

# **An Electronic Data Entry System for Point Sources**

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## **ABSTRACT**

In 1999, in response to requests from industries, St. Louis City and St. Louis County cooperated to develop a software program in MS Access to enable our point sources to submit their emission inventory data electronically. Originally the program was developed in MS Access 97. It is still in use, now in MS Access 2000 through 2007.

The overriding objective of the program is to make the annual Emission Inventory submittal as painless as possible for the industry personnel and still collect all the necessary data. In developing the program, we addressed industry concerns about confidentiality, integrity of the data as submitted, and user friendliness. Since the St. Louis City and St. Louis County data is submitted to the Missouri Air Program, we also had to develop a system to transfer the data into a format that is compatible with their system.

By using an MS Access database, we are able to extract data as we need it for our local agency use, including permitting, enforcement and fees. It also lends itself to easy quality assurance.

The program addresses the following issues:

1. The screens look exactly like the paper forms. This facilitates the learning curve of the new system.
2. Data is submitted on a disc. This preserves the integrity of the data as submitted by the company and reduces the amount of paper in our files.
3. No data is posted on a site or network that is available to the public. This insures confidentiality.

The program automatically transfers some data from form to form, to reduce copying errors. The program also extracts the data and puts it into tables in the format requested by the Missouri Air Program for transfer into their system.

Since the Microsoft Office Suite is in general use throughout industry, the program is easily installed. Many companies use MS Excel spreadsheets for their own data. This is easily transferred to MS Access, and then into our program. The Access software itself facilitates data validation.

The program incorporates the SCC codes from FIRE, and the list of 189 Hazardous Air Pollutants (HAPs).

## **INTRODUCTION**

In response to the 1990 Clean Air Act Amendments, the State of Missouri developed a new set of Emission Inventory Questionnaire (EIQ) forms. These forms were designed to gather the information required by EPA, the State, and the four Local Agencies, and to enable the companies to calculate their own air emissions and determine the amount of fees to pay. The four Local Agencies in Missouri are St. Louis City, St. Louis County, Kansas City and Springfield-Greene County. State and Local Agency personnel designed the forms during 1992 and used them to collect the 1992 data. Prior to that, each Local Agency and the State had its own set of EIQ forms for use within its jurisdiction.

In addition to the paper forms, the Missouri Air program developed a data entry program using Borland's Paradox. They provided this program to the local agencies for submitting our data to them in a compatible format and for our use. They also developed a runtime version for point sources.

In 1997, the Missouri Air Program stopped supporting the Paradox program in order to develop a comprehensive data management system. In 1999 they started to contract with Tier Technologies to develop the system and to include a program for point sources to enter their data electronically over the Internet. They used the system internally for a couple of years, and made it available for point sources to use for the 2002 EIQ submittal.

In February of 1999, personnel from the St. Louis County and St. Louis City Air Programs decided to investigate the feasibility of developing a data entry program in MS Access. We were told to hire a consultant and a programmer, and that we could expect to pay \$200,000 to \$300,000. Then, one of the St. Louis County sources offered the use of a summer intern to help us develop a program if it would reduce their company's data entry time. With that, the program was born.

## **BODY**

### **Goals of the Program**

From the earliest discussions between St. Louis City and St. Louis County, we developed a list of requirements for the program. These included:

1. The system must be compatible with the Paradox system used by the Missouri Air Program to allow data transfer.
2. The system must maintain structural integrity among "Plants", "Points", and "Segments".
3. The format for the company to submit their data should allow for a permanent record of the data as submitted.

From our discussions with our point sources in the City and County, we added requirements to address their concerns. These included:

1. The Program should be developed in MS Access. The MS Office Suite is widely used in industry, so many companies keep records in MS Excel. Using MS Access would enable some more technically proficient companies to transfer their data directly into our tables.
2. The program should be sent to the companies on a disc for downloading to their computers. They would update the information for the current year, and return the data to the Local Agencies by the April 1 due date. They did not want to enter data over the Internet, because they were concerned about confidentiality, and/or because they did not have Internet access.
3. The data entry screen should resemble the paper forms. This is necessary to make the program more user friendly.
4. Report forms should be included for printing hard copies.

During the summer of 1999, the summer intern and clerical help designed the data entry screens to look exactly like the paper forms. They used the Paradox tables imported into MS Access as the tables for the new database. St. Louis County assisted with answering questions about the idiosyncrasies of EIQs. By the end of August, we were trying to figure out how to keep the data for each plant and point separate. When Jeff DeWald, the City Air Program computer programmer, started working on the programming, that problem was solved. By the end of December, we announced to selected sources in St. Louis City and St. Louis County that we had a new data entry system ready to try.

That first year, I sent diskettes with the zipped program to 22 companies for 37 sites in St. Louis County. Eleven companies representing 26 sites actually used the program and submitted their data on diskette. Because it was the inaugural year, I also required a paper copy to check the data. For the 2002 data, I sent diskettes to 23 companies for 42 sites. I no longer require paper copies to accompany the electronic version.

The first year we sent “patches” out five times to repair problems with the program. These repairs to the forms or reports did not affect any data in the tables. We have not had to “patch” later versions.

## **Using the Program: The Companies**

Each year we have two versions of the program, a “secure” version we send to the companies, and a “local” version for use by the local agencies. The local version contains the programming necessary to process the data to and from the companies, and to put the data in the correct format for transfer to the State. The local version also retains more of the MS Access toolbars visible on the screen.

When the company personnel open their program on their computer, the program automatically goes to an opening page with five options: “Begin,” “Make a Copy of the Tables,” “About this Application,” “EIQ Instructions and Help,” and “Exit.” Clicking on “Begin” takes the user to a page that looks exactly like Form 1.0 of the State’s paper Emission Inventory Questionnaire. Each company receives a program that is already populated with the previous year’s data. Some fields are blanked out, like throughput and some emission factors that change from year to year. From this first page, the user can proceed to Form 2.0 to enter emissions data, or to Form 3.0 to calculate the annual fee, or to Form 4.0 to report costs of completing the forms. Each of these forms looks like its corresponding paper form. From Form 2.0, the user can proceed to any of 17 worksheets, which again correspond to the paper forms. These worksheets were designed to gather information on specific processes like fuel combustion, incineration, haul roads, solvent use, or Hazardous Air Pollutant (HAPs) emissions. Since the St. Louis metropolitan area is non-attainment for ozone, one form is included to collect ozone season information. The MS Access referential integrity feature ensures that the data submitted on the table associated with each worksheet corresponds to the correct emission point.

Where it is possible, quality assurance features are built into the screens. For example, if a user enters more than 7 days per week of production, an error message will appear and the incorrect value will not be accepted.

Each form screen also includes a button that will take the user to instructions for completing the form. These instructions are simply the MS Word versions of the instructions provided to users of the paper forms. The form screens also include a button that will show the user a preview of a printed version of that form.

Through the years, of course, we have improved the program by adding more features. For the year 2001, Jeff added the list of SCC codes from EPA’s FIRE database. By choosing from the various categories from each level, the user can determine the correct SCC number and the units associated with the number. For the year 2002, I added the list of 189 HAPs and a query to compare CAS numbers. For 2004 data, I added fields for PM2.5 and NH3.

When the user is finished with the data entry, the program will transfer all of the actual emission data to the Form 3.0 for the fee calculation. In the early versions, the user had to input all of this data on

this form. Later versions also have more places where the computer will perform calculations and the user can choose to accept those calculations or not.

At any time, the user can print all the pages associated with a specific site, or print one page at a time. Since the emissions fees go to the State program, all companies have to print the forms required to accompany the check. I also require a hard copy of Form 1.0, for the signature of the authorized company representative, to be submitted with the data.

To submit the data, the user returns to the opening page and clicks on “Make a Copy of the Tables.” This feature will automatically copy the tables to a disk. Since the company is only supposed to send tables, not executable files, the chance of receiving a virus are reduced. The company then mails the disk with any accompanying documentation to the Local Agency.

### **Using the Program: The Agencies**

When the disk arrives, I log in the date received and copy the tables to a temporary database on my computer. I retain the original data as received from the company on the disk. I review the data in the temporary file to see if there are any major changes from the previous year or any glaring errors. If the data is too badly corrupted, I don’t want to add it into my copy of the program. I can then run an import module to append the data to my database.

Most of the companies in St. Louis County still submit their data using the paper forms. I can use the program to pre-print selected forms and worksheets for each company. Of course, only data that usually remains the same from one year to the next is pre-printed, with fields like throughput and some emission factors that change from year to year blanked out, just like on the disk. When the paper copies are completed and returned, I review them and enter the data into the tables using the same format as the companies.

When the data entry is complete, I look at the tables to discover fields with missing or incorrect data. MS Access sorting features make this easy. I am able to catch most errors before forwarding the data to the State.

After the data validation is complete, I send a copy of the tables to the State Air Program. At first, I used a macro that put the data into the same format as the Paradox tables. In 2003, I developed a new macro to put the data into EPA’s NET format, as the State Air Program requested. Now, I am using a third macro to put the data into the State Air Program’s current system.

### **Problems**

There are, of course, some drawbacks to the program. These include:

1. MS Access is limited to two gigabytes per database and 32,768 objects per database. Our program currently uses 58 megabytes. We have a second database of 2 megabytes for code tables that are linked to the main database.
2. The program is designed to be used by one person at a time. Appending data from copies of the program can accommodate multiple users, but this can be time consuming.
3. The initial mail out is labor intensive. This is more than compensated, however, when the data is returned.
4. We now have versions in Access 2000 through Access 2007. This makes the initial mail out more difficult. The original Access 97 version converted to the later Access versions automatically. The 2007 version has to be saved as a version that is compatible with 2002 to 2003.

## **The Future**

The program has been well received by companies and consultants who are using it. For a few years the number of companies using the program increased. It has since leveled off, and in the last two years it has decreased. More companies have started using the Missouri Air Program's on line data entry program.

Our local agency will continue to use the program for our internal use, since the policy for our local government is to use MS Office products. It will be revised, as necessary, to correspond with the paper version and to accommodate State requirements.

## **CONCLUSIONS**

The St. Louis City/County data entry program for point sources is a practical, user friendly system. It was developed with no extra costs to the users, and requires minimal ongoing maintenance costs. It has many built-in quality assurance features, and allows for additional individual checking of the data in the Access tables. The data is easily accessible for other uses within the agency.

## **REFERENCES**

None

## **KEYWORD**

Emission Inventories  
Point Sources  
St. Louis City, Missouri  
St. Louis County, Missouri