The COMPASS User's Manual

Compliance Assurance System
Emission Calculation and Process History Module

"COMPASS-Calcs"

Process Data Control Corporation

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION TO CALCS

1.1 About Calcs

The COMPASS Emission Calculation and Process History ("COMPASS-Calcs" or "Calcs") module facilitates the collection, storage, and reporting of Air Emissions data, including emissions inventory and calculations, and Title V permitting. Other modules of PDC's COMpliance ASsurance System (COMPASS) handle MSDS management, and other environmental, health, and safety compliance needs.

Calcs incorporates data from such items as stream composition and process rate, and computes overall emission calculations needed for reporting purposes. Once the data is calculated, it can be automatically updated in the EI (Emission Inventory) section of COMPASS.

1.2 Manual Procedures Affected by Calcs

Maintaining Process Data from plant operations – manual procedures that have been used to record process data from plant operations that are pertinent to emission calculations, such as fuel usage, run times, and throughputs, would likely be discontinued in favor of using the Calcs module, for the following reasons:

a. Although process data can be manually inputted into Calcs, many users find it more convenient to export spreadsheets containing the previous year's process data for Sources of a particular type (e.g., Tanks), and then ask process engineers or supervisors to provide the current year's data. These updated spreadsheets can be imported into Calcs using standard program features.

b. Process data that has been updated in Calcs can immediately be used to calculate and characterize air emissions, because the "set-up information" for each Source's calculation regime, such as formulas, factors, and stream compositions, are usually defined in the system and require no updates.

c. Calcs maintains process data in its database for every year that it was used, and enables users to retrieve the data and the emissions that were calculated based on the data with minimal effort. In addition, users can re-calculate emissions for prior years by changing the process data for that year, applying, at their option, either currently assigned formulas and factors, or the ones assigned in the previous year (unless they were deleted or modified).

Calculating Emissions – the manual procedure for calculating emissions in CPC facilities, as in most other plant where programs such as Calcs are not used, involves inputting process data into MS Excel workbooks where the formulas, factors, and streams have been provided to enable a calculation of air emissions. These workbooks tend to be calendar year-specific, complex, and extremely large – factors that create special challenges for users in organizing, archiving, and using them. They also present significant challenges to making alterations or updates because calculation methodologies are not explicitly defined but, rather, exist in hidden areas that would be familiar only to the workbook author, such as cell formulas, pivot tables, and macro code. Because Calcs contains explicit and readily observable methods for calculating emissions and speciating chemical-specific emissions from "Total VOC," users generally find that calculating emissions in Calcs offers a superior work process than XLS-based approaches.

Responding to Emission Calculation Questions from the TCEQ - the manual procedure for responding to TCEQ questions about how emissions were calculated usually involves a "cut and paste" of data from one or more worksheets. The process of extracting portions of the data contained in spreadsheets that contain macros and formulas can itself be very challenging, but the major drawback for manually preparing responses to TCEQ questions is the fact that the excerpted data rarely explains how calculations were done. Thus, CPC staff must describe their calculation methods in e-mails or letters, which introduces the possibility of inadvertently making an incorrect statement in such documents. Calcs provides a special "Emission Calculation Parameters" report that can be produced for any Source, or group of Sources, with little time or effort. That report presents the values of relevant process information used in the calculation, the emission calculation results, and all aspects of the methodology, such as formulas, factors, and stream compositions. In addition, this report always provides an accurate summary of the methods and data that were employed in the calculation of emissions for which questions have been raised, so there is no chance of erroneously explaining them to the TCEQ.

1.3 System Requirements

The following platform is strongly recommended to operate the Calcs application:

- Pentium II PC running at 250 MHz. with 64 megabytes of RAM and 50 megabytes of free disk space.

The following platform is the minimum required to operate the EI application:

- Pentium I PC running at 90 MHz. with 25 megabytes of free disk space and 32 megabytes of RAM to obtain reasonable performance.

The following operating systems are supported:

- Microsoft Windows 95, Windows 98, Windows ME, Windows XP or Windows NT Operating Environment, (all Trademarks acknowledged).

The following Database Management System (DBMS) software is supported for the Data Repository:

- ORACLE 7.3 and higher, Sybase SQL Anywhere 5.5 and higher.

1.4 Installation Instructions

Directions for the installation are furnished in a separate document entitled "Installation Instructions," which is provided with this operations manual. Calcs should always be loaded onto a local or network hard disk under the directory structure: <drive>:\... \PDC\ACM\CALCS. The installation program creates this structure below the target installation folder chosen by the user.

The installation routine creates a COMPASS folder under the programs group on the Start menu with the Calcs icon in place. Double click on the *Calcs* icon to enter Calcs. A login screen will appear asking for your User I.D. and Password.

1.5 Using Help

Help is provided on-line with Calcs and is as extensive as the printed documentation. The on-line Help allows you to search by topic or keyword for the area in which you need help, and categorizes and defines words and phrases, giving you a clear picture as to what you are doing.

When you click on the *Help* menu item, a dialog box will appear with selections for using the help features of the system. Users can search for a specific topic of interest using the Index or by reviewing subject areas. Users may also review the version number of Calcs by clicking on the submenu item *About*.

1.6 Technical Support of Calcs

Technical Support of the system is provided by PDC Corp. Please be aware that support technicians will be handling many users, so you can help them by doing the following:

- Careful reading of printed and on-line documentation of the System. Please carefully read this documentation to be sure that your question or problem has not been addressed.
- Make sure that the Data Sources section in your control panel is configured properly to run the Calcs database, which is called *ACM.db*. If you are not using Oracle, then the drivers for ODBC will also need to be loaded for proper program operations.
- If you are running on a Network, check with your system administrator to make sure your workstation is configured correctly to run the program and connect to the database, and check that you have the rights to modify a file in the drive and directory where Calcs is loaded (namely, the database file ACM.db).
- If your issue is not addressed in the documentation and you are satisfied that your system configuration is fine, feel free to call PDC Corp. Please have information about your system, including Windows version and type of network.

1.7 Getting Started with Calcs

The installation routine will automatically create ODBC connection profiles, path adjustments, and a *COMPASS* folder on the Start menu with an icon for the Calcs login screen. Click on the *Calcs* icon to directly access the Calcs main screen.

1.8 Logging onto Calcs

When you click on the *Calcs* icon in the *COMPASS* folder, a login window entitled, *Calcs Emission Calculations Program* will appear. If you are using an Oracle database, enter your User I.D. and Password and select *Oracle* from the selection list, and then click *OK*. Otherwise, you may leave the default entries alone and select *SQLAnywhere* from the selection list, and then click *OK*. (See Figure 1.1)

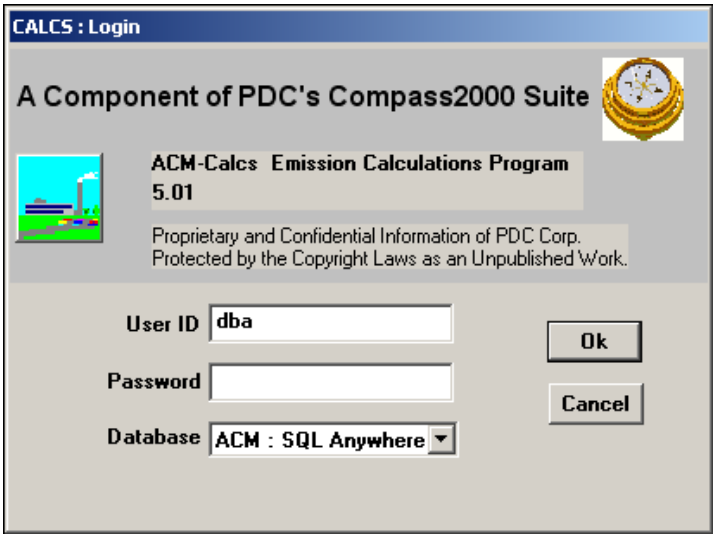


Figure 1.1

1.9 Exiting Calcs

To exit out of Calcs back to the desktop, simply select the *Exit* icon, or choose the *Exit* selection from the *File* menu. You will be presented with a confirmation of your choice, so select *Yes*.

1.10 Conventions Used in This Documentation

The *Frame* window is the main window in CALCS with a Frame toolbar (*FrameBar*) at the top and an empty workspace. (See Figure 1.2). A user can open one or more windows in the Frame workspace. These windows are called *sheets*.

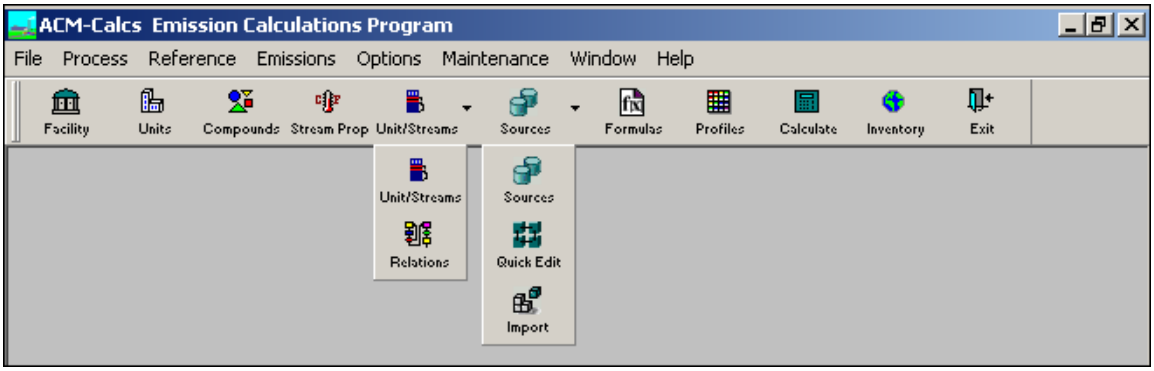


Figure 1.2

Each sheet is provided with a Sheet toolbar (*SheetBar*) at the top, and the workspace displays the corresponding data. (See Figure 1.3)

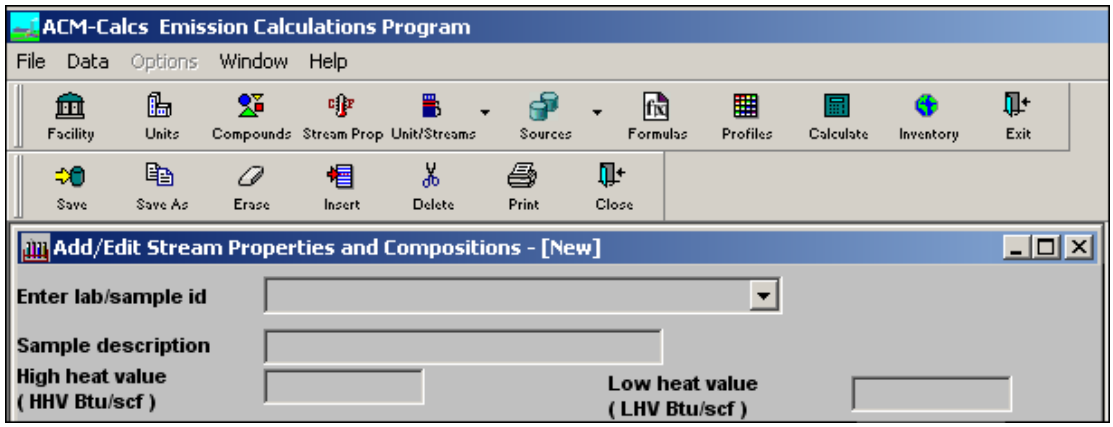


Figure 1.3

CHAPTER 2: CALCS OVERVIEW

2.1 Facilities

The *Facility* section of Calcs is the same as Facilities set up in the TaskTrakker module of COMPASS. A *Facility*, in this case, is the site. It often uses the Account Number as the ID. You may, upon entering Calcs, select a default Facility (site) to work with and define emissions within that Facility. You may, of course, choose any Facility already set up in TaskTrakker to work with, but you may not modify certain Facility data, such as account number, once the Facility is updated in the Database.

2.2 Units

Units are generic process unit types, such as sulfur recovery units, tank farms, and powerhouse complexes. You may select the *Unit* to work with in Calcs, and you may modify existing Units. The same Unit may be used in multiple Facilities because it is a unit rather than a physical area in a specific plant. Units are associated with process streams and emission sources in Calcs.

2.3 Compounds

You will need to define all chemical *Compounds* for emission calculation purposes. Compounds are unique to Calcs because there is no corresponding entity linking the compounds to another module of COMPASS.

Compounds are either *single* or *multiple* species compounds identified by a unique *CAS Number*, which may be a real or "dummy" CAS Number. Most of the columns that are presented to the user on the Compounds Detail screen contain physical/chemical data, such as molecular weight, TVP, and the coefficients to be used for vapor phase speciation (i.e., 3 parameter equation coefficients, 2 parameter coefficients, or vapor pressure – temperature data points for five different temperatures). Columns are also provided for *SARA* and *HAP* chemical identification; these "flags" are used under the *Compound List* icon to make compound lists that contain only SARA or HAP chemicals. A *Category* column is also provided so that users can produce criteria pollutant summary reports, as available under the Process Unit Reports on the *Calculations* window.

2.4 Streams and Stream Properties

Streams and *Stream Properties* are unique to Calcs as you may add, modify, and delete existing Properties. Stream Properties define each stream, which are contained under one or more Process Units.

Stream properties may be used in emission calculations. Streams are generic liquid or gaseous fuels, materials, or emission streams. A single stream may be used in multiple Facilities. Only the data that will be used in a calculation formula is required to be filled in. For example, BTU value of a stream is important for fuel streams, and it may be left blank in a tank or loading stream.

2.5 Sources

Sources are the sources of the emissions you will be calculating. Sources include boilers, engines, flares, manufacturing process units, and other equipment as well as area sources that generate air emissions. Unlike units and streams, sources are Facility-specific.

2.6 Emission Factors

You will need to define both the *Emission Factors* or *Formulas* and the corresponding equations for the emission sources contained within each Facility. Only when these factors are defined will you be able to calculate emissions.

2.7 Profiles

Emission *Profiles* are groupings of factors and formulas that are used to calculate a range of contaminant emissions for a source.

2.8 General Equipment Information

You will need to associate *Sources* with emission *Profiles* prior to calculating emissions. This task is accomplished under the *General* equipment information tab. Additional equipment information and emission point parameters may also be stored under *General* equipment information.

2.9 Menu Structure

2.9.1 File Menu

The *File* menu of Calcs only allows one selection if no screens are open, which is to Exit the Calcs program. (See Figure 2.1) Use this selection when you are finished working in Calcs. After opening a screen, other options appear, such as *New, Run, Close, Save, Save As, Erase, Print Preview, Print,* and *Print Setup,* depending on the screen..

Figure 2.1

2.9.2 Process Menu

The *Process* menu in Calcs gives you direct access to the *Emission Sources*, *Stream Properties and Compositions*, and *Emission Source Profiles*. (See Figure 2.2) This menu also provides access to a feature, *Copy Data To Another Year*. This feature duplicates all process history records for a user-selected base year to a target year. If, for example, there are twelve process history records in the base year, one for each month, for a storage tank, then twelve records will be created in the target year for that tank. If desired, a *Scaling Factor* may be entered in the *Units*

window before using this feature. If the user enters a scaling factor of "0.5" for, say, Unit #2, and the *Copy Data To Another Year* feature is selected, then all process history records will be duplicated for the selected target year, but the process rate for all Sources that are located in Unit #2 will be changed to a value that is one-half as large as the values in the base year. *Manually entered emissions* may also be copied to a new year if this feature is selected by the radio button shown near the bottom of the screen.

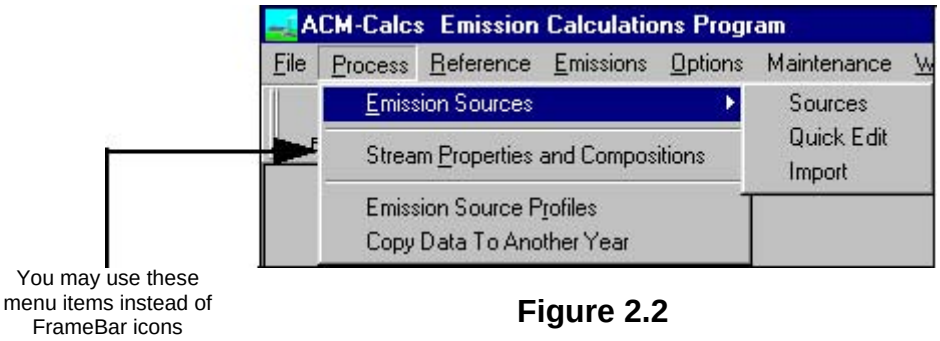


Figure 2.2

2.9.3 Reference Menu

The *Reference* menu allows you to go directly to the various windows to set up Facility Data, Compounds, Streams, and other data. (See Figure 2.3) The *Reference* menu is also where the Contractor Leak data can be imported.

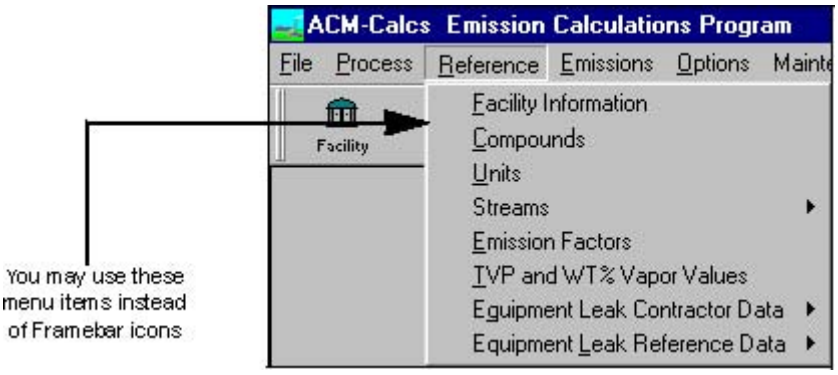


Figure 2.3

2.9.4 Emissions Menu

The *Emissions* menu allows you to *Estimate Emissions* from the data entered and *View* those *Emission Results*. (See Figure 2.4).

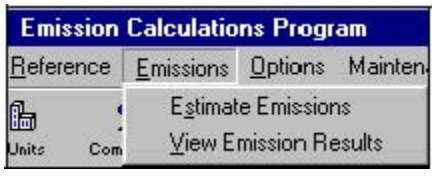


Figure 2.4

2.9.5 Options Menu

The *Options* menu within Calcs allows you to select a default *Facility* to work within. Once the Facility is selected, you may only do data modification on equipment or sources within that facility until you select another default facility. (See Figure 2.5).

Figure 2.5

2.9.6 Maintenance Menu

The *Maintenance* menu (Figure 2.6) has five options and is viewable only when all screens are closed. *Stack Tests* has fields for entry of stack test results to be used later as a basis for emission rates. *Compound Lists* are lists made by the user for emission calculation of only certain compounds. *Source Type Display* allows rearrangement of the order of Source Types in pick lists. *Disable Formula Edit* allows locking and unlocking of general formulas such as those from AP-42. *Cleanup Database* is generally used after calculating emissions to remove streams not used in the database, stream compositions not linked to a unit/stream, records showing zero emissions, and emissions not linked to current accounts or sources.

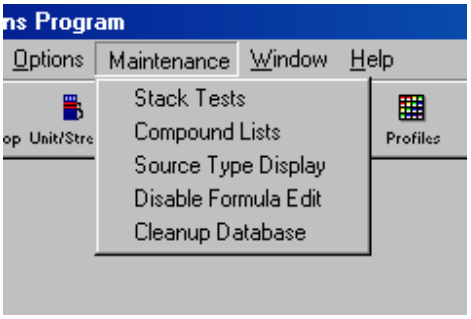


Figure 2.6

2.9.7 Window Menu

The *Window* menu allows you to manipulate the Data Windows into the structure you wish to operate in Calcs. The *Window* menu also allows you to bring up the *Toolbar* configuration window. (See Figure 2.7).

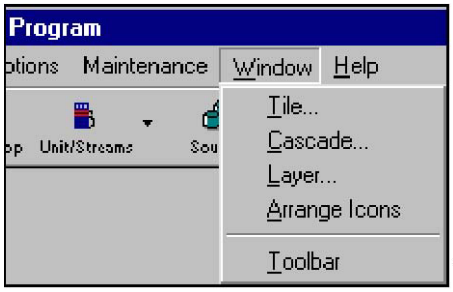


Figure 2.7

2.9.8 Help Menu

The *Help* menu in Calcs gives you access to the on-line Help system and other information relating to Calcs and COMPASS. (See Figure 2.8).

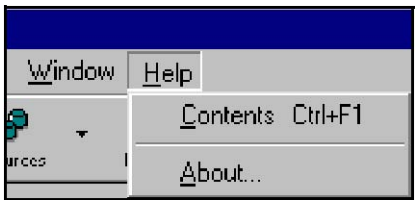


Figure 2.8

2.10 Toolbar Configuration

Calcs has toolbars that are the quickest navigational route to different windows and areas of the program. The Calcs *FrameBar* is the main toolbar that allows access to the various Windows. The FrameBar is, by default, positioned at the top of the screen. The Calcs *SheetBar* is a secondary toolbar that appears when each section window (sheet) is open. The *SheetBar* icons allow you to add, modify, delete records, update your editing changes to the database, and exit the window.

You may customize the toolbars by choosing the *Toolbar* selection from the *Window* menu. This will open the *Toolbar* dialog box, where you may select the position of the toolbar relative to the screen and whether or not to show the text displayed with the icon. (See Figure 2.9).

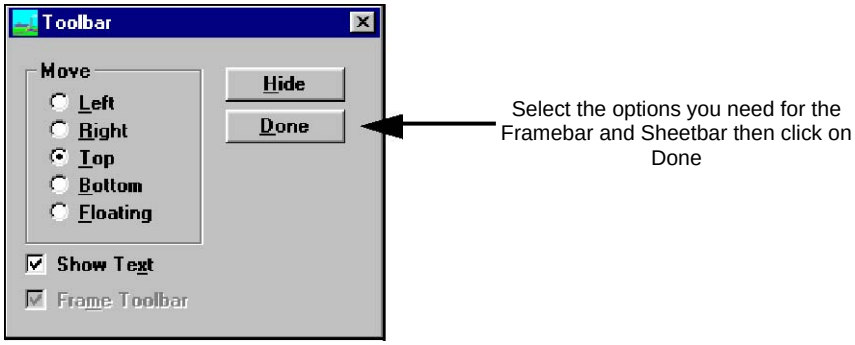


Figure 2.9

2.11 Comments on Data Items

You may enter comments in the database about various entities and other elements of Calcs wherever there is a *Comments* icon. Click on the *Comments* icon to open up a free form text box that will allow you to enter pertinent information that may not be contained within a field listing, or it will allow you to make notes to yourself or other Calcs users on the network.

Once finished entering the notes and/or text desired, click on the *OK* button. To clear previous notes, click on the *Clear Text* button. To delete the entire comment entry, click on the *Delete* button. To undo without saving what you are presently doing, click on the *Cancel* button.

2.12 Steps in Entering Data into Calcs

In order for Calcs to work correctly and generate the emissions data you need for inventory purposes, it is important that you follow these steps closely in entering and modifying data in Calcs. In general, use the buttons from left to right. Also, ID number fields recognize spaces and are case-sensitive. PDC recommends entering ID's using all CAPs and no spaces, unless it is necessary to duplicate a FIN. This practice will reduce the possibility of errors that are difficult to trace.

Step 1: Locate an existing *Facility* or create a new one.

Step 2: Identify *Units* by either establishing new Units or by using the previously created ones.

Step 3: Enter and modify *Compound* data that will be needed for emission calculations.

Step 4: Assign *Stream Properties* and create stream compositions from *Compounds* previously entered. Calcs will automatically convert entered stream data into proper standard units of measure, and it will notate the stream type. Alternatively, use an existing stream type.

Step 5: Associate process streams and Units in the *Unit/Streams* screen.

Step 6: Create or modify emission *Sources* and define all types of equipment that create emissions. Link the source to *Units* and *Streams.*

Step 7: Enter stack test data from the *Maintenance* menu, if such data will be used in emission calculations.

Step 8: Create or edit an emission factor or *Formula* for each contaminant that will be emitted.

Step 9: Create a *Compound List* if desired.

Step 10: Create an emission *Profile,* which is a list of *Formulas* or *Stream Compositions.* Alternatively, use profiles that already exist in the system.

Step 11: Link the *Profile* to an emission *Source*.

Step 12: Estimate emissions with the *Calculate* screen, view and print reports.

CHAPTER 3: CALCS ENTITIES

3.1 Operating Facilities

You may view and modify Facilities that exist in Calcs. Provided Facilities are resident in COMPASS, they will also be present in Calcs.

To enter the Facility section of Calcs, select the *Facility* icon. This will bring up the *Facility Information* window (See Figure 3.1) where you may add, modify, or delete Facility information.

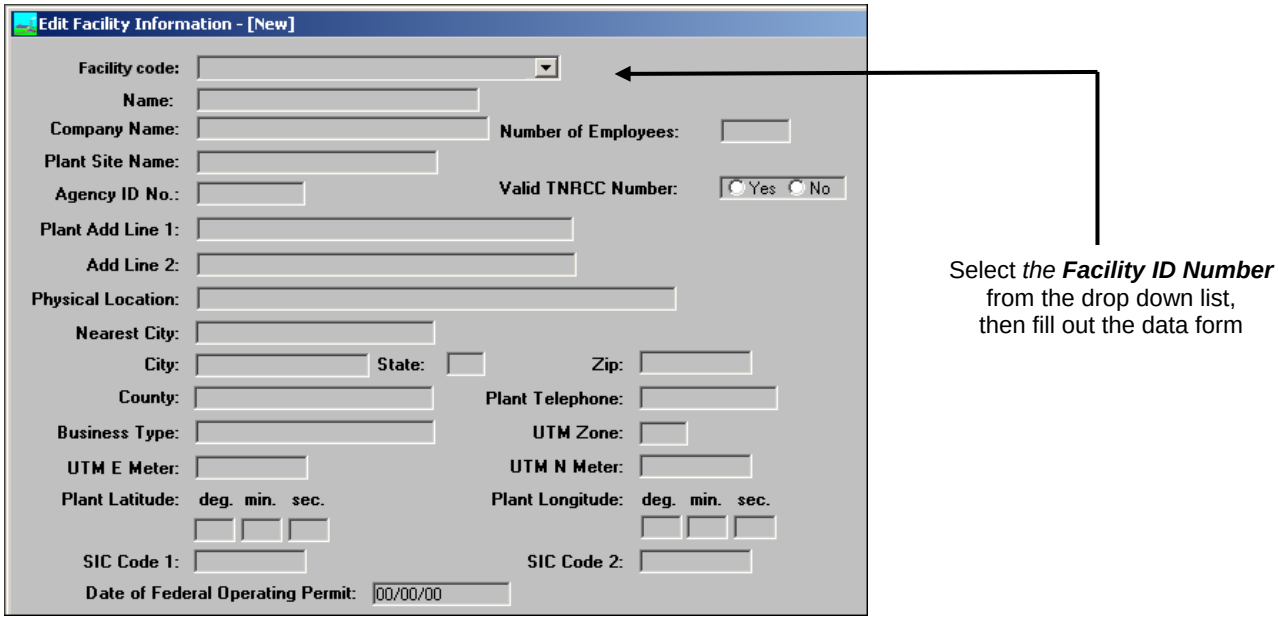


Figure 3.1

To select an existing Facility to modify, click on the drop down list on the Facility Code field. You will be given your choice of current Facilities resident in the system. Clicking on the desired Facility will fill out the data entry boxes with the currently installed data items for that particular facility. Notice the vertical scroll bars on the right side of your screen that will allow you to view the rest of the data.

Once an existing Facility is selected, you may make modifications to the data that is present. Once you have made any modifications to the data, select the *Save* icon. This will update the database. Note that clicking on the *Save* icon first will result in a dialog error box appearing asking you to make a Facility selection first. (See Figure 3.2)

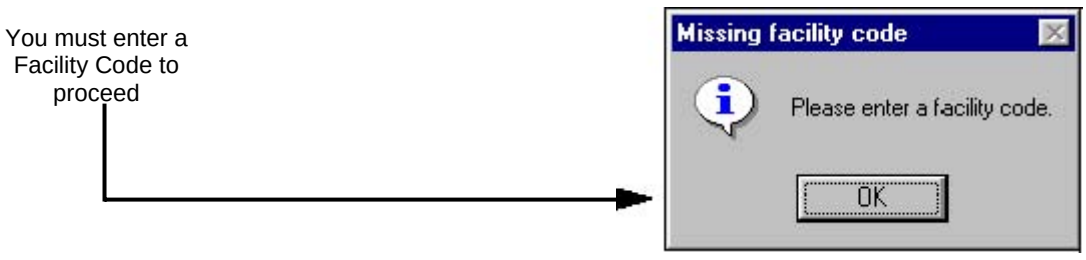


Figure 3.2

You may print the Facility information by clicking on the *Print* icon.

Once you are finished editing data in the Facility section of Calcs, click on the *Close* icon. This will return you to the main screen. Be sure that you have saved changes to the database by clicking the *Save* icon before closing.

3.2 Units

To enter a Unit, click on the *Units* icon. This will open the *Add/Edit Process Units* window.

To enter a new Process Unit, click on the *Insert* icon. This will open up a data box directly under the last existing Unit and place the cursor in that box. You may enter the data as needed, selecting the *Save* icon when finished. (See Figure 3.3)

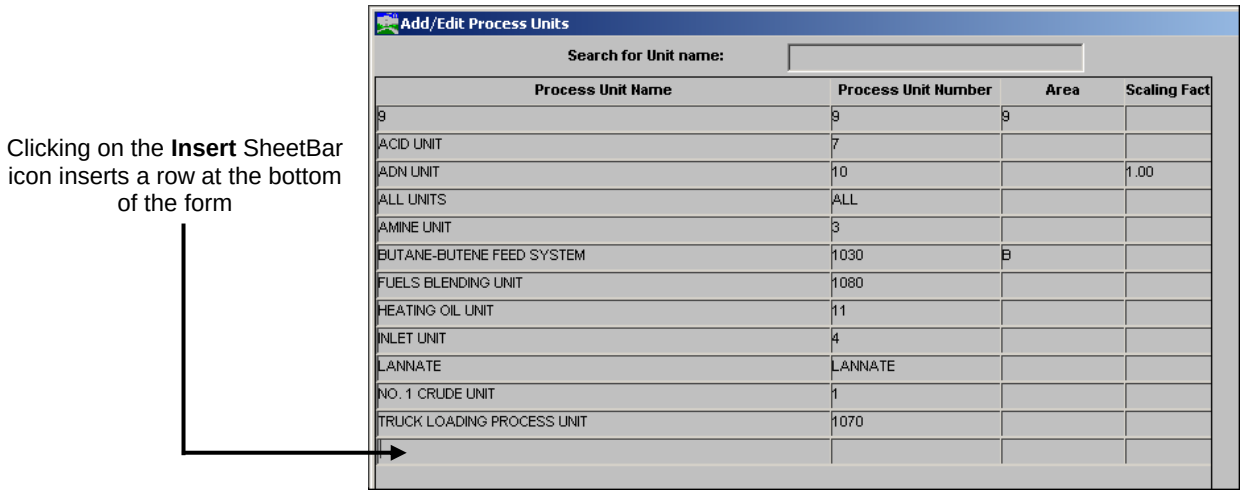


Figure 3.3

You may delete an existing Process Unit by selecting the unit record you wish to delete. Click on the *Delete* SheetBar icon and you will be asked to verify the deletion, so choose *Yes*. To print the listing of Process Units, click on the *Print* icon. This will send the Process Units report to your printer.

The *Units* screen includes a column called "*Scaling Factor*". This factor may be used in conjunction with another feature to copy all of the process history data for all sources from one year to a future (or current) year. That feature is accessed by clicking on the *Process* menu, and then clicking on the menu item called "*Copy Data To Another Year*". (See Figure 3.4)

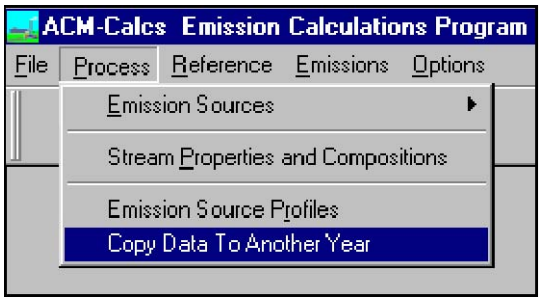


Figure 3.4

If the Scaling Factor for, say, Unit #1 is "1" or is not filled in, and the "Copy Data To Another Year" feature is selected, then all process history records will be duplicated for the selected target year. If there are twelve process history records in the base year, one for each month, for a storage tank, for example, then twelve records will be created in the target year, with exactly the same throughput.

If the Scaling Factor for, say, Unit #2 is "0.5", and the "Copy Data To Another Year" feature is selected, then all process history records will be duplicated for the selected target year, but the throughput for all tanks and loading racks that are located in Unit #2 will be changed to a value that is one-half as large as the values in the base year. In fact, all Sources located in Unit #2 will have their process or activity rate (e.g., fuel usage for combustion, flare gas burned for flares, etc.), changed per the scaling factor.

Note that this feature does not scale emissions directly, only process rates. Therefore, the effect on emission estimation is as defined in the estimation formulas. If process rate is an important calculation variable (e.g., storage tanks), then the scaling of process rates will have a significant effect. If the process rate is a minor variable, or if it is missing altogether from the formula (e.g., fugitive emissions), then the scaling of process rates will have little or no effect on emission rates.

Click on the *Close* icon when finished editing the Process Units data to return to the main Calcs screen.

3.3 Emission Sources - Quick Edit Screen

Users will note that there is a drop-down arrow located just to the right of the *Sources* icon. When this arrow is clicked, the *Quick Edit* icon can be selected, which enables multiple sources to be edited on a single screen. (See Figure 3.5)

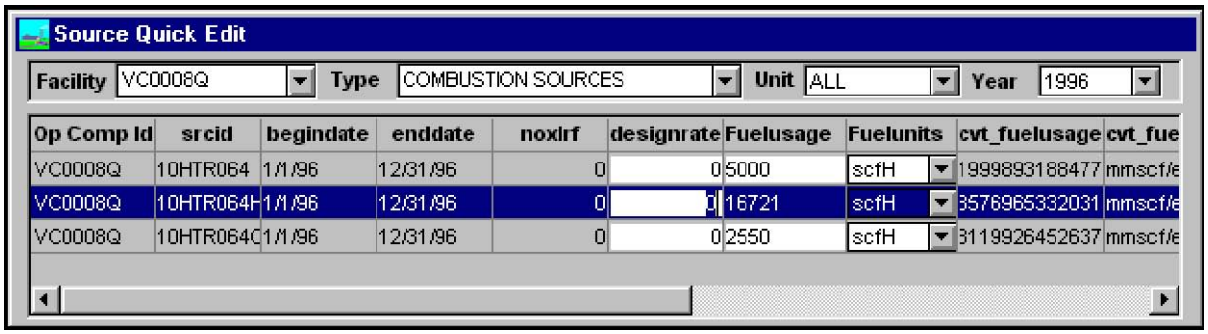


Figure 3.5

3.4 Emission Sources

Emission Sources, or the producers of emissions, can be edited under the *Sources* section of Calcs. To enter the Sources section, click on the *Sources* icon. This will open the *Add/Edit Sources* window. (See Figure 3.6)

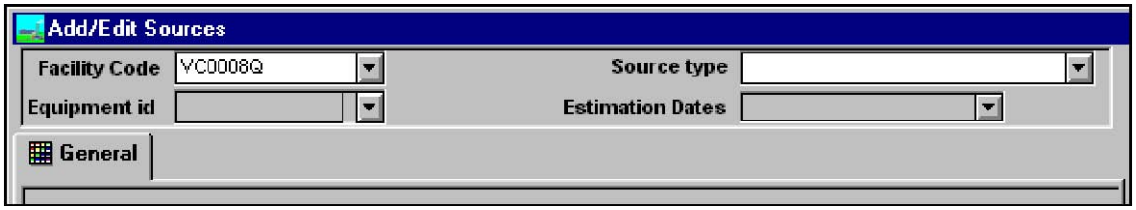


Figure 3.6

You must select the Source type to work with any Source on this screen. Selecting a *Source Type* and *Equipment ID* will open up data entry fields. (See Figure 3.7 and Figure 3.8)

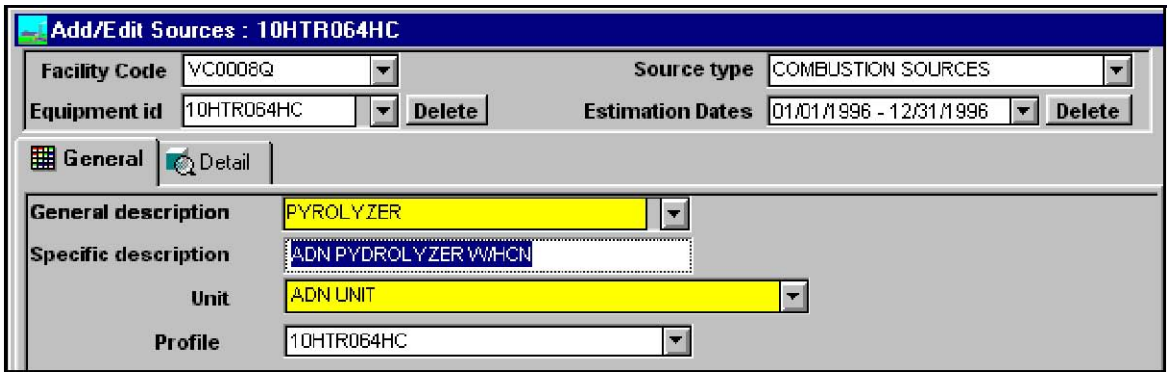


Figure 3.7

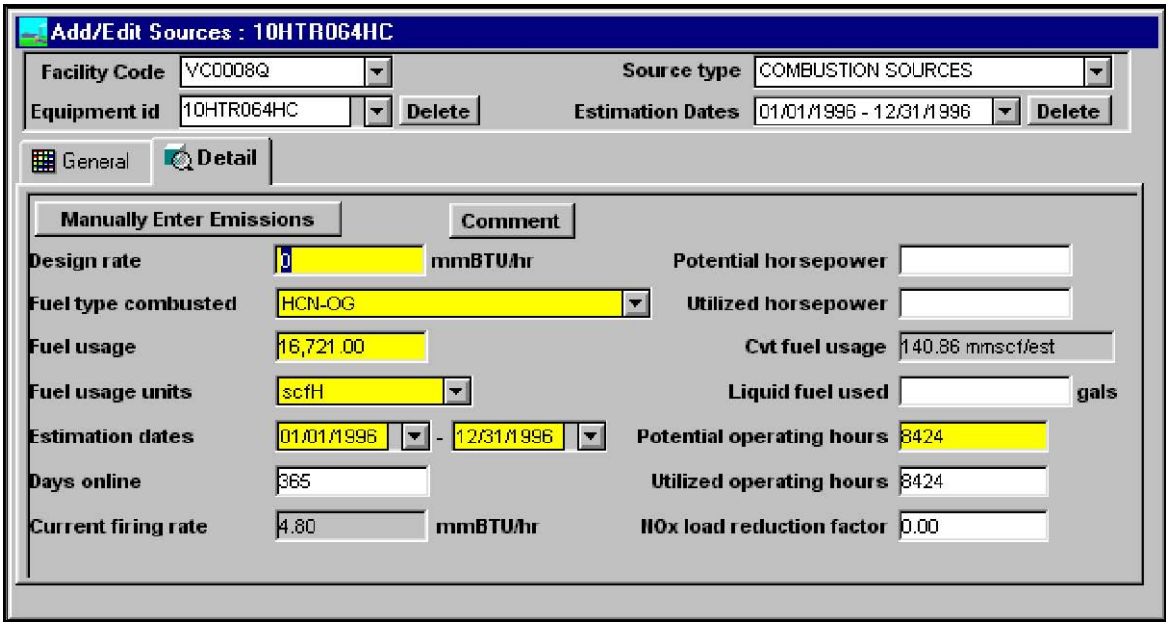


Figure 3.8

An emission source needs to be linked to a Profile that contains one or more emission calculation formulas. These formulas are engaged during the calculation process.

Sources may be viewed or edited one at a time on the Sources screen or in a group for a specified time period and Unit, in the Quick Edit screen. Not all process variables are displayed on the Quick Edit screen. In general, only the variable(s) that are likely to change from one year to the next, such as throughput or fuel usage, are shown in the Quick Edit screen.

You may print the Source listing by clicking on the *Print* icon. This will send the Source report to your printer. By clicking on the *Comment* button on the detail screen, you may make further informational entries into the comment box. (See Section 2.11: Comments on Data Items)

Chapter 4: Source Types deals specifically with Source Types and explains each available Source type and its corresponding data entry fields that become available upon selection. Sources can be broken down into Secondary Sources, if desired. This would be done for any source for which the emissions must be calculated using more than one formula.

An example might be a Loading Rack that has both working losses and blowdown losses, two types of emissions that are calculated in entirely different ways. Reactor vessels used in batch processes are often broken down into steps, and the emissions for each step are likely to be calculated in different ways (e.g., temperature increase, loading of catalyst, mixing, etc.). These steps can be identified as Secondary Sources, which can then be summed to the Primary Source that represents the total emissions from the reactor vessel (i.e., all steps).

All Sources are automatically deemed to be Primary unless indicated otherwise in the *Equipment Maintenance* window. This window is accessed by clicking on *Options* menu while the *Sources* screen is open. Only the *Account* needs to be selected in the *Add/Edit Sources* window prior to retrieving the Equipment Maintenance.

Each row in the *Equipment Maintenance* window represents one Source, as identified in the first column of the screen display. The column located along the right margin is used to indicate if the Source is "secondary" to a Primary Source. To indicate this, users click in this column and select the Primary Source from the drop down list of all sources.

The Primary Source for which Secondary Sources have been identified is also highlighted, but the same Source ID is selected from the drop down list for the Primary Source – i.e, it is a primary source related to itself as a primary source. The actual summing of emissions from Secondary Sources into Primary Sources is done from the *Inventory* window by clicking on the *Data* menu item, and then on *Sum Emissions*.

The *Equipment Maintenance* window is also used to correct or change a Source Type for a Source. This is accomplished by clicking on the second column entitled Source Type and selecting the correct Source Type from the drop-down list. Specific and general descriptions for Sources may also be edited in the *Equipment Maintenance* window.

3.5 Import Function

A third option is also available on most versions of Calcs, which is called "Import." The drop-down arrow to the right of the *Sources* makes this choice available. This function enables export and import of the Sources data from an external file format, such as an Excel file. While many file formats are available for users to export process data from Calcs, only the tab-delimited text file format may be used to load data from an external file into Calcs.

CHAPTER 4: SOURCE TYPES

4.1 The Importance of Source Types

Source types are the determining factor in many different areas of Calcs. Thus, it is important that you fully understand each Source Type and its use. The Source Type does not need to be the same as in the EI module.

Source Types define the equipment at the facility that generates emissions. All data entry screens that require source types to be entered as data fields have a drop down list with all the available source types. Select the one that fits with the data you are working with. Other data fields will appear in the same form depending on the Source Type you select. The following specific Source Type descriptions will give you an idea what data fields to expect upon that Source Type selection. Estimation Dates, Days On-line and Operating Hours are available fields for all Source Types.

4.2 Specific Source Types

4.2.1 Air Strippers

Air Strippers are devices used to reduce the VOC concentration in a process stream. The data fields that are present with the selection of Air Strippers as a source type are as follows:

- Stream Processed
- Flow Rate
- Inlet VOC Concentration
- Sand Filter Effluent VOC Concentration
- Outlet VOC Concentration

4.2.2 Catalyst Handling Sources

Catalyst Handling Sources create emissions as a result of handling catalyst. The fields that are present with the selection of Catalyst Handling as a source type are as follows:

- Catalyst Type
- Unloaded Amount
- Unloaded Units
- Percent Lost

4.2.3 Combustion Sources

Combustion sources are calculated emissions from heaters, engines and boilers. The fields that are present with the selection of Combustion Sources as a source type are as follows:

- Design Rate
- Fuel Usage
- Fuel Usage Units
- Horsepower
- Fuel Type Combusted
- NOx Load Reduction Factor
- Liquid Fuel Used (gallons)

4.2.4 Cooling Tower Sources

Cooling Tower sources measure the emissions from cooling towers due to system leaks or chemical additives to the cooling tower water. The fields that are present with the selection of Cooling Tower Sources as a source type are as follows:

- Stream Processed
- Flow Rate
- Plant Feed Amount (M bbls)

4.2.5 Drains, Sumps, and Junction Boxes

Emissions from Drains, Sumps and Junction Boxes are determined by emission factors. The fields that are present with the selection of Drains, Sumps and JB as a source type are as follows:

- Stream Processed
- Number of Controlled Sources
- Number of Uncontrolled Sources

4.2.6 Equipment Leaks

Equipment Leaks represent fugitive emissions. These emissions come from equipment like pumps, compressors, flanges, and valves. Before you may add data under this source type, you must have already set up the Leaks data in order for the stream name to appear in the drop down list. For the information needed on Equipment Leaks, see Chapter 8: Equipment Leaks. The fields that are present with the selection of Equipment Leaks as a source type are as follows:

- Monitoring Program
- Stream Name
- VOC Percentage

4.2.7 FCC Sources

FCC Sources are Fluid Catalytic Cracking Units that have various emissions. The fields that are present with the selection of FCC Sources as a source type are as follows:

- Type of Flue Gas
- Wt.% Sulfur in Feed
- Fresh Feed Amount
- Flue Gas/Coke Ratio
- Coke Production
- Electric Precipitator & CO boiler?
- Wt.% Sulfur in Coke

4.2.8 Flares

Flares burn gaseous waste products from refineries. The fields that are present with the selection of Flares as a source type are as follows:

- Type of Gas Flared
- Quantity Flared
- Flare Efficiency
- Flared Units
- Crude Processed
- Processed Units

4.2.9 Loading Rack Sources

Loading Rack sources represent emissions due to loading losses from tanks, truck, railcar or marine vessels. The fields that are present with the selection of Loading Rack Sources as a source type are as follows:

- Product Type
- Percent Control Efficiency
- Throughput
- Saturation Factor
- Throughput Units
- Max Temp

- Average Temp
- Average Vapor Press
- Max Vapor Press
- Pumping Rate

4.2.10 Oil Water Separation

Oil Water separators receive the wastewater flow from process drains and junction boxes and remove the oil from the wastewater. The fields that are present with the selection of Oil Water Separation as a source type are as follows:

- Stream Processed
- Flow Rate
- Separator Type

4.2.11 Spills

Some spills of VOCs result in emissions. The fields that are present with the selection of Spills as a source type are as follows:

- Stream Spilled
- Spill Amount
- Spill Units
- Percent Vaporized

4.2.12 Storage Tanks

Storage tanks have emissions as the result of vapor displaced during transporting of volatile liquids. The fields that are present with the selection of Storage Tanks as a source type include, but are not limited to, the following:

- Product
- State
- City
- Min, Avg & Max Vapor Pressure
- Max Ambient Temp Tax
- Min Ambient Temp Tan
- Insolation Factor
- Wind Speed
- Pumping Rate
- Constant Level Tank (Y/N)
- Constant Temperature Tank?

The fields on the *Tank Data* tab, such as diameter, height or length, and other variables change depending on tank type. Floating roof tanks have an additional *Tank Fittings* tab for entering the number of columns, hatches, etc.

4.2.13 Sulfur Recovery Sources

The fields that are present with the selection of Sulfur Recovery Sources as a source type are as follows:

- Sulfur Recovery Efficiency Percent
- Sulfur Produced
- Produced Unit
- Tail Gas Emitted
- Emitted Units
- CEM Type
- CEM Concentration
- Type of Exit Flue Gas

4.2.14 Wastewater Treatment Systems

Wastewater treatment system filters process wastewater from plant water runoff, including equalization tanks, aeration tanks, clarifiers, dissolved air flotation units, lagoons, etc. The fields that are present with the selection of Wastewater Treatment Systems as a source type are as follows:

- Stream Processed
- Flow Rate
- Flow Rate Units

4.2.15 User-Defined Sources

Enter the Source Type *User-Defined* if none of the other Source Types fit the description for your specific equipment, or if the calculations for a particular source will be facilitated or simplified by using the User-Defined category. When a user makes a new source and identifies its source type as "User-Defined," the *General Description* that is entered for that source will be used by the system as a source type subcategory. Examples of such subcategories include: Blowdown Losses, Reactor, and Process Vent. For each user-defined subcategory, the user can customize the data element labels that will be used by the system on the *Detail* screen for all sources that have the same General Description. Thus, when the first source of a specific user-defined subcategory is created, the user creates data element labels that will be used for all future sources of the same type and populates the data values, at the same time, on the *Source Detail* screen.

For example, to add a new source called "Reactor 101" to the system, the user clicks on the *Sources* icon to add the new source and enters the *Equipment ID* as "REACTOR101" (no spaces). The *Specific Description* might be entered as "Reactor for Product XYZ." The *General Description*, which will serve as the source type subcategory, might be entered as "ReactorXYZ." Then in the lower portion of the screen, the user might identify ("label") the first data element as "Reaction Time" with a unit of measure of "Minutes." The second data element might be labeled "Chlorine Used" with a unit of measure of "Pounds." The third data element might be labeled "Temperature" with a unit of measure of "Degrees F." Note that some data elements, such as Potential Throughput and Operating Hours, are pre-defined. Therefore, they do not require adding a label to identify the data that is entered for these items. The user could enter the values for these data elements at the same time that the labels are defined, but this is not necessary. All fields need not be used.

When the *Detail* screen is saved, the user-defined source type subcategory called "ReactorXYZ" will be stored in the system, much like a source type such as "Storage Tanks" is stored. The next time a source is added, if the user selects ReactorXYZ from the drop-down list of General Descriptions on the *Detail* screen, three data elements will automatically be presented to the user for data entry (Reaction Time, Chlorine Used, and Temperature). Also, when a new Formula is added on the *Formula* screen, if the user selects ReactorXYZ from the drop-down list of General Descriptions, three data elements will automatically be presented to the user for use in the calculation formula labeled: Reaction Time, Chlorine Used, and Temperature.

Because of the capability to scale throughputs of sources in future years from a base year throughput and user-entered *Scaling Factor*, as explained in Section 3.2, it is advisable to use the

throughput data element that is provided by the system instead of creating a new label for throughput. However, if the scaling factor will never be used in connection with a User-Defined Source, there is no reason to use the throughput data element instead of a data element labeled "Throughput" that is created by the user. In some cases, such as in Loading Racks, a conventional AP-42 calculation formula might be used for the working losses during loading and a User-Defined "Secondary Source" (as discussed later in this manual) might be used, with its own user-specified formula, to account for Blowdown losses. The working and blowdown losses can easily be added together after calculations are done to estimate emissions for the entire Loading Rack.

CHAPTER 5: CALCS OPERATIONS

5.1 Selecting the Operating Facility

To select the desired operating, or "default" *Facility*, choose the *Setup* selection from the *Options* menu. You will be presented a list to choose the desired Facility in which to work. (See Figure 5.1) This Facility selection will carry the desired Facility across Process Units and other entities.

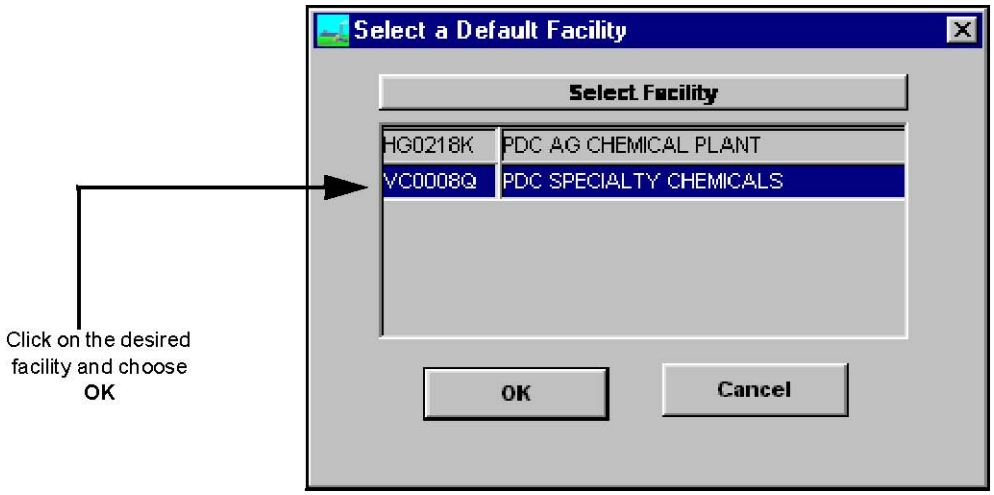
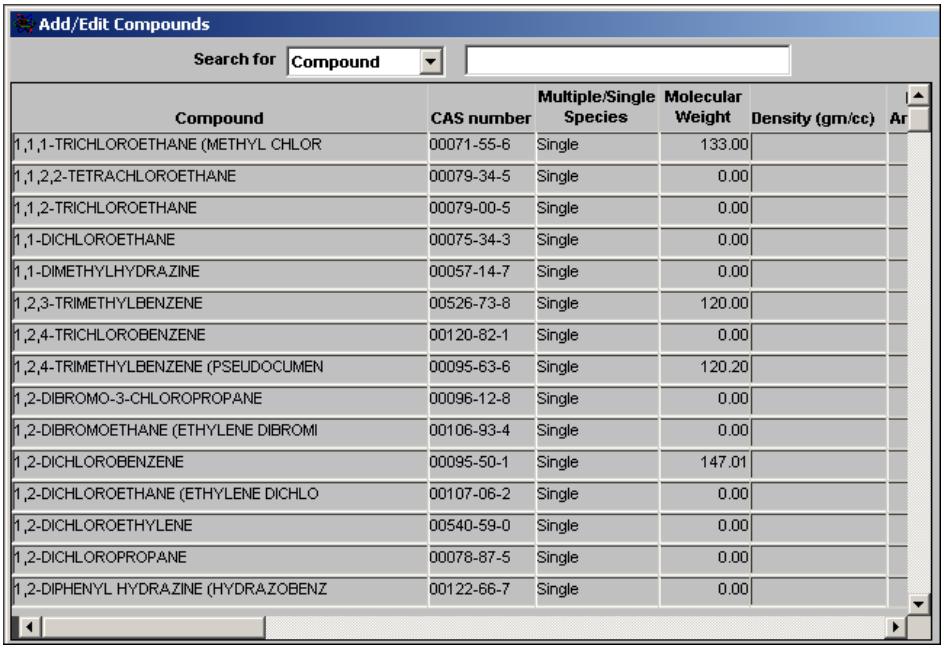


Figure 5.1

5.2 Compounds

A listing of Compounds and their related data can be edited by clicking on the *Compounds* icon. This will open the *Add/Edit Compounds* window. (See Figure 5.2) You may add, edit, delete, or print resident compounds.



Compound	CAS number	Multiple/Single Species	Molecular Weight	Density (gm/cc)	Ar
1,1,1-TRICHLOROETHANE (METHYL CHLOR	00071-55-6	Single	133.00		
1,1,2,2-TETRACHLOROETHANE	00079-34-5	Single	0.00		
1,1,2-TRICHLOROETHANE	00079-00-5	Single	0.00		
1,1-DICHLOROETHANE	00075-34-3	Single	0.00		
1,1-DIMETHYLHYDRAZINE	00057-14-7	Single	0.00		
1,2,3-TRIMETHYLBENZENE	00526-73-8	Single	120.00		
1,2,4-TRICHLOROBENZENE	00120-82-1	Single	0.00		
1,2,4-TRIMETHYLBENZENE (PSEUDOCUMEN	00095-63-6	Single	120.20		
1,2-DIBROMO-3-CHLOROPROPANE	00096-12-8	Single	0.00		
1,2-DIBROMOETHANE (ETHYLENE DIBROMI	00106-93-4	Single	0.00		
1,2-DICHLOROBENZENE	00095-50-1	Single	147.01		
1,2-DICHLOROETHANE (ETHYLENE DICHLO	00107-06-2	Single	0.00		
1,2-DICHLOROETHYLENE	00540-59-0	Single	0.00		
1,2-DICHLOROPROPANE	00078-87-5	Single	0.00		
1,2-DIPHENYL HYDRAZINE (HYDRAZOBENZ	00122-66-7	Single	0.00		

Figure 5.2

To add a new Compound, click on the *Insert* icon. This will bring a blank field listing at the bottom of the existing lists of compounds. Simply enter the data using the tab key to move to the next field. When you have added the new compound, click on the *Save* icon. This will update the database. Compounds are not related to any operating Facility; the same compound list is used, or can be used, for all plants.

To delete an existing compound, click on the *Delete* icon. Be careful when you are deleting compound records, as there is no confirmation window in this section. To print a listing of compounds, click on the *Print* icon.

5.3 Streams

To work with Stream data, click on the *Unit/Stream* icon. Note that this icon is different from the *Stream Properties* icon. This will open up the *Add/Edit Streams* window. (See Figure 5.3) It is assumed that the Stream Property (i.e., “composition”) for any stream that will be added in this part of the program already exists. (See Section 5.4 for adding Stream properties)

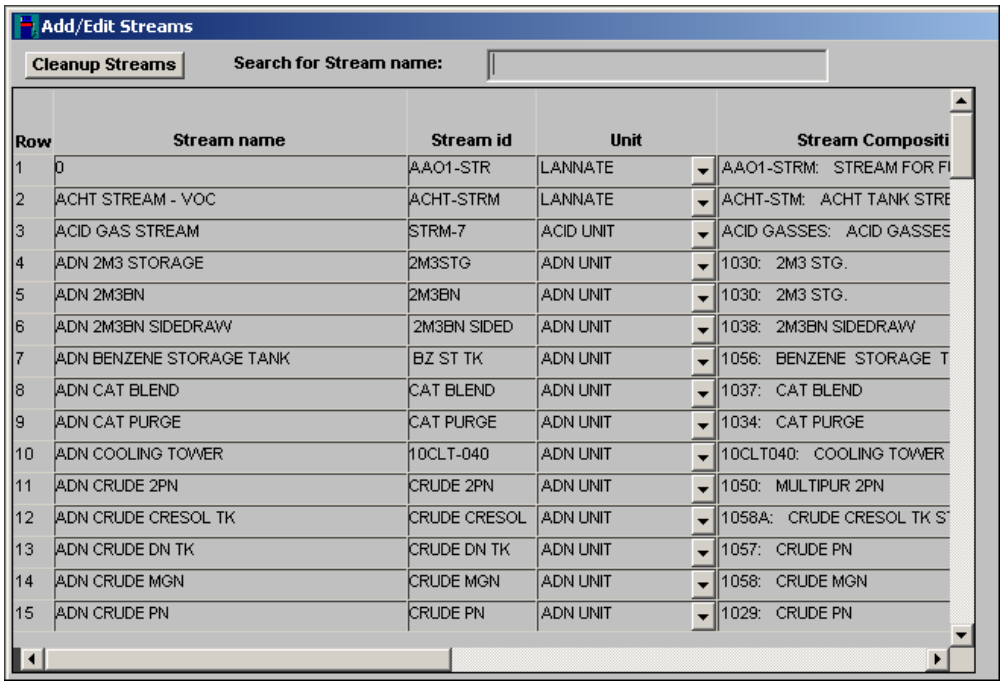


Figure 5.3

The reason for the Unit/Stream selection is to identify all of the Stream Properties that will be used in each process Unit in the plant. The stream properties are entered separately, as discussed in the next section. There are two reasons for separating the streams from stream compositions in the system.

1. First, when process history is entered for a Source (as described in Section 3.4 of this manual), users are asked to identify the Stream(s) that are consumed in, stored in, or used by the Source during the process history time period. Sources are related to specific Units, just as the Streams are; thus, the system can provide a drop down list of Streams for this selection that is limited to the Streams associated with the Unit in which the Source is located. If there were no relationship of streams to units in the system, then the drop down list could contain several hundred streams, or more, for a large plant. Therefore, the Unit/Stream feature makes future use of the system more convenient and greatly reduces the potential for error (e.g., selecting the wrong stream for a Source). It also allows for calculation of emissions by unit.

2. Second, by separating stream compositions from streams, the user has more flexibility in using Streams in emission calculations. For example, several Streams can (and often do) reference the same composition; thus, if the composition changes in some, but not all, units, the user can add one or more new compositions and relate them to the Streams that have modified compositions (only). Also, if several Streams reference the same composition, and the composition changes for all streams, the user needs only make the change in one place, at one time, thereby reducing maintenance of the system.

In short, the Stream and Stream Property concepts in Calcs is one example of using the power of a relational database, much like the Formula and Profile concepts discussed later in this manual.

The extra time that is spent in "set-up" for streams and compositions is more than offset by the increased convenience and more powerful maintenance capabilities that result from this aspect of the system. Streams, as well as Stream Properties (and many other system entities) are not related to any specific operating Facility. Even though streams are related to Units, the Units themselves can be generic, if the user wishes to set up the database in this manner. For example, if a company has several gas processing plants that have Amine Units, the Unit called "Amine Unit" can be entered only once, and an associated stream, such as "Amine Gas," can also be entered only once. This stream can be associated with Sources located in several different operating Facilities.

To add new streams to the database, click on the *Insert* icon. This will open a field box at the bottom of the current field listing where you may enter data. Much of the data to be entered in the *Streams* window consists of drop down list boxes. Simply click on the drop down portion of the box and scroll down until you find the desired entry. The Stream Composition is one such drop down list.

You may also modify existing stream data by clicking on the field of the stream record you wish to modify. Simply overwrite existing data or make another selection with the drop down field listing.

After stream additions and modifications are done to your satisfaction, click on the *Save* icon. This will update the database with your edits. To print the current streams, click on the *Print* icon.

5.4 Stream Properties and Composition

You may work with Stream Properties and compositions by clicking on the *Stream Prop* icon. This will open up the *Add/Edit Stream Properties and Compositions* window. (See Figure 5.4)

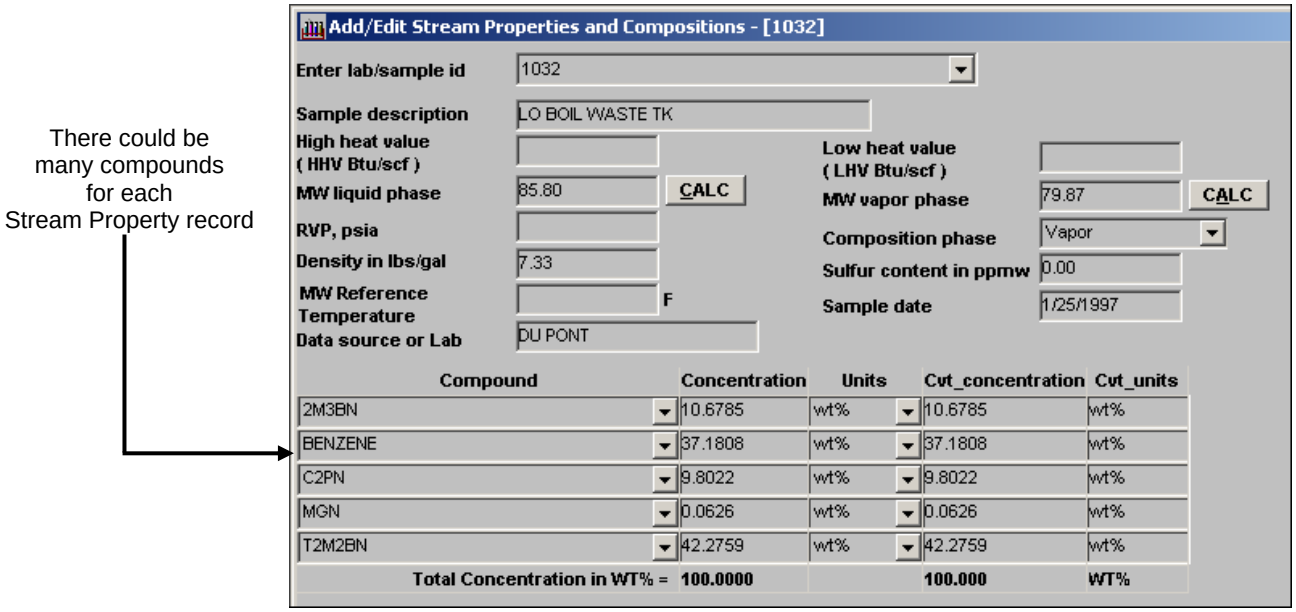


Figure 5.4

When adding a new Stream Property, you may enter all of the compounds that are present in the composition. Composition data is required for streams that will be speciated based on the weight percent of components in the vapor phase, in which case the composition data may be entered for the liquid or vapor phase of the stream. For streams that will not be speciated, such as a fuel for a boiler, composition data is not necessary (but BTU value probably will be needed for a calculation, which is also entered on the same window). To enter compounds for the composition, simply make the selection from the drop down listing under the *Compound* section of the screen. When you are finished adding the data, click on the *Save* icon. This will update the database.

The accuracy of certain calculations, such as Stream TVP, will depend to a great extent on the completeness of the composition analysis that is entered into the Stream Property. Hence, a running tally of the percentage of total stream composition is displayed, in weight percent, at the bottom of the screen while users input composition data. Note that a wide range of units of measure may be used to enter compounds in the composition (e.g., weight percent, weight fraction, ppm, etc.). When the *Save* icon is clicked by the user, all composition amounts that are entered in units other than weight percent are automatically converted into weight percent.

To modify existing properties, select the property you wish to modify from the drop down listing at the *Enter Lab/Sample ID* field box. Selecting one property from the list will fill out the form with the data that has been previously entered. Simply make needed changes and click on the *Save* icon.

You may also add or delete existing Compound records from each property. It is important that you understand that the *Delete* icon is for this purpose, while the *Erase* icon is for the purpose of deleting the entire Stream Property record.

When you are finished with modifications, click on the *Save* icon. If you wish to create another unique property from the modifications you have just made, click on the *Save As* icon. This will allow you to keep intact the existing record(s). You will be asked to enter a new ID code to update the database. Once this code is entered and the database is updated, there will be a unique property record similar to the one you used to create the new one, with the new data resident.

Liquid and Vapor Molecular Weight (MW) may be calculated on the *Add/Edit Stream Properties and Compositions* window, provided that the data needed to execute the required computations have been entered by the user (e.g., Reference Temperature for the Vapor MW computation). Simply click the Calc button by either the liquid or vapor MW field. Message boxes will prompt the user for missing data as required for the calculations. Alternatively, users can enter the Liquid or Vapor MW instead of calculating the value.

Stream Properties are not related to any specific operating Facility, nor to any Unit. The relationship of a Stream Property to a Unit is established when the user includes the composition in a *Unit/Stream*. Because the physical/chemical data that comprises Stream Properties often is communicated to the user from a sample analysis, the *Add/Edit Stream Properties and Compositions* window includes data elements such as Laboratory Name and Sample Date, which enable users to store the source of the analytical data as well as the composition.

5.4.1 NY–Stream Properties and Composition

The CALCS module depends on Stream Properties information to determine emission rates of the specific chemical constituents that make up a material. Each material may be defined in the program by clicking on the *Stream Properties* icon on the main toolbar, as shown in Figure 5.5.

Figure 5.5

A material composition is referred to as a *Lab/Sample Id*. In the standard version of the CALCS module, a drop-down list of Lab/Sample Id.'s is displayed from which the user selects one item to edit or delete. In the New York version, due to the large number of potential materials (>200,000 items), users enter the Lab/Sample Id that they wish to view, change, or delete next to the phrase *Enter Lab/Sample Id.* If the material was previously entered, it will be found and displayed. Otherwise, the program will assume the material will be added to the list. Compositions may be updated automatically by using a feature that links to the "MSDS" database, shown in Figure 5.6.

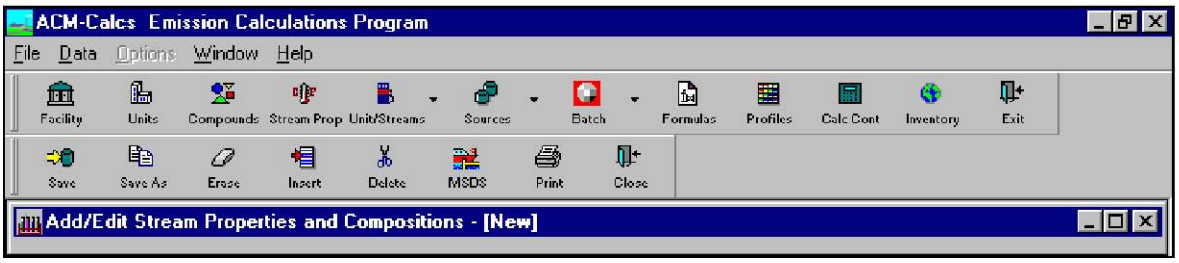


Figure 5.6

The *Stream Properties* icon is also used to display, add, change, or delete materials that are used by continuous Sources, such as fuels, loading materials, and tank materials.

5.5 Stack Testing

Stack Testing provides storage of data derived from laboratory analysis of streams, as well as pertinent operating conditions data. To enter the Stack Testing portion of Calcs, click on the *Maintenance* menu and select *Stack Test* from the list. This will open the *Add/Edit Stack Testing Information* window. (See Figure 5.7)

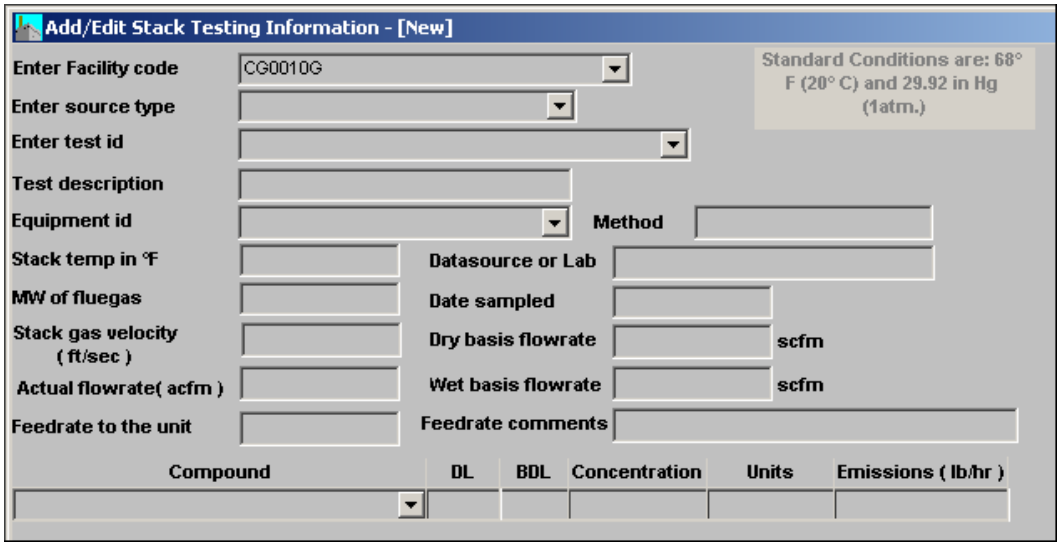


Figure 5.7

The *Stack Testing* data entry window allows you to enter information after selecting the *Facility* and *Source Type* via drop down lists. Enter the new *Test ID* and the rest of the relevant data values. Near the bottom of the form is the *Compound* entry where you may enter as many compound values for that test as needed.

Once you have entered the new test data, click on the *Save* icon. This will update the database with the new test information. Minimum data requirements for a new stack test include Test ID, Test Description, Equipment (source) ID, and at least one compound.

To make modifications to an existing test, select the *Test ID* from the drop down list after selecting the relevant *Facility* and *Source Type*. The previously entered data will appear, along with the list of compounds. If you only need to make modifications and not delete any portion of the compound record, simply make the necessary edits and click on the *Save* icon.

You may cancel certain compound entries by selecting the particular compound record and clicking on the *Erase* icon. It is important to note that *Erase* clears the compound record, while the *Delete* icon clears the entire Test ID record. Use the *Delete* icon only when you need to delete the entire portion of data appearing on your screen.

You may also use an existing Test ID to create another similar ID by making necessary edits and clicking on the *Save As* icon. This will open up a window asking you to name the new ID. Remember that all fields of data from the previous ID that have not been modified will appear in the new ID. Stack test data can be included in a calculation formula, as discussed later in this manual.

To print the Stack Testing Report, select the *Print* icon. To exit out of the Stack Testing area, click on the *Close* icon. If any unsaved data remains on the entry form, you will be asked whether you wish to update those records to the database.

5.6 Emission Source Profiles

Emission source *Profiles* identify the compounds emitted from a certain type of emission source, as well as the methods used to calculate those emissions. *Emission Factors* are equations for each compound emitted during a process. A *Profile* is a group of these factors used to calculate all emissions for a particular source type; the profile can also include instructions for speciation of Total VOC into constituent compounds based on their weight percent in the vapor phase.

To enter the emission source Profile area of Calcs, click on the *Profiles* icon. This will open the *Emission Source Profile* window. (See Figure 5.8)

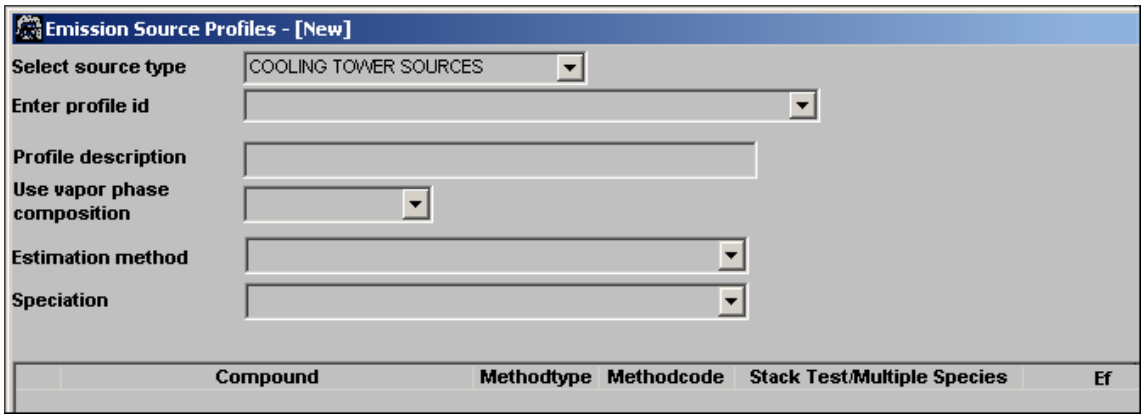


Figure 5.8

You will need to first select the *Source Type* with which you wish to work. Then you may add a new *Profile ID* or select an existing ID to modify current data. Enter the *Profile Description* in the field directly under the ID field. The user includes the instruction of whether or not to use the vapor phase composition for speciation by making the appropriate entry on the screen. If this question is answered "no," then the composition that was entered in the Stream Property will be used without conversion to the vapor phase (i.e., liquid phase weight percent will be used for speciation). If, for example, a user wishes to perform calculations for wastewater discharges along with air emissions, then a Profile can be included with this question answered "no" for the wastewater calculations.

When you click on the arrow for *Estimation method*, a drop down list appears where you can choose from *Emission Factors – Site-specific*, *Emission Factors – General*, or *Manually Entered Emissions*.

After choosing one, a dialog box appears with *Factors*, or *Compounds*, relevant to that Profile record. Select the Factors needed for the data you are working with. (See Figure 5.9)

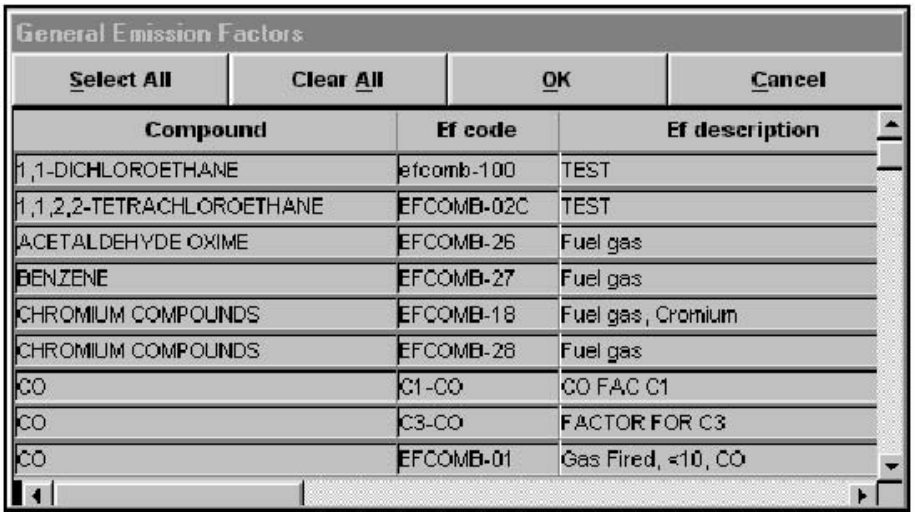


Figure 5.9

Another dialog box also appears when you click on the Speciation drop down field list. When you select one of the entries from the list, a window entitled, *Multiple Species Compounds*, appears. (See Figure 5.10)

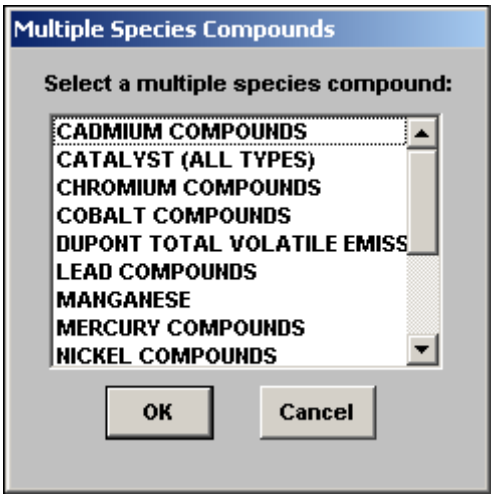


Figure 5.10

You may click on the desired item. Compositions may be entered directly from a pre-defined Stream Composition by selecting *Using Stream Comp* from the Speciation drop-down list.
To save the existing Profile record, click on the *Save* icon. If you made changes to existing records, you may also click on the *Save* icon to update that particular record, or you may save those changes to another, unique, record by choosing the *Save As* icon and naming the new record.

If you are making changes to the compound listing under the Profile record, and you wish to delete a compound entry, select the desired compound and click on the *Erase* icon. This will delete that specific compound from the Profile ID. Remember that clicking on the *Delete* icon will delete the entire Profile ID record, so use that icon only when needed.

To print the Profile report, click on the *Print* icon. This will present the user with three choices for printing out the profile information:

(a) print the profile on the *display* screen only.

(b) print all profiles stored in the database.

(c) print all profiles listed by site.

To exit out of the emission source Profile area, click on the *Close* icon. If there is any unsaved data, you will be asked whether you wish to update the database.

Profiles may be assigned to a Source in one of two ways, as explained in the following paragraphs:

1. While the Profiles detail screen is open, users may click on the *Link Sources* icon or the *Options* menu located at the top of the screen and select *Link Sources*. This will open a screen in which Profiles and Sources are displayed in separate windows, and users may "drag and drop" the desired Profile to the appropriate window to save this link. (See Figure 5.11)

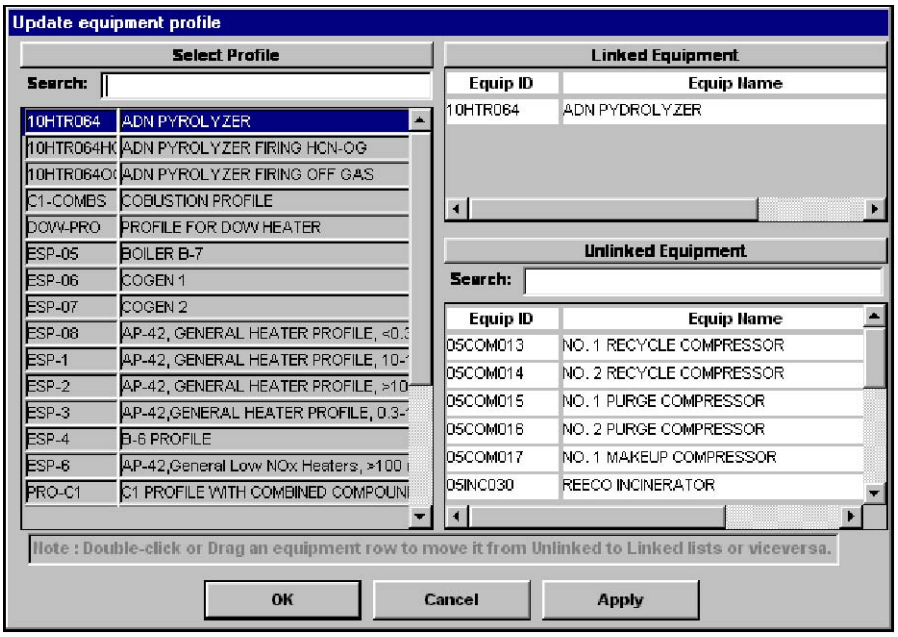


Figure 5.11

This screen also enables users to view the currently-assigned Profile for all Sources. A Profiles report is also available under the *Options* menu selection to enable a detailed review of Profile links to Sources.

2. While the Sources *Detail* screen is open on the first tab, users may click on the *Profile* data entry item and select from all Profiles that have been created for the selected Source Type to link the Source to a Profile. (See Section 3.4)

CHAPTER 6: EMISSION CALCULATIONS

6.1 Formulas

Formulas are the building blocks of the Emission Source Profiles in Calcs. To create a formula, you manipulate the objects you have at your disposal, including data elements, values, and mathematical routines. Once these formulas are created, they may be used in multiple instances (i.e., profiles) to calculate emissions. Should it become necessary to modify the formula, it can be changed in one place at one time, and all profiles that reference the formula will instantly be updated.

To enter the formula area of Calcs, click on the *Formulas* icon. This will open the *Add/Edit Emission Factors and Formulas* window. (See Figure 6.1)

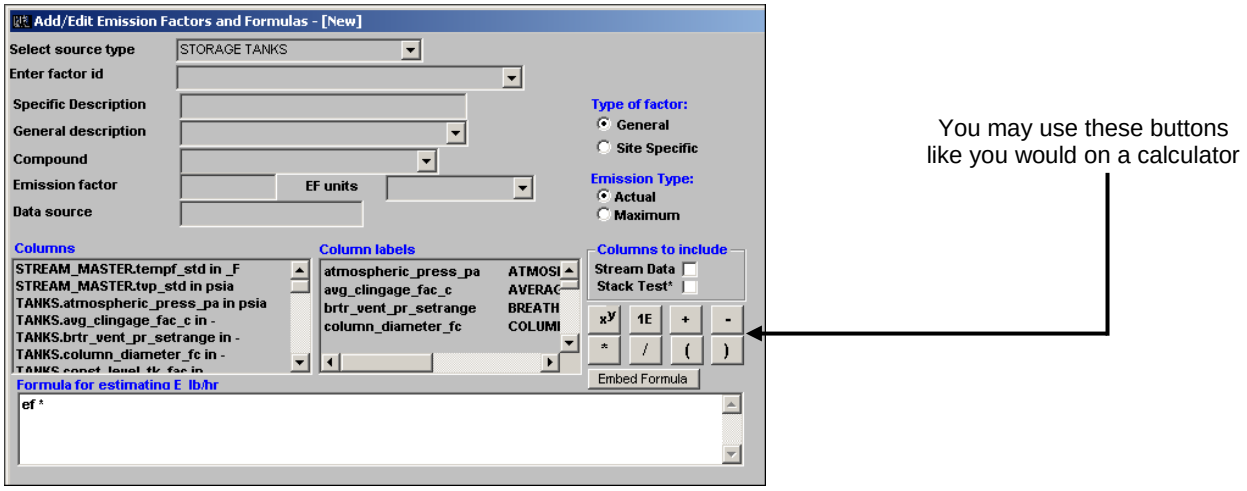


Figure 6.1

To add or modify formulas, you must first select the *Source Type* for the formula. If you are adding a new Factor or formula, enter the new formula name in the *Factor ID* field. If you are modifying an existing Factor ID, select that ID from the drop down list box. Once the Source Type and Factor ID (to be modified) are selected, the form accepts data in all other data fields. (See Figure 6.2)

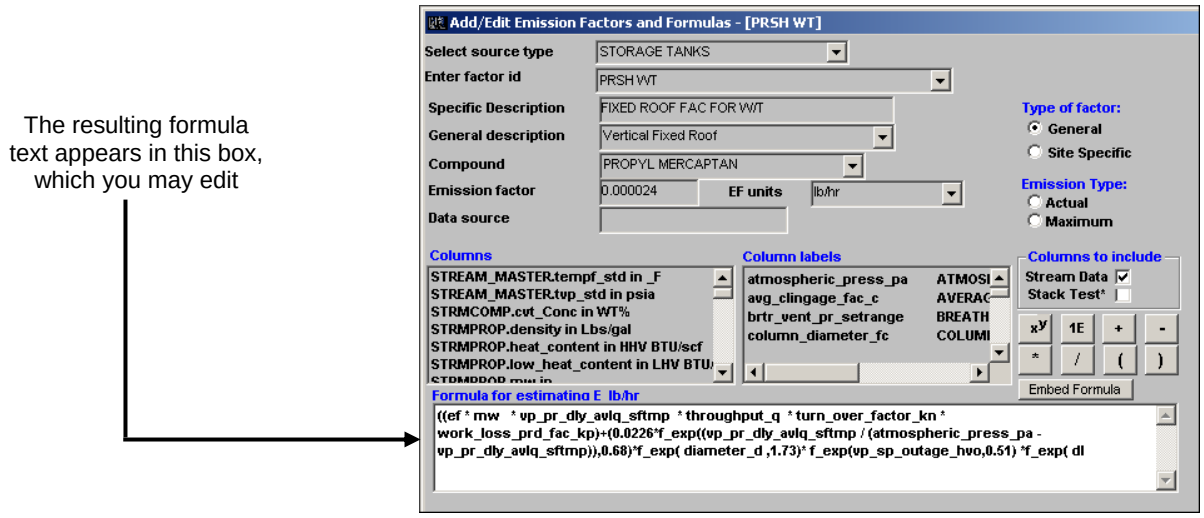


Figure 6.2

The *Columns* box provides the variable building blocks for your formula. To enter one of those variables, you will need to double click that variable to add it to the formula. The mathematical tools to the left are there for you to manipulate the variables into the formula you need. Simply click on the calculation function you need for that particular variable. Some formulas are quite complex and may involve many variables (e.g., storage tank variables).

The Source Type called *User-defined* is a special case for developing Formulas. That is because the User-defined Source data table is actually a generic spreadsheet-type table, in which the user defines the labels for data elements. The *General Description* field is used as a Source Type subcategory for User-defined Sources.

When the user selects the User-defined Source Type in the *Add/Edit Emission Factors and Formulas* window and then selects a *General Description* from the drop down list, the windows on the screen appear slightly different but work the same way as for other Source Types. The *Column Labels* window on the right side of the screen displays the user-specified data element labels, while the *Columns* window on the left side of the screen displays the actual column numbers (i.e., from the data table). The user double-clicks on the column numbers in the *Columns* window on the left side of the screen to add a variable to the formula. (See Figure 6.3)

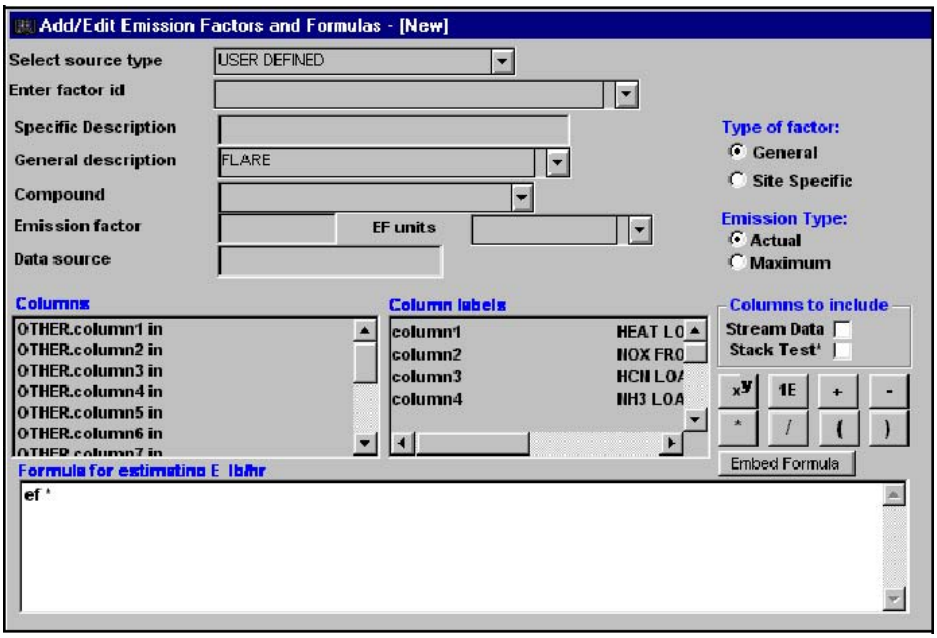


Figure 6.3

By clicking on the *Embed Formula* button, a *Formula Picklist* is accessed showing previously defined formulas that can be add to a new formula. Click *OK* after your selection. (See Figure 6.4)

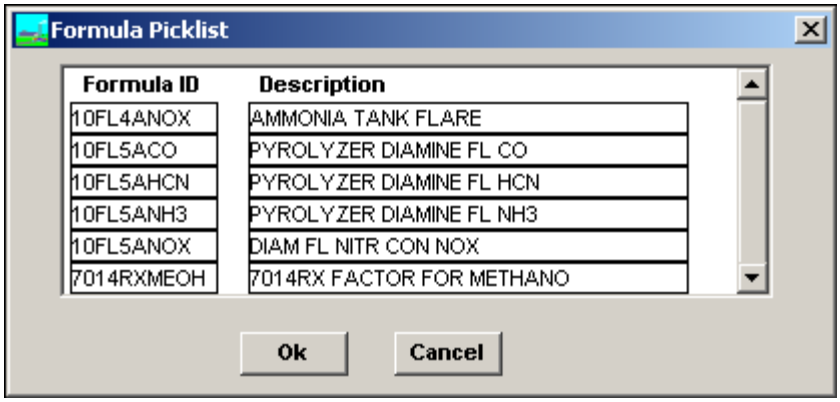


Figure 6.4

To exit out of the *Emission Factors* window, select the *Close* icon. This will take you back to the main Calcs screen.

6.2 Estimating Emissions

The *Estimate Emissions* windows allow you to build the reports with which to view an estimated Emissions list. To enter the Estimated Emissions window, click on the *Emissions* menu, and then select *Estimate Emissions*. Alternatively, click on the *Calculate* button. (See Figure 6.5)

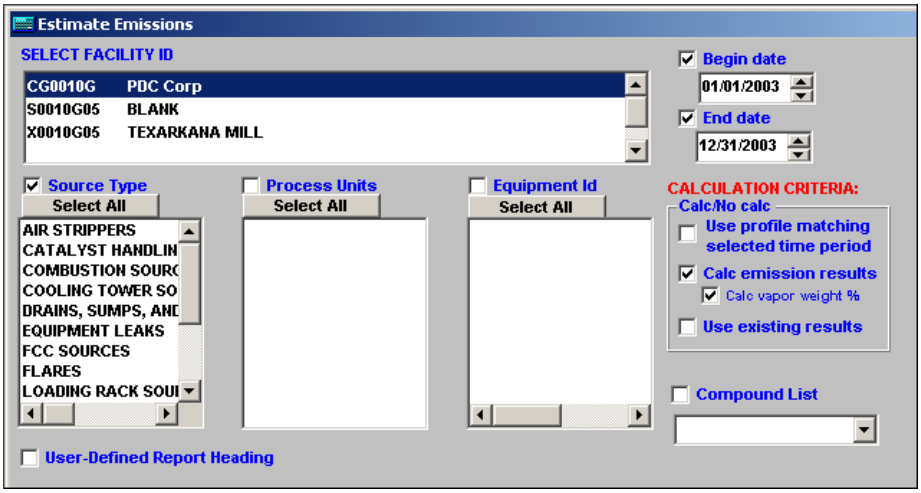


Figure 6.5

You must select *Source Type*, *Equipment ID*(s), and the *Begin-End date* range to establish the necessary parameters for emission estimation. Source data, such as fuel usage, pertinent to this date range will be utilized in the emission calculation procedure.

You may click on the Up/Down arrows that appear on the right side of the date entry windows to change the Year, Day, and Month, after clicking in the appropriate area of the Begin/End data for the change. The begin date will automatically default to January 1st of the preceding year, while the end date will default to December 31st of the same year.

You may specify a Begin-End date range that is longer in duration than the date ranges used for source data. For example, if monthly fuel schedules have been entered for January, February, and March of 2007 and the total fuel burned for the same source was entered for the period June 1 through December 31 of 2007, then an emission calculation may be run for all of 2007, for the first quarter of 2007, or for the month of March (or any month mentioned). However, an emission calculation could not be performed for the month of July or for the third quarter because source process data does not exist for such time periods.

After emissions have been calculated for the desired sources, click on the *Use Existing Results* check box and select a new report format from the *Options* menu. For example, a *Source Summary* report will sum emissions for all embedded date ranges within the Begin-End date range. The *Emission Calculation Parameters* report will show the methodology information, including formula, value of variables used when calculations were done, and the calculated emission values. (See Figure 6.6)

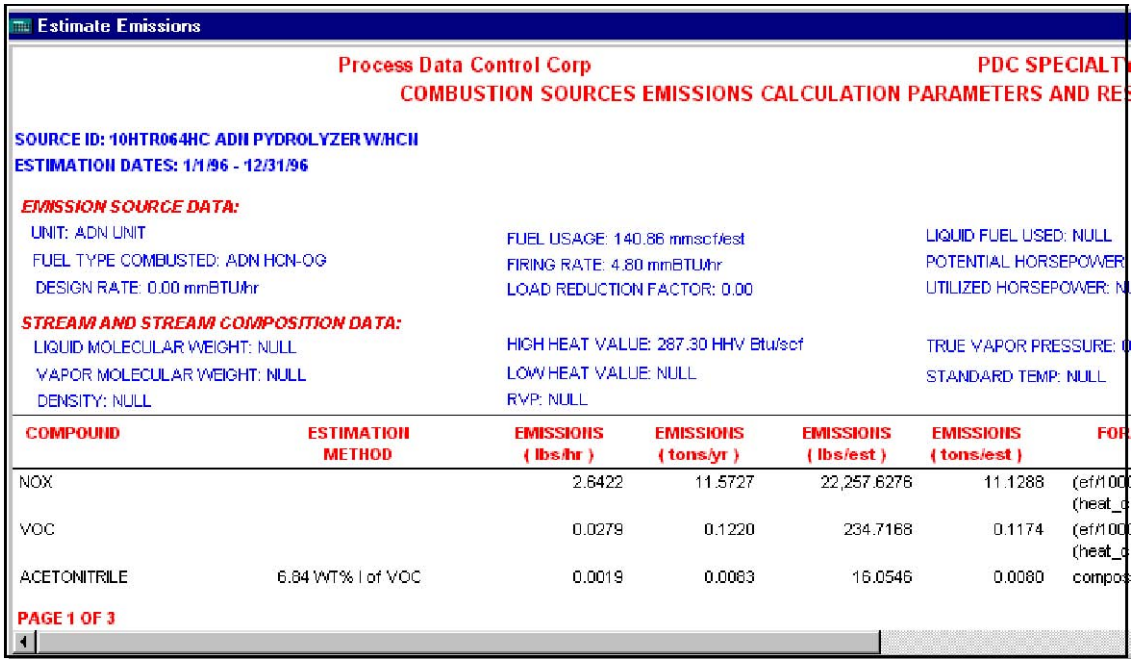
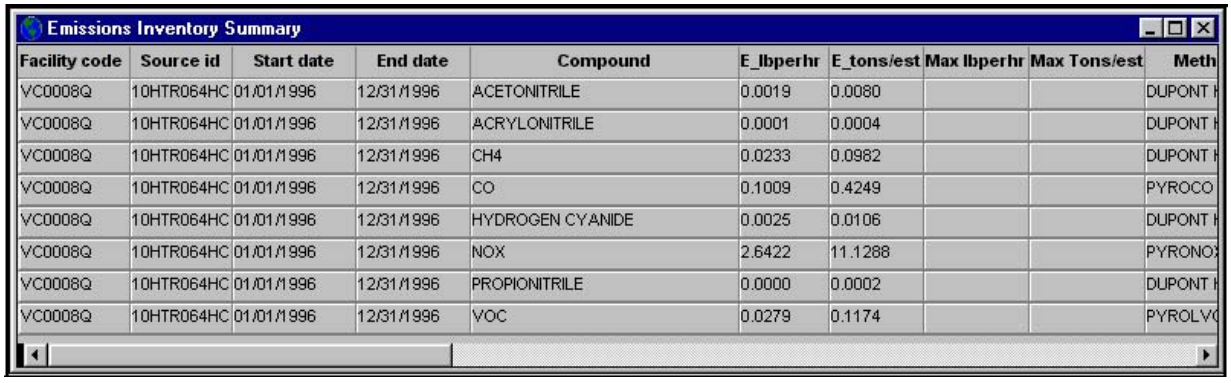


Figure 6.6

6.3 Emission Inventory Summary

The *Emission Inventory Summary* is a data table that contains all of the emissions for all sources and date ranges that have been calculated by the user, along with critical explanatory information. Click on the *Inventory* icon to bring up an *Emission Inventory Search Criteria* screen that enables users to specify the scope of the emissions data that will be reviewed. After the Facility ID, time frame, and other filter criteria have been entered in the criteria screen, the user clicks on the *Retrieve* command button to access the *Emission Inventory Summary* window. (See Figure 6.7)



Facility code	Source id	Start date	End date	Compound	E_lbperhr	E_tons/est	Max lbperhr	Max Tons/est	Meth
VC0008Q	10HTR064HC	01/01/1996	12/31/1996	ACETONITRILE	0.0019	0.0080			DUPONT H
VC0008Q	10HTR064HC	01/01/1996	12/31/1996	ACRYLONITRILE	0.0001	0.0004			DUPONT H
VC0008Q	10HTR064HC	01/01/1996	12/31/1996	CH4	0.0233	0.0982			DUPONT H
VC0008Q	10HTR064HC	01/01/1996	12/31/1996	CO	0.1009	0.4249			PYROCO
VC0008Q	10HTR064HC	01/01/1996	12/31/1996	HYDROGEN CYANIDE	0.0025	0.0106			DUPONT H
VC0008Q	10HTR064HC	01/01/1996	12/31/1996	NOX	2.6422	11.1288			PYRONOX
VC0008Q	10HTR064HC	01/01/1996	12/31/1996	PROPIONITRILE	0.0000	0.0002			DUPONT H
VC0008Q	10HTR064HC	01/01/1996	12/31/1996	VOC	0.0279	0.1174			PYROLVC

Figure 6.7

You may delete rows from the *Emission Inventory Summary* window by selecting the row and clicking on the *Delete* icon. Multiple rows may be deleted by selecting one row and then selecting another row while holding down the <Shift> key. This will highlight all rows between the 2 rows selected with the mouse. Click on the *Delete* icon to delete any highlighted rows.

You may also enter Permit limit and reference data into rows of the *Emissions Inventory Summary* window. These items are located on the right side of the window and must be accessed by moving the horizontal scroll bar to the right.

Users may sum up emissions from Secondary Sources into Primary Sources by clicking *Data* and *Sum Emissions* while viewing emissions in the *Emissions Inventory Summary* window. All Primary Sources are listed at the top of the *Sum Emissions To Primary Sources* window. When a *Primary Source* is highlighted by a single mouse click in this window, all emissions from related Secondary Sources appear in the bottom portion of the screen. (See Figure 6.8)

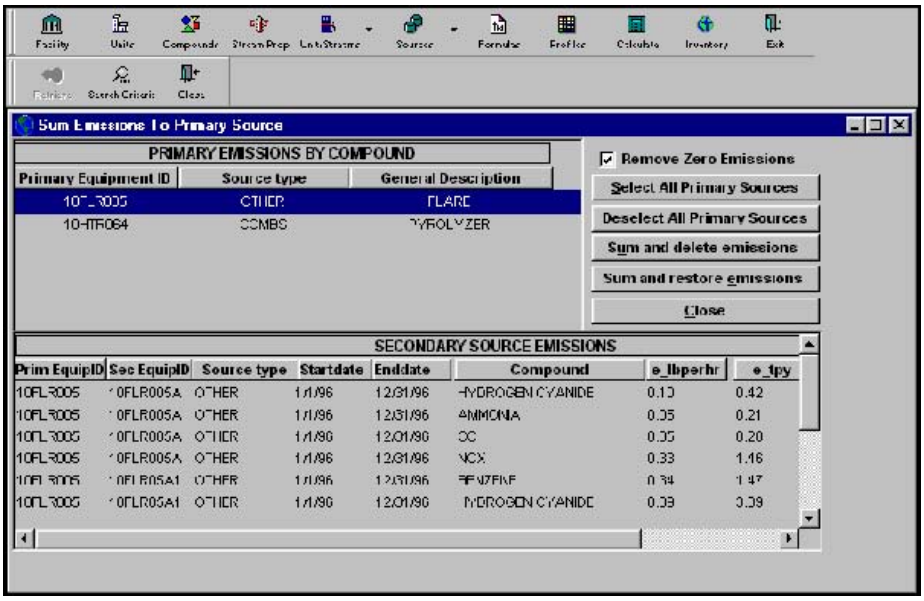


Figure 6.8

Several command buttons enable the user to sum up the Secondary Source emissions into the Primary Source and to delete them, or not delete them, depending on the button that is pushed. Command buttons also enable users to select all Primary Sources for summing with a single click.

If the user has not taken the time to set up Secondary Sources and their relationship to Primary Sources in advance but still wishes to sum emissions, a feature is available for meeting this objective. By double-clicking on any row in the *Emissions Inventory Summary* window, a window with four different options is presented to the user to assist him in finding the emissions that will be summed.

Regardless of the summing technique, any summed emission records in the *Emissions Inventory Summary* window are automatically displayed with a gray highlight, and a *Summed* note is entered into the comment column of the Inventory data table. Both a *Print* icon and *File* menu *Print* function are available to the user to prepare hard copy reports from the data presented in the *Emissions Inventory Summary* window.

Users can re-calculate historical emissions using the Profile that was linked to the Source in a previous time period, if they wish. If the historical data exists in the Inventory data table and the

user has checked the check box on the Estimate Emissions screen labeled *Use Profile Matching Selected Time Period*, then the calculations will be performed in accordance with the information contained in the previously linked Profile instead of the currently linked Profile (assuming that it still exists in the system).

6.4 Data Pipeline

The data *Pipeline* is a feature designed to copy calculated emissions from the Calcs module to WinCeis (i.e., the Emission Inventory module). It is accessed by selecting the *Pipeline* icon from the COMPASS folder on the *Start* menu. As shown in Figure 6.9, the main tool bar enables choices to be made as to whether to "pipeline" equipment parameters or emissions, as well as whether to run maintenance functions such as for equipment relationships or contaminants. Most users will use this feature to copy emissions data only.

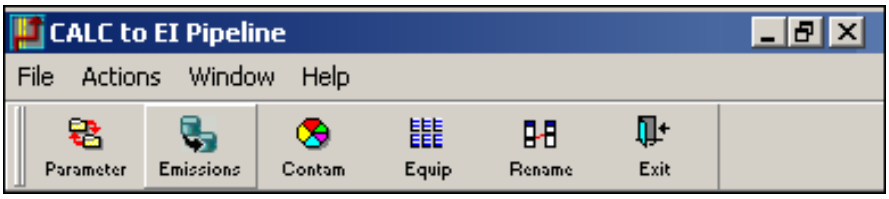


Figure 6.9

The procedure to copy emissions is to first select the *Emissions* icon from the *Pipeline* tool bar and enter the pertinent information on the retrieval screen to show the emissions that will be "pipelined," and then click on the *List* icon to retrieve the list. (See Figure 6.10) Highlight the emissions that you want to be copied to WinCeis.

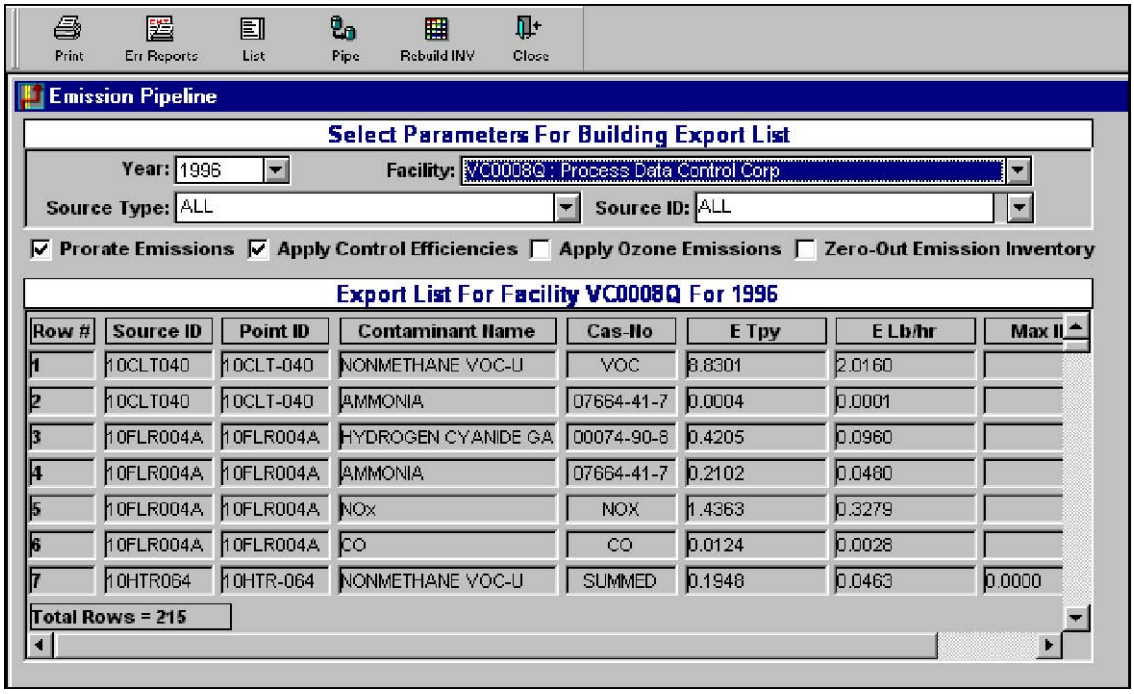


Figure 6.10

In addition to copying emissions, the Pipeline feature also applies control efficiencies for all connected control devices and prorates emissions to connected emission points. Selections are available to turn these special processing functions on or off. The *Zero Out* option will change all actual emission rate values to "0" before the pipeline is done, including emissions that are not affected directly by the Pipeline. Otherwise, if this checkbox is left blank, emissions that are not affected by the pipeline will retain their current emission rate value.

6.4.1 NY–Pipeline

The data Pipeline is accessed by clicking on the *Pipeline* icon in the COMPASS folder. As shown in Figure 6.11, the main toolbar has two reference lists to assist the user to synchronize data between CALCS and WinCeis for the export of emissions. They are *Equip*, which displays equipment relationships, and *Contam*, which displays a list of chemicals with the WinCeis-assigned contaminant code and CALCS-assigned CAS Number. In order for chemical-specific emissions to transfer from CALCS to WinCeis, it is necessary for the correct CALCS-assigned CAS Number to be correlated with the related WinCeis Contaminant Code.

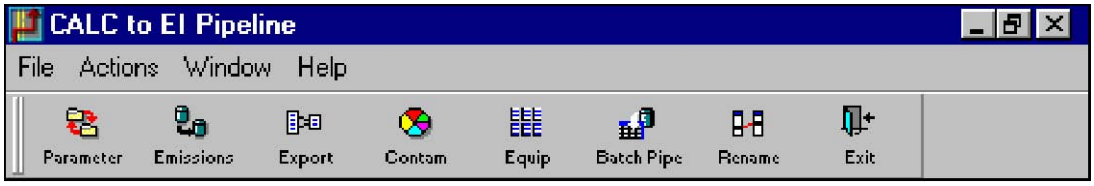


Figure 6.11

The *Batch Pipe* icon provides a list screen to select batch Sources for transferring emissions from CALCS to WinCeis, as shown in Figure 6.12. The *Emissions* icon provides a list screen to select non-batch Sources for transferring emissions from CALCS to WinCeis, as explained in Section 6.4.

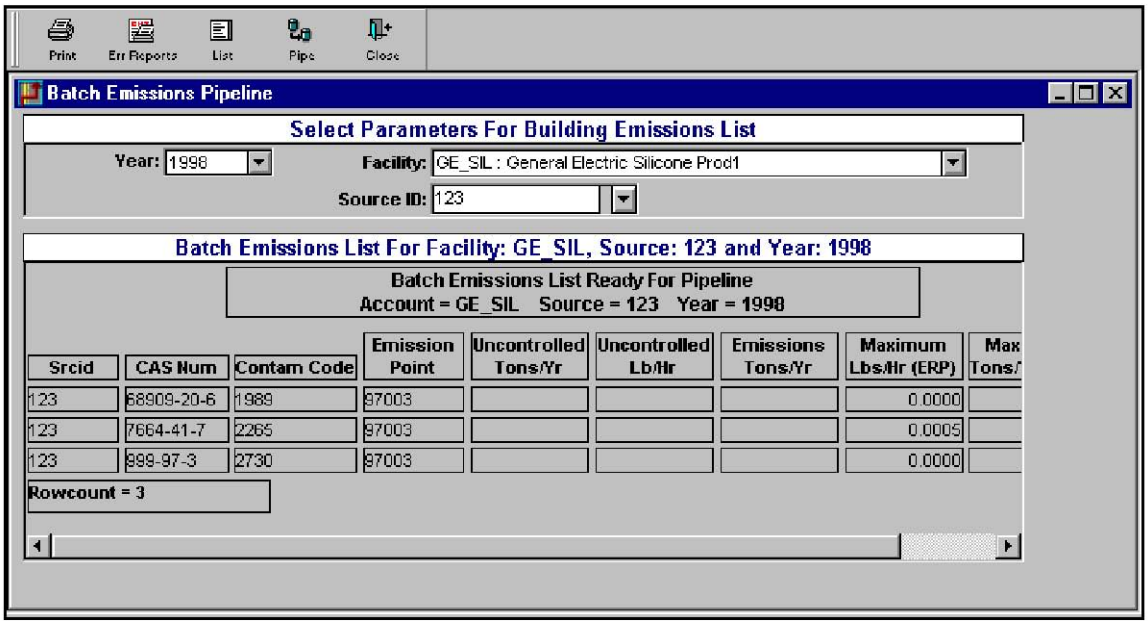


Figure 6.12

6.5 Renames

A special *Rename* icon is provided on the *Pipeline* toolbar. Users can use the screen that appears when this icon is clicked on to rename CALCS Sources that do not have the same Source Id as was used in WinCeis. This feature may not be used to add new Sources in either module nor to change Source Id's in WinCeis. (Note: to change a Source Id in WinCeis, simply edit it in the *Detail* screen.) The renamed Source Id data entry column is labeled *Rename to FIN* on the *Rename* screen, as shown in Figure 6.13.

The *Err Reports* icon enables users to review reports that can explain why a calculated emission rate is not transferring from CALCS to WinCeis. There are three possible reasons:

1. The Source Id's don't match.
2. The equipment relationship has not been defined or critical data showing the percent of flow from Sources to Control Device(s) and/or Emission Point(s) is missing, or
3. The CAS Number for the chemical that is being emitted as shown in CALCS has not been associated with a valid WinCeis contaminant.

More than one of these three conditions could exist at the same time. If one or more conditions do apply and are interfering with the Pipeline, users can easily correct the missing or incorrect data related to Source Id's, flow routing, or contaminant code-CAS Number assignment, and re-try the Pipeline when corrections are finished.

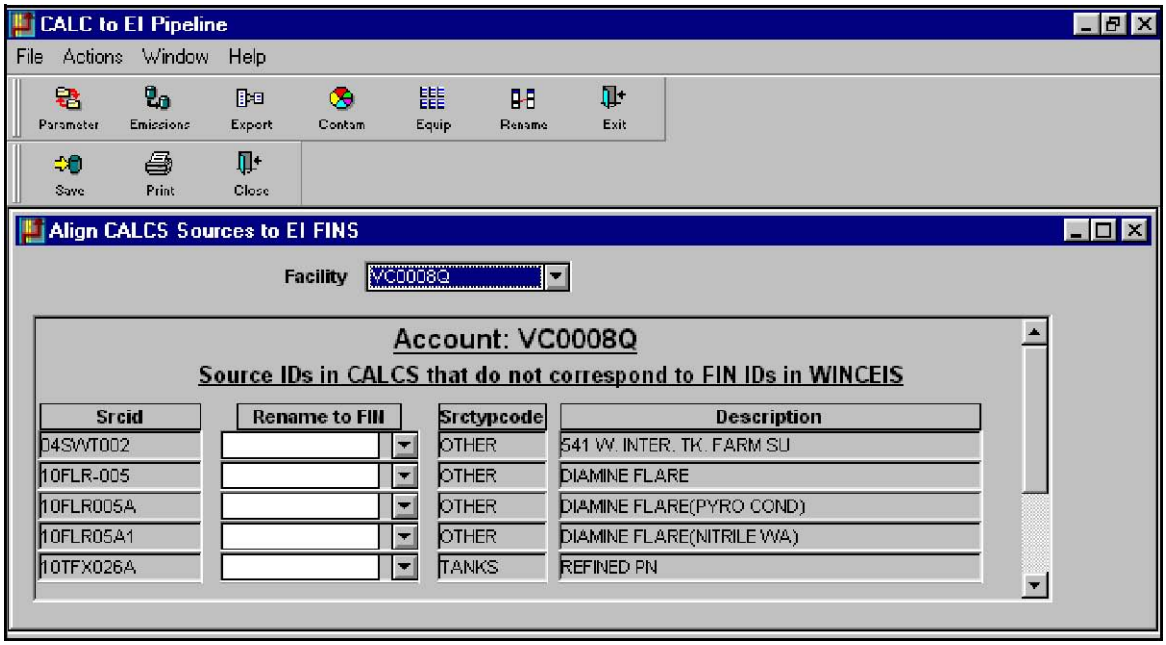


Figure 6.13

6.6 NY–Emission Calculations for Batch Processes

The Batch Calculation feature and related features, such as automatic updates from production and materials databases, are custom features that were added to the CALCS module especially for New York. Program functions related to creating Formulas and Profiles for continuous Sources, calculating emissions, summing secondary and primary Sources, and other features, are explained in the standard CALCS user's manual.

Batch calculations require extensive "setup" data to be entered into the system to identify how the batch processes operate. Once created, the Batch Source information may be updated with a more streamlined set of information to calculate emissions for future time periods. The *Number of Batches* field – an important data element that drives significant portions of the emission calculations – can be updated automatically from the PIMS database through a feature that is explained in the next section. (See Figure 6.14) This section concentrates on manual data entry by engineers or technicians who understand batch processes and are familiar with the type of information that will be required by the system to calculate emissions.

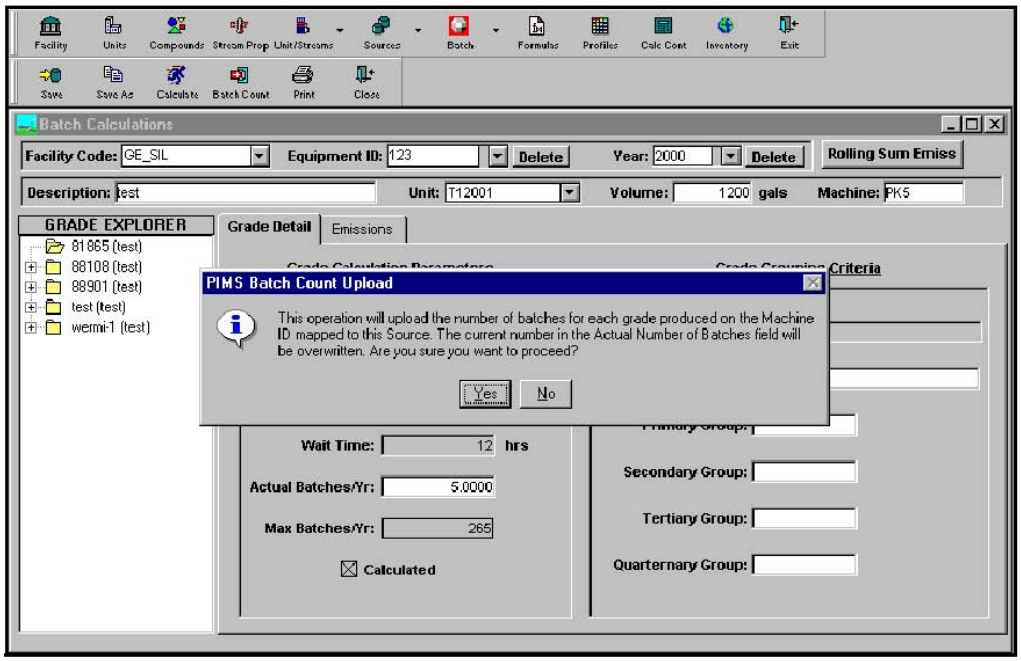


Figure 6.14

A *Batch* icon appears on the main screen of CALCS, as shown in Figure 6.15, which may be used to access all batch-related functions.

Figure 6.15

Using this set of features, users can simulate a multi-step batch process with charge, drain, and clean out operations. Each set of batch emission calculations is associated with a product grade being manufactured.

One reactor vessel can be in service for manufacturing multiple product grades. The emissions from each batch are then extrapolated to an annual emission based on the number of batches produced in a given year. The software estimates the potential to emit (PTE=total uncontrolled emissions) for a given source and the ERP (maximum uncontrolled emissions).

6.7 NY–Using the Tabs to Navigate Batch Calculations Screens

The user can enter any number of steps to simulate a manufacturing process. Each step can be associated with heating, pressurization, and material charging activities. The grade explorer on the left side of the screen keeps track of the various production batches being run. Each grade (product) represents a batch from a production standpoint and it is associated with one or more steps involved in the manufacturing process. The user specifies the operating parameters for each

step, for example the temperatures, pressures, etc. (See Figure 6.16) The user also chooses a flow condition which points to a control device network configuration utilized for emissions abatement.

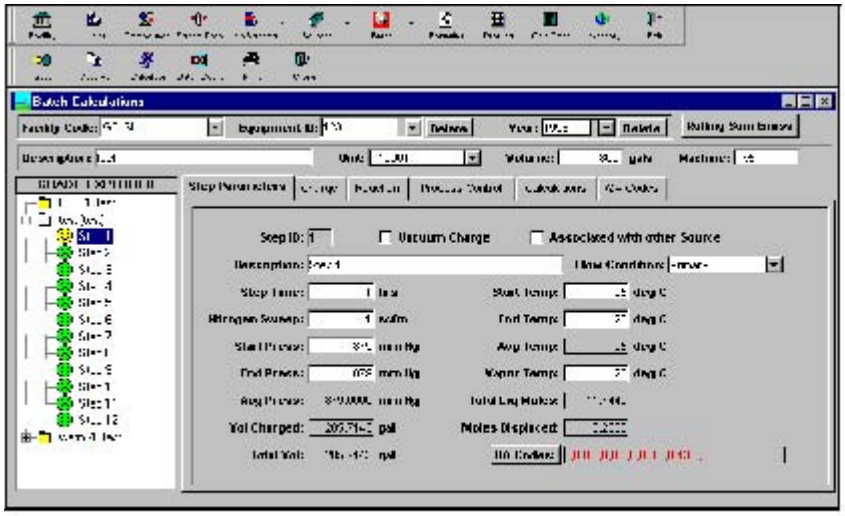


Figure 6.16

The second tab displays material input/output information. (See Figure 6.17) The user selects an input grade or raw material from a predefined set of materials stored in the database. These materials and their chemical compositions are user maintained. When a user selects an input grade, the corresponding chemical composition is displayed under grade composition. The number of pounds of each chemical fed to the reactor is calculated from the grade/material composition.

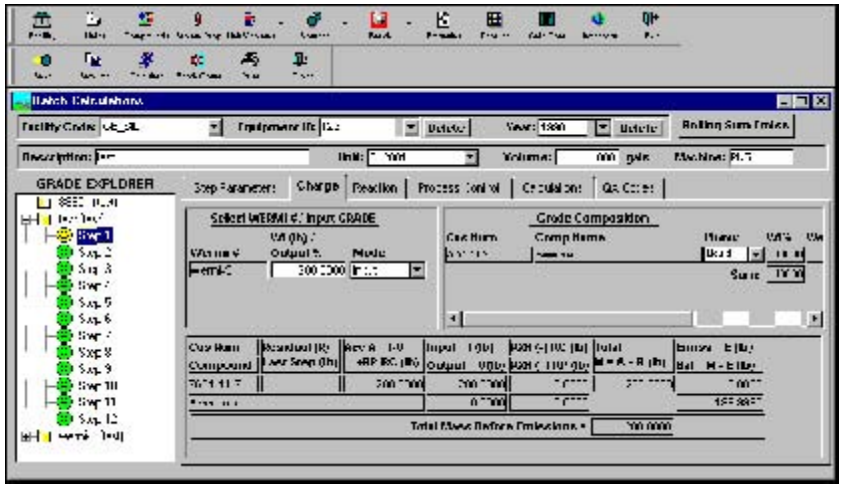


Figure 6.17

The bottom section of the Charge tab displays the material balance for the current step. The emissions are calculated based on the moles of vapor displaced during the current step. The volatility of various chemical species at the given temperature and pressure and the volume of

material charged affect the number of moles displaced. Heating, de-pressurization, and material charging all lead to vapor displacement from the reactor. The vapor pressures of various chemical species determine how much each will contribute to the total emissions resulting from vapor displacement.

Chemicals charged into the vessel can participate in one or more reactions. (See Figure 6.18) The software identifies the limiting reactant based on the quantities of the reactants present during a given step and the reaction stoichiometry. The limiting reactant is the chemical species that will be completely consumed during a given chemical reaction, and the reactor will still be left with other reactants to spare. Hence, the reaction can only proceed when all of the limiting reactants are available. The program also accounts for the percent completion of a reaction. The maximum amount of limiting reactant that can participate in a given reaction will be dictated by the percent completion of the reaction.

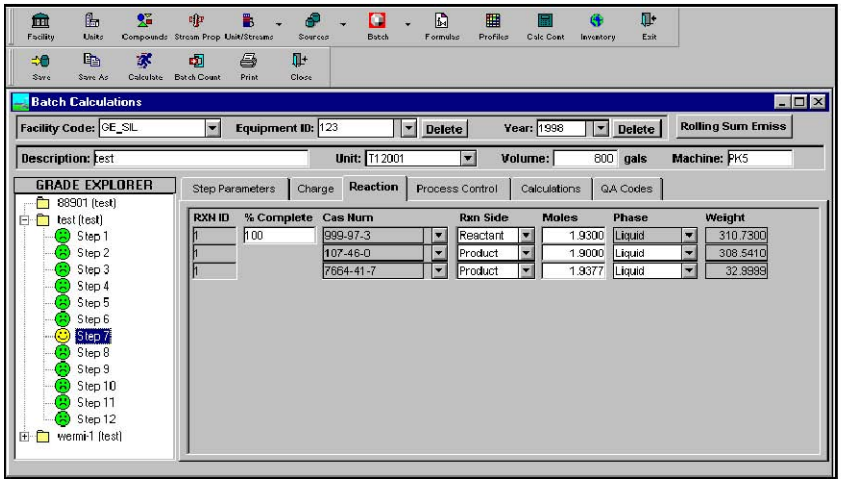


Figure 6.18

Each step can optionally be linked to a control device that is integral to the process. (See Figure 6.19)

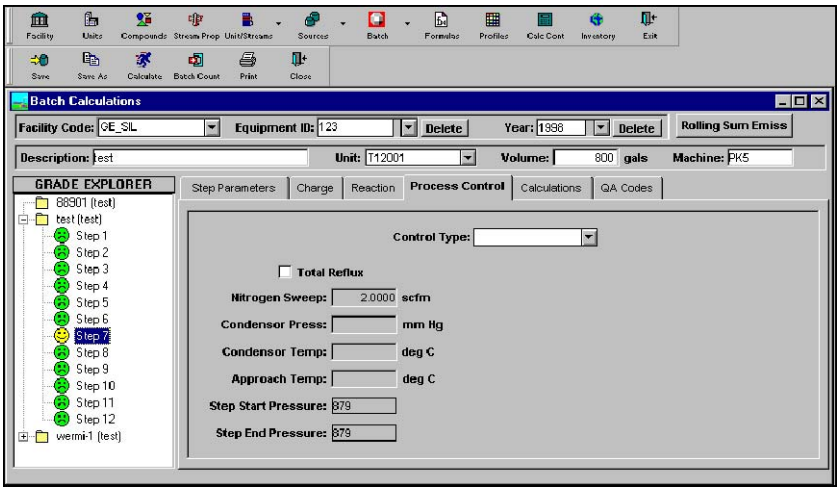


Figure 6.19

This control device is not a regulatory abatement device but a process control device, such as a condenser or a scrubber. The software performs a vapor liquid equilibrium calculation using the Newton-Raphson computation method. This calculation provides the final emissions after condensation/scrubbing. The resulting condensate can also be recycled to the system by selecting the *Total Reflux* checkbox. The calculations yield percent control efficiency for each chemical. This process results in generated emissions from a given step.

The *Calculations* tab displays vapor pressures, vapor fractions, moles of liquid and percent control efficiency achieved from the process control step. (See Figure 6.20) If there is no process control, then the potential and calculated emissions are the same.

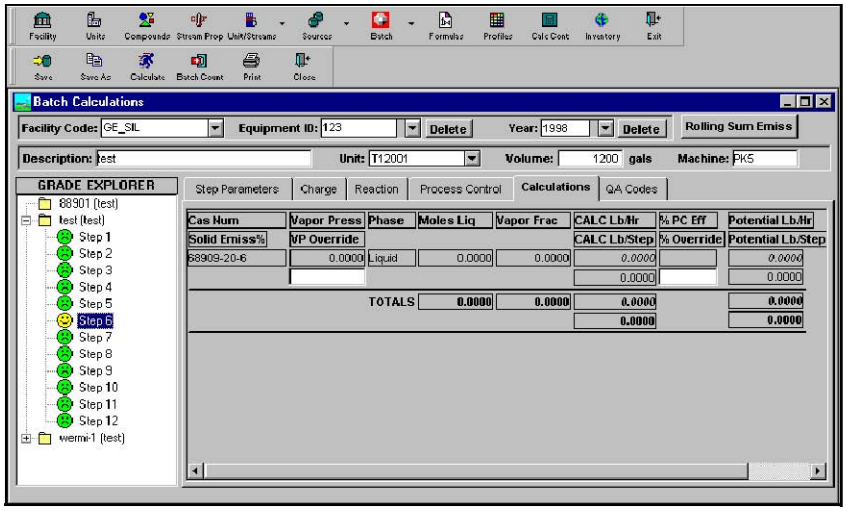


Figure 6.20

During the calculation process, if any missing parameters, such as molecular weights, densities, Antoine coefficients, etc. are detected by the program, it notifies the user through a list of QA codes. (See Figure 6.21) The QA codes will also trap value overruns – for instance, vapor fractions greater than 1.0. If a user inadvertently inputs more material than the reactor can hold, the system assigns QA code #12. Such user notifications can be very helpful to identify problems and ensure correct emission calculations.

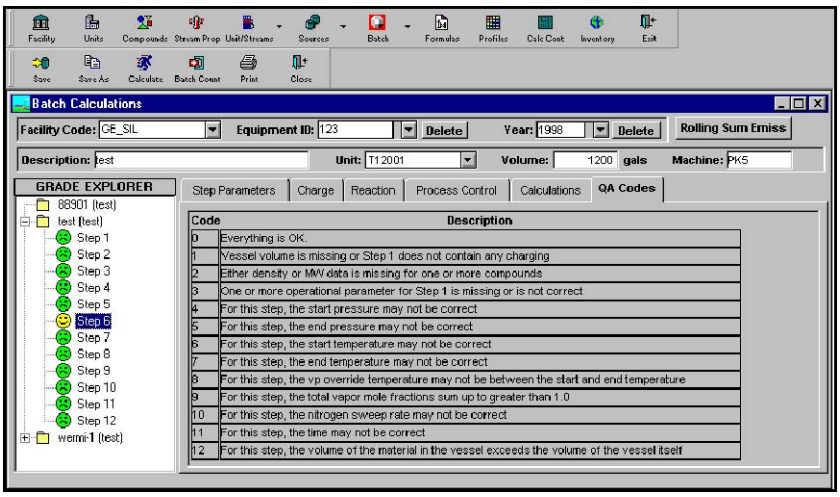


Figure 6.21

6.8 NY–"Rolling Sum" of Emissions

WinCeis data is used to produce a report that shows the *Rolling Sum* of emissions from Batch Sources. This feature is run from the *Batch Sources* screen in the CALCS module, as shown in Figure 6.22. When run for a specific Source, this feature searches all records in the PIMS (i.e., Production database) to obtain a total number of Batches produced in each month during the prior twelve months. Emissions data in WinCeis is used to correlate the emission amounts with the number of batches, so it is important for users to have calculated emissions and to have used the data *Pipeline* to update WinCeis for any time period in which a Rolling Sum report is produced.

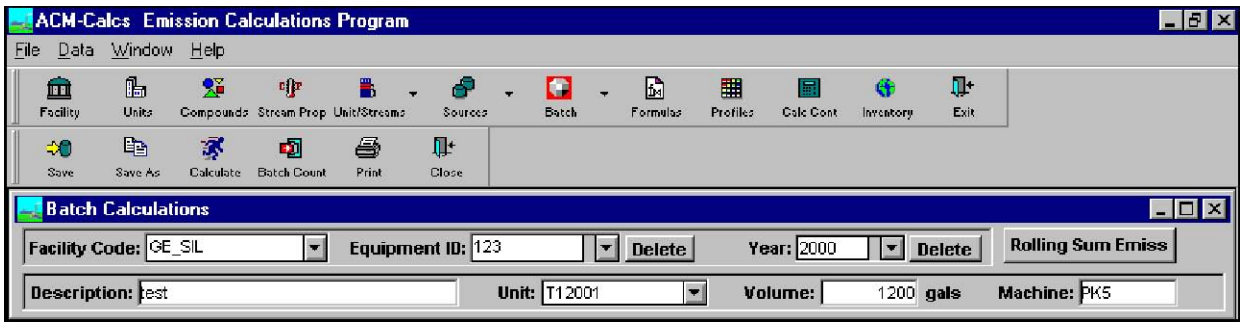


Figure 6.22

CHAPTER 7: CALCS TUTORIAL

7.1 What You Will Do

The tutorial is a series of lessons in which you will estimate air emissions for an emission source in the refinery using the Calcs module. You will begin by creating a unit, a stream, a composition for the stream, a source, a formula, and a profile for the source. You will then link the estimation profile back to the emission source, calculate estimated emissions, and print a report.

7.2 What You Will Learn

After finishing the tutorial, you should know how to do the following:

- Create an emission source
- Create all pieces of information about that emission source
- Create an emission profile
- Create and use a compound list
- Estimate air emissions for an emission source
- Access/print the different types of emission reports

7.3 Step Overview

The following steps are what you will be doing in the tutorial. You will create a process heater, and estimate the VOC emissions and speciate the benzene emissions.

Step 1: Creating a unit - Calcs is designed to estimate emissions for sources included in a unit.

Step 2: Creating a process stream - A process unit has several incoming and outgoing streams to perform its ultimate process. This is where you define those streams and link them to the process unit.

Step 3: Creating a stream composition. A stream has several physical properties and is a mixture of several different compounds. When this mixture is processed, it emits these compounds into the air.

Step 4: Editing compound data - Compound properties are important for converting units of measure to a standard unit and are used in converting liquid compositions to vapor.

Step 5: Creating an emission source - An emission source is a piece of equipment inside of a process unit that performs a task that releases contaminants to the air.

Step 6: Creating an emission factor - An emission factor is actually a formula for calculating emissions for a particular compound. You build this equation by selecting parameters for the source you are building the equation for.

Step 7: Creating an emission profile - An emission profile is a group of emission factors and compounds to be speciated. After you build a profile once, you can link it to several pieces of equipment for that source type.

Step 8: Linking the profile to the emission source - A profile has to be associated with a piece of equipment before you can estimate emissions. Otherwise, the system would not know how to estimate emissions.

Step 9: Estimating emissions - This window provides you with different search criteria for calculating emissions.

Step 10: Viewing/printing the different reports. Now that you have calculated emissions you are ready to see the results! There are several different report options.

7.4 Proceeding With the Tutorial

7.4.1 Log Into the Database

Before you start the tutorial, you will need to log into the database. Follow the directions in "Logging onto Calcs" in Section 1.7.

7.4.2 Create a Unit

Calcs is designed to estimate emissions for sources included in process units. Therefore, the first step in estimating emissions is defining one or more units, such as a powerplant or a sulfur recovery complex.

1. Click on the *Process Unit* icon.
2. A window with a list of resident process units appears. Click on the *Insert* icon.
3. Enter a name for the process unit you are creating (e.g. Process Unit "SRU").
4. In the *Process Unit Number* column, type an ID number that corresponds with the name you gave the process unit (e.g. PU1).
5. Use the tab key to move into the other columns to enter the necessary data.
6. Click on the *Save* icon to record your process unit to the database.
7. Click on the *Close* icon to exit this window.

7.4.3 Creating a Process Stream

A process unit has several incoming and outgoing streams to perform its ultimate process. This is where you define those streams and link them to the process unit. Like the process unit itself, streams are generic in nature. Thus the same process stream, e.g. Natural Gas, may be used in more than one Facility.

There are several stream parameters that are needed when estimating emissions in the vapor phase using a liquid composition. Be sure to complete these parameters before calculating emissions, otherwise emissions cannot be estimated:

1. Click on the *Unit/Streams* icon.
2. A window appears with the resident process streams. Click on the *Insert* icon, which will insert a new blank row.
3. Enter a name for the *Stream Name* (e.g. Process Stream 1).
4. Use the t*ab* key to move forward to the *Stream ID* column, where you will assign the new process stream an ID number (e.g., PS1).

5. Tab to the *Unit* column and click on the drop down list to display the list of units, and select the process unit you created in the previous step.
6. As you move through the columns, the stream name scrolls off the screen. You can fix the columns so they never leave the screen by clicking on the small black bar at the left of the horizontal scroll bar and dragging the black bar to where you wish to split the screen. Once that is done, there will be two horizontal scroll bars at the bottom of your screen.
7. Leave the *Stream Composition* field blank since we have not yet created the composition.
8. Click on the *Save* icon to update the database.
9. Click on the *Close* icon to leave this window.

7.4.4 Creating a Stream Composition

A Stream has several physical properties and is a mixture of several different compounds. When this mixture is processed, it emits these compounds into the air. Estimated multiple species compounds are speciated based on the weight percent of the compound in the stream.

Stream properties are important for converting units of measure to a standard unit, and they are also used in converting liquid compositions to vapor. Be sure to complete these parameters before calculating emissions. Otherwise, emissions cannot be estimated.

1. Click on the *Stream Properties* icon.
2. To create a new composition, *Enter Lab/Sample ID* and press the tab key to move to the next field.
3. Enter the *Sample Description* for the composition.
4. Fill the remaining fields in the top portion of the window.
5. Click on the drop down list box under *Compound* to select *Benzene*.
6. Type in *1500* as the concentration of the compound you have added, and select *ppmw* as the unit of measure. If the units are other than wt%, they will be converted for you when you save the composition.
7. Click on the *Save* icon.
8. Click on the *Close* icon to exit out of this window.

7.4.5 Editing Compound Data

Compound properties are important for converting units of measure to a standard unit, and they are also used in converting liquid compositions to vapor. Be sure to complete these parameters before calculating emissions. Otherwise, the emissions cannot be estimated.

1. Click on the *Compounds* icon.
2. Make sure the compounds you selected for your stream composition have *molecular weights* and vapor pressures data such as *Antoine Constants, 2-Parameter* data or *5-point* data.
3. If you made changes, click on the *Save* icon, which will update the database.
4. Click on the *Close* icon to leave this window.

7.4.6 Creating an Emissions Source

An emission source is a piece of equipment inside of a process unit that performs a task that generates releases to the air. There are several different types of emission sources. They all have different operating parameters that are used to estimate their emissions. Fugitive equipment leaks are the most complicated.

1. Click on the *Sources* icon.
2. Click on the drop down list to select a source type. Choose *Combustion Sources*.
3. To enter a new combustion source, type in an *Equipment ID* for the source.
4. Select the *Unit* and the S*tream* you created earlier.
5. Fill in the remaining process data including the time frame this data is valid for. These dates will be used as criteria for estimating emissions.
6. Click on the *Save* icon.
7. Click on the *Close* icon.

7.4.7 Creating an Emissions Factor

An emission factor is a formula for calculating emissions for a particular compound. You build this equation by selecting variables from the *Columns* list.

1. Click on the *Formulas* icon.
2. Click on the drop down list to *Select Source Type*. Choose *Combustion Sources*.
3. To enter a new emission factor, *Enter Factor ID.*.
4. Enter a specific description for your emission factor. Indicate whether this formula will calculate a *Maximum* (also called "Potential to Emit") emission rate or an *Actual* (e.g., annual tons/year) emission rate, by selecting the appropriate *Emission Type* radio button. Also indicate whether this formula uses a *General* or a *Site-specific* calculation approach, by selecting the appropriate *Type of Factor* radio button. Formulas based on U.S. EPA AP-42 or American Gas Association factors would be examples of *General* formulas.
5. Select *Process Heater* as the general description for this combustion source.
6. Select *VOC* as the compound.
7. Enter the *Emission Factor* as 5.5, and the *EF units* as lb/mmscf.
8. In the *Columns* listbox, double-click the column name *COMBS.cvt_fuelusage*. You should see the formula change to reflect '*ef * cvt_fuelusage'*. Now click on the '*/*' (division symbol) button and double click on *COMBS.Operating_hours*. The final formula should read '*ef * cvt_fuelusage / operating hours'*. Spaces are allowed for readability and ignored in the calculations.
9. Click on the *Save* icon.
10. Click on the *Close* icon.

7.4.8 Creating an Emissions Profile

An emission *Profile* is a group of *Formulas* and *Compounds* for speciation. After you build a Profile once, you may link it to several pieces of equipment for that source type.

1. Click on the *Profiles* icon.
2. Click on the drop down list to Select Source Type. Select Combustion Sources.
3. Enter Profile ID for the new profile.
4. Type in a Profile Description.
5. Select No for Use vapor phase composition.
6. For Estimation method, select Emission Factors–General. A popup window with a list of general emission factors for combustion sources appears.
7. Scroll to the VOC emission factors and click on the EF Code or formula you created. Click on the OK button.
8. Now choose Compositional Analysis–Manual for the Speciation method. A popup window with a list of multiple species compounds appears. Select VOC and press OK.
9. Click inside the blank Compound field.
10. Press B and choose Benzene from the list.
11. Click on the Save icon.
12. Click on the *Close* icon.

7.4.9 Linking the Profile to an Emission Source

Another method for linking profiles to source is described in the following six steps:

Step 1: Click on the *Sources* icon.

Step 2: Click on the drop down list to select a *Source Type*. Choose *Combustion Sources* from the list.

Step 3: Select the piece of equipment you created earlier under *Equipment ID*.

Step 4: Click on the *Profile* drop down list. Select the profile you just created.

Step 5: Click on the *Save* icon.

Step 6: Click on the *Close* icon.

7.4.10 Estimating Emissions

After establishing Sources, Formulas, and Profiles, you are ready to calculate emissions. You are provided with different search criteria for calculating emissions. You may choose from one to many source types, process units, pieces of equipment, specific chemicals, and estimation periods.

1. Click on the *Calculate* icon.
2. Click on the checkbox to activate the listbox for *Source Types*, and then select *Combustion Sources*.
3. Check the *Equipment ID* check box and select the Source you created. (Note: In a large plant, equipment can be "filtered" by clicking on *Process Units* check box first, selecting a *Unit*, then clicking on the *Equipment ID* box to list the equipment associated with the selected Unit.)

4. The *Begin date* and *End date* are required fields. You must enter the dates exactly as you did on the piece of equipment, OR enter dates that include the date range for the piece of equipment.
5. Click the *RUN* (green flag) icon.
6. The results of your calculation will appear in the default or selected report format, as discussed below. Icons are provided to go to the next or previous page of the report, print the report, or *Zoom* back to the calculate window. A *Print Preview* feature is available under the *File* menu.

7.4.11 Displaying and Printing Reports

Once Emissions are calculated, you may view the results. There are several different report options, as discussed below:

1. Select the desired report format from the *Options* menu. There are two types of reports: General and Process Unit. A total of eleven different formats are provided in these two categories. Under General Reports, all reports that have the word "Summary" in the report name will sum up emissions for the time period that was selected on the calculation screen, and they will only display the total emission rate. All other reports will present emissions separately for each time period for which process history data has been entered. To continue this lesson, select the *Source Specific* report under the *General Reports* category.
2. Click the *Use Existing Results* checkbox in the *Calculation Criteria*. This will “unclick” the calculate button.
3. Click on the green *Run* flag to view the report.
4. Repeat this process for all the reports. To view a summary report, change the begin date to at least two years before the end date, so that it will pick up the previous results.
5. Click the *Save* icon.
6. Select the *Close* icon.
7. To exit Calcs, select *Exit* from the *File* menu or the *X* in the upper right corner of the screen, then *Yes* in the confirmation box. This will take you out of Calcs.

CHAPTER 8: EQUIPMENT LEAKS

8.1 Calculating Equipment Leaks

Equipment Leak (or Fugitive) emissions data is usually supplied by a contractor. The user is responsible for creating the links between certain fields in both Calcs and the corresponding fields in the Source data files. The system has capabilities to import the data provided by the contractor, as long as the format that is used for this import procedure matches the format for which this feature was written (call PDC for details).

There are several files needed for import. The first set of files imported will be the 'leakers' files that Calcs uses to enter in the component counts. The next set of files is the Totals file that Calcs uses to keep track of the total number of components in the facility. The total number of components and the number of zero leakers are determined by Calcs after processing this file.

Once the data is imported, you set up equations in Calcs and calculate emissions. If you used correlation equations, Calcs will need to import the 'leakers' file again to input the specific leak rates into the equations.

8.2 Setting Up the Data

Before importing contractor data, you must first set up Calcs to accept the data for import. You will need to perform the following steps before attempting to import equipment leak contractor data:

Step 1: Make sure all the process units are entered.

Step 2: Define all the chemicals and compounds that will be needed for speciation of the stream data.

Step 3: Define all your streams, and enter the stream compositions in this window.

Step 4: Link the streams to each process unit in this window by inputting the first four columns. Also, the Leak contractor Stream ID and the Equipment leak stream category columns are necessary when importing data. If you will be speciating your VOC, the TVP and Deg F columns also need to be entered. The columns for Stream phase, VOC service, and TVP@68F are optional.

Step 5: To access these screens from the main window choose *Reference*, *Equipment Leak Reference Data*. Before continuing on to the *Source* window, make sure you fill in the *Leak Ranges*, *Leak Component Types*, *Leak Monitoring Programs*, and *Stream Categories*. Calcs uses the Leak Ranges and Leak Component Types information in Sources to construct the Leak Count table for Equipment Leaks, so it is important that you consider what leak ranges you will need and the components to be monitored before proceeding.

Step 6: Consider each process unit as an Emission Source for fugitives. List the streams within each process unit that are monitored for fugitive emissions. The estimation dates should correspond to the frequency of the contractor data.

If the contractor supplies data for each month (which is probably the most common), each Source should have 12 sets of records with different *Estimation Dates* (i.e. 01/01/2007–01/31/2007, 02/01/2007–02/28/2007. 03/01/2007–

03/31/2007, and so on). When you access the *Leak Counts* table, Calcs constructs a table that includes all the information identifying the components in each stream. The Leak Counts column will be blank. When you import the data, the Leak Counts column will be filled in for you.

> TIP: If you choose to have multiple estimation dates (i.e. monthly), then only set up one estimation period (i.e. one month) and import the first month's contractor files. If errors are found, then you can correct the errors in that month's record. Once you have imported the files for one month, go ahead and save the emission source for the remaining 11 months. This way, each file will have the corrections already saved. This will save you a large amount of time if errors are found.

Step 7: From the main window choose *Reference, Equipment Leak Contractor Data*. These windows must be filled out so that the imported data will correspond correctly to the data in Calcs.

Step 8: Create an emission factor or correlation equation for each range group, monitoring program, component type, and stream category. A correlation equation calculates emissions by considering the actual ppm leak rate concentration of each component. An emission factor estimates emissions by considering the number of components. Both methods may be used. Be sure to select the radio button on the upper right corner of the screen that corresponds to either "Emission Factor" or "Correlation Equation". For the monitoring program, you may select "ALL" if the factor/correlation equation works for all the programs entered in Reference, Equipment Leak Reference Data, Monitoring Programs. For the equation, if you want to raise a number to a power, select the "^" button on the square button to the left of the equation box. When "^" is selected, the formula "f_exp(x,y)" will appear, which represents xy. You need to replace the x and y with the actual values. For instance, 5^{3} would be ‘f_exp(5,3)’ and $(leak\_rate)^{0.82}$ would be ‘f_exp(leak_rate, 0.82)’.

Step 9: Set up an *Profile* for calculating Equipment Leak emissions based on the factors set up in *Formulas*. When selecting estimation methods, you may choose both correlation equations and emission factors, which you may have set up for different leak ranges in Step 8.

Step 10: Link each *Source* to the *Profile*. You may do this faster for multiple sources in the *Profiles* window by selecting *Options, Link Equipment*.

8.3 Importing Contractor Data

The second file is a listing of the total number of components by stream in the plant during that estimation period. The information must be in a specific format.

From the main window, select *Reference, Equipment Leak Contractor Data, Import* and *Process Leak Counts*. This will bring up the *Import* window.

8.3.1 Leakers

Always enter the Leakers file first!

1. Enter the leak time period covered by the file to be imported. (Note only one file can be imported at a time).
2. Select the leakers file by choosing *Browse*.
3. Make sure the *Leakers* box is X'd.
4. Select *Import* to begin importing the leaker data. When the import is complete, the data will be output to the screen.
5. Next, select *Process* on the toolbar. This function places the leak counts into the *Leak Counts* column within the *Source* table. Some of the rows may get highlighted in blue. This means that the data does not match with the information in Calcs. When processing is complete, a status box will appear saying either that the process was successful or that the contractor supplied data could not be processed. Click *OK*, and a reminder will appear saying to *Process Totals* now to calculate zeros.
6. If certain rows could not be processed, see "Common Errors That May Cause Data Not To Be Processed:" in Section 8.7 on how to resolve data that could not be processed. Correct the data and repeat Step 5.

8.3.2 Totals and Zeros

If you have not processed the Leakers file, do so before proceeding!

1. Select the Totals file by choosing *Browse.*
2. Make sure the *Totals and Zeros* box is X'd.
3. Select *Import* on the toolbar to begin importing the Totals data. This may take several minutes to complete because Calcs is reading and inserting each row into the database. When the import is complete, the data will be output to the screen.
4. Select *Process* on the toolbar. This function inserts the total counts in the appropriate row in the leak counts tables in *Sources*. Next, it will calculate the zero leakers by subtracting the number of leaking components from the number of total components. Some of the rows may get highlighted in blue. This means that the data does not match with the information in Calcs. When processing is complete, a status box will appear saying either that the process was successful or that the contractor supplied data could not be processed. Click *OK*.
5. If certain rows could not be processed, see Section 8.7 on how to resolve data that could not be processed. Correct the data and repeat Step 4.
6. Close out of this window and select *Sources*. Select an *Equipment Leak* emission source and proceed to the *Leak Count* tab. Check to see that the process worked.
7. Repeat all importing steps for the remaining estimation periods.

8.4 Calculating Emissions

After importing the Contractor Data, you are ready to calculate emissions. Go to the *Calculate* window, and calculate emissions for the *Equipment Leak* sources as you would for any other source.

If correlation equations are used to estimate emissions, the user must enter estimation dates that correspond to the estimation periods used when setting up the emission sources, and do a calculation for each estimation period (i.e. 1/1/2007–1/31/2007). Calcs will prompt the user to "Select the files for use in the correlation equation." Choose the Leakers file that corresponds to the correct estimation period, and Calcs will read the actual leak rate values from the Leakers file and input them into the correlation equation. This will take several minutes because Calcs will have to import the file again. Repeat this process for each estimation period. When all the emissions have been calculated once, you may select an estimation period that spans all the estimation dates to sum up these emissions if you mark the box *Use Existing Results* before selecting *Run*. For instance, if you chose to set up monthly estimation dates for the year 2007, you may choose 1/1/2007–12/31/2007 in this window to calculate the emissions for the entire year. If no correlation equations were used to estimate emissions (only emission factors used), you may choose 1/1/2007–12/31/2007 whether or not you had calculated emissions once before. This is possible because Calcs does not have to pull in any import files for emission factors. (You may also calculate multiple date ranges simultaneously for any other Source Type in Calcs.)

You may display the results in several different report formats if you choose *Options* and the desired report under *General Reports* or *Process Unit Reports*. Select *Use Existing Results*, and then *Run*. The *Source Detail* report will give you the most detailed information, including a listing of the leak counts. This report is good for QA/QC of the data. The *Source and Stream Summary* report sums up emissions by source and stream. The *General Description Summary* report totals all the fugitive emissions on one page.

8.5 Format of Contractor Data

The imported files must be in a specific format, and your contractor should be able to supply you with the data in the correct format at minimal cost. Usually, the contractor charges a one-time fee for the initial programming to get the data in this format, but should not charge any more to continue supplying the data in this format.

First, decide how frequent you would like to obtain fugitive data. Some plants desire the ability to quantify each month's emissions, and others only require quarterly emissions reports. Still others may only need an annual report. Note that monthly emissions gives you the most flexibility. You can easily sum the emissions for each year if needed. On the other hand, a yearly report cannot be broken down by emissions occurring in each month. Consider this step carefully before proceeding.

Next, ask the contractor to supply you with data. It must be ASCII (text) files in comma delimited format with the specified character format for each estimation period. An example of comma delimited format is: "01/01/2007","01/31/2007","01234","NSPS","ASPHALT". If you choose monthly emissions, you will get 12 sets of files, one set for each month in a reporting year (2 files per set).

For each estimation period, the contractor will need to supply you with two files: a Leakers file and a Totals file. The leakers file is a listing of all the leaking components and their ppm leak rates during the estimation period. (Note that we are considering leaking components as any component leaking above background zero, not the regulatory 10,000 ppm definition.) The totals

file is a listing of the total number of components by stream in the plant during that estimation period.

The information in each file should be the most recent available. For instance, if a certain unit is not monitored during the time period of interest, then information for that unit should be obtained from the most recent past data. If the past data indicates that a particular component was screened at 1000 ppmv, then it should continue to be recorded in these monthly tables as being screened at 1000 ppmv until it is monitored differently in the future. All components in the plant should be accounted for in these tables each month, regardless of how many are monitored each month.

The Unit and Stream Information has a primary and secondary priority to it. The *Unit ID* and *Stream ID* should always be filled in. If the only data available is the Unit name or Stream name, then this data should be placed in the *Unit/Stream ID* column with the *Unit/Stream Name* column blank. If this is the case, the format restricts the number of characters to the specified format.

The reason why the blank column exists in the Totals file is that the two files need to have the same number of columns so that Calcs can import the files correctly. The contractor format will read: "01/01/2007","01/31/2007","NSPS",,"ASPHALT" and so on. Note the 2 commas that indicate a blank column.

8.6 Resolving Unprocessed Data

After you have imported contractor equipment leak data and have run the "*Process*" data step, you may find that a number of records could not be processed. This is because something in Calcs is not linking correctly with the contractor data. You may have left a necessary piece of information out of a record, the contractor may have added streams that you don't have input in your records, and so on.

The rows that could not be processed are highlighted in blue on the "*Import and Process*" screen. You may view these rows by scrolling down the file line by line. Note the first highlighted row. Without closing this screen, click on the following items to determine what the problem may be. (Do not close the import screen, or you will have to repeat the entire process of importing and processing the data. You may have many windows open at one time, and an easy way to switch between open windows is the select *Window* from the menu bar and the correct window to view.)

8.7 Common Errors That May Cause Data Not To Be Processed

If you find that you only need to make a change to a few items, it may be quicker to manually input the leak count. Do this by going to the *Leak Count* window in the *Sources* screen, entering the leak count, and saving.

1. From the *Import* window, select *Reference, Process Units*. Check to see that the correct Process unit ID is entered. If not, add it from this screen.
2. From the *Import* window, select *Reference, Component Types*. Check to see that the abbreviations used by the contractor correspond to the existing abbreviations in this window. If the abbreviation does not exist, add it to this window.

3. Click on *Sources* on the toolbar. Check to see that the stream has been added to the correct emission source record. If not, add the stream and save. If you add a stream in emission sources, check to see that the *Leak Contractor Stream ID* has been listed in *Unit/Streams*.
4. Also in *Sources*, check to see that you have the correct estimation dates. If not, create a record with the correct estimation dates and save.
5. Click on *Unit/Streams* on the toolbar. Check to see that the correct ID for the stream is listed in the *Leak Contractor Stream ID* column. If the contractor has a different stream ID, either:
   (a) add another stream with the same information except the new stream ID (i.e. if stream is fuel gas, rename fuel gas-2), or
   (b) change the stream ID, as long as the contractor did not use the existing stream ID for any of the imported streams.

If (a) is done, add this new stream to the emission source record.

If for some reason the contractor has monitored components or streams that you do not need to report or calculate emissions from, then simply ignore this highlighted row. The data will not be imported.

After troubleshooting is complete, you will need to reprocess the data from the *Import* window by selecting *Process*. If rows are still incompatible, the rows will be highlighted in blue. Repeat this troubleshooting procedure until all the errors are found. Remember, if you find that you only need to make a change to a few items, it may be quicker to manually input the leak count. Do this by going to the *Leak Count* tab in *Sources*, entering the leak count, and saving.