CHAPTER 3—EMISSIONS INVENTORY STRUCTURE

Emissions inventory information must be stored in a standardized manner that accurately represents a site's processes. This chapter aims to help you represent your processes properly. It begins with a section on identifying emission sources and a general discussion of how to represent these sources in the standardized emissions inventory format. The representation of sources in this standardized format is referred to as *EI structure*. Examples of common industrial processes and their appropriate structural representation are discussed. Finally, the chapter concludes with a section on modifying existing EI structure.

Identifying Emission Sources

To develop an accurate emissions inventory, each emission source at the site must be identified. Using all available tools—including, but not limited to, plot plans, site maps, comprehensive process flow diagrams, and your knowledge of the site's processes, list all equipment and operations that may result in air emissions, such as:

- combustion sources
- storage tanks
- loading operations
- piping component fugitive areas
- wastewater collection and treatment systems
- process areas (for example, building vents, process vents, or reactors)
- evaporative losses (for example, in surface coating, solvent degreasing, railcar or tank truck cleaning, or printing operations)
- plant roads

The emissions from each source have to be determined as recommended in the guidance in Chapter 4 and in the technical supplements (Appendix A). This information is used to determine EI structure.

Guidelines for Including Sources in Emissions Inventory Structure

Depending upon the type of emissions source, you will either need to add the emissions source to the EI as an individual source, group the emissions source with other similar sources, or **possibly** omit the source from the EI.

Sources That Must Be Added to the EI and That May Be Grouped as Collective Sources

Each emissions source at a site must be added to the EI if it meets **any** of the following criteria:

- the source emitted 1 ton or more of **any** regulated pollutant;
- the source emitted 0.1 ton or more of any toxic chemical or hazardous air pollutant; or
- you are required to include the source in your inventory's structure under any TCEQ enforceable document, such as a permit, regulation, or commission order.

If **individual** sources do **not** meet the requirements listed above, these sources may be omitted from the EI, provided that the collective emissions from **all** such unreported sources total less than 5 tons of any regulated pollutant and less than 1 ton of aggregate HAPs. If individual sources do not meet the requirements listed above, but exceed the collective emissions totals outlined above, then these sources must either be:

- individually added to the EI, or
- grouped according to the "Collective Sources" section of this chapter, and added as a collective source to the EI.

The EAS encourages the grouping of similar small emission sources. When creating a new path for grouped sources (grouped facilities) refer to the guidelines in the "Collective Sources" section. If small sources or small facilities are grouped in a permit, group these sources in a similar manner when adding them to the EIQ.

Representing the Structure of a Regulated Entity in the Emissions Inventory

For emissions inventory purposes, the term *facility* refers to a source, unit, device, structure, or area capable of generating air contaminants. The point where air contaminants are emitted to the environment is called the *emission point*. Some contaminants that may have an impact on the environment have to be controlled by an abatement device prior to being emitted at the emission point.

Facilities and Facility Identification Numbers

Each facility at the site must be identified. Examples of a facility include:

- a reciprocating engine
- a spray booth
- a chemical storage tank
- a flare

Each facility at your site must be given a unique alphanumeric code called a facility identification number (FIN). The FIN cannot be longer than10 characters. Examples of possible FINs for the facilities listed above are:

- COMP01
- SPRBTH
- TANK03
- FLR

Every FIN must be linked to at least one emission point.

Emission Points and Emission Point Numbers

An emission point is the spatial location (point) where emissions enter the air. Every facility has at least one emission point; therefore, each emission point at the site must be identified. Examples of emission points include:

- an engine exhaust stack
- a spray-booth vent
- a process fugitive area
- a building vent

Each emission point must be given a unique alphanumeric code called an *emission point number*. The EPN cannot be longer than to 10 characters. Examples of possible EPNs for the emission points listed above are:

- STK1A
- VENT
- FUG
- BLDGVENT

Every EPN must be linked to least one facility.

Abatement Devices and Control Identification Numbers

An *abatement device,* also called a *control device,* is a piece of equipment or a recognized operational procedure that limits, controls, or abates emissions. Each abatement device at the site must be identified. Examples of abatement devices include:

- a flare
- a scrubber
- a condenser
- a vapor recovery unit
- a fugitive leak detection and repair program

Each abatement device must be given a unique alphanumeric code called a control identification number. The CIN cannot be greater than 10

characters. Examples of possible CINs for the abatement devices listed above are:

- FLR
- SCRUB4
- VAPORCOND
- VRU
- LDAR2

Every CIN must be associated with at least one facility (identified by a FIN) that is linked to an emission point (identified by an EPN).

Some control devices, such as thermal oxidizers and flares, also create emissions and must be represented as both facilities and control devices. For more information on this subject, refer to "Representing Combustive Abatement Devices" later in this chapter.

Emission Paths

An emission path is the route a contaminant must travel from the facility to the abatement device to the atmosphere via the emission point. Every emission path must include at least one facility and one emission point.

Refer to Figure 3-1 for an example of the emission paths for a site that has all of the following facilities, abatement devices, and emission points:

- a spray booth with a filtered vent
- a two-stack engine without catalytic reduction
- a process fugitive area not subject to an LDAR program

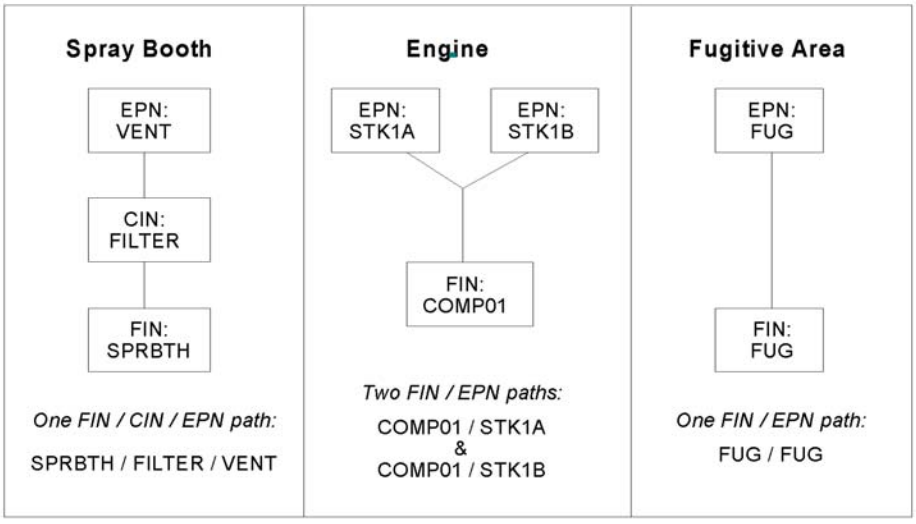

Figure 3-1. Emission Paths

Collective Sources

Small emission sources or facilities that emit a small amount of emissions, have similar Source Classification Codes, and emit similar emissions may be grouped as one collective emission source. The collective emission source will be given a unique FIN and be added to the EI. A small emission source or a small facility must meet **all** of the following criteria:

- the source emitted less than 1 ton of each regulated pollutant;
- the source emitted less than 0.1 ton of any toxic chemical or hazardous air pollutant; and
- the source is not required to be included in the inventory's structure under any other TCEQ enforceable document, such as a permit or a commission order.

For example, 20 similar aggregate storage piles each emitted 0.5 tpy of PM_{10}. These emissions need to be represented in the EIQ since collectively the storage piles emitted 10 tpy of PM_{10}. If the storage piles are not individually represented in any permits, they could be grouped together under a single facility.

If small sources or small facilities are grouped in the regulated entity's air permits, group these sources as collective FINs in a similar manner when adding them to the EIQ. Use the following guidelines when adding collective sources to the EIQ.

Facility Guidelines

Group only those sources with similar SCC and similar emissions as one collective facility. Create different collective FINs for each distinct type of process and equipment. Examples of different source types that can be grouped in a collective FIN include:

- solvent cleaning areas and equipment
- painting areas and equipment
- piping component fugitive areas
- VOC loading operations
- tanks
- internal combustion sources
- external combustion sources
- other sources as appropriate

Emission Point Guidelines

Unless all of the sources in a collective facility group vent to a common control device, a collective facility group should have a fugitive area emission point.

- Complete the Emission Point Information—Fugitive form for the fugitive area emission point. The length and width of the fugitive area is the length and width of the entire site and the height of the fugitive area is 3 feet.
- If the collective emission point is represented in any air permits for the site, the TCEQ recommends using the same naming convention as the air permit when assigning the EPN; otherwise, the EPN can begin with the character string "GRP" such as EPN: GRPTANKS or EPN: GRPSOURCES.
- When supplying UTM coordinates for the collective emission point, use the UTM coordinates for the site centroid.

Abatement Device Guidelines

Add abatement devices to collective facilities. If the abatement device only abates certain sources in the grouped facilities, note this in the "Path Comments" portion of the EIQ.

If you need assistance with collective source structure, please contact the EAS Help Line at 512-239-1773.

Representing Combustive Abatement Devices

Most abatement devices do not generate their own emissions and should therefore appear only as control devices within EI structure. However, a combustive abatement device generates emissions while burning contaminants and must appear in the EI structure as an abatement device and as an emissions source.

Emergency flare structure is similar to process flare structure, except that you may not need to link an emergency flare to each individual facility. If an emergency flare controls emissions from a large number of sources, then associating it with each facility would greatly increase the inventory's size without substantially improving its quality. For emergency flares, the emissions path will be from the process to the abatement device to the flare. Thus, you would create the path FIN: PROCESS / CIN: FLARE / EPN: FLARE. All undestroyed VOC emissions should be reported in this path. Another emissions path will have to be created to report the emissions generated by the combustion of emissions at the flare. The products of combustion will be reported in the emissions path from the flare to the flare.

If you need assistance with establishing correct flare structure, please contact the EAS.

Appropriate Structural Representation of Common Industrial Processes

This section discusses appropriate structural representation of some common emissions sources. If you need assistance with establishing the correct structure for a process, please contact the EAS.

Cooling Towers

In order to promote data consistency within the STARS database, represent each cooling tower as one facility with one associated **stack** emission point, regardless of whether it is a natural-draft or a mechanical-draft tower. A mechanical-draft tower with multiple cells should also be considered one facility with one stack emission point; the number of cells should be represented as one of the parameters under the FIN group and profile characteristics on the EIQ.

Cooling towers are designed with drift eliminators. A drift eliminator is part of a cooling tower's basic design and is not considered an abatement device from a structural standpoint.

Glycol Units and Amine Units

For the purposes of establishing EI structure, treat an amine unit as you would a glycol unit, using the following guidance.

Two paths are needed to represent each glycol unit: a still path for reporting emissions from the gas-stripping process, and a reboiler path for reporting combustion emissions. If still and reboiler emissions are vented through different stacks, then you will need to represent the unit by two facilities linked to two different emission points, as in Figure 3-2.

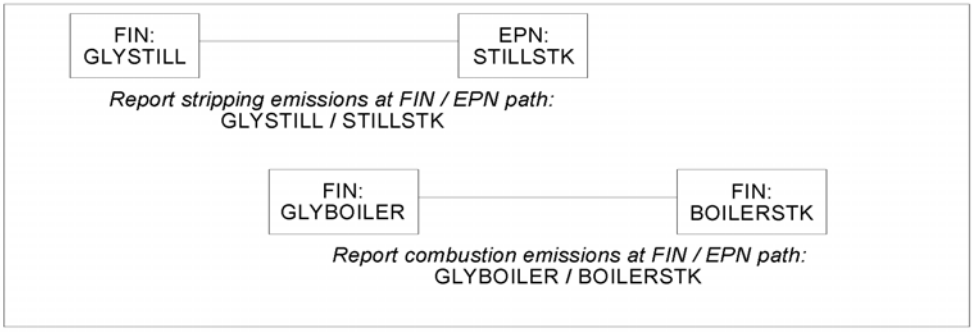

Figure 3-2. Glycol Unit Structure—Separate Still and Reboiler Vents

If still emissions and reboiler emissions vent through a common stack, then you will need to represent the glycol still and reboiler by two facilities linked to a single emission point. This structure is demonstrated in Figure 3-3.

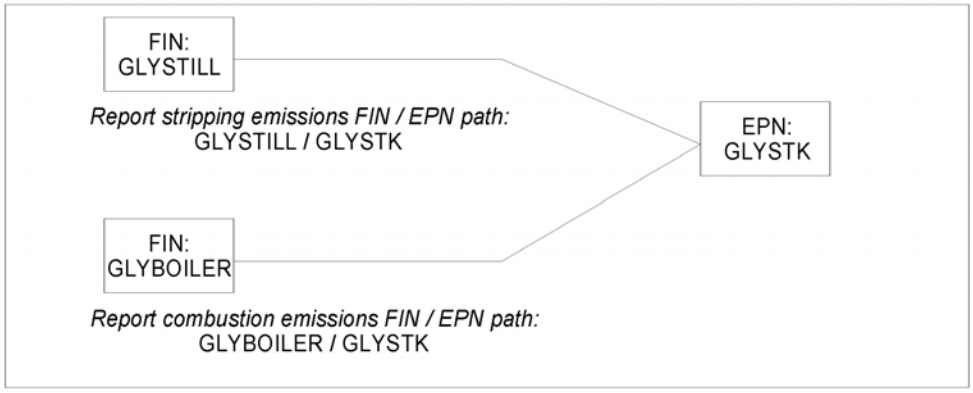

Figure 3-3. Glycol Unit Structure—Common Still and Reboiler Vents

If glycol still emissions are routed to a flare, then you should represent the still and reboiler as shown in Figure 3-4.

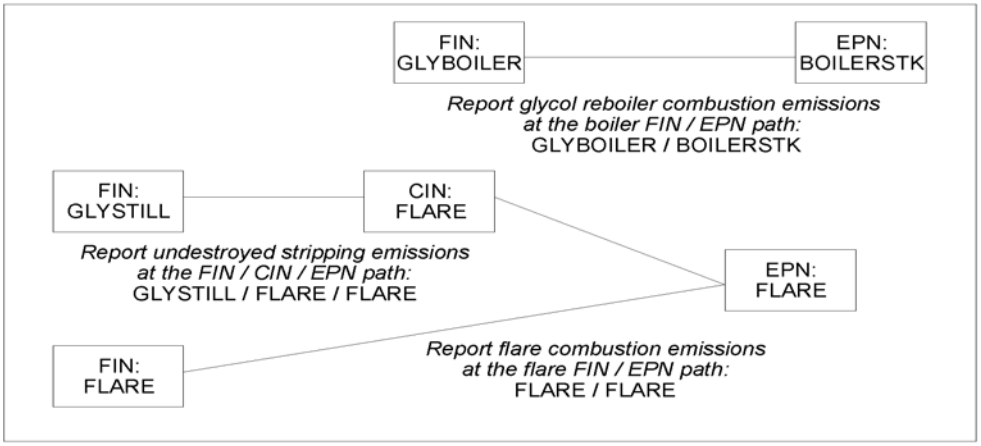

Figure 3-4. Glycol Unit Structure—Flared Still Emissions

If glycol still emissions are routed through the reboiler and combusted, then you should represent the still and reboiler as shown in Figure 3-5.

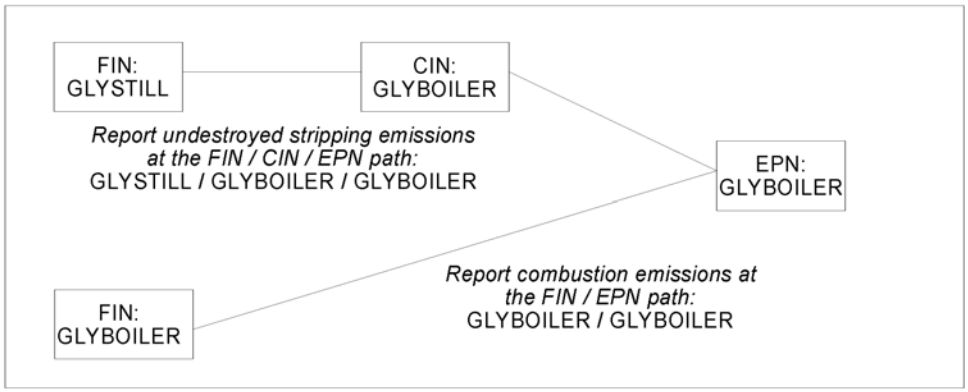

Figure 3-5. Glycol Unit Structure—Still Emissions Routed Through Reboiler

Sulfur Recovery Units

An SRU is not an abatement device, but rather a unit generating hydrogen sulfide emissions. Some common SRU structures are shown in Figures 3-6 through 3-9.

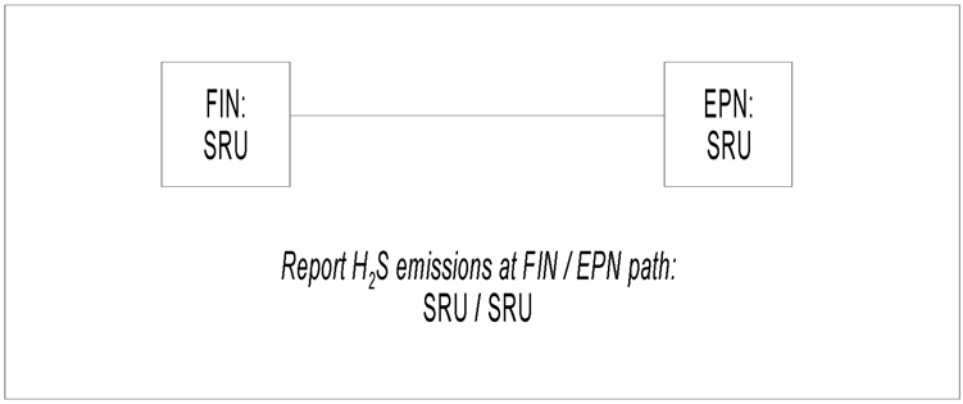

Figure 3-6. Sulfur Recovery Unit—Unabated

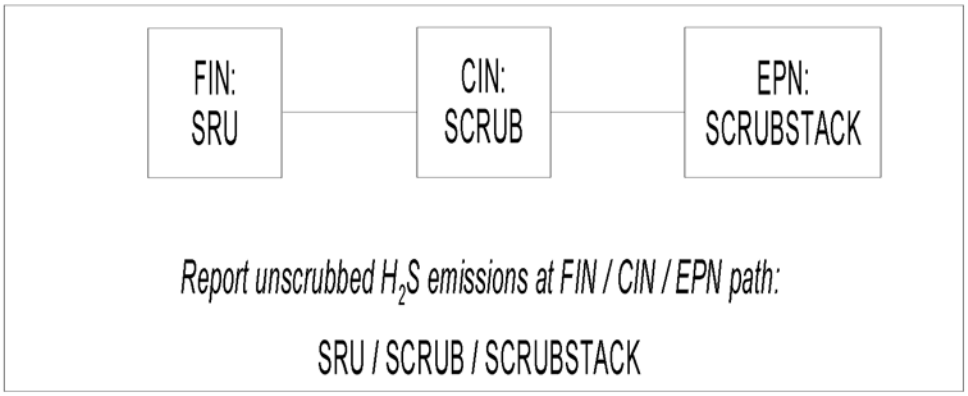

Figure 3-7. Sulfur Recovery Unit with Scrubber

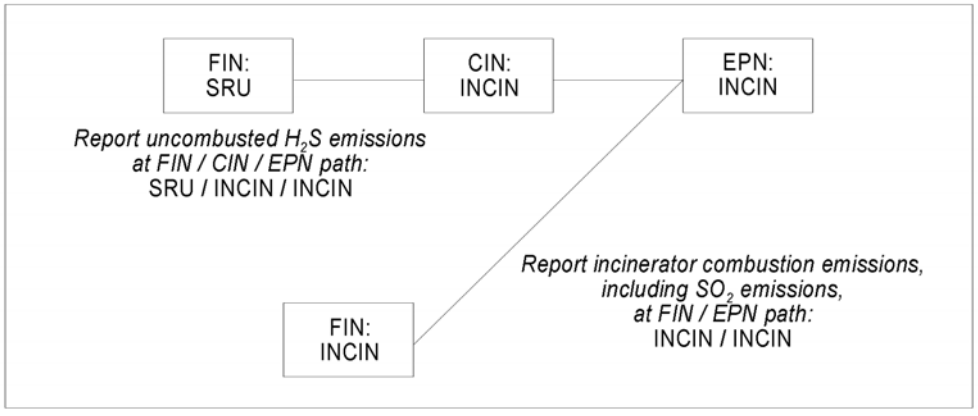

Figure 3-8. Sulfur Recovery Unit with Incinerator

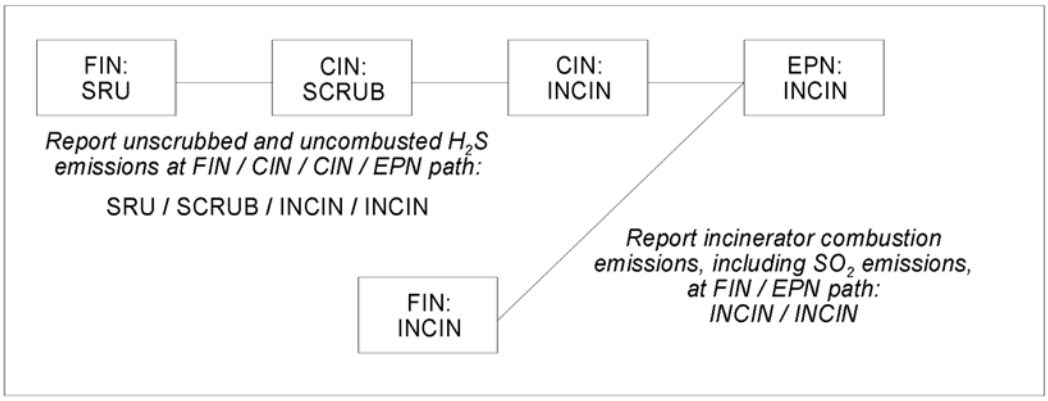

Figure 3-9. Sulfur Recovery Unit with Scrubber Prior to Incinerator

Loading Operations

If loading emissions are not routed to an abatement device, then represent the emissions path from each separate loading area to a single fugitive-type emission point (Figure 3-10).

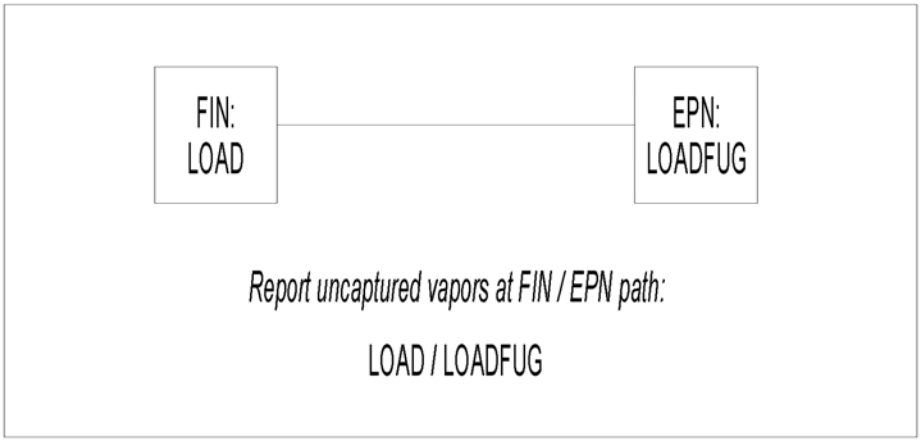

Figure 3-10. Loading Area—Unabated

If loading emissions are controlled, the emissions paths will be from the loading operation to the fugitive loading area and the flare emission points. Report the uncaptured vapors that are not routed to the flare at the fugitive loading area emission point. Report the emissions from the captured, undestroyed vapors at the abatement device. Figure 3-11 illustrates proper structure for a loading area controlled by a flare.

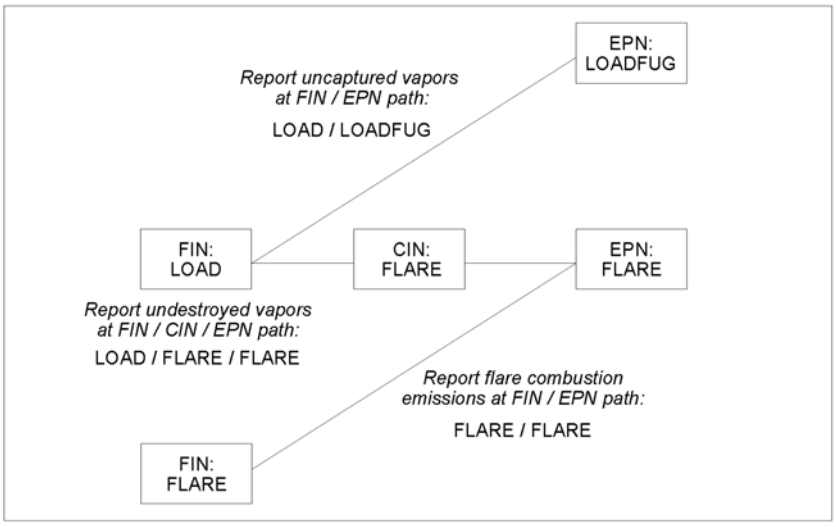

Figure 3-11. Loading Area Controlled by a Flare

Blowdown Operations

Compressor engines and other forms of process equipment are routinely taken offline for periodic maintenance or emergency shutdown. Before maintenance can be performed, the gas in the lines is usually vented. These vented gases can result in significant emissions depending on maintenance schedules, line pressures, and the volume of gas released. The emissions can either be vented to the atmosphere or sent to a control device.

Blowdown emissions should be reported at a VOC Process facility path if combustion and blowdown emissions are vented through separate stacks, as in Figure 3-12.

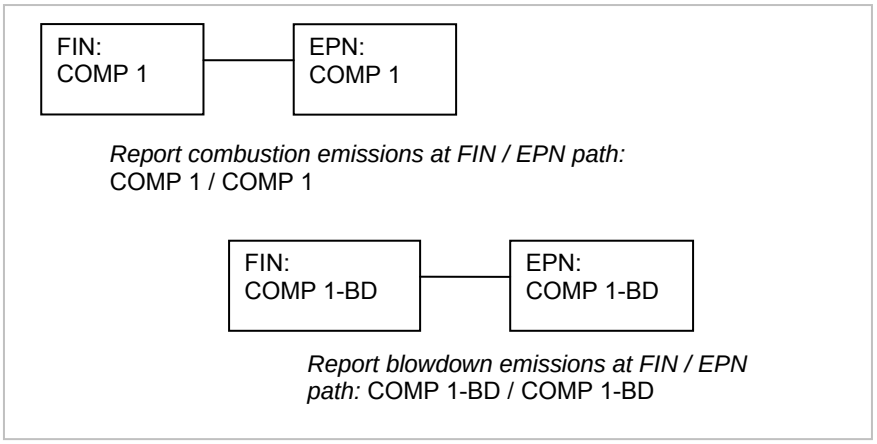

Figure 3-12. Blowdown Operations Structure—Separate Compressor Engine and Blowdown Vents

If combustion and blowdown emissions are vented through the same stack, then you would represent the structure as shown in Figure 3-13.

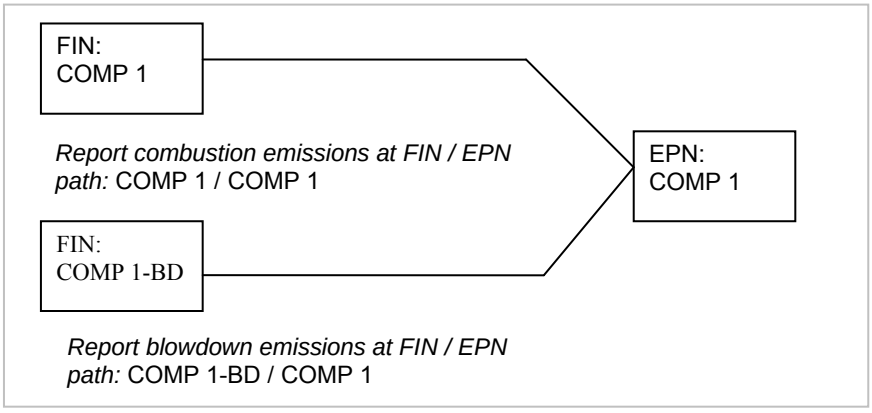

Figure 3-13. Blowdown Operations Structure—Common Compressor Engine and Blowdown Vent

If blowdown operations are routed to a flare, then you should represent the combustion and blowdown emissions as shown in Figure 3-14.

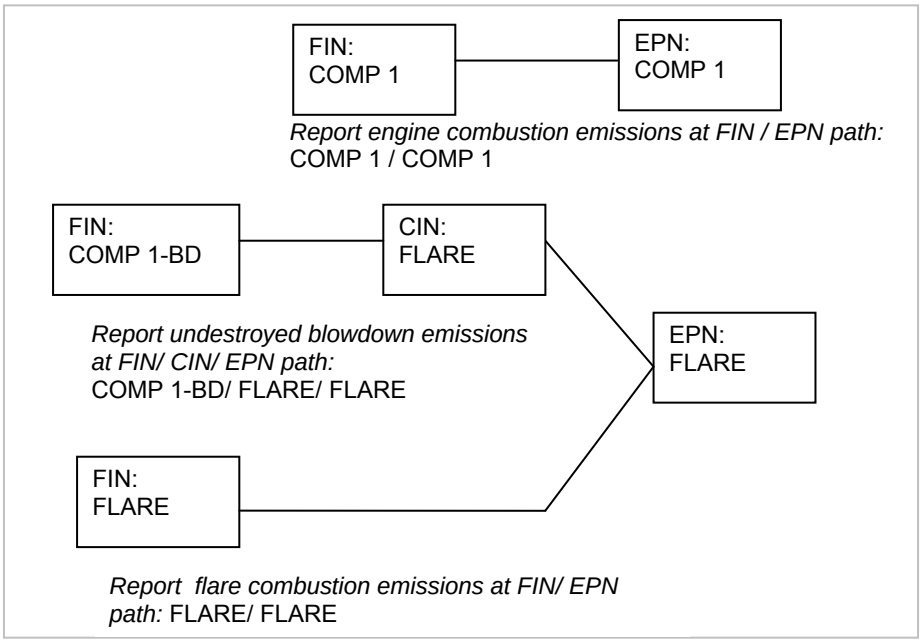

Figure 3-14. Blowdown Operations Structure—Flared Blowdown Emissions

If the blowdown operations do not meet the individual source reporting requirements, the emissions can be grouped together as a collective emission source. One facility and one emission point can represent two or more collective blowdown operations facilities, as shown in Figure 3-15.

See Collective Emission Sources in this chapter for details on collective emission source reporting requirements and how to represent the emission point.

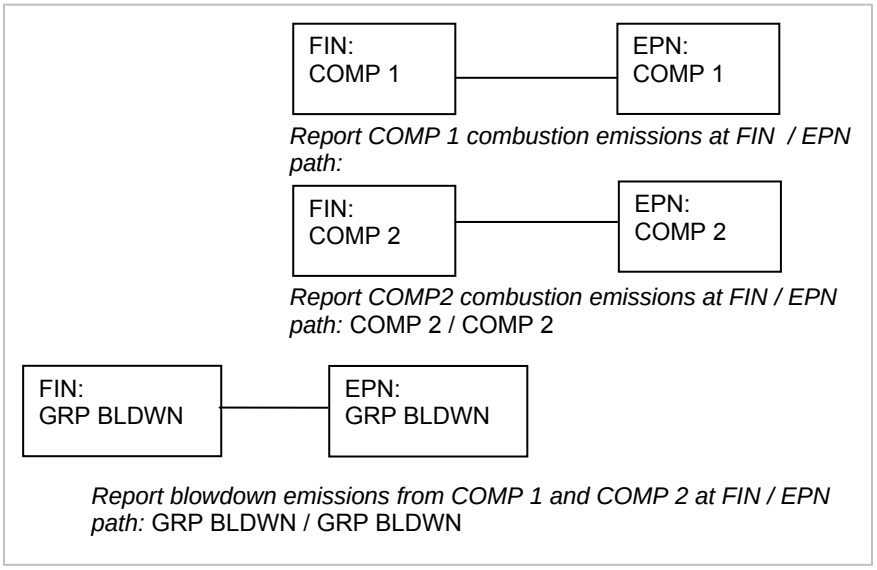

Figure 3-15. Blowdown Operations Structure—Grouped Compressor Blowdowns

Surface Coating Operations

If emissions from a paint booth are completely uncontrolled, then represent the booth by a single facility and emission point path (Figure 3-16). If emissions are filtered to control particulate emissions, then add the filter as the abatement device (Figure 3-17). If paint booth emissions are routed to an incinerator to control VOC emissions, then represent the booth as shown in Figure 3-18.

Figure 3-16. Paint Booth—Unabated

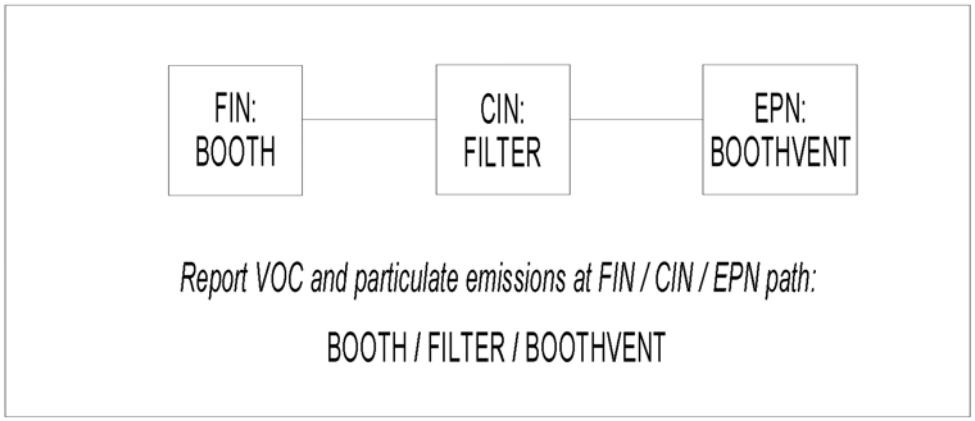

Figure 3-17. Paint Booth—Particulate Emissions Abated by a Filter

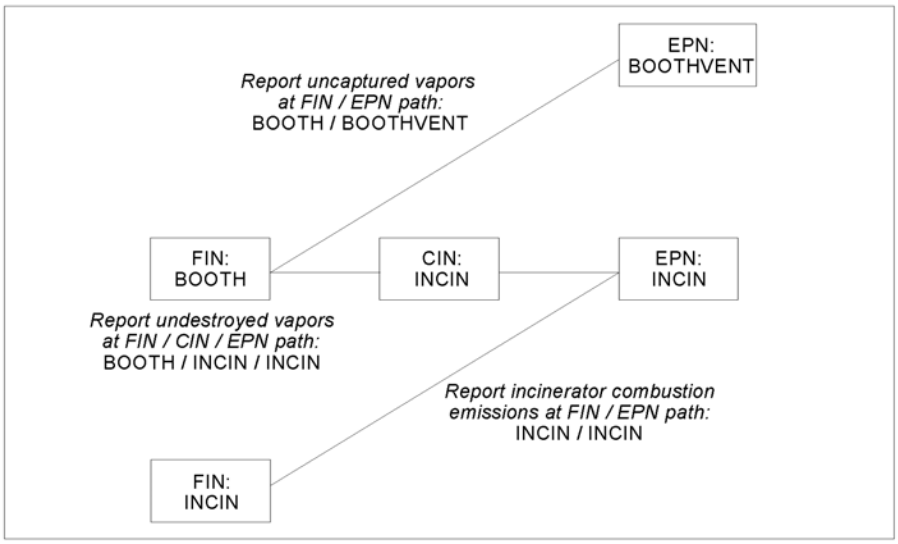

Figure 3-18. Spray Booth Controlled by an Incinerator

If coated surfaces are heat-dried, be certain to include the drier in the EI structure.

Aggregate Operations

Emission sources from aggregate operations include storage piles and material transport and processing operations, such as crushing, grinding, milling, mixing, calcinating, and kilning. Represent each step in material storage, transport, and processing with a separate path made up of a unique FIN and EPN.

Classify aggregate storage piles by material type and particle size—for example, a site using a water-spray system to control emissions from a

fine-particle pile and a coarse-particle pile composed of the same material, as shown in Figure 3-19.

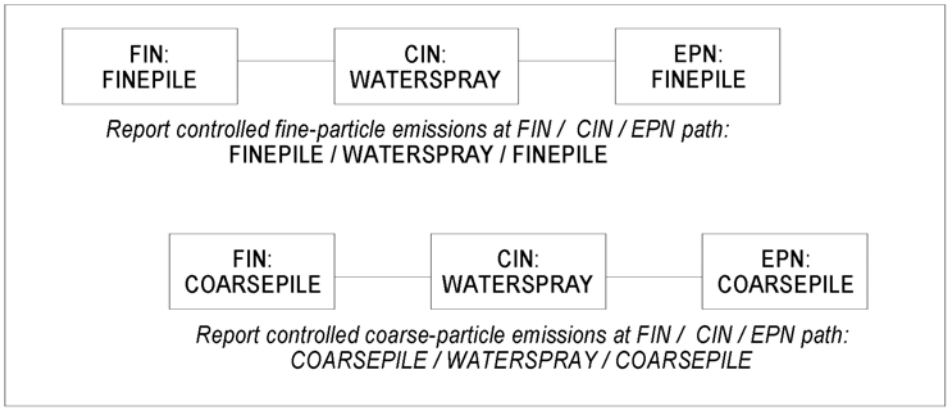

Figure 3-19. Fine and Coarse Piles—Emissions Controlled by Water Spray

Separate batch from continuous material-transport operations. For example, an operation moving limestone in batches from a quarry to a storage pile, then continuously feeding the limestone into a process stream, as shown in Figure 3-20.

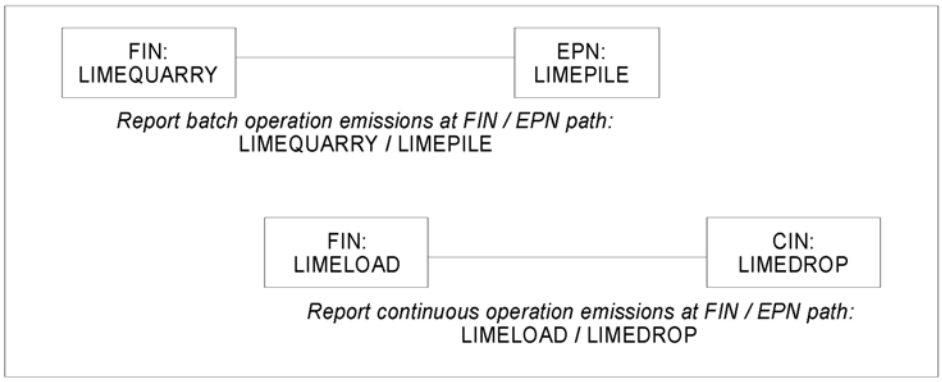

Figure 3-20. Continuous and Batch Operations Separated

Rather than grouping all conveyor transport operations under a single FIN / EPN path, represent each of the conveyor's interdependent operating systems separately. For example, a conveyor system that has both a fine- and a coarse-particle process line should have an emissions path for each line. This structure is shown in Figure 3-21.

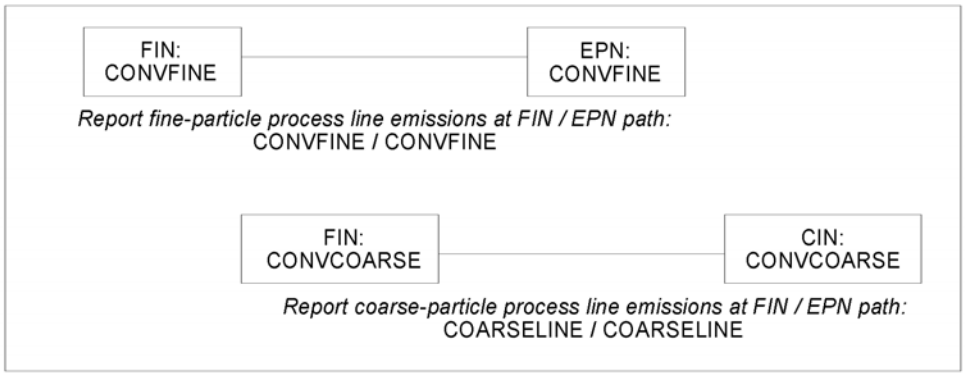

Figure 3-21. Conveyor Transport—Interdependent Systems

Marine Operations

Rather than reporting all marine losses at a single FIN / EPN path, you should uniquely identify each individual equipment or process type in your inventory. This section addresses correct structure for several common marine operations. Please contact the EAS if you require additional guidance on representing the structure of your marine facility.

Loading and Unloading Bulk Liquids

If loading operations are uncontrolled, represent the emissions path from one or more vessels as shown in Figure 3-22.

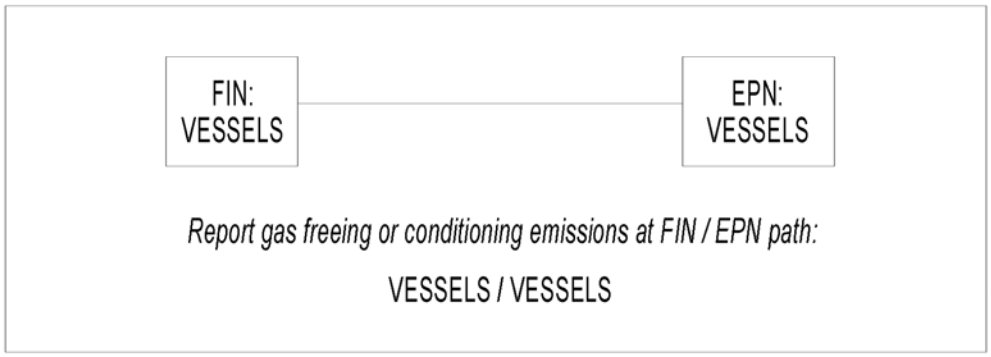

Figure 3-22. Uncontrolled Bulk Material Liquid Emissions

If loading operations use a vacuum-assisted vapor recovery system, any uncollected emissions should be reported at the vessel, with the balance of emissions reported at the onshore equipment serving as a control device. Figure 3-23 shows an example of correct structure.

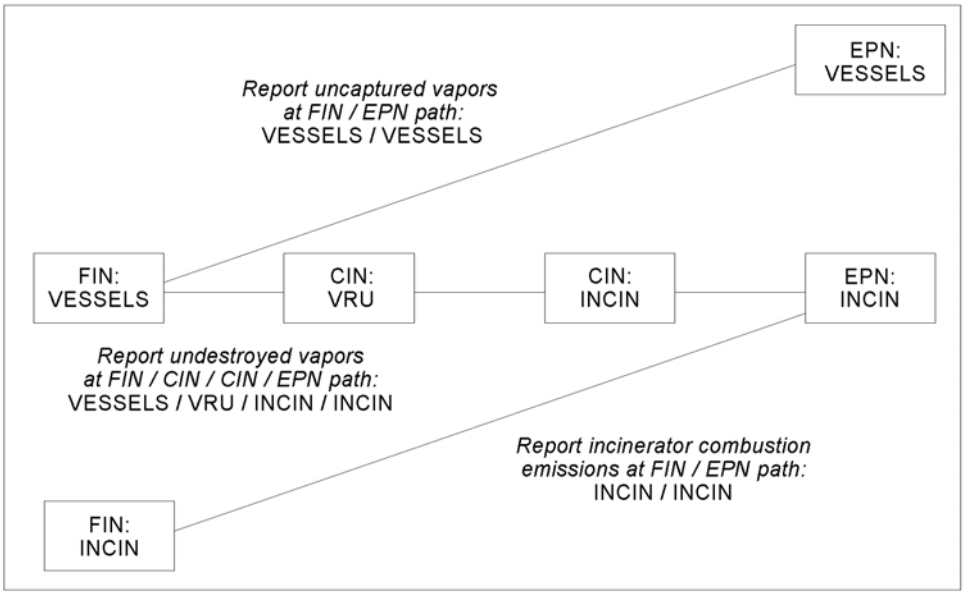

Figure 3-23. Liquid Loading Controlled by a Vapor Recovery Unit and Routed to an Incinerator

Loading and Unloading Bulk Liquefied Gaseous Materials

Since pressurized marine vessel compartments do not normally release to the atmosphere, loading and unloading bulk liquefied gaseous materials may generate fugitive emissions from equipment leaks. These should be reported at the appropriate equipment leak fugitive area on the dock.

If gas freeing or gas conditioning is performed, emissions should be reported at the FIN / EPN path representing the vessel or vessels. See Figure 3-24.

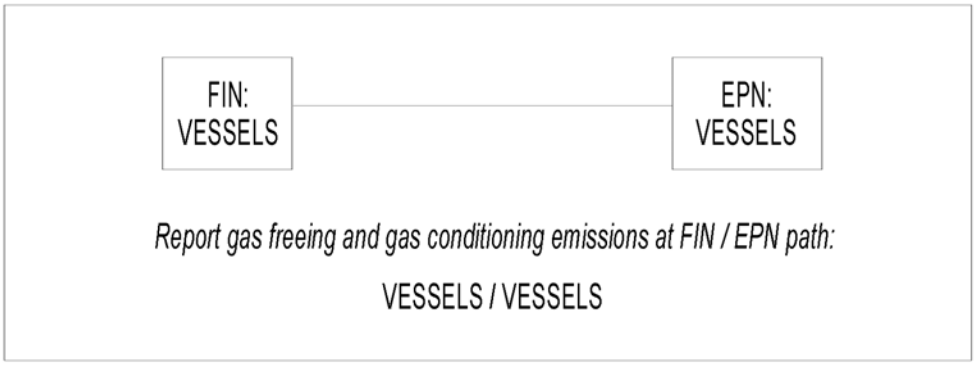

Figure 3-24. Uncontrolled Degassing and Cleaning Emissions

Loading and Unloading Solid Bulk Materials

Although unloading operations are not limited to the use of hoppers or pneumatic systems, those are perhaps the most common methods. Pneumatic systems transfer material to silos or storage tanks, where air is separated from the material and vented to a baghouse or cyclone. An example of this structure appears in Figure 3-25.

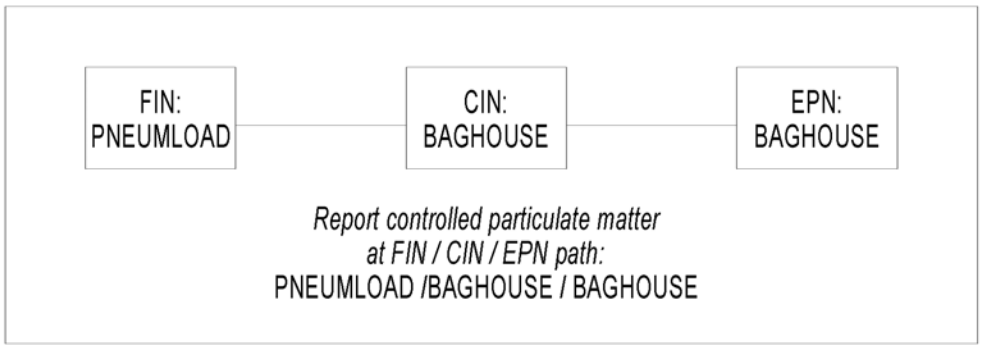

Figure 3-25. Pneumatic Transfer of Solids Controlled by a Baghouse

Degassing and Cleaning Liquid Vessel Compartments

Emissions from liquid vessel cleaning and degassing will occur either from the vessel itself (if the vessel does not have a vapor recovery system) or from the shore-based control equipment. See Figures 3-26 and 3-27.

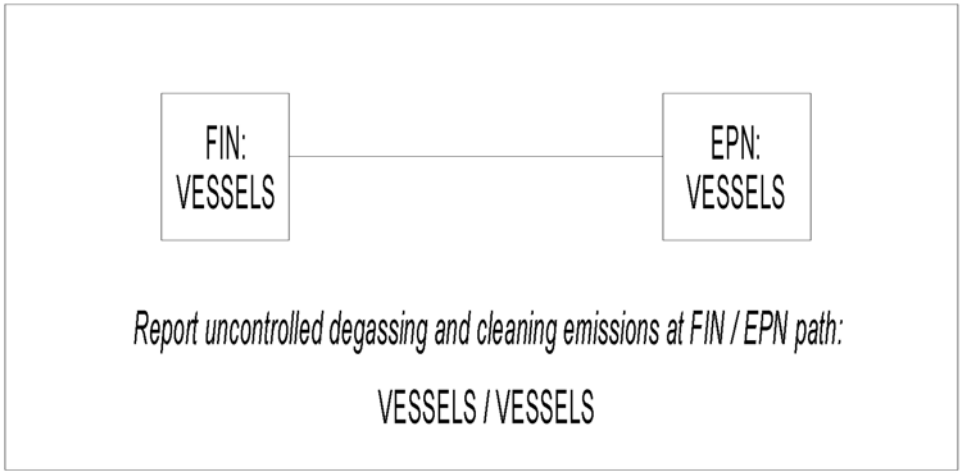

Figure 3-26. Uncontrolled Degassing and Cleaning Emissions

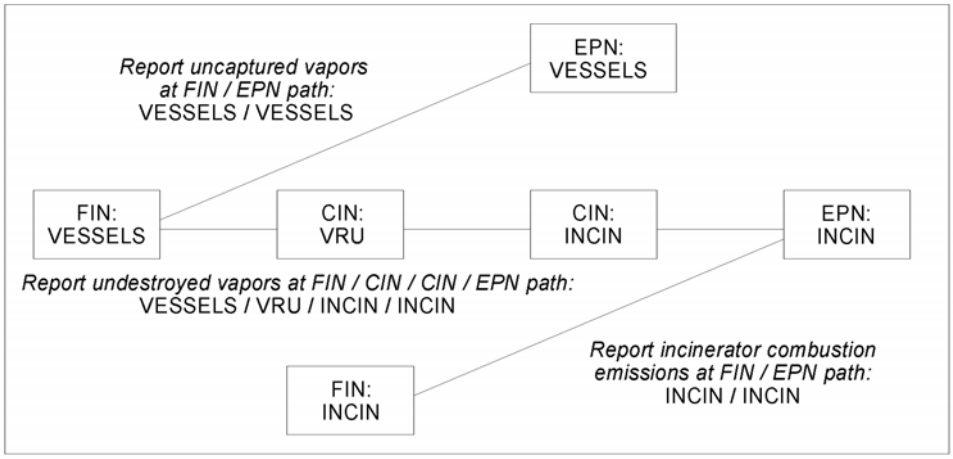

Figure 3-27. Degassing and Cleaning Emissions Captured by a VRU and Routed to an Incinerator

Wastewater Collection and Treatment

Because wastewater collection and treatment involve several different processes, you should not represent an entire wastewater collection and treatment system by a single path. Instead, represent each of the system's processes, including collection, by a unique FIN / EPN path. For assistance with establishing or modifying your wastewater plant's structure, contact the EAS.

Chemical Production

Do not represent an entire chemical plant by a single facility linked to multiple emission points. If you wish to group emission sources by plant, you may assign each group a unique plant identification number. You should assign each source within a plant a unique FIN / EPN path.

Chemical plant structures vary widely. For assistance with establishing or modifying your plant's structure, contact the EAS.

Modifying Existing Emissions Inventory Structure

If the EI structure is incorrect, or if it has changed because new equipment has been added or existing equipment has been newly linked, then you will need to modify the structure by submitting the appropriate forms available in *2008 Emissions Inventory Forms and Instructions* (publication number RG-360B) or at the EAS Web page, <www.tceq.state.tx.us/goto/ieas>. The remainder of this chapter tells how to make common structural modifications.

Removing Structure

For historical reasons, the EAS does not normally delete structure or emissions records. If a facility has been permanently shut down or removed from the site, simply change its status accordingly and zero all emission rates. If a facility operated at any time during the emissions inventory year, you must list its operating status as "active."

Changing Facility and Emission Point Designations

The EAS does not normally allow changes to facility or emission point designations due to the historical nature of emissions data. Exceptions to this policy will be made to correct errors or to align EI nomenclature with permit nomenclature. If you feel revisions to facility or emission point designations are necessary, submit a Revision Request form available in the *2008 Emissions Inventory Forms and Instructions* (RG-360B) or on the EAS Web page, <www.tceq.state.tx.us/goto/ieas>. Be sure to give a reason for the requested revisions. The EAS reserves the right to approve or disapprove all such revision requests.

Adding a New Emission Point to an Existing Facility

To add a new emission point to an existing facility:

- list the new path on one line of the Structural Overview form;
- complete an Emission Point Information form; and
- complete a Path Emissions form, noting that the facility "Already exists in STARS database."

Example: If you wish to link a new flare, EPN: FL, to an existing tank, FIN: TK, you will need to:

- enter the new FIN: TK / CIN: FL / EPN: FL path on the Structural Overview form, since the flare will also act as a control device to control the tank's emissions;
- complete an Abatement Device Information form for the flare;
- complete an Emission Point Information form for the flare, including the form's Flare Information section;
- complete a Path Emissions form for the FIN: TK / CIN: FL / EPN: FL path, noting that the FIN: FL "Already exists in STARS database";
- enter the new FIN: FL / EPN: FL path on the Structural Overview form because the flare is also an emissions source (a facility) in this case;
- complete the Facility Information for a Flare Combustion Unit form for the flare;
- complete a Path Emissions form for the FIN: FL / EPN: FL path; and

- complete a Material Throughput for Combustion Units form for the flare.

Adding a New Facility to an Existing Emission Point

To add a new facility to an existing emission point:

- list the new path on one line of the Structural Overview form;
- complete the appropriate Facility Information form as determined by the nature of the facility (combustion unit, storage tank, wastewater facility or other);
- complete a Path Emissions form, noting that the EPN: FL "Already exists in STARS database"; and
- complete the appropriate Material Throughput form.

Example: If you wish to add a new tank, FIN: TK, whose emissions are routed to an existing flare, EPN: FL, you will need to:

- enter the new FIN: TK / CIN: FL / EPN: FL path on the Structural Overview form;
- complete the Facility Information for Storage Tanks form for the tank;
- complete a Path Emissions form for the FIN: TK / CIN: FL / EPN: FL path, noting that the EPN: FL "Already exists in STARS database"; and
- complete a Material Throughput for Storage Tanks form for the tank.

Linking an Existing Facility to an Existing Emission Point

To connect an existing facility to an existing emission point:

- list the new path on one line of the Structural Overview form and
- complete a Path Emissions form, noting that the FIN and EPN each "Already exists in STARS database."

Example: If an existing tank, FIN: TK, is being connected to an existing flare, EPN: FL, you will need to:

- enter the new FIN: TK / CIN: FL / EPN: FL path on the Structural Overview form and
- complete a Path Emissions form for the FIN: TK / CIN: FL / EPN: FL path, noting that the FIN:TK and EPN:FL each "Already exists in STARS database."

Adding a New Abatement Device to an Existing FIN / EPN Path without Changing the Emission Point

To add a new abatement device to an existing FIN / EPN path, leaving the emission point unchanged:

- list the new path on one line of the Structural Overview form;
- complete an Abatement Device Information form; and
- complete a Path Emissions form for the new path, noting that the facility and emission point each "Already exists in STARS database."

Example: To add a catalytic converter, CIN: CC, to an existing engine path FIN: COMP / EPN: STK, you need to:

- enter the new FIN: COMP / CIN: CC / EPN: STK path on the Structural Overview form;
- complete an Abatement Device Information form for CIN: CC;
- and complete a Path Emissions form for the new path, noting that the FIN: COMP and EPN: STK each "Already exists in STARS database."

Adding a New CIN / EPN Path to an Existing Facility, Unlinking the Old Emission Point, and Linking the New CIN / EPN Path

To add a new abatement device to an existing FIN path, deactivate the old abatement device, and activate the new CIN / EPN path:

- list the new path on one line of the Structural Overview form;
- complete an Abatement Device Information form;
- complete an Emission Point Information form for the new emission point;
- complete a Path Emissions form for the new path, noting that the facility "Already exists in STARS database"; and
- mark the status of the old path on the EIQ (where the facility is linked to the old emission point) as "DEACTIVATED."

Example: Suppose that all emissions from an existing tank, FIN: TK, are now sent to a new flare, EPN: FL. Then you will need to:

- enter the new FIN: TK / CIN: FL / EPN: FL path on the Structural Overview form;
- complete an Abatement Device Information form for the flare;
- complete an Emission Point Information Flare form for the flare;
- complete a Path Emissions form for the FIN: TK / CIN: FL / EPN: FL path, noting that the FIN:TK "Already exists in STARS database";
- mark the status of the FIN / old EPN path as appropriate on the EIQ;
- enter the new FIN: FL / EPN: FL path on the Structural Overview form, because, in this case, the flare is also an emissions source (a facility);
- complete the Facility Information for Flare Combustion Units form for the flare;

- complete a Path Emissions form for the FIN: FL / EPN: FL path; and
- complete a Material Throughput for Combustion Units form for the flare.

Adding an Existing Abatement Device to an Existing FIN / EPN Path without Changing the Emission Point

To add an existing abatement device to an existing FIN / EPN path, leaving the emission point unchanged:

- list the new path on one line of the Structural Overview form and
- complete a Path Emissions form for the new path, noting that the facility, emission point, and abatement device "Already exists in STARS database."

Adding an Existing Abatement Device to an Existing Facility, Unlinking the Old Emission Point, and Linking the New CIN / EPN Path

To add an existing abatement device to an existing facility, deactivate the old emission point, and activate the new CIN / EPN path:

- list the new path on one line of the Structural Overview form;
- complete an Emission Point Information form if the abatement device is not already an emission point elsewhere in the EIQ;
- complete a Path Emissions form for the new path, noting that the facility, emission point, and abatement device each "Already exists in STARS database"; and
- mark the status of the old path on the EIQ (where the old facility is linked to the old emission point) as "DEACTIVATED."