the Byproduct Exemptions

For byproduct chemical substances that are used for a separate commercial purpose, there are three categories of exemptions (for a total of five byproduct exemptions) under which byproducts are not required to be reported. This section provides information on how to apply each of these exemptions.

1) Burn as a fuel (see 40 CFR 720.30(g)(1), referenced by 40 CFR 711.10(c))

This exemption is for byproducts that only have a separate commercial purpose "for use by public or private organizations that" *burn it as a fuel*. The exclusion only applies to byproducts and does not apply to component substances extracted from the byproduct.

In interpreting 40 CFR 720.30(g)(1), note that if that same quantity of a byproduct that is burned as a fuel is also burned for other non-exempt commercial purposes (e.g., if the combustion residue is used as a process input), then the exemption does not apply under CDR. An example is black liquor that is burned to generate power in a paper pulping process that undergoes a chemical change to become manufactured smelt. If the manufactured smelt is then used as an input in the manufacture of white liquor which is then returned to the pulping process, the *burn as a fuel* exemption would not apply to the manufacture of the black liquor because the black liquor's post-combustion commercial purposes includes a non-exempt commercial purpose. Alternatively, if the black liquor was burned solely to generate power and the manufactured smelt was disposed of as a waste, and a separate amount of black liquor was used for a non-exempt commercial purpose, then the *burn as a fuel* exemption would apply only to the amount burned solely to generate power.

Note the distinction between burning a byproduct as a fuel and incinerating it as a waste, both are exempt from reporting under CDR. Incinerating a byproduct as a waste solely for destruction is not considered use for commercial purposes (40 CFR 720.30(h)(2)) and is exempt from reporting. In the using black liquor to generate power in a paper pulping process example, if the manufactured smelt was incinerated solely for destruction, the exemption under 40 CFR 720.30(h)2) would apply. Also note that black liquor may be impacted by the exemption set at 40 CFR 711.10(d)(1) (exemption 4).

2) Dispose of it as a waste, including in a landfill or for enriching soil (see 40 CFR 720.30(g)(2), referenced by 40 CFR 711.10(c))

This exemption is for byproducts that only have a separate commercial purpose "for use by public or private organizations that" dispose of it as a waste, including in a landfill or for enriching soil. This exclusion only applies to byproducts and does not apply to component substances extracted from the byproduct.

In interpreting 40 CFR 720.30(g)(2), note the manufacture of a byproduct is exempt if the byproduct is subsequently disposed of as a waste for purposes of enriching the soil (e.g., to change the soil properties in a desirable way, such as by serving as a filler to make the soil less dense or enhancing moisture retention). Note that a substance used as a fertilizer is not necessarily excluded under the *dispose of it as a waste* exemption. For example, if the substance's ordinary manner of use is as a fertilizer, then the substance is not a byproduct in the first place and the provisions at 40 CFR 720.30(g)(2) are inapplicable.

When considering whether sending a byproduct to a landfill is "dispose of as a waste," note that mine fill or landfill cover many not be "disposing of as a waste":

- To the extent that a byproduct sent to mine sites is being used for a commercial purpose (e.g., used for mine reclamation as mine fill or to control acid mine drainage), the substance should be reported under the CDR (assuming other reporting requirements are met).
- If you are using the landfill as storage for the byproduct with the intention to later excavate the material, then the byproduct was not disposed of as a waste. The key here is that you have the intention to excavate the material and use it at some future point in a commercial activity.
- If you put the byproduct in the landfill without the intention to later excavate the substance, then you are disposing of it as a waste. If you later identify an alternate commercial purpose and excavate the material, any material excavated during a reporting year may be reportable under CDR. For example, in 2019 you excavate 500,000 pounds of coal ash from your landfill for a commercial purpose. During the 2020 submission period, you would report the 500,000 pounds of coal ash as this material now has a separate commercial purpose and no longer is being disposed of as a waste. In addition, you may need to report new coal ash manufactured in 2019 if that substance is also used for a commercial purpose (i.e., not put in the landfill as waste) other than those specified in 40 CFR 720.30(g).

3) Extract component chemical substances from it for commercial purposes (see 40 CFR 720.30(g)(3), referenced by 40 CFR 711.10(c))

This exemption is for byproducts that only have a separate commercial purpose "for use by public or private organizations that" extract component chemical substances from the byproduct for commercial purposes. This exclusion only applies to byproducts and does not apply to component substances extracted from the byproduct. The individual component chemical substances extracted from a byproduct are reportable substances if they are extracted for a commercial purpose, even if the manufacture of the byproduct itself is not reportable.

In interpreting 40 CFR 720.30(g)(3), a "component chemical substance" means a chemical substance that is present in the byproduct prior to extraction. Heat or chemical reactions can only be used to extract a component chemical substance if the component substance that is being extracted is left chemically unchanged in the process. For example:

- Extracting a component chemical substance: A chemical reaction could be employed on a byproduct to convert component Chemical Substance X into Chemical Substance Y, so as to facilitate the extraction of component Chemical Substance Z (which undergoes no chemical transformation) from the byproduct.

- Not extracting a component chemical substance: If component Chemical Substance Z from the byproduct was first transformed into another chemical substance, and then that different chemical substance was extracted, the overall process would not qualify as extraction of a "component chemical substance." Note that the component chemical

substance must be viewed as a particular chemical substance and is also reportable to CDR.

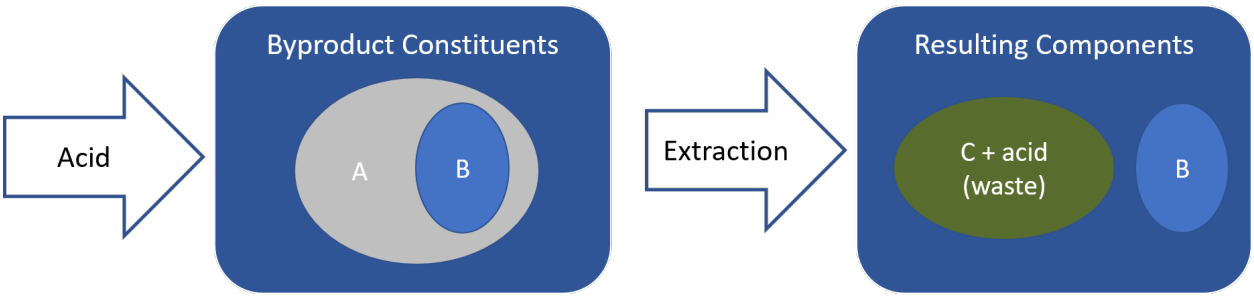

Figure 2. Diagram for Evaluating 40 CFR 720.30(g)(3)

Figure 2 illustrates extracting a component substance, B, from a byproduct A. Constituents of A, other than B, are reacted to form C + acid. This reaction allows B to be extracted from the byproduct. The remaining substance, C + acid, is disposed of as a waste. In this scenario, B did not undergo a reaction itself and was extracted as a component chemical substance. The original byproduct, A, does not need to be reported for CDR. B is reportable by the entity that performed the extraction (and therefore is its manufacturer) (see 40 CFR 720.30(g)(3)).

In interpreting 40 CFR 720.30(g)(3), an "extraction" for proposes of component chemical substances means separating a substance that already exists in a distinct chemical structure from another physically (e.g., by filtration, centrifuge, etc.) or chemically (only if the yielded substance is left chemically unchanged by the extraction process).

See Scenarios 10A and 10B for examples related to this exemption.

4) For certain industrial processes, the listed byproducts are exempt when recycled or otherwise used to manufacture another chemical substance within an enclosed system, within the same overall manufacturing process, and on the same site as originally manufactured (see 40 CFR 711.10(d)(1)).

Byproduct substances are exempt from reporting if they are listed in 40 CFR 711.10(d)(1)(i), produced as part of Portland Cement Manufacturing or the Kraft pulping process, and are: (1) site limited), (2) recycled or otherwise used within a physically enclosed system that is part of the same overall manufacturing process from which the byproduct substance was produced, and (3) when the site is reporting a different chemical substance that was manufactured from the recycled byproduct or manufactured in the same overall manufacturing process. Note that this exclusion only applies to the amount of the byproduct that is recycled in physically enclosed equipment and does not apply to amounts that are not recycled or that are not recycled in physically enclosed equipment.

In interpreting 40 CFR 711.10(d)(1), byproduct substance volumes that are used for a commercial purpose distinct from their manufacture as a byproduct, such as when directly incorporated into already manufactured Portland Cement or removed for some use outside of the Kraft pulping process, are not exempt from reporting under this exemption. Additionally, byproduct volumes that are removed from the enclosed systems (e.g., byproducts that are stored

in an open tank or pit, or stored in any non-connect tank or vessel) are not exempt and remain reportable.

In interpreting 40 CFR 711.10(d)(1), an "enclosed system" is a system of equipment directly connected to the production process that is designed, constructed, and operated in a manner that prevents emissions or the release of any chemical substance into the facility or environment during the production process. For such systems, exposure and release could only occur due to loss of integrity or failure of the manufacturing process equipment or control systems. In an enclosed system, any equipment (e.g., tanks, reaction vessels, reactors, processing units, and/or connecting lines) that the byproduct is present in at any point during the production process, must: (1) be of high structural integrity and contained on all sides, (b) pose no foreseeable potential for escape of constituents to the facility or environment during normal use, and (c) be connected directly by pipeline or similarly enclosed device to a production process. Additionally, any transfers or holding steps occurring in the enclosed system must be necessary to the recycle process and must take place within physically enclosed equipment that meet the aforementioned criteria.

5) Byproducts that are manufactured solely in certain equipment (i.e., (i) Pollution control equipment or (ii) Boilers used to generate heat or electricity for that site), when that equipment is not integral to the chemical manufacturing processes of the site (see 40 CFR 711.10(d)(2)).

Byproduct substances are exempt from reporting if they are manufactured solely in pollution control equipment or boilers used to generate heat or electricity for that site when that equipment is not integral to the chemical manufacturing processes of the site. Under this exemption, the byproduct remains exempt from reporting even if the byproduct is used for a commercial purpose and subsequent manufactured substances are subject to reporting. For example, if the exempted byproduct is used to manufacture a different chemical substance, the different chemical substance may be subject to reporting under CDR but the reporting status of the byproduct itself does not change. If the exempted byproduct substance is used for a separate commercial purpose subsequent to its manufacture, the reporting status of the byproduct does not change.

Integral vs non-integral equipment

In interpreting 40 CFR 711.10(d)(2), an *integral process* is the portion of the manufacturing process that is chemically necessary or provides primary operational support for the production of the intended product. Byproducts that are manufactured in equipment that is integral to the production process remain subject to reporting under CDR, unless otherwise exempted. Some examples of equipment that are likely to be *integral* include:

- Utilities that produce electricity as a product may be using boilers as part of their production of electricity and, therefore, those boilers are considered equipment integral to the production process. Thus, byproducts produced by these electric utility boilers would continue to be subject to reporting.

- Reverberatory furnaces, which may function similarly to some boilers, can have a chemical processing function such as smelting. This and similar equipment, when used in such scenarios, would be considered integral to the main production process and any resultant manufactured byproduct substances would continue to be subject to reporting.

In interpreting 40 CFR 711.10(d)(2), a *non-integral process* are certain associated processes that are not chemically required to produce the intended product. For example, such processes could include ones required due to other regulations. Byproducts manufactured due to the use of pollution control equipment and boilers that generate heat or electricity on-site, when such equipment is not part of the main production process, are exempted from reporting under CDR. Some examples of equipment that are likely to be *non-integral* include:

- Boilers that are used to produce heat or electricity for their building but do not produce the heat or electricity as a product.
- Pollution control equipment including flue gas desulfurization (FGD) and selective catalytic reduction (SCR) systems.
- Equipment used to treat wastewater resulting from cleaning production line tanks.

Determining if Exemption Applies – Flow Chart and Examples

Figure 3 provides an in-depth flow chart to determine if a byproduct is reportable under the non-integral equipment byproducts exemption (40 CFR 711.10(d)(2)).

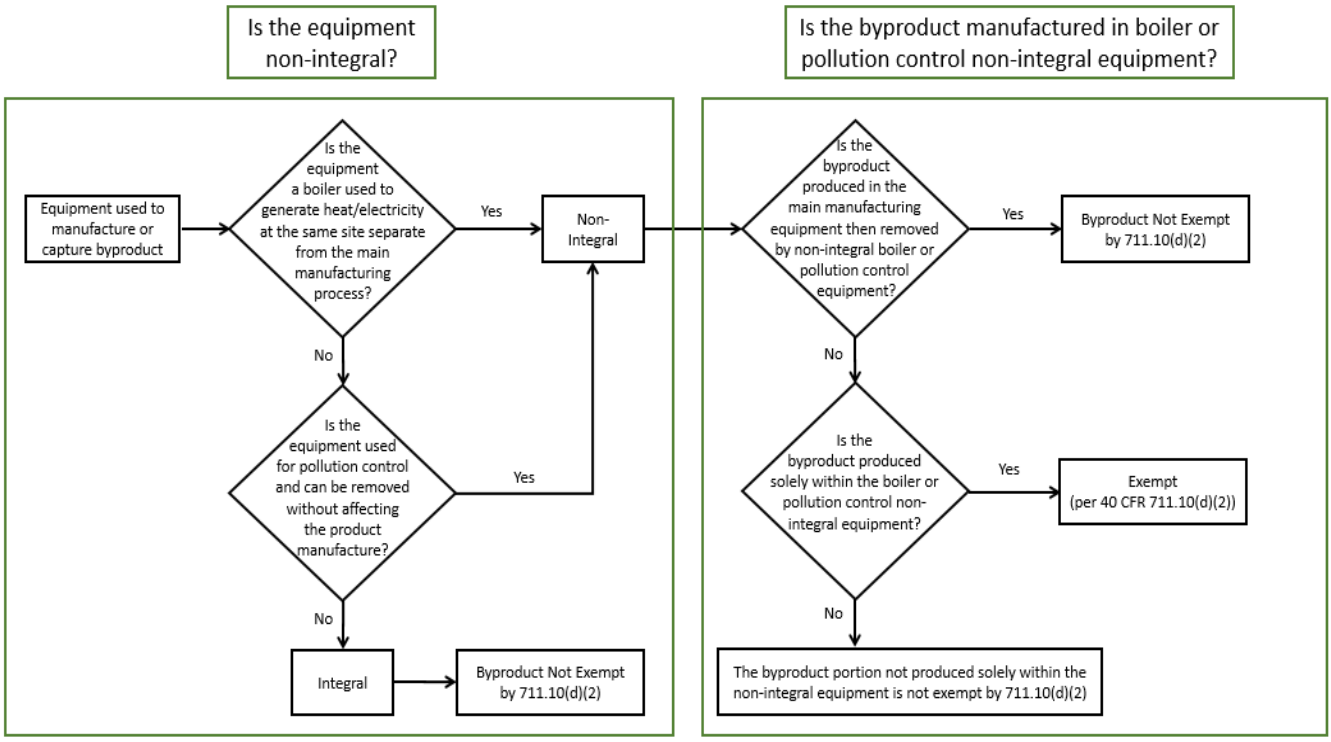

Figure 3. CDR Reporting Determination Flow Chart for Non-Integral Equipment Byproducts Exemption

Byproducts Exemption Examples

Below are more detailed manufacturing process flow diagrams to demonstrate different reportable and exempt byproducts as it pertains to the non-integral equipment qualification.

Example 1 – Pollution Control and Electricity Generation

Figure 4, shown below, is a process flow diagram for a general coal-fired powered steam electric plant; however, all the equipment (i.e., manufacturing, pollution control, electricity generation) is general and can be applied to other processes. Several byproducts are generated from the main and auxiliary processes; the diagram demonstrates the lifecycle of each byproduct. The following reportable and exempt byproducts are presented:

- **Byproduct A** – Exempt. This byproduct is produced on the main manufacturing equipment (integral); however, the byproduct is disposed to landfill and exempt per 40 CFR 720.30(g).
- **Byproduct B** – For this byproduct, three potential scenarios are considered:
    1. Reportable. This byproduct is produced on the main manufacturing equipment (integral) and used to manufacture another product.
    2. Exempt. This byproduct is produced on the main manufacturing equipment (integral) but disposed of as waste and exempt per 40 CFR 720.30(g).
- **Byproduct C** – Exempt. This byproduct is produced solely in the non-integral pollution control equipment from chemicals, used in the pollution control equipment 2, reacting with byproduct stream 1 to form Byproduct C. Pollution Control Equipment 2 is non-integral because it is used to remove chemicals from the PCC 1 Exit Stream, which has no effect on the main manufacturing process; therefore, Byproduct C is exempt per 40 CFR 711.10(d)(2).
- **Byproduct D** – Exempt. This PCC 2 Exit Stream is originally produced from the main manufacturing equipment, but only used to extract other chemical components and released to air (exempt per 40 CFR 720.30(g)).

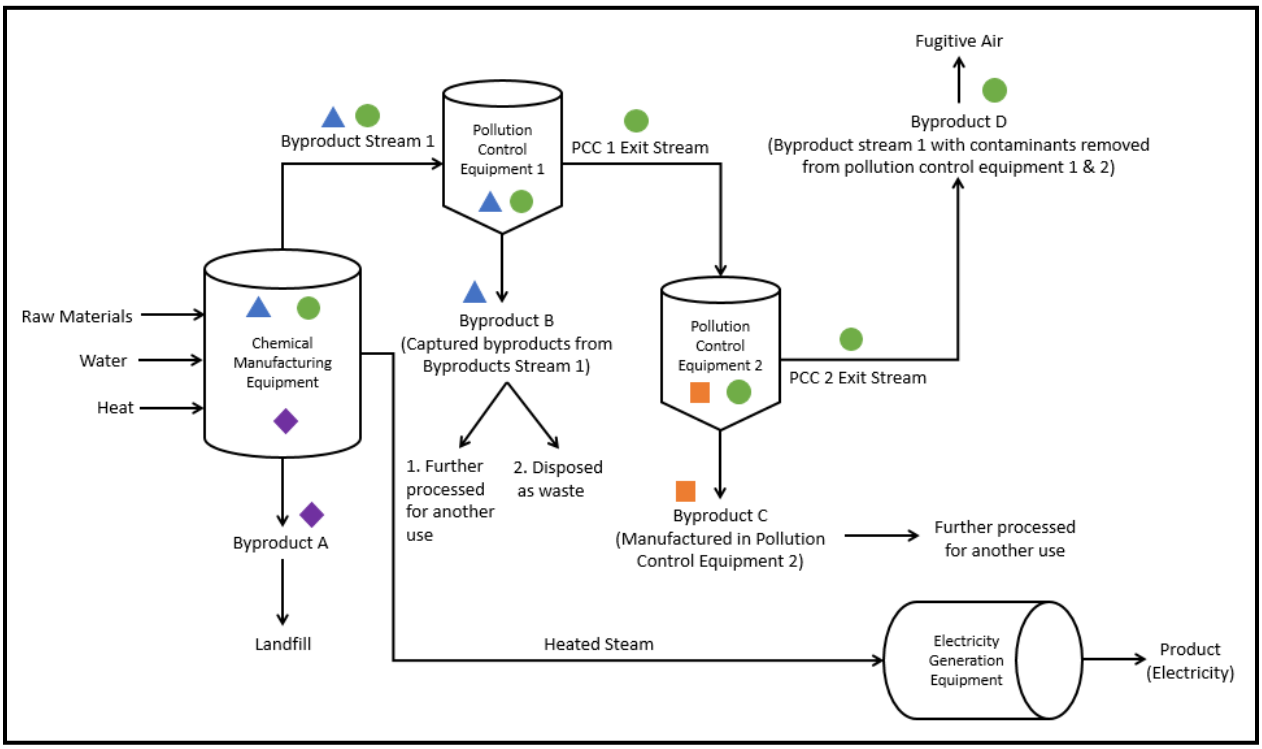

Figure 4. Byproducts Example 1 Process Flow Diagram

Example 2 – Pollution Control and General Chemical Manufacturing

Figure 5 provides the process flow diagram for a general chemical manufacturing process. Several byproducts are generated from the main and auxiliary processes and the diagram demonstrates the lifecycle of each byproduct. The following reportable and exempt byproducts are presented:

- **Byproduct A** – Reportable. This byproduct is produced on the main manufacturing equipment (integral) and further processed for another use.
- **Byproduct B** – Exempt. This byproduct is produced on the main manufacturing equipment (integral), collected in the pollution control equipment (non-integral), and disposed of as waste (exempt per 40 CFR 720.30(g))
- **Byproduct C** – Reportable. This byproduct is produced on the main manufacturing equipment (integral) and further processed for another use.
- **Byproduct D** - Exempt. Byproduct D is manufactured solely in the non-integral wastewater treatment/recovery equipment through a reaction with the wastewater treatment chemicals. Although the byproduct is further processed for another use, it is exempt per 40 CFR 711.10(d)(2).
- **Byproduct E** – Exempt. This byproduct stream is originally produced from the main manufacturing equipment (integral) but only used to extract other chemical components and sent to surface water (exempt per 40 CFR 720.30(g)).

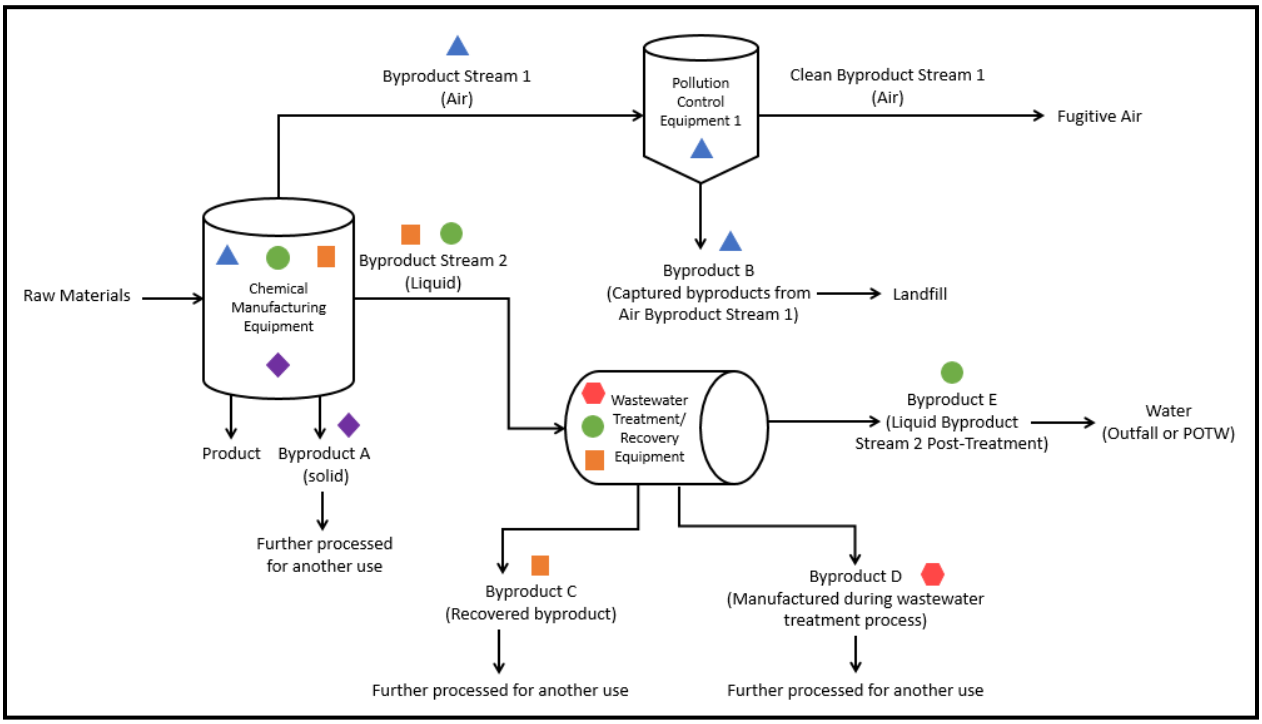

Figure 5. Byproducts Example 2 Process Flow Diagram

Part II. Scenarios

Scenario 1- Spent Etchant

Description:

In its operations, ABC Company uses an etchant to strip copper off of a substrate. The process results in a mixture containing a complex combination of substances. The mixture is sent to XYZ Recycler to extract the elemental copper by electrolytic reduction. The remaining components of the mixture are disposed of by XYZ Recycler.

Discussion:

It is given in the scenario's starting assumptions that the spent etchant solution is a complex combination of substances and is not readily identifiable as a mixture of discrete substances. EPA further assumes the etching process used by ABC Company involves one or more chemical reactions between the etchant and elemental copper to form oxidized copper salts and/or complexes of Copper (II) ion with the etchant.

ABC Company's spent etchant solution is a byproduct of the use of the etchant in its operation (See the 40 CFR 704.3 byproduct definition), and therefore is considered to be manufactured for a commercial purpose and subject to CDR requirements. Although it is a chemical substance manufactured for commercial purpose, a byproduct qualifies for a reporting exemption if it does not have any commercial purpose of its own after it is manufactured (*See* 40 CFR 720.30(h)(2)), or if its separate commercial purpose is among those exempted under 40 CFR 720.30(g). ABC Company needs to determine if the byproduct will be used for a non-exempt commercial purpose.

In this scenario, XYZ Recycler is using the spent etchant solution to manufacture elemental copper for a commercial purpose. The spent etchant contains Copper (II) ions which are electrolytically reduced to produce elemental copper. The produced elemental copper is not a component of the spent etchant solution. Because XYZ Recycler is not extracting a component chemical substance from the byproduct, the manufacture of the byproduct by ABC Company does not meet the requirements of the byproduct exemption at 40 CFR 720.30(g)(3). None of the other byproduct exemptions apply, based on the facts given.

CDR Reporting Obligations:

ABC Company

- Report the spent etchant solution. The specific chemical identity of this byproduct should be determined by ABC Company.
- Answer "yes" to the question "Is chemical being recycled?" if the spent etchant would otherwise be disposed of as a waste by ABC Company.
- Answer "100%" to the voluntary question "Is the chemical a byproduct?"
- Report the following downstream processing and use scenario:
  - PC (processing as a reactant) - the spent etchant is being used as a reactant in a reduction reaction
  - IS19 (All other basic inorganic chemical manufacturing) - for the manufacture of elemental copper; and
  - U015 (intermediate) -the spent etchant is an intermediate that is converted to copper.

XYZ Recycler

- Report elemental copper (Copper, CASRN 7440-50-8).
- Answer "no" to the question "Is chemical being recycled?" Elemental copper is an intended commercial product, not a substance that XYZ Recycler would potentially dispose of as a waste. While the byproduct was recycled, the elemental copper is not.
- Answer "0%" to the voluntary question "Is the chemical a byproduct?"

Scenario 1A – Sulfuric Acid Spent Etchant

Description:

This scenario is identical to Scenario 1, except that the specific etchant is identified. ABC Company uses sulfuric acid etchant to strip copper off a substrate. The process results in a mixture containing essentially cupric sulfate in solution, which is sent to XYZ Recycler to obtain the elemental copper by electrolytic reduction. After obtaining the elemental copper, XYZ Recycler disposes of the rest of the mixture.

Discussion:

In this scenario, as opposed to the original scenario, the spent etchant solution is a readily identifiable mixture of discrete chemical substances. The etching process used by ABC Company involves a chemical reaction between the etchant and elemental copper to form cupric sulfate in solution as a byproduct of the etchant process. The resulting byproduct mixture was manufactured for a commercial purpose, and the cupric sulfate was subsequently used for a commercial purpose (to produce copper).

CDR Reporting Obligations:

ABC Company

- Report the currently correct Chemical Abstracts name and corresponding CASRN (Sulfuric acid copper (2+) salt (1:1), CASRN 7758-98-7) for cupric sulfate.
- Answer "yes" to the question "Is chemical being recycled?" if the cupric sulfate would otherwise be disposed of as a waste by ABC Company.
- Answer "100%" to the voluntary question "Is the chemical a byproduct?"
- Report the following downstream processing and use scenario:
  - PC (processing as a reactant) - the cupric sulfate is being used as a reactant in a reduction reaction;
  - IS19 (All other basic inorganic chemical manufacturing) - for the manufacture of elemental copper, inorganic manufacturing; and
  - U015 (intermediate) - the cupric sulfate is an intermediate that is converted to Copper.

XYZ Recycler - Same as in Scenario 1

- Report elemental copper (Copper, CASRN 7440-50-8).
- Answer "no" to the question "Is chemical being recycled?" Elemental copper is an intended commercial product, not a substance that XYZ Recycler would potentially dispose of as a waste. While the byproduct was recycled, the elemental copper is not.
- Answer "0%" to the voluntary question "Is the chemical a byproduct?"

Scenario 2 - Byproduct Mixture

Description:

In its process to produce Chemical A, GEF Company produces a byproduct, Mixture B. Mixture B is comprised of Chemical A (formed via a chemical reaction) and Chemicals X, Y, and Z (all of which were present in the original purchased starting materials). Based on its technical expertise, GEF Company is aware of the individual components that make up the byproduct. Due to processing variability, however, GEF Company does not know the specific percentage of each component in Mixture B.

Mixture B is sent off-site to Company 123 for further processing. Company 123 extracts Chemical X from Mixture B via a chemical reaction. After Chemical X is extracted, the remaining mixture is disposed of by MNO Company, and Chemical X is used for a commercial purpose.

Discussion:

The scenario does not specify the chemical reaction used to extract Chemical X from Mixture B. The identification of whether Chemical X is being reacted or whether other substances, and not Chemical X, are being reacted is important for determining reporting obligations. EPA's response assumes that Chemical X is reacted to form a salt of X, that the salt is extracted from the mixture, and that another reaction is used to turn the salt into Chemical X. Chemical X and Salt of X are different chemical substances. Both Salt of X and Chemical X are used for commercial purposes, and therefore Company 123 has manufactured both for a commercial purpose.

GEF Company has sufficient knowledge to characterize its byproduct as a mixture ("Mixture B") rather than as a UVCB substance. GEF Company does not know the precise proportions of X, Y, and Z in the mixture, but GEF Company did not manufacture any of these substances and so the unknown volume of X, Y, and Z in the mixture would not trigger any reporting under CDR. GEF Company does not know the proportion of Chemical A in the mixture. Because the Chemical A in this mixture will be disposed of as a waste and not used for any other separate commercial purpose, for CDR purposes it is not necessary to know the amount in the mixture.

CDR Reporting Obligations:

GEF Company

Chemical A:

- Report manufacturing information for Chemical A.
- Report downstream processing and use activities for Chemical A.
- Answer "0%" to the voluntary question "Is the chemical a byproduct?"

Chemicals X, Y, and Z:

- No manufacturing, and therefore no reporting.

Mixture B:

- GEF Company is not required to report Mixture B. The CDR does not require the reporting of mixtures.

Company 123

Salt of X:

- Report manufacturing information
- Report processing information (used to manufacture Chemical X)
- Answer "0%" to the voluntary question "Is the chemical a byproduct?"

Chemical X:

- Report manufacturing information for Chemical X
- Report processing and use information
- Answer "0%" to the voluntary question "Is the chemical a byproduct?"

Note that, depending upon the process, Salt of X may be a non-isolated intermediate. If the salt of X is a non-isolated intermediate, Company 123 would not need to report Salt of X and would only report Chemical X (*See* 40 CFR 711.10(c) which references 40 CFR 720.30(h)(8)).

Also note that the original scenario stated that "GEF Company has not notified the mixture to EPA as a "new chemical" because it is not used for commercial purposes and there is no regulatory obligation to notify mixtures if the individual components of the mixture are listed on the Inventory." EPA disagrees with the characterization of regulatory obligations implied in this sentence. Premanufacture notice ("PMN") obligations apply to chemical substances, not mixtures. (*See* TSCA § 5(a)(1)(A)). Where individual components of a mixture are not listed on the Inventory and a person intends to manufacture them for commercial purposes, the proper course of action would be to submit a PMN for the unlisted components, not for the mixture as a whole. If "mixture" is a misnomer that actually refers to a single Class 2 chemical substance of "unknown, or variable composition, complex reaction products, and biological materials" (i.e., a UVCB substance), then there could potentially be PMN obligations with respect to this UVCB substance.

Scenario 3[1] *- Sulfuric Acid*

Description:

Site A domestically purchases and uses sulfuric acid in its operations, which generates a spent sulfuric acid (SSA). SSA is a mixture of water, sulfuric acid, and unspecified chemical substances. No unused sulfuric acid is contained in SSA, which is shipped to Site B.

At Site B, SSA is reacted in a closed system to convert the sulfuric acid to sulfur dioxide. The sulfur dioxide is also reacted in a closed system to create sulfur trioxide. The sulfur trioxide is then reacted in a closed system to form sulfuric acid.

Discussion:

Because the precise use of the sulfuric acid is not specified, EPA made some assumptions in order to address the scenario. The scenario identifies that SSA is a mixture of water, sulfuric acid, and some other unidentified chemical substances. EPA assumed that Site A may have manufactured the water, but did not manufacture the sulfuric acid (i.e., Site A did not convert the purchased sulfuric acid to another substance and back again to sulfuric acid). EPA also assumed that the unidentified chemical substances comprising SSA are disposed of as a waste and never used for another separate commercial purpose.[2]

Site B uses the sulfuric acid in SSA to manufacture sulfur dioxide, sulfur trioxide, and finally sulfuric acid. The other substances that are in SSA are disposed of as a waste, do not contribute to the commercial use of SSA, and therefore, for CDR purposes, are exempt from reporting under 40 CFR 720.30(g)(2).

The scenario states that sulfur dioxide and sulfur trioxide are generated in closed reaction vessels (including closed lines for any transfers of sulfur dioxide and sulfur trioxide between reaction vessels), which by itself does not affect the CDR reporting status of the chemicals.

[1] The following statement was removed from the original scenario provided to EPA because, for TSCA purposes, mixtures are not considered to be a single substance: "[S]SA has the same CAS Number as sulfuric acid."
[2] Note that the original scenario in the Appendix identify that the unidentified chemical substances in SSA are impurities. EPA believes it is more likely that these are not impurities. See the Discussion for more information on impurities.

CDR Reporting Obligations:

Site A has no reporting obligations for the following reasons:

- SSA is not reported under the CDR regulation because it is considered a mixture in this scenario. If SSA were an UVCB substance, then reporting of the UCVB substance may be required.[3]
- The sulfuric acid in the SSA mixture is an unreacted substance that is purchased, not manufactured, by Site A.
- Water is not reportable because it is a byproduct with no commercial use, therefore exempted by 40 CFR 720.30(h)(2). Note that if water were not a byproduct, it would still not be reportable because it is a fully exempted chemical substance under CDR.
- Other unspecified chemical substances are not reportable because they are byproducts disposed of as a waste and not used for another separate commercial purpose.

Site B: Based on this scenario, Site B's reporting obligations are for the three chemical substances it is manufacturing:

- Sulfur dioxide
- Sulfur trioxide
- Sulfuric acid

Note that the scenario description contained insufficient information to determine that the sulfur dioxide and sulfur trioxide were non-isolated intermediates. Non-isolated intermediates do not need to be reported for CDR (40 CFR 711.10(c)). If the sulfur dioxide and sulfur trioxide were non-isolated intermediates, then Site B's reporting obligations would be for only sulfuric acid.

The definition for non-isolated intermediates is:

> *Non-isolated intermediate* means any intermediate that is not intentionally removed from the equipment in which it is manufactured, including the reaction vessel in which it is manufactured, equipment which is ancillary to the reaction vessel, and any equipment through which the substance passes during a continuous flow process, but not including tanks or other vessels in which the substance is stored after its manufacture. Mechanical or gravity transfer through a closed system is not considered to be intentional removal, but storage or transfer to shipping containers "isolates" the substance by removing it from process equipment in which it is manufactured. (40 CFR 704.3)

[3] See the Discussion for information regarding the difference between a mixture and a UVCB substance.

Scenario 4a - Wastewater

Description:

MNO Company, a metal processing facility, has an agreement with Company 678 to remove its wastewater/spent baths for treatment. It is technically feasible to recover Metal G from the soluble metal compounds in the wastewater. If the market value of Metal G is high, Company 678 will engage in the recovery process. If the market value of Metal G is low, Company 678 will dispose of the wastewater without recovering Metal G.

Once the wastewater leaves the MNO Company facility, MNO Company is unaware as to whether Metal G is extracted from the wastewater or not. In other words, MNO Company cannot be certain as to the amount of its wastewater that Company 678 uses to manufacture Metal G.

Discussion:

Based on this scenario, EPA assumes that MNO Company is combining all of the wastewater and/or spent baths into one complex chemical combination, presumably in a holding tank until there is sufficient volume to send it to Company 678. This type of complex combination is typically of unknown, uncertain, or variable composition, and therefore is expected to be characterized as a UVCB chemical substance. For purposes of this example, EPA assumed it is so characterized.

Because the UVCB chemical substance, Byproduct W, was generated as part of the manufacture, processing, use, or disposal of another chemical substance or mixture for a commercial purpose, it meets the definition of byproduct and is considered to be manufactured for a commercial purpose (40 CFR 704.3). As a chemical substance manufactured for a commercial purpose, Byproduct W is subject to reporting under CDR unless it is otherwise exempted.

To determine the reporting obligations associated with Byproduct W, MNO Company will need to determine if it meets any of the exemptions in 40 CFR 711.10(c), which references 40 CFR 720.30.[4] Based on the scenario, Byproduct W is either disposed of as a waste or is used to recover Metal G. The volume disposed of as a waste is exempted from reporting based on 40 CFR 720.30(g)(2).

Since the scenario states that the metals in the baths are present as "soluble metal compounds," EPA assumes that Company 678 will need to recover Metal G via chemical reactions carried out on the metal compounds in Byproduct W. Therefore, Company 678 is not extracting a component chemical substance from Byproduct W (as Metal G is not left chemically unchanged) and the 40 CFR 720.30(g)(3) exemption does not apply to MNO's manufacture of Byproduct W. The volume of Byproduct W associated with the recovery of Metal G would be reportable for CDR.

[4] The exemptions in 40 CFR 711.10(d) do not apply to this scenario because there is no pollution control equipment used that results in the creation of byproducts.

CDR Reporting Obligations:

MNO Company:
Under this scenario, reporting obligations depend on what exactly Company 678 did with Byproduct W. MNO Company does not report the volume of Byproduct W that Company 678 disposes as waste. MNO Company does report the volume of Byproduct W that Company 678 uses for commercial purposes. MNO Company should report based on its reasonable estimate of how its production volume was allocated between these two possible outcomes. If MNO Company cannot arrive at a reasonable estimate, it should report the full volume of Byproduct W.

MNO Company will need to determine the appropriate chemical identification for its UVCB byproduct. They can use their own expertise, search the TSCA Inventory, or engage consultants (which could involve using the CAS Inventory Expert Service) to assist them.[5]

MNO Company should answer "yes" to the question "Is chemical being recycled?" MNO Company would otherwise dispose of Byproduct W as a waste, and as discussed above, is only reporting the volume of Byproduct W that is used for a commercial purpose (i.e., it is being further processed to recover Metal G). Note that downstream processing and use information should also be reported for Byproduct W to reflect the processing of the spent bath to recover Metal G.

Company 678:
If Company 678 does indeed recover Metal G from metal compounds in Byproduct W, the volume of Metal G would be reportable.

Company 678 would answer "no" to the question "Is chemical being recycled?" Metal G is an intended commercial product, not a substance that Company 678 would potentially dispose of as a waste. While the byproduct was recycled, Metal G is not.

[5] Examples of chemical substances currently on the TSCA Inventory that might be used in similar scenarios are:

- Wastewater, chromium-contg. (CASRN 70969-49-2)
  Definition: By-product of the manufacture of menadione bisulfite.

- Wastes, ferrous metal pickling (CASRN 65996-75-0)
  Definition: The solution of an appropriate pickling acid or combination of acids containing any of the elements, oxides, or salts present in steel. Pickling acids include hydrochloric, hydrofluoric, nitric, phosphoric, and sulfuric acids.

Scenario 4b - Wastewater, with On-Site Pollution Control Treatment

Description:

In 2016, PC Company used 25,000 lbs of an imported plating chemical, Chemical X, to plate printed circuit boards. After plating, the residual plating chemical on the circuit board is removed via rinsing and the rinsate is sent to an on-site wastewater treatment center. The rinsate is a complex combination of various substances from the site's processes.

At the treatment center, the wastewater is treated with sodium hydroxide to react with the undesired portions of the complex mixture and then filtered to remove the resulting solids from the water, resulting in treated wastewater and a byproduct filter cake, Byproduct FC. The treated wastewater is released to a POTW and the byproduct filter cake is sent to a recycler, R Company.

R Company receives Byproduct FC from PC Company and uses various methods to recover the valuable metal content from the filter cake. The recovered metal content is either sold to customers who formulate the plating chemical, Chemical X, or other products.

Figure 1 provides a process diagram for the printed circuit board manufacturing and wastewater treatment process.

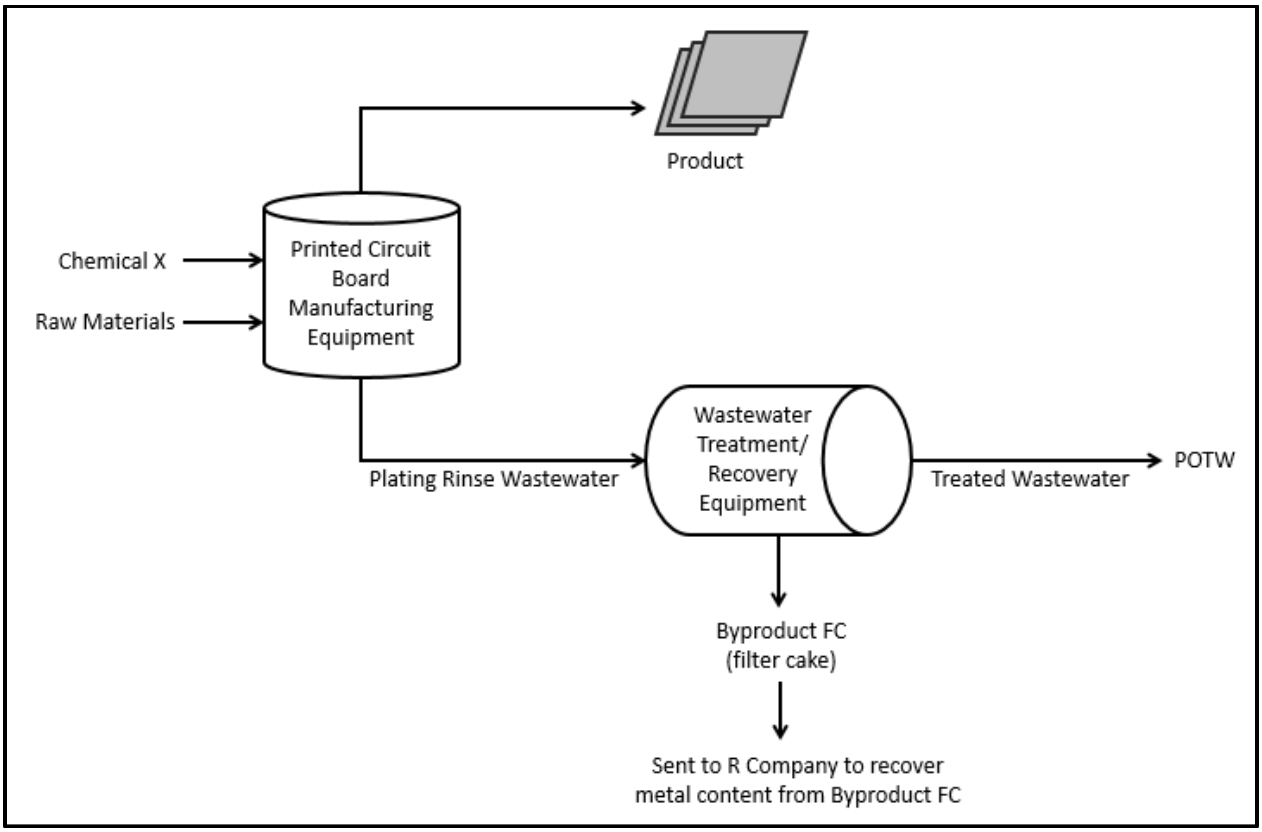

Figure 1. Wastewater Treatment Scenario Process Flow Diagram

Discussion:

Based on this scenario, PC Company is importing 25,000 lbs of the plating chemical, Chemical X, and using it for a commercial purpose; therefore, this chemical is subject to CDR reporting requirements. The residual Chemical X and other substances are removed by rinsing the printed circuit boards and the resulting wastewater is treated using pollution control equipment.

The pollution control equipment (wastewater treatment/recovery equipment in Figure 1) is considered non-integral because it can be removed from the process without affecting the printed circuit board manufacture. In the process of treating the wastewater, Byproduct FC is produced. Therefore, Byproduct FC is manufactured solely in non-integral pollution control equipment and meets the requirements of the byproduct exemption at 40 CFR 711.10(d)(2).

In this scenario, R Company is using the Byproduct FC to recover the metal content. R Company would be required to report any chemicals manufactured for a commercial purpose from Byproduct FC, if other requirements (such as reporting thresholds, were satisfied.

CDR Reporting Obligations:

PC Company

- Report the 25,000 lbs of imported plating chemical, Chemical X, used to manufacture the printed circuit board product.
- Report processing and use information for Chemical X.
- Answer "0%" to the voluntary question "Is the chemical a byproduct?" for Chemical X.
- Do not report Byproduct FC. Under this scenario, PC Company is exempted from reporting the manufactured byproduct because it is manufactured solely on non-integral pollution control equipment.

R Company

- Consider the need to report the manufacturing information for chemicals manufactured from Byproduct FC.
- Answer "no" to the question "Is chemical being recycled?" The manufactured chemical is an intended commercial product, not a substance that the recycler would potentially dispose of as a waste. While the byproduct was recycled, the resulting substance is not.
- Answer "0%" to the voluntary question "Is the chemical a byproduct?"

Scenario 5 – Reaction Byproduct

Description:

Company 123 reacts Chemical A and Chemical B to form Product AB and a mixture of a byproduct and unreacted substance A. The byproduct substance, Chemical C, is coincidentally formed via a chemical reaction during the manufacture of Product AB.

Company 123 ships the mixture to Company 456. Company 456 distills the mixture to separate it into Chemical A and Chemical C. No chemical bonds are formed or broken in the distillation process. Company 456 uses Chemical A and Chemical C for commercial processing operations.

Company 123 is aware that Company 456 separates Chemical A and Chemical C from the mixture by distillation and that the substances are then used commercially.

Discussion:

The scenario specifies that the mixture is a combination of only Chemical A and Chemical C, and therefore correctly characterizes it as a mixture of those two substances. Chemical A is an unreacted starting material, which is not manufactured by Company 123. Chemical C is coincidently formed via a chemical reaction during the manufacture of Product AB, and therefore is a byproduct that was manufactured by Company 123 for commercial purposes.

Company 456 separates the mixture into Chemical A and Chemical C, and therefore is not manufacturing either substance. In addition, Company 456 is using Chemical C for commercial purposes, which means that the manufacture of byproduct Chemical C by Company 123 is not eligible for any of the CDR byproduct reporting exemptions.

CDR Reporting Obligations

Company 123

- Product AB:
  - Report manufacturing, processing, and use information.
  - Answer "no" to the question "Is chemical being recycled?"
  - Answer "0%" to the voluntary question "Is the chemical a byproduct?"
- Chemical C:
  - Report manufacturing, processing, and use information.
    - Assuming it would otherwise be disposed of as a waste, answer "yes" to the question "Is chemical being recycled?"
  - Answer "100%" to the voluntary question "Is the chemical a byproduct?"
- Chemical A and Chemical B: Do not report. Company 123 does not manufacture these chemicals.
- The mixture: For purposes of CDR, not reportable because it is a mixture.

Company 456: No reporting, because it is not manufacturing any of the above chemical substances. Chemical A and Chemical C were separated from a mixture.

Scenario 6 – Reaction Byproduct 2

Description:

As in Scenario 5, Company 123 reacts Chemical A and Chemical B to form Product AB and a mixture. In this scenario, Company 123 is aware that, in addition to unreacted Chemical A and Chemical C (a byproduct reaction product), the mixture contains a small amount of other unknown chemical substances, including other reaction products.

As in Scenario 5, Company 123 ships the mixture to Company 456. Company 456 distills the mixture to separate it into Chemical A and Chemical C, both of which are used for commercial purposes. Company 456's distillation also results in a third component, M, which contains the unknown substances in the original byproduct mixture. Company 456 disposes of M.

Discussion:

The difference between this scenario and Scenario 5 is inclusion of the unknown chemical substances in the mixture.

Company 456 separates the mixture into Chemical A, Chemical C, and M. M contains the other unidentified substances from the byproduct mixture produced by Company 123. Company 456 uses Chemicals A and C for a non-exempt commercial purpose and disposes of M as a waste.

The mixture can be characterized as such because the scenario identifies that the unknown substances, which now comprise M, are disposed of as a waste with no other separate commercial purpose. Irrespective of their identity or volumes, the substances that comprise M are exempt from CDR pursuant to 40 CFR 720.30(g)(2).

CDR Reporting Obligations:

The reporting obligations are similar to those in Scenario 5.

Company 123

- Product AB:
  - Report manufacturing, processing, and use information.
  - Answer "no" to the question "Is chemical being recycled?"
  - Answer "0%" to the voluntary question "Is the chemical a byproduct?"
- Chemical C:
  - Report manufacturing, processing, and use information.
  - Assuming it would otherwise be disposed of as a waste, answer "yes" to the question "Is chemical being recycled?"
  - Answer "100%" to the voluntary question "Is the chemical a byproduct?"
- Chemical A and Chemical B: Do not report. These chemicals are not manufactured by Company 123.
- Unknown chemical substances from the mixture: Do not report the individual components, because it is disposed of as a waste and exempt under 40 CFR 720.30(g)(2).
- The mixture: Not reportable because it is a mixture. CDR does not require the reporting of mixtures.

Company 456: No reporting, because it is not manufacturing any of the above chemical substances.

- Chemical A and Chemical C were separated from a mixture.
- M: Do not report the individual components, because it is disposed of as a waste and exempt under 40 CFR 720.30(g)(2), and because Company 456 did not manufacture them.

Scenario 7 – Reaction Byproduct 3

Description:

Using information in Scenario 5, except Company 123 is not aware that Company 456 separates the byproduct mixture into component chemical substances that are used commercially.

Discussion:

The given characterization of what Company 123 does not know is ambiguous. For purposes of developing a response, EPA assumes that the scenario is as follows: Company 123 lacks the basis to reasonably discern whether or not Company 456 is putting either Chemical A or C to a non-exempt commercial purpose.

Whether Company 456 has a non-exempt commercial purpose for Chemical A is irrelevant to Company 123's reporting obligations for Chemical A. In any event, Company 123 is not manufacturing Chemical A and so has no reporting obligations for it.

Company 123 is manufacturing Chemical C for commercial purposes, and it must report this byproduct unless it has a factual basis upon which it can base a reasonable claim that it is exempt from reporting. In Scenario 5, Company 123 *knew* it did not qualify for the exemption at 40 CFR 720.30(g) or (h)(2) (i.e., it knew there was a non-exempt commercial purpose for the byproduct). In this scenario, Company 123 instead lacks an adequate factual basis to claim the exemption (i.e., it lacks a factual basis to reasonably claim that the byproduct has no commercial purpose or only exempt commercial purposes). Company 123 cannot claim the exemption in either case.

CDR Reporting Obligations: Same as Scenario 5.

Company 123

- Product AB:
  - Report manufacturing, processing, and use information.
  - Answer "no" to the question "Is chemical being recycled?"
  - Answer "0%" to the voluntary question "Is the chemical a byproduct?"
- Chemical C:
  - Report manufacturing, processing, and use information.
  - Assuming it would otherwise be disposed of as a waste, answer "yes" to the question "Is chemical being recycled?"
  - Answer "100%" to the voluntary question "Is the chemical a byproduct?"
- Chemical A and Chemical B: Do not report. Company 123 does not manufacture these chemicals.
- Byproduct X: Not reportable. Byproduct X is a mixture and the CDR does not require the reporting of mixtures.

Company 456: No reporting, because it is not manufacturing any of the above chemical substances. Chemical A and Chemical C were separated from a mixture.

Scenario 8 – Reused Solvent Mixture

Description:

Company X manufactures Polymer Q in the presence of Solvent G, purchased from an outside vendor, in a reactor. At the end of the polymerization, there exists in the reactor the following: polymer and spent solvent mixture, Mixture TT, which consists of unreacted raw materials, unspecified impurities, and Solvent G. Polymer Q is physically separated from Mixture TT by filtration. Mixture TT is transferred to a storage tank. From the storage tank it is not further processed or purified, but is transferred back to the reactor where it is used for its solvent properties. Mixture TT continues to be recycled each time Polymer Q is manufactured.

Discussion:

Company X uses Solvent G in the manufacture of Polymer Q, resulting in Polymer Q and a spent solvent Byproduct X consisting of unreacted raw materials, other unknown chemical substances (no information was provide in the scenario to indicate whether they can properly be characterized as "impurities"), and Solvent G. Although Company X manufactures Polymer Q for a commercial purpose, the polymer is likely to be exempt from CDR requirements under 40 CFR 711.06(a)(1). For purposes of this scenario, EPA therefore assumes that the polymer *is* exempt under that provision of the CDR and also assumes that Solvent G is domestically purchased.

This discussion assumes that the spent solvent mixture is correctly characterized as a mixture, and returned to the reactor to continue its use as a solvent and, presumably, to fully react the other materials. The spent solvent mixture continues to be recycled each time Polymer Q is manufactured.

Consistent with our general assumptions about the unspecified fate of chemical substances in these scenarios, we assume that Company X only uses Mixture TT as a source of Solvent G, and continues in this fashion until the unknown chemical substances (which might or might be impurities) begin to interfere with the polymerization process. At that point, Company X disposes of Mixture TT as a waste.

CDR Reporting Obligations for Company X:

None, for the following reasons:

- The manufactured Polymer Q is likely to be exempt under 40 CFR 711.6(a)(1). For purposes of this example, EPA simply assumes that it is exempt.
- Solvent G and the other starting materials were not manufactured by Company X.
- Whatever the unknown chemical substances are, or whether they actually qualify as "impurities," if they were manufactured and they have no commercial purpose other than disposal as a waste, then they qualify for a reporting exemption under CDR.

Scenario 9- Potassium Iodide

Description:

Company 123 reacts Chemical A and Chemical B to form Intermediate AB, which was later used for a commercial purpose. A byproduct mixture, Mixture K, consisting of potassium iodide (KI) and water is formed.

Mixture K is sold to Company 456. Company 456 oxidizes the KI to form iodine. The iodine is used for commercial purposes. Company 123 is aware of Company 456's handling of the byproduct mixture.

Discussion:

In this scenario, the byproduct is a mixture of only KI and water. Mixtures are not reportable for CDR, but the individual components of the mixture may be reportable when manufactured as part of making the mixture. EPA assumed both the KI and the water were manufactured substances. EPA also assumed that the KI would not be disposed of as a waste.

The mixture of KI and water is sold to Company 456, which uses the KI to manufacture iodine for commercial purposes. The KI is not extracted from a byproduct substance, but rather functions as a chemical reactant, and therefore the byproduct exemption found at 40 CFR 720.30(g)(3) is not applicable to Company 123's manufacture of the KI byproduct.

CDR Reporting Obligations:

Company 123:

- Intermediate AB: Report
- Mixture K: The CDR does not require reporting of mixtures.
- Water: Fully exempted from CDR.
- KI:
    - Report the volume of KI manufactured. Do not include the volume of the water.
    - Answer "no" to the question "Is chemical being recycled?" Company 123 would not otherwise have disposed of KI as a waste. Note that, if Company 123 would have otherwise disposed of KI as a waste, the answer to this question would have been "yes."
    - Answer "100%" to the voluntary question "Is the chemical a byproduct?"

Company 456:

- Iodine: Report

Scenario 10 – Applying the Extract Component Chemical Substance Byproduct Exemption

This scenario illustrates the application of the 40 CFR 720.30(g)(3) exemption when a chemical reaction is used to extract a chemical substance from a byproduct. Both examples include a chemical reaction, but only in example Scenario 10(B) is a component chemical substance being extracted from a byproduct. If the substance being extracted is chemically changed as it is removed, then the substance being extracted is not a component chemical substance of the byproduct. This is true even if the extracted substance is then chemically returned to the same identity as the component chemical substance, as illustrated in Scenario 10(a).

Scenario 10(A)

Description:

In the process of making a product, Company 10 produces a byproduct (Byproduct A) that is complex mixture of copper dust, copper compounds, sand, and other miscellaneous components. The Company is interested in recovering copper and does so by dissolving the byproduct in acid. The acid reacts with the copper to make copper sulfate (Chemical A2), which is then separated from the sand by filtration. After separation, the copper sulfate is reduced back to copper (Chemical A1).

Discussion:

The manufacturer of the byproduct does not qualify under 40 CFR 720.30(g)(3). The component chemical substance (elemental copper) is not separated from Byproduct A without changing its chemical composition and structure (copper → copper sulfate →copper). Both the byproduct and the produced substance are reportable to CDR (if meeting the threshold and not otherwise exempt).

One could consider whether the copper sulfate would meet the non-isolated intermediate exemption. Given the circumstances presented, the copper sulfate is not likely to be a non-isolated intermediate. However, this might change depending upon the process to separate the copper sulfate from the sand and reacting it to form copper. See the Fact Sheet: Non-isolated Intermediates for additional discussion.

CDR Reporting Obligations:

Company 10(A):

- Byproduct A: Report
  - Answer "yes" to the question "Is chemical being recycled?"
  - Answer "100%" to the voluntary question "Is the chemical a byproduct?"
- Chemical A1: Report
  - Answer "no" to the question "Is chemical being recycled?"
  - Answer "0%" to the voluntary question "Is the chemical a byproduct?"
- Chemical A2: Report (assuming not a non-isolated intermediate)
  - Answer "no" to the question "Is chemical being recycled?"
  - Answer "0%" to the voluntary question "Is the chemical a byproduct?"

Scenario 10(B)

Description:

In the process of making a product, Company 10(B) produces a byproduct B that is gold dust mixed with plaster. The company is interested in recovering the gold dust and does so by using acid to dissolve away the plaster. This leaves the elemental gold dust (Chemical B). Any other remaining materials are disposed of as a waste.

Discussion:

In this case, the manufacturer of the byproduct qualifies for the 40 CFR 720.30(g)(3) exemption. The component chemical substance (elemental gold dust – Chemical B) is extracted from the byproduct (gold dust mixed with plaster – Byproduct B) without changing the chemical structure of the component, therefore the manufacture of the elemental gold dust is reportable under CDR (if meeting the threshold and not otherwise exempt) while the byproduct (plaster mixed with gold dust) is exempt from CDR reporting, assuming that byproduct is not put to any further commercial purpose.

CDR Reporting Obligations:

Company 10(B):

- Byproduct B: Do not report; exempt under 40 CFR 720.30(g)(3)
- Chemical B: Report
    - Answer "no" to the question "Is chemical being recycled?"
    - Answer "0%" to the voluntary question "Is the chemical a byproduct?"

Scenario 11 - Spent Solvent 1

Description:

Company X reacts raw materials, including monomers and other agents, in the presence of a purchased Solvent A to form Polymer P. A spent solvent mixture, Mixture SS, is formed. Mixture SS consists of Solvent A, unreacted starting materials, and unspecified impurities. Mixture SS is collected in a storage tank.

Mixture SS is transferred to a distillation column, where it is distilled to separate Solvent A from the impurities and the unreacted starting materials. No bonds are formed or broken. The distilled Solvent A is transferred back to the reactor where it is again used as solvent. For purposes of the scenario, the impurities and unreacted starting materials are incinerated.

Discussion:

Company X manufactures Polymer P by reacting raw materials, including monomers and other agents, in the presence of Solvent A. Company X manufactures Polymer P intentionally; however, it is likely to be exempt from CDR reporting under 40 CFR 711.6(a)(1). For purposes of this scenario, EPA assumed Polymer P is exempted from CDR. Solvent A itself does not react during the manufacture of Polymer P.

The resulting byproduct, Mixture SS, is characterized as a mixture of Solvent A, unreacted starting materials, and impurities. EPA does not assume that the "unspecified impurities" were properly characterized as impurities for CDR purposes and instead considers them to be unspecified chemical substances that may include unreacted starting materials and various reaction products.

Company X separates Solvent A from Mixture SS, and disposes of the remaining materials as a waste, by incineration. For CDR purposes, Mixture SS can be considered a mixture because it consists of a known chemical substance, Solvent A, and the rest of Mixture SS is disposed of as a waste and not used for any other separate commercial purposes.

CDR Reporting Obligations for Company X:

- Polymer P: No reporting obligations under the assumptions of this scenario.
- Solvent A: No reporting obligations because it is initially purchased and later separated from a mixture and not manufactured.
- Unreacted starting materials: No reporting obligations because they are not manufactured.
- Unspecified chemical substances: No reporting obligations for these byproduct chemical substances. They are disposed of as a waste and therefore exempt under 40 CFR 720.30(g)(2).
- Mixture SS: CDR does not require reporting of the mixture itself.

Scenario 12 - Spent Solvent 2

Description:

Using information in Scenario 10, except that Mixture SS is shipped to Company Y and Company Y distills out the Solvent A. Company Y then ships the Solvent A back to Company X for commercial use. Any remaining portions of Mixture SS are disposed of as a waste.

Discussion:

The fact that a different company separates Solvent A from Mixture SS does not change the reporting obligations.

CDR Reporting Obligations:

Company X: The reporting obligations are the same as for Scenario 10.

Company Y: No reporting obligations, because Solvent A is being separated from a mixture and is not being manufactured by Company Y.

Scenario 13 - Off-spec Refrigerant Gases

Description:

Company 123 manufactures refrigerant Gases A, B, and C at the same plant site in three different operations. As part of the manufacturing process, off-spec gases are generated. An off-spec gas is the same substance as the intended refrigerant gas, but it fails to meet commercial specifications (*e.g.*, it is contaminated with the purchased compressor oil in the manufacturing process and, as such, fails to meet required purity levels).

Off-spec gases A1, B1, and C1 from the three manufacturing operations are collected in a consolidation tank. The resultant mixture, Mixture P, is sold to Company 456. Company 456 distills Mixture P to separate the three different gases into Recovered Gas A, Recovered Gas B, and Recovered Gas C. No chemical bonds are broken or formed. The compressor oil is incinerated. The three separated gases (Recovered Gases A, B, and C) are sold by Company 456 for commercial use. Company 123 knows how Company 456 is handling Mixture P.

Discussion:

As part of the manufacture of three gases, Company 123 produces a mixture of the off-spec gases, which includes compressor oil. Company 456 separates the mixture back into the three gases and the compressor oil.

CDR Reporting Obligations:

Company 123:

- Gases A, B, and C: Report, because they are manufactured.
- Gases A1, B1, and C1: Volume of the gases reported as part of Gases A, B, and C; volume of the compressor oil is not included in what is reported
- Gases A1, B1, and C1: Answer "no" to the question "Is chemical being recycled?" because Company 456 is finishing the gases and is not removing a chemical substance from a waste stream.
- Mixture P: Not reportable because it is a mixture. Furthermore, the individual manufactured components were already reported
- Recovered Gases A, B, and C: No additional reporting, because there has been no additional manufacture (the impure gases were reported as part of the volume for A, B, C). They were separated from a mixture by Company 456.

Company 456:

- Gases A, B, C and A1, B1, C1: No reporting – Company 456 did not manufacture these.
- Mixture P: No reporting – CDR does not require reporting of mixtures.
- Recovered Gases A, B, and C: No reporting – Company 456 is just separating a mixture of chemical substances that it did not manufacture (the chemical substances were manufactured by Company 123).

Scenario 14 – Off-spec Material

Description:

In 2011, Company A produced 180,000 lb of Substance X that met product specifications and was sold. Company A also produced 20,000 lb of Substance X that was off-spec for color due to traces of a highly colored impurity, although its assay was approximately 99 percent Substance X. Although Company A could have sold the off-spec material into a non-color sensitive application, it chose to rework the off-spec Substance X by distillation to remove the impurity and bring it up to specifications. The distilled Substance X met the color specification and was > 99 percent pure. The recovered volume was approximately 20,000 lb. Company A determined that their CDR-reportable volume of Substance X in 2011 was 200,000 lb.

Discussion:

Company A correctly identified the need to report 200,000 lb of Substance X. Company A is required to report the total volume of Substance X if Substance X has a commercial purpose, even if there are differences in the level of purity.

In this scenario, Company A is considered to be completing the manufacture of Substance X by reworking the off-spec material. EPA intends that the reporting element regarding recycling would be used by manufacturers to indicate whether a chemical substance they manufactured, such as a byproduct, which might otherwise be disposed of as waste, was or is expected to be recycled.

CDR Reporting Obligations for Company A:

- Chemical X: Report manufacture of 200,000 lb.
- Answer "no" to the question "Is chemical being recycled?" because the purification activity of the off-spec Substance X is simply product finishing and does not involve removing a chemical substance from a waste stream.

Scenario 15 - Carbon Canisters

Description:

In its chemical production unit, Company A uses carbon canisters to remove excess organic alcohol during the manufacture of another chemical substance. Company A sends used carbon canisters to Company Z, where Company Z removes the spent carbon to regenerate the carbon. The absorbed hydrocarbons are removed from the carbon through a heating process and are disposed of as waste. Company Z repacks the canister with fresh carbon, new and/or regenerated and sends the canisters back to Company A for use. Through its relationship with Company Z, Company A receives the regenerated canisters at a reduced fee.

Discussion:

Company A is using carbon canisters to remove excess organic alcohol (which EPA assumes is an excess starting material), during the manufacture of another chemical substance. It is assumed that the alcohol is being adsorbed to the carbon as a physical interaction as opposed to a chemical interaction. The organic alcohol is not an "impurity" of the carbon, because the alcohol and the carbon are being intentionally combined into a mixture.

CDR Reporting Obligations:

Neither company is required to report under the CDR rule for the following reasons:

Company A

- Neither domestically manufactures nor imports the canisters and is therefore not required to report the carbon under CDR.
- The organic alcohol adsorbed onto carbon can be treated as a mixture of carbon and organic alcohol. Under the assumptions of the scenario, Company A did not manufacture the organic alcohol.

Company Z

- No reporting obligations. The separation of carbon from a mixture of carbon and organic alcohol is processing rather than manufacturing and would not trigger CDR reporting obligations.

Scenario 16 –Palladium Catalyst

Description:

Company X purchases and uses a palladium catalyst. The palladium catalyst is commercially supplied on a carbon support, which allows the catalyst to be in a finely divided state with a large surface area to increase its catalytic activity. Such a catalyst is described by the supplier as a mixture of palladium (CASRN 7440-05-3) and carbon (CASRN 7440-44-0), consistent with common industry practice. During use of the catalyst, the palladium becomes progressively more deactivated by adsorption of contaminants onto the palladium surface. When its catalytic performance is no longer acceptable, the catalyst is sent to Company Y, a precious metal reclaimer, and Company X is credited for the value of the palladium. The process used by Company Y for catalyst regeneration is not known to Company X.

Discussion:

Company X is using a palladium catalyst, which becomes deactivated by adsorption of contaminants until its catalytic performance is not acceptable and it is sent to Company Y for catalyst regeneration by an unknown process. For this scenario, it is assumed that the palladium catalyst adsorbs contaminants through a physical interaction and not a chemical interaction. It is also assumed that Company Y's catalyst regeneration process does not involve a chemical reaction and that once the contaminants are removed, they are disposed of as waste.

CDR Reporting Obligations:

Neither company is required to report under the CDR rule for the following reasons:

Company X

- Neither domestically manufactures nor imports the palladium catalyst and is therefore not required to report under CDR.
- The palladium catalyst becomes contaminated over the course of its use. The contaminants are byproducts that are disposed of as a waste and are not subject to CDR requirements.

Company Y

- When it purifies the palladium catalyst by removing contaminants, the chemical substances removed are now a byproduct of Company Y's purification process. Company Y is manufacturing this byproduct for commercial purposes.
- However, the byproduct is disposed of as a waste and is not used for any other separate commercial purpose. The manufacture is exempt from CDR under 40 CFR 720.30(g)(2).

Note that if the substances contaminating the palladium catalyst had formed chemical bonds with the catalyst, the spent catalyst would not be considered impure palladium, but rather a different chemical substance, distinct from palladium. Consequently, the act of regenerating the spent catalyst would require the breaking of chemical bonds between the impurities and the palladium, which would be a manufacturing activity that is reportable under CDR. The spent catalyst would

be considered a single, reportable UVCB substance if it has an uncertain, variable, or unknown chemical composition.

Scenario 17 – Electronics 1

Description:

Company EG sends outdated computers, cell phones, and other office equipment (*e.g.,* copiers, fax machines) to CR Recycling Group. There is no exchange of funding between Company EG and CR Recycling. CR Recycling Group may refurbish the equipment and resell to the general public, or it may take the components of the equipment and reuse within its own processes. As part of the procedure to reuse components, CR Recycling will extract metals used in solder within the outdated equipment for reuse. Company EG is not aware how CR Recycling will process the equipment it provides.

Discussion:

This discussion assumes that Company EG is collecting, from domestic sources, used office equipment that has reached the end of its useful life, and is sending them to another company (CR Recycling Group). The act of simply collecting the used office equipment from domestic sources is not considered manufacturing.

CR Recycling Group takes used office equipment and either:

- Refurbishes the used office equipment for continued use as office equipment,
- Reclaims metal value from the used office equipment by chemical oxidation and reduction, or another chemical reaction.

Refurbishing the used office equipment (e.g., mechanically repairing and replacing components of the equipment) does not make CR Recycling group the manufacturer of the component chemical substances in the office equipment. However, removing metals from the used office equipment by means of a sequence of chemical oxidation and reduction steps makes CR Recycling the manufacturer of the chemical substances produced by those chemical transformations.

CDR Reporting Obligations:

Company EG has no reporting obligations under CDR for the used office equipment.

CR Recycling:

- If merely engaged in refurbishing the equipment – CR Recycling has no CDR reporting obligation.
- Chemical reclamation of metals. CR Recycling is subject to CDR for the chemical substances it manufactures in the chemical reactions involved in the reclamation process.

Scenario 18 – Electronics 2

Description:

This scenario is the same as Scenario 16, except that Company EG is aware that the contributed office equipment will not be refurbished and will only be used to extract usable components, including metals.

Discussion:

As in Scenario 16, because Company EG is not considered a manufacturer of the used office equipment, its knowledge of the disposition of the equipment does not affect its obligations under CDR.

CDR Reporting Obligations:

The reporting obligations are the same as for scenario 16.

Company EG has no reporting obligations under CDR for the used office equipment.

CR Recycling:

- If merely engaged in refurbishing the equipment – CR Recycling has no CDR reporting obligation
- Chemical reclamation of metals. CR Recycling is subject to CDR for the chemical substances it manufactures in the chemical reactions involved in the reclamation process

Scenario 19 – Imported Electronics

Description:

Using information in Scenario 16, except Company EG conducts its collection activities outside of the United States, imports the equipment into the United States, then sends its office equipment to CR Recycling Group.

Discussion:

Importation is manufacture for TSCA purposes. However, the substances that are imported as part of articles are exempt from CDR requirements. (*See* 40 CFR 711.10(b)). An article is defined, in part, as "a manufactured item (1) which is formed to a specific shape or design during manufacture, (2) which has end use function(s) dependent in whole or in part upon its shape or design during end use…" (*See* 40 CFR 704.3).

If the office equipment is imported for the end use of metals reclamation, then that is an end use that is not dependent in whole or in part on the shape or design of the office equipment.

EG needs a factual basis to reasonably claim the imported articles exemption. To the extent that EG lacks the basis to reasonably claim the imported articles exemption, it is a manufacturer of the metals and other chemical constituents that are intended for separation from the office equipment. The portion of the equipment that is refurbished maintains its status as an imported article, so does not need to be reported under the CDR rule. The portion that is disposed of as waste also does not need to be reported under the CDR rule.

CDR Reporting Obligations:

Company EG:

- CR Recycling refurbishes EG's imports: The imports are articles. EG has no CDR reporting obligations for the articles.
- CR Recycling reclaims metal value from EG's imports: The imports are not articles. EG reports the manufacture of the specific chemical substances (e.g., copper, lead, etc.) that will be separated from the rest of the office equipment.
- If imports are for dual purposes, CR should apportion the import volume between volume imported for use in office equipment and volume imported for metal value.

CR Recycling:

- Refurbishing of articles: CR Recycling has no CDR reporting obligation.
- Chemical reclamation of metals. CR Recycling is subject to CDR for the chemical substances it manufactures in the chemical reactions involved in the reclamation process.

Appendix: Original Case Studies as Submitted to EPA in 2012

Chemical Data Reporting (CDR): Case Studies for Byproduct/Recycling Reporting

Scenario 1

In its operations, ABC Company uses an etchant to strip copper off of a substrate. The process results in a mixture containing a complex combination of substances. The mixture is sent to XYZ Recycler to extract the elemental copper by electrolytic reduction. The remaining components of the mixture are disposed of by XYZ Recycler.

U.S. Environmental Protection Agency (EPA) guidance states that the byproduct manufacturer (ABC) should report the spent etchant and the recycler (XYZ) should report the elemental copper (assuming other requirements, such as production volume, are met).

- *What does ABC Company report as the chemical identifying number?*
- *How does ABC Company report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*
- *If there is more than 100,000 pounds (lbs) of etchant sent to XYZ Recycler, what does ABC Company report under processing and use information under Part III?*
- *What does XYZ Recycler report as the chemical identifying number?*
- *How does XYZ Recycler report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*

Scenario 2

In its process to produce Chemical Substance A, GEF Company produces 100,000 lbs/year of a byproduct, Mixture B, which is a mixture of chemical substances, one of which is formed via a chemical reaction -- Chemical A, while others were present in the original starting materials, Chemicals X, Y, and Z. Based on its technical expertise, GEF Company is aware of the individual components that make up the byproduct, and each component is listed on the Toxic Substances Control Act (TSCA) Inventory. Due to processing variability, however, GEF Company does not know the specific percentage of each component in the byproduct. GEF Company has not notified the mixture to EPA as a "new chemical" because it is not used for commercial purposes and there is no regulatory obligation to notify mixtures if the individual components of the mixture are listed on the Inventory.

The byproduct mixture is sent off-site to Company 123 for further processing. Company 123 extracts Chemical X via a chemical reaction. Chemical X was one of the starting materials used to produce Chemical Substance A. After Chemical X is extracted, the mixture is disposed of by MNO Company.

- *Is GEF Company obligated to report under the CDR? If yes,*
  - *Which substances does GEF report? Chemical A? Chemical X? Chemical Y? Chemical Z? Mixture B?*
  - *What does GEF Company report as the chemical identifying number?*
  - *What does GEF Company report as the volumes manufactured?*
  - *How does GEF Company report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*
- *What are the reporting obligations for 123 Company?*

Scenario 3

Site A purchases and uses sulfuric acid in its operations, which generates a spent sulfuric acid byproduct mixture, Mixture SA. Mixture SA is a mixture of water, sulfuric acid, and unspecified impurities. Mixture SA has the same CAS Number as sulfuric acid. No new sulfuric acid is contained in Mixture SA.

Mixture SA is shipped to Site B. At Site B, Mixture SA is reacted to convert the sulfuric acid to sulfur dioxide. The sulfur dioxide is reacted to created sulfur trioxide. The sulfur trioxide is then reacted to form sulfuric acid.

- *What are the reporting obligations for Site A for Mixture SA?*
- *What are the reporting obligations for Site B for Mixture SA, sulfuric acid, sulfur dioxide, and sulfur trioxide?*

Scenario 4

MNO Company, a metal processing facility, has an agreement with Company 678 to remove its wastewater/spent baths for treatment. It is technically feasible to recover Metal G from the soluble metal compounds in the wastewater. If market value of Metal G is high, Company 678 will engage in the recovery process. If the market value of Metal G is low, Company 678 will dispose of the wastewater without recovering Metal G.

Once the wastewater leaves the MNO Company facility, MNO Company is unaware as to whether Metal G is extracted from the wastewater or not. In other words, MNO Company cannot be certain as to the amount of its wastewater that Company 678 uses as a "feedstock" for manufacture of Metal G.

- *Is MNO Company obligated to report the wastewater? If so,*
  - *What does MNO Company report as the chemical identifying number?*

- *How does MNO Company determine the volumes that are reportable?*
- *How does MNO Company report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*

Scenario 5

Company X reacts purchased Chemical A and purchased Chemical B to form Product AB and a byproduct mixture. The byproduct mixture consists of unreacted Chemical A and by-product Chemical C, which is a chemical that is coincidentally formed via a chemical reaction during the manufacture of Product AB. There is no CAS Number for the byproduct mixture, but there are CAS Numbers for Chemicals A, Chemical B, Chemical C, and Product AB, all of which are listed on the TSCA Inventory.

Company X ships the byproduct mixture to Company Y. Company Y distills the byproduct mixture to separate the mixture into Chemical A and Chemical C. No chemical bonds are formed or broken in the distillation process. Company Y uses Chemical A and Chemical C for commercial processing operations.

Company X is aware that Company Y separates Chemical A and Chemical C from the byproduct mixture by distillation and that the substances are then used commercially.

- *What are the CDR reporting obligations for Company X for Chemical A, Chemical B, Chemical C, Product AB, and byproduct mixture?*
  - *For each substance that Company X is to report, how does it report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*
- *What are the CDR reporting obligations for Company Y for Chemical A, Chemical B, Chemical C, Product AB, and byproduct mixture?*
  - *For each substance that Company Y is to report, how does it report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*

Scenario 6

Using information in Scenario 5, except Company X is aware that the byproduct mixture contains a small amount of unintended unspecified impurities. Company Y's treatment of the byproduct mixture remains the same -- distillation to separate into Chemical A and Chemical C, which are used for commercial processing operations. Company Y's distillation also results in a third component, Mixture M, which contains the impurities in the original byproduct mixture. Company Y disposes of Mixture M.

- *What are the CDR reporting obligations for Company X for Chemical A, Chemical B, Chemical C, Product AB, byproduct mixture, and Mixture M?*

  - *For each substance that Company X is to report, how does it report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*

- *What are the CDR reporting obligations for Company Y for Chemical A, Chemical B, Chemical B, Product AB, byproduct mixture, and Mixture M?*

  - *For each substance that Company Y is to report, how does it report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*

Scenario 7

Using information in Scenario 5, except Company X is not aware that Company Y separates the byproduct mixture into component chemical substances that are used commercially.

- *What are the CDR reporting obligations for Company X for Chemical A, Chemical B, Chemical C, Product AB, and byproduct mixture?*

  - *For each substance that Company X is to report, how it report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*

Scenario 8

Company X manufactures Polymer Q in the presence of Solvent G, purchased from an outside vendor, in a reactor. At the end of the polymerization, there exists in the reactor the following: polymer and spent solvent mixture, Mixture TT, which consists of unreacted raw materials, unspecified impurities, and Solvent G. Polymer Q is physically separated from Mixture TT by filtration. Mixture TT is transferred to a storage tank. From the storage tank it is not further processed or purified, but is transferred back to the reactor where it is used for its solvent properties. Mixture TT continues to be recycled each time Polymer is manufactured.

- *What are the reporting obligations for Company X for Polymer Q, Solvent G, and Mixture TT?*

Scenario 9

Company X reacts purchased Chemical A and purchased Chemical B to form Intermediate AB. A byproduct mixture, Mixture K, consisting of potassium iodide (KI) and water is formed. The components of the byproduct mixture are on the TSCA Inventory, the mixture itself is not.

Mixture K is sold to Company Y. Company Y oxidizes the KI to form iodine. The iodine is used for commercial purposes. Company X is aware of Company Y's handling of the byproduct mixture.

- *What are the CDR reporting obligations for Company X for Intermediate AB and Mixture K?*
- *Is the byproduct mixture exempt from CDR reporting under 40 C.F.R. §720.30(g)(3)? If not,*
  - *What CAS Number is used for the byproduct mixture if one does not already exist?*
  - *How would Company X determine production volume for the byproduct mixture? Is it the entire volume of the byproduct, or only the weight of the KI in the mixture?*
- *What are the CDR reporting obligations for Company Y for Mixture K, KI, iodine, and water?*

Scenario 10

Company X reacts raw materials, including monomers and other agents, in the presence of a purchased Solvent A to form Polymer P. A spent solvent mixture, Mixture SS, is formed. Mixture SS consists of Solvent A, unreacted starting materials, and unspecified impurities. Mixture SS is collected in a storage tank.

Mixture SS is transferred to a distillation column, where it is distilled to separate Solvent A from the impurities and the unreacted starting materials. No bonds are formed or broken. The distilled Solvent A is transferred back to the reactor where it is again used as solvent. For purposes of the scenario, the impurities and unreacted starting materials are incinerated.

- *What are the CDR reporting obligations for Company X for Polymer P, Mixture SS, and Solvent A?*

Scenario 11

Using information in Scenario 10, except Mixture SS is shipped to Company Y and Company Y distills out the Solvent A. Company Y then ships the Solvent A back to Company X for commercial use.

- *What are the CDR reporting obligations for Company X for Mixture SS and Solvent A?*

- *What are the CDR reporting obligations for Company Y for Mixture SS and Solvent A?*

Scenario 12

Company X manufactures refrigerant Gases A, B, and C at the same plant site in three different operations. As part of the manufacturing process, off-spec gases are generated. An off-spec gas is the same substance as the intended refrigerant gas, but it fails to meet commercial specifications (*e.g.*, it is contaminated with the purchased compressor oil in the manufacturing process and as such, fails to meet required purity levels).

Off-spec gases A1, B1, and C1 from the three manufacturing operations are collected in a consolidation tank. The resultant mixture, Mixture P, which includes the three off-spec gases and compressor oil, is sold to Company Y. Company Y distills Mixture P to separate the three different gases into Recovered Gas A, Recovered Gas B, and Recovered Gas C. No chemical bonds are broken or formed. The compressor oil is incinerated. The three separated gases (Recovered Gases A, B, and C) are sold by Company Y for commercial use. Company X knows how Company Y is handling the off-spec gases byproduct mixture.

- *What are the CDR reporting obligations for Company X for Gases A, B, C, A1, B1, C1, Mixture P, Recovered Gas A, Recovered Gas B, and Recovered Gas C?*

- *What are the CDR reporting obligations for Company Y for Gases A, B, C, A1, B1, C1, Mixture P, Recovered Gas A, Recovered Gas B, and Recovered Gas C?*

Scenario 13

In 2011, Company A produced 180,000 lbs of substance X that met product specifications and was sold. Company A also produced 20,000 lbs of Substance X that was off-spec for color due to traces of a highly colored impurity, although its assay was approximately 99 percent Substance X. Company A reworked the off-spec Substance X by distillation to remove the impurity. The distilled Substance X met the color specification and was >99 percent pure. The recovered volume was approximately 20,000 lbs. Company X determined that their CDR-reportable volume of Substance X in 2011 was 200,000 lbs.

- *How does Company A report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*

- *Would the response to the question above be different if Company A never considered disposing of the off-spec Substance X as waste, but instead of purification, chose to sell it at a lower price into an application for which color did not matter?*

- *Is the purification activity reportable under Part III -- Processing and Use Information? If so, what is the appropriate code for the Type of Industrial Processing and Use?*

Scenario 14

In its chemical production unit, Company A uses carbon canisters to remove excess organic alcohol during the manufacture of another chemical substance. Company A sends used carbon canisters to Company Z, where Company Z removes the spent carbon to regenerate the carbon. The absorbed hydrocarbons are removed from the carbon through a heating process and are disposed of as waste. Company Z repacks the canister with fresh carbon, new and/or regenerated and sends the canisters back to Company A for use. Through its relationship with Company Z, Company A receives the regenerated canisters at a reduced fee.

- *Is Company A obligated to report under the CDR? If yes,*
  - *What does Company A report as the chemical identifying number?*
  - *What does Company A report as the volumes manufactured?*
  - *How does Company A report under the reporting element "Is Chemical Substance Being Recycled, Remanufactured, Reprocessed, or Reused?"*
- *What are the reporting obligations for Company Z?*

Scenario 15

Company X purchases and uses a palladium catalyst. The palladium catalyst is commercially supplied on a carbon support, which allows the catalyst to be in a finely divided state with a large surface area to increase its catalytic activity. Such a catalyst is described by the supplier as a mixture of palladium (CAS Number 7440-05-3) and carbon (CAS Number 7440-44-0), consistent with common industry practice. During use of the catalyst, the palladium becomes progressively more deactivated by adsorption of impurities onto the palladium surface. When its catalytic performance is no longer acceptable, the catalyst is sent to Company Y, a precious metal reclaimer, and Company X is credited for the value of the palladium. The process used by Company Y for catalyst regeneration is not known to Company X.

- *What are the reporting obligations for Company X? What chemicals are reportable? How should volumes for reportable chemicals be determined?*

Scenario 16

Company EG, a U.S. based company, sends outdated computers, cell phones, and other office equipment (*e.g.,* copiers, fax machines) to CR Recycling Group. There is no exchange of funding between Company EG and CR Recycling. CR Recycling Group may refurbish the equipment and resell to the general public, or it may take the components of the equipment and reuse within its own processes. As part of the procedure to re-use components, CR Recycling will extract metals used in solder within the outdated equipment for reuse. Company EG is not aware how CR Recycling will process the equipment it provides.

- *Is Company EG obligated to report under the CDR? If yes,*

- *What does Company EG report as the chemical identifying number?*
- *What does Company EG report as the volumes manufactured?*

- *What are the reporting obligations for CR Recycling Group?*

Scenario 17

Using information in Scenario 16, except Company EG is aware that the contributed office equipment will not be refurbished and will only be used to extract usable components, including metals.

- *Is Company EG obligated to report under the CDR? If yes,*

  - *What does Company EG report as the chemical identifying number?*
  - *What does Company EG report as the volumes manufactured?*

- *What are the reporting obligations for CR Recycling Group?*

Scenario 18

Using information in Scenario 16, except Company EG is not a U.S. based company, but sends its office equipment to CR Recycling Group, which is a U.S. company.

- *Is Company EG obligated to report under the CDR? If yes,*

  - *What does Company EG report as the chemical identifying number?*
  - *What does Company EG report as the volumes manufactured?*

- *What are the reporting obligations for CR Recycling Group?*