# "Benefits, Trials and Tribulations of Building an Emission Inventory Point Source Inventory Software Integrated With Permits and Compliance Needs"

James H. Southerland, A. Hall, H. Hawkins, S. Macieira, T. Manning, S. Moser, T. Sabetti; C. Walker & J. Sheppard
James.southerland@ncmail.net

North Carolina Division of Air Quality, Department of Environment and Natural Resources, Raleigh, NC 27699-1641

**ABSTRACT**

The North Carolina Division of Air Quality (DAQ) has used a proprietary point source emission inventory development and storage software package for several years. This package was not functioning as well as desired with the requirements of the state's air quality management program resulting in a great deal of hand coding and re-entry of emissions and other data, especially as resulted from the advent of Title V and annual emission fees. As a general long-term accommodation, the Division started an internal project several years ago to develop and implement a custom software system to handle the recording, calculation and invoicing of emission fees for Title V and other facilities. This system is called IMPAQ, with the initial Oracle-based modules being termed Facilities and Fees. The Facilities module is to track the facility information regarding names, contacts, addresses, etc., while the Fees module handles the tracking and issuance of the invoices and record keeping of the receipt of the payments.

In 1999, the Division's Information Technology Steering Committee determined that the Division should develop additional software modules to provide the support needed for other parts of the Division's responsibilities. These included writing and issuance of permits and associated tracking, tracking of compliance milestones and related recordkeeping, enforcement actions, etc. and emission inventory data reporting and tracking as required to satisfy the state's various rules and planning exercises, as well as to satisfy the emissions data EPA reporting needs. These modules were determined to necessarily use the same data, to the extent possible.

This paper addresses some of the design criteria, the development of data models that enable the communication between modules, development of business rules to integrate the various functions of other program aspects. Many of the other efforts are on different schedules for software development. However, adoption of "simple as possible" code tables, putting a web-based module on the Internet for direct entry by sources, management and labor saving advantages of integrated on-line systems, compromises faced during these developments, etc. must be viewed 'holistically.' The continuing development and maintenance of the system will be ongoing and evolving for some time. These and other practical developments are discussed. All aspects of this paper are presented in the context of providing experiences that may be useful to others who may undertake such designs in their own jurisdictions, not as a 'best way' that is universal.

**BACKGROUND:**
The North Carolina Division of Air Quality (DAQ) is responsible for the management of a program that covers nearly 3,200 permitted point sources. The Division has broad functions and purposes, but the program can be characterized as permit-oriented. Of the permitted facilities, just over 400 (but waning) are Title V (~>100 "ton-ers") that must be inventoried each year to administer annual permit fees based on annual actual emissions. In addition, there are over 640 facilities classified as Synthetic Minor and about 2200 with permits classified as Small (including General). Dry Cleaners are in the system but not permitted (with inventory updated only when specifically needed). North Carolina's permits have a nominal 5-year life. They must be renewed by their expiration date to remain valid. The state also has three of its 100 counties that have local programs. Their inventories are separately administered and are not included in many of DAQ's routine inventory activities.

When North Carolina's facility population is analyzed against the Combined Emissions Reporting Rule (CERR-2000) as defined in the Code of Federal Regulations in June of 2001[1], it is apparent that a relatively small proportion of the state's inventoried facilities are covered by the new reporting requirement. Given this distribution, DAQ will continue to report most or all of these routinely for both criteria and HAP's (and TAP's). Below are some approximations from CY 1999 data summaries for criteria pollutants:

**TABLE 1:**
**Point Source Reporting Requirements in CERR vs NC's Emissions Population**

| Pollutant | Type A (tpy) | #/% Emissions | Type B (tpy) | #/% Emissions |
|---|---|---|---|---|
| SOx | 2500 | 21/94 | 100 | 80/99.4 |
| VOC (moderate) | 250 | 79/65 | 100 | 169/88 |
| NOx | 2500 | 18/83 | 100 | 75/97 |
| CO | 2500 | 7/58 | 1000 | 17/75 |
| Pb | 250- | - | 5 | 0 |
| PM-10 | 250 | 23/78 | 100 | 38/85 |
| PM-2.5 | 250 | 12/83 | 100 | 20/91 |
| $NH^3$ | 250 | 2/58 | 100 | 4/70 |

As may be seen in Table 1, a few of the larger sources account for most of the state's emissions for most pollutants. For example, only 21 facilities account for 94% of the states air emissions of SOx from point sources. Since Title V in NC requires annual reporting for purposes of emission fees, then all sources essentially default to become Type B sources and NC intends to continue to submit this entire group, annually.

North Carolina's DAQ is the administrative and working arm of the Environmental Management Commission (EMC). Through the EMC, the DAQ has statutory authority and further interpretation by means of implementing Rules, which provide for direct reporting of emissions data by the facilities to the Division on forms and formats designated by the Division. These reports are legal documents and are certified by the "authorized" or "responsible" official. These reports have been required in one form or another since the early days of the Division, but become more sophisticated and elaborate

starting in the early 1990's, in order to meet the anticipated needs of the Clean Air Act Amendments of 1990[2]. North Carolina DAQ has historically remained "above average" (in the allusions parallel to those of Garrison Keillor) in emission inventory submittals, but it has not escaped the pits of the "under appreciated inventory-syndrome[34]" nor the inherent problems in making reasonable and practical decisions based upon less than succinct instructions[5].

The North Carolina DAQ has used purchased proprietary emission inventory data systems for several years. Though such programs have provided the ability to accomplish many functions, they often carry along various downsides and raise repeated obstacles. Among these have been:

- ✓ The system was not custom-made to North Carolina's business rules and needed to be frequently "worked around" to accomplish specific program needs
- ✓ Being proprietary, completely satisfactory changes were not always possible
  - Within a short turn-around
  - Within reasonable costs
  - Compatible with other users of the software in other locations
  - Or at all
- ✓ When changes had to be made, they had to be done through a cumbersome and sometimes expensive contract process
- ✓ These actions put NC at the mercy of others
  - Outside the Division and
  - Sometimes outside the state
- ✓ Data coding was less than efficient in the opinion of those who had the responsibility for annual data entry (primarily the staff of the 7 regional field offices)
- ✓ It was just too complicated to maintain
- ✓ It did not allow a convenient and seamless merger of data with other data systems and plans within the Division.

Then, and currently, the entire state was in attainment status for all pollutants. The revisions to the National Ambient Air Quality Standards (NAAQS) and subsequent measurements for ozone and PM2.5 have put the hand writing on the wall that a substantial part of the state will likely be falling under designation as non-attainment (maybe as many as 45 of the state's 100 counties). This will likely bring significant added record keeping, modeling and inventory requirements, as are inevitable with such actions. During the same time, there have been no increases in budget or positions (nor expected), further straining the work force at the regional offices, particularly for data entry.

Consequently, in mid 2000 (post-Y2K confusions and distractions) the DAQ Information Technologies Steering Committee (ITSC) commissioned a new group, called the Emission Inventory User Group (EIUG) to design and build a custom emission inventory data module for IMPAQ, and they began recruiting "volunteers" to serve upon this group. The volunteers selected were representative of "large" regions, "small" regions and various Sections of the DAQ Central Office that were involved with the emission

inventory in the past and as envisioned in the future. Also, the members were selected who had some cross-DAQ experience with permitting, compliance and other functions. Initially, the group had eight members, with the chair being from the Central Office. DAQ is composed of seven regional offices, and a Central Office composed of Planning, Permits, Technical Services and Ambient Monitoring Sections, and the Director's Office. The IT function and staff are housed within the Director's Office.

EIUG members were recruited from all regions (currently six regions are represented on the Group) and all Sections except Ambient Monitoring and the IT group, with a heavy regional office ratio being the intent. IT has an *ad hoc* membership on the EIUG and works almost as an extension of the Group. The EIUG first met in October of 2000, initially on a monthly basis, to discuss the existing operations and to draft out the understanding of their scope for presentation to the ITSC for their approval. By January 2001 the IUG had met sufficiently to complete this review and reformulation of their charge and to verbalize it into a written Scope Document which was presented to, reviewed by, and approved by the ITSC head, who is also the Deputy Director of DAQ.

The Emission Inventory User Group's basic charge and guidance was to:

- Operate under the auspices and authority of the ITSC
- Report monthly
- Accept authority to challenge the sanctity of existing business rules and practices across the Division when they relate to emission inventory efforts for point sources
- Report where functionality losses may occur or advantages gained at a cost and get approvals or authorizations from the ITSC
- Eventually encompass mobile and area sources as well as other integrated components of the inventory and DAQ's program
- Assurance of strong management support
- And others more mundane

The **Scope** document developed by the EIUG and approved by the ITSC spelled out several requirements and constraints, was reviewed by the ITSC, and signed by its Chair, the Deputy Director. It had several facets and expectations:

- It should integrate with the already operating modules of the Division's Oracle-based IMPAQ data system
- It should make use of the same Emission Sources (and ID's), Control Devices (and ID's) and their Descriptions as used in the Permits and (later to be known as) Emission Source Module
- It should improve the functionality of the inventory (make it more useful and usable)
- Make the facility model used compatible with future automated permit application formats and review processes
- It should have a centralized functionality with the regions working with a live database out of a Central Office server
- It should provide adequate and timely access

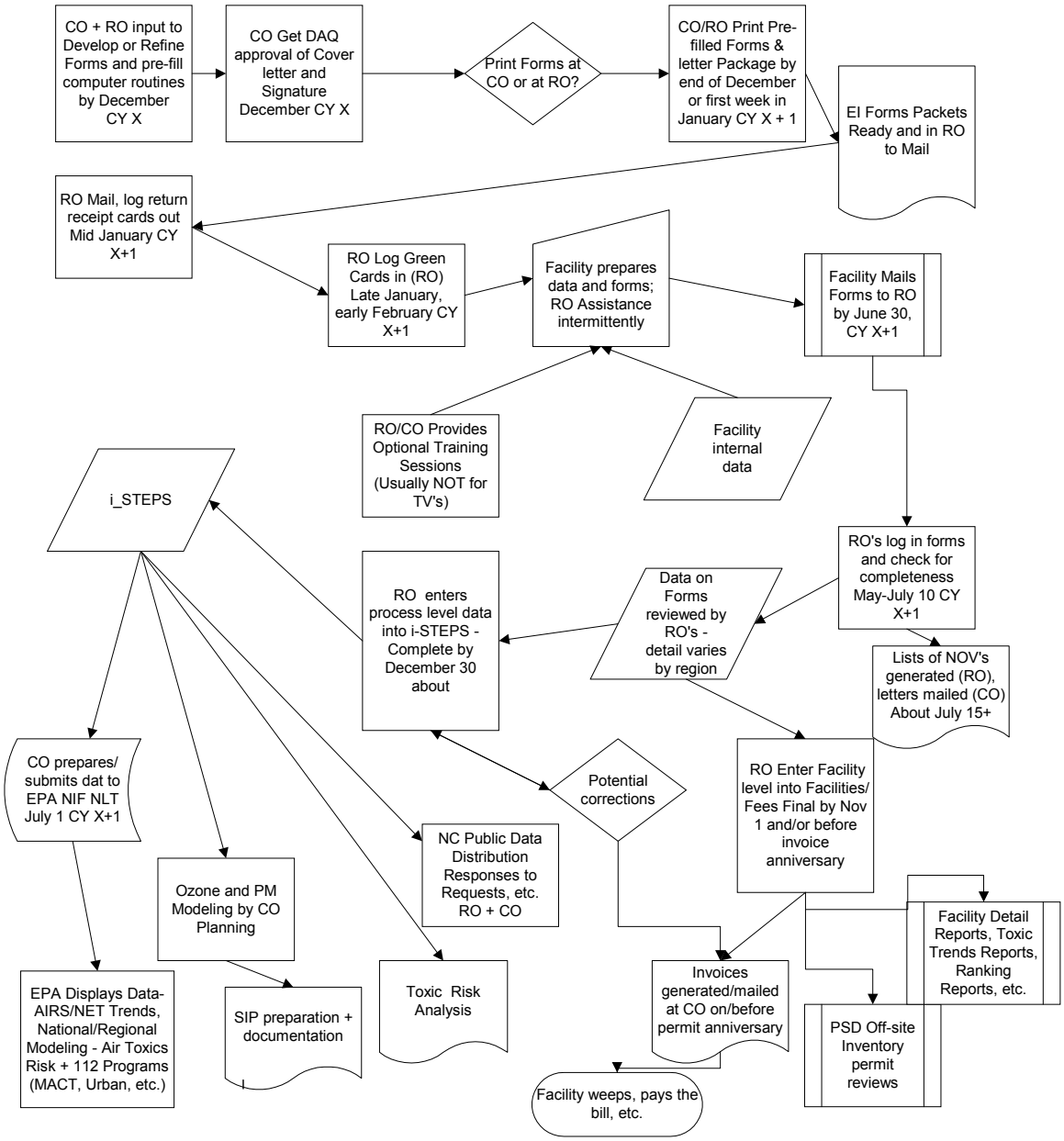
- It should improve the ease of data entry and eventually allow for web-based direct update by facility staff with provision for DAQ review and approval
- Provide for review and editing of the data by personnel in the regions and at least some automated interface by the central office
- Eliminate nuisances and more serious problems of existing system
- Improve cost and time saving considerations
- Provide interfaces (such as common data tables) to easily interface with other Departmental and Division databases
- Minimize, if not eliminate double entry and manual coding where possible
- Provide tracking functions for mailings, notifications, responses and other physical and status requirements
- Allow central office, regions and the public read-only access to statewide EI information, but with comment and feedback capability
- Provide auto-generation of pre-filled detailed web based and other emission inventory input formats (e.g. paper) for direct completion by facilities
- Report generation capabilities that are simple and easy to use and serve the functions desired

**APPROACH**

Much of the initial efforts involved detailed discussions about how the current system worked and the related business rules. Initially, monthly meetings were held with members being charged to study general or specific areas of the process. They were then to bring their thoughts on those parts of the data collection and flow to the next meeting for discussion and further brainstorming. Flow charts were drawn of the existing process (See example as Figure 1) and these were then debated as to how the data solicitation and flow could be made more efficient and less costly to the Division and to the facilities themselves. Flow charts were then drawn of these proposed "sub-modules" in order to provide a roadmap for writing of business rules needed by the programmers.

The EIUG, over the first 30 months of its lifetime, met approximately 60 times for all-day meetings (9:00 – 3:00, typically), sometimes for single days, sometimes for concentrated two and three day sessions, and sometimes as frequently as weekly, depending on the need and pressures at the time in the development cycle. An estimated 5,000 or more person-hours have been expended to date to analyze the needs, design flows, write business rules, write HELP text and instructions, work with IT on programming details, test and react to proposed screens, routines, etc. and in general to make a system that serves the needs. The programming hours in addition to the EIUG's time are probably between half and equal to the EIUG time. Additional enhancements and improvements are defined that will likely require at least half again the resources

Table 1: Existing Emission Inventory Forms Process - Annual Title V




already expended, not to include routine maintenance due to data corruption, changes and updates in provider software (e.g. Oracle), etc. that will require some continuing maintenance and update attention.

Gradually, direction and guideposts began to materialize and the core of the data requirements were more universally understood. In addition, the manner in which they fit together became clearer. Hours of exhausting, and sometimes frustrating, discussion were held regarding the various data elements and their corresponding requirements (past, present, future). Valiant efforts were made to eliminate both the aspects of collecting data that were not needed from the facility and for entry and storage of data that was not needed by the Division (EPA requirements were considered a Division requirement). Thus, the NIF data model[6] was viewed as a "first cut" at what the EIUG would build a system to house and manipulate. Some NIF data elements are termed "mandatory." All these elements were accepted as valid components of the system. The NIF also has data elements that are "necessary." These were evaluated case-by-case regarding their need by DAQ and EPA. However, the guiding philosophy was that we would rather collect and provide "real data" than to leave blanks and have EPA fill those slots with estimated or "manufactured" default data, especially since the data are used for modeling both in North Carolina, EPA and the surrounding states for SIP development.

Such intricate evaluations and expressions of opinions required extensive discussions within the EIUG and with the IT programmers and staff. Most of these meetings involved hands-on joint viewing on screen by the entire group and thus were held almost exclusively in the central office, which in addition to being central, provided the least travel impact and LAN network connections were readily available. Each member of the EIUG had his or her regular stack of work to do at his or her "day job." These jobs included field inspections, responses to complaints, preparation of reports, data entry, permit reviews and sundry other activities that could not be fully turned aside. Thus, one of the early lessons of the group was that more work could be done in the room where the meeting was held than by assignment away and at the office between meetings. The meetings then became more frequent and of greater length, sometimes up to three days sequential. In all, the EIUG to date has met about 60 times for at least one day each. For each day spent in meetings, an equal time (or more) was probably spent outside of the meeting. Eventually, a series of flow charts emerged which helped define the system's components and functions. Figure 2 is a sample of many developed.

The system in-house was eventually democratically named **ED** (more specifically ED-Entry) and the web page portal was later named Air Emissions Reporting On-line (**AERO**).

## BENEFITS OF "UNITIZED" AND INTERCONNECTED MODULES (Perceived and Real)

Each module in DAQ's data system, IMPAQ, shares data tables with other modules, usually many other or even most other modules. There are many "computer programmer" reasons why this is done, but those discussed here only are intended to partially address some of the more important practical and day-to-day 'business' reasons.

## COMMON USAGE OF NAMES, ADDRESSES AND CONTACT INFORMATION[7]

The IMPAQ system has a module called "Facilities" which is the central repository for names, addresses, contacts, etc. These cover physical ('911') addresses, mailing addresses, invoice addresses, contact names, responsible official names, etc. and are used by a wide variety of personnel. These tables are accessed when mailing inventory-pertinent information. Each of these data elements has a specific owner or limited number of owners that work together in a defined procedural way to assure that there is not a dueling "database" phenomenon introduced. Establishing who is authorized to make these changes, and when, has required strict analysis of who is the most appropriate. Elaborate tables of authorities to control those who have access to make the changes involved have been developed and implemented. Thus, these administrative data fields have been removed from the inventory regime. The burden and responsibility for update and maintenance of these items have now been distributed to the various 'sole proprietors,' often outside the inventory "community." This also benefits the staff in general by facilitating consistency in definitions and day-to-day understandings of the participants/users of the databases. This aspect involved an evolution of probably 5 years to adopt and implement consistently throughout the Division.

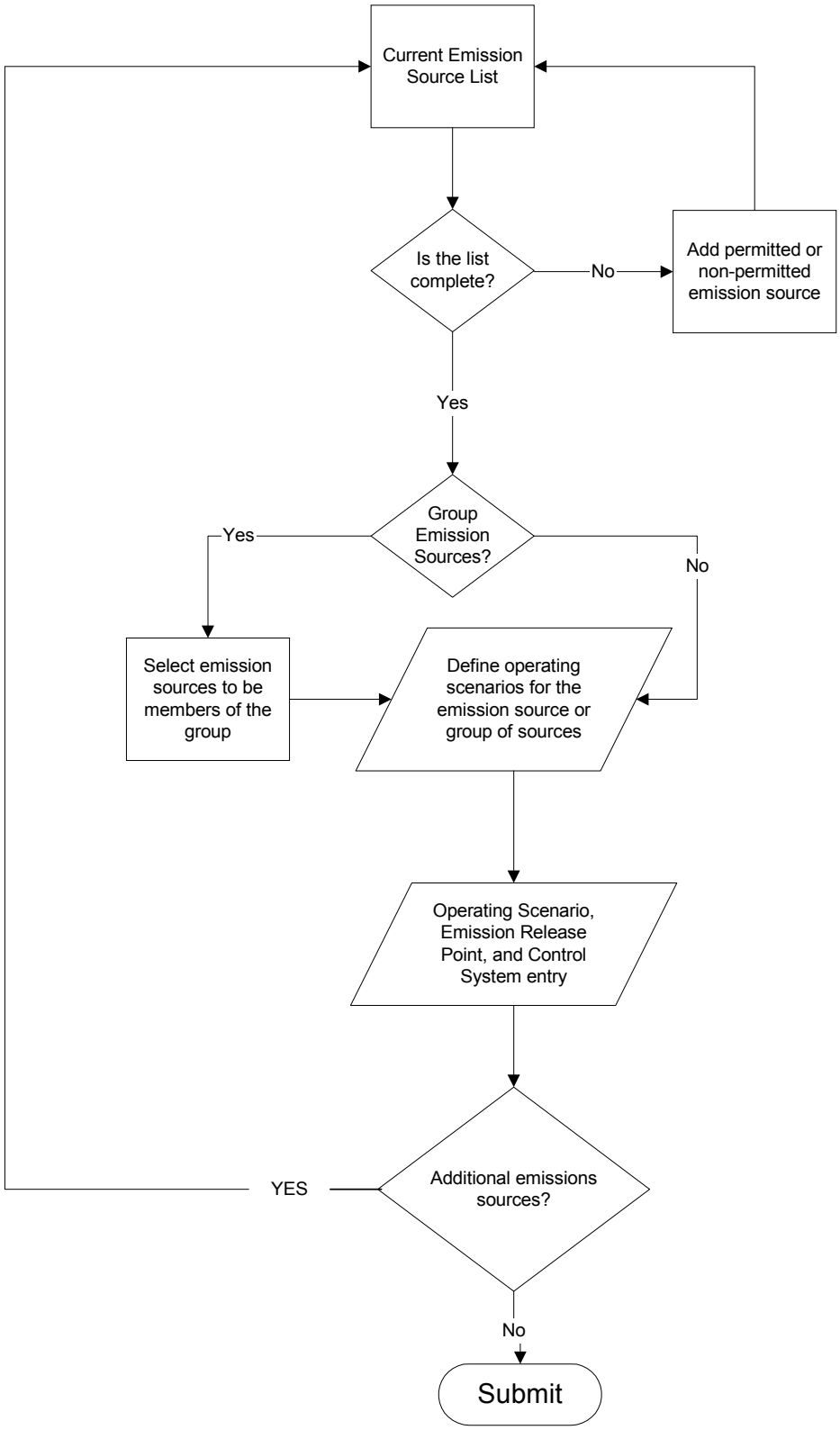
Historically, the permit community has sent a letter, 90 days prior to the expiration date, to each Synthetic Minor or Small facility, to remind them of the permit renewal application being required. With the newly modified and integrated process, each facility is now notified of this requirement 6 months prior to the expiration date. They are now also notified at the same time, that their emission inventory report for a specified Calendar Year is due, and must be received before that application will be considered complete. The data system helps track and guarantee that the inventory report is received prior to granting a renewal. This letter also contains an ID and PIN that is necessary for the facility to access their custom (pre-filled) sections of the DAQ web page.

After notification, the facility goes to the DAQ **AERO** web page to retrieve and print paper forms pre-filled for their facility or to do an on-line data entry/update. Thus, postage, paper and effort are reduced significantly, and the impetus for getting the inventory submitted completely and on time is enhanced. They may choose to submit their information on line. However, if they submit on paper, DAQ staff enters the data into the internal system, reviews them, and approves them as appropriate, within 30 days of the permit renewal. When the updates for the data are entered on-line, there is only select fields that can be updated and this is submitted to DAQ for the approvals involved before it is accessible to the public and other users. A facility can continue to access and review their inventory data on-line, but not change them until the next inventory cycle.

## LOCATION AND COORDINATES

Similarly, the UTM/Long-Lat data have been centralized. The modelers generally use UTM's, but they, as well as the system, have converters that change from Longitude and Latitude as needed. With the advent of Global Positioning Satellite (GPS) capabilities and various address-conversion software packages, the inventory community has adopted

Figure 2 - A Typical New Flow Chart Used to Define Overall Data Entry for ED



a more universal and conventional "Degrees/Minutes/Seconds" standard, with the conversion capability to whatever is needed.

The inventory questions asked of facility also no longer asked to includes any input information on these coordinates. The coordinates are displayed for their comment, if appropriate, and they have capability to add stack specific coordinates where available. These are also checked automatically to assure that they are within reasonable distance of the facility's established location. Although the permit application currently still asks for coordinates, general consensus seems to be that the facility may know where they are, but often will provide incorrect or inaccurate information if asked, primarily due to the fact that this is something they are not routinely familiar with. The data system also performs checks to assure that the facility is at least in the proper county and we anticipate that this capability will be made more sophisticated as time and resources allow.

## UNIFORM SET OF EMISSION SOURCES, CONTROL DEVICES AND DESCRIPTIONS

One of the intentions of the integration of the permit and inventory data streams is to facilitate the more stringent adoption of a single nomenclature, lists of emission sources, their descriptions, the control devices and their efficiencies, etc. Grouping of emission sources is allowed and encouraged in the inventory and the permit (although not necessarily exactly the same) such that the permit community, the inventory community and the facilities themselves all have the same concepts and lists of what the facility "looks like" and what is necessary to keep well defined. Previously, many short cuts were taken in the electronic based inventory and the paper permits were not always consistent. The basic tool or system design factor to assist in this communication process is the Emission Source Module of IMPAQ. This functions as the repository of all ID's descriptions, etc for the Emission Sources and control devices in the permit and thus in the inventory. This module insures the function of the modules to be consistent building blocks that will allow some deviations in approach and final objective, but insure accurate and consistent communication between different parts of the program.

## ABILITY TO KEEP ONE RECORD IN ONE TABLE FOR ONE DATA ELEMENT

The above examples are illustrative of the general concept in IMPAQ that applies to the component (and ever-expanding) modules. If a data element is identified and defined in one program, that same data element is not redefined as an identical element elsewhere unless it is distinctively different. For example, Name of Responsible Official may be used by several program areas, but it is defined in the data element tables or data model only once. This forces new data elements to be reviewed in terms of what is already collected and by whom for what purpose so that duplicative, and possibly conflicting, information for the same thing does not exist in multiple tables within the system. This also forces business rules and procedures to clearly define who owns particular data elements and the process to get those data value(s) updated or changed, if needed. This process is cumbersome, at best, but this function enforces the need and helps overcome organizational resistance to such coordination. It also fosters teamwork among various parts of the organization.

## TRIALS AND TRIBULATIONS ENCOUNTERED
## (And in some cases, their solutions)

Some points have been particularly problematic in addressing the coordination and consistency between various organizational components, or their purposes. This has evidenced itself most pointedly with the permit considerations. Trying to blend inventories and permit functions for consistency is not without its issues. Some of the more important, and "issue-generating" aspects, are summarized below. These are not intended to be a complete list, but representative of some of the most interesting, common and problematic.

### POLLUTANT LIST

Pollutants in NC include both HAPs (from Clean Air Act) and TAPs. The TAPs are Toxic Air Pollutants under the state's Toxic Air Pollutant program[8]. Many TAPs are also HAPs, but not all TAPs are HAPs. Accounting for overlap, the list becomes approximately 230 pollutants as opposed to the CAA list (as now implemented) of 188[9]. Some of the differences of the list are indeed perplexing. For example, chromium (as a group or "family of pollutants" is defined as a HAP. However, the NC Toxics program defined several specific chromium (VI) compounds, which are additionally qualified as part of sub-groups (such as bio-accumulative chromium) that complicate the list. Most of the TAPs so defined have some significance in NC rules and thus permit specifications. Another example is EPA's NATA HAP definition for PAH's and the EPA permit (classification defining) definition of PAH's. The former contains 7 specific pollutants and the latter is 17 specific pollutants and replace a variety of presentations of compounds that previously existed.[10] The manner in which the NC decisions were made avoids the conflict of multiple definition by allowing the individual compounds, adds them to the group and allows undefined components to be reported as "other."

The previous data files in the proprietary system used had pollutant lists with literally thousands of pollutants defined, many of which were duplicative and the results could be very confusing. Some on this list were there because they included TSCA, RCRA, TRI, water and other pollutant reporting requirements, defined in the way that the governing legislation defined it or as it was implemented in the subsequent regulations. This became problematic at data entry when the data entry person was given several choices and without a clear guide. The typical "semi-informed" person was very likely to pick an inappropriate or wrong definition for the application. On the data retrieval side, it was often necessary to carefully search for the different ways that a pollutant may have been entered and pull all of those or combine them in some manner, which may or not have been correct, depending on the interpretation of what the coder was assuming when the data were entered.

The solution adapted was to first reduce the long list to a single entry for each distinct pollutant to be reported. This discarded a large number of incidental (or mal-defined) pollutants on the original list. This list was then compared to the data in the previous database and a determination/estimate made of which pollutants matched the new list or were "translatable" to the new list from this sub-set actually used and reported in previous inventories. Those not used at all previously were discarded, unless they were

on the list of HAPs and/or TAPs, as newly refined. Groups of pollutants (e.g. Chromium as a group of all chromium compounds, including elemental chromium) were constructed using all previously reported compounds within that group and others that could be readily identified as probably existing in the reporting community. A rather clever process/software was developed by the IT group that added up component compounds and compiled them into a group total for the individual group. In the example used, the individual chromium compounds are added together to make a group total (which is the CAA pollutant). A "wild card" was also defined where there was not a specific compound defined on the list and this was "Compounds of xxx, other." This also facilitates adding in a group total if individual compound information is not available, as is often the case. Though the result of this process is very positive and satisfying, arriving at the final product and capability has been rather complex and perplexing at times.

## CONTROL DEVICES IN PARALLEL

As mentioned earlier, the permit identifies and defines each control device. A control 'system' concept has been previously foreign to the permit application community, but was reflected in the development of this capability, and has since worked its way into the permit terminologies. The Control Device information is also included in the Emission Sources Module to be shared by all IMPAQ modules. The tribulation or problem in reaching consistency and intra-Division unity in some cases relates to how these are handled.

The most significant divergence from the permit listing may be with how these data are handled in the inventory as "parallel" devices. There are many such cases where multiple (up to 60 or more) control devices operate in a "parallel" fashion. There is no way to accurately determine emissions and flow for all of these semi-fugitive operations. Many such cases are in the woodworking and furniture industry where multiple operations such as joining, sawing, sanding, etc. may occur in the same building, with each operation having a hood with its own set of controls, more or less controlling that equipment's emissions. In such cases, the system allows reality to be perturbed, such that all these devices are thrown into a large conglomeration of controls with the output consisting of a description (with a listing of all component devices), identification of the "last (may be typical) device" before the stack (emission release point - ERP), and the 'estimated' system efficiency. These then may be released through one or more ERP's, which may also be groupings or approximations of the "stacks." Since such situations are not anticipated to have much effect on any Ozone or PM 2.5 SIP modeling or strategy development, the simplification does not appear to cause harm to the ultimate uses of the database.

## INSIGNIFICANT SOURCES

The NC permitting program and the inventory program have several areas where differences in purpose and "legalistic" viewpoints between the permit world and the inventory world have caused "head scratching" problems or points of incompatibility and irritation. One of these is the subject of "Insignificant Sources." The inventory community is charged by the CAA to provide "complete, comprehensive and accurate"

emission inventories. However, in the permit world, the rules may specifically exclude many sources as insignificant "by category" or some other definition. In many/most cases, these do not probably contribute to major errors above the "noise level" but can be a topic of hot discussion between these communities trying to meet separate requirements of divergent users, without omitting potentially large 'chunks' of emissions, and maintaining credible bookkeeping and audit trails.

Currently, the compromise position reflected in the inventory (and the instructions for the inventory) is that insignificant sources that are itemized on the insignificant source list of the inventory should be included in a base case inventory. However, they are allowed to remain static in future submittals, with the certification from the Responsible Official, that they have not changed from the conditions under which they received classification as insignificant, originally. This seems to preserve the best of both worlds in an acceptable fashion

CONTYROL DEVICE CODES

Control Device Codes seem to be pertinent only to the EPA's NIF and to the modeling or control-strategy-development sector. Thus, there is reluctance for these codes to be provided by others far removed from the users. Hence, definition of these befalls the regional inventory data entry staff. There are obviously many more codes in the full EPA NIF code table than are necessary and several are internally inconsistent. It will normally not be possible to specify one code universally that meets the actual definition and description provided in the permit.

The EIUG decided, early on, to reduce the NIF list to a more select group of codes that covers the spectrum, and are extracted from the EPA master NIF list, but not inclusive of all codes on the list. Probably half of the codes and device permutations on the original list were discarded as redundant or miss-defined. A second level of definition was then added to the table to allow a first cut into removal mechanism categories to include filtration, scrubbing, process change, state change, etc. that are based on physical laws and are a bit more intuitive. This seems to make the selection of the proper code much easier, for most. This table appears as a multiple level selection "pull-down" in both the internal and external data entry systems.

SOURCE CLASSIFICATION CODES (SCC's)[11]

ED/AERO incorporates SCC's as needed by the NIF. To include (and select) them, the EIUG desired to make the process as simple and painless as possible. Agreement was reached that SCC's should best be incorporated into the system by way of pull-down pick-tables. The first step toward including the SCC's in the ED/AERO was to redesign or re-organize the table of codes and descriptions so that they could be more readily chosen by a user with limited knowledge of the full content and structure of the table. The sources that did not exist in North Carolina, and were unlikely to, were first weeded out and discarded. Wholesale changes in grouping and descriptions were made to make the hierarchy and pull down concept more intuitive and applicable to an unfamiliar user searching for some particular equipment or operating scenario. The code themselves were left 'sacred' such that when the NIF export is completed, the data will be properly

interpreted by EPA and other data users. The base first step of the revised organization is much the same as the chapter organization of AP-42.[12]

MALFUNCTIONS, START-UPS AND SHUT-DOWNS

Certain activities are excluded from Title V permit fee calculations. The start-ups, shut-downs and malfunctions are examples of situations where the emissions that occur during these times are substituted by what the emissions 'normally' would have been under the conditions that applied during these periods if such excursions had not occurred. These emissions can be quite large, and it is not difficult to define situations where such emissions may approach a doubling above the normal optimum emissions. These conditions are specified in Rule and must be adhered to. However, future efforts may extend to requiring additional calculations or estimations during these periods and accounting for the hours such that a "non-fee" supplement of emissions is provided to the system to allow for refinement in the emissions to be modeled for SIP modeling or whatever the application may be where more realistic emissions are required or desired. For non-Title V facilities, no such fee restrictions are involved and these facilities are currently asked to provide the best information possible on all emissions at all times from all operating scenarios. As to how effective that is remains to be determined as there is not good way to measure it, though there are compliance reports quarterly that provide information on how much time was spent in non-compliant status and thus with elevated emissions.

OTHER SIMILAR ASPECTS OF DIVERGENCE

There are many parts of the inventory, permit and compliance processes that remind one of the old axiom of trying to pound a "square peg into a round hole." There may not always be exact and precise legalistic-oriented solutions, but the inventory is generally flexible to a degree and can stand up to the tests of such situations and challenges. The discussions above have dwelt primarily on the permit aspects of the interfaces, but similar interfaces exist with the compliance/enforcement community. The main point is that it is to everyone's advantage to try to pick common ground and agree to handle things as consistently, but accurately as possible. The air quality community must first reach consensus within itself before it can expect to herd the facilities into a common understanding and process.

**SUMMARY**

Developing a "slice" of software that interconnects with other parts of a large Division or other organization allows/requires that the diversity of all data uses and needs of others be taken into account. The process has the effect of building an organization-wide team. From things as simple as how a name of a facility is written down or defined, to more complex engineering issues, there can be very critical differences, directions, scope, etc. The very act of developing such systems forces understanding and consistency. The various parts of the organization can begin to realize and understand how they interact and how these different interactions impact the customer (the emission sources and their staff in this case).

The development of AERO and ED-Entry is not complete; nor will it likely ever be (though it may grow, evolve, be renamed, etc.). Continued awareness and motion of philosophy will, over time, continue to help and improve the organization and what it is trying to accomplish. This exercise over the last nearly three years for emission inventory systems development has significantly enhanced the understanding of all the component and participating parts of the organization in these matters.

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[2] Clean Air Act, Public Law 95-95, November 15 1990, as signed by George H. Bush

[3] Bromberg, Steven M., The Underappreciated Emission Inventory; Foundation for Pollution Control Decisions, EM, pp 17 - 20, August 1997

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[5] Southerland, James H., Incongruities in Terminology and Actions: From the Clean Air Act to Reality, The Emission Inventory: Regional Strategies for the Future, Proceedings of a Specialty Conference (Raleigh, NC) Air & Waste Management Association, VIP-93, Pittsburgh, October 1999, pp 41-48.

[6] National Emissions Inventory Input Format: Control Device Codes; http://www.epa.gov/ttn/chief/nif/

[7] **IMPAQ User's Manual**: Available on-line from within the internal IMPAQ modules of North Carolina Division of Air Quality

[8].North Carolina Air Toxics Program: General Information (http://daq.state.nc.us/toxics/intro.shtml) and underlying rules; Control of Toxic Pollutants: § 2D.1101 - § 2D.1106 and § 2D.1107 - § 2D.1111 (http://daq.state.nc.us/rules/rules/).

[9] **Clean Air Act** as Implemented by 64 FR 1780, 64 FR 33453: 58 FR 45081 and other **Modifications To The 112(b) 1 Hazardous Air Pollutants**: http://www.epa.gov/ttn/atw/atwsmod.html

[10]James H. Southerland; **Practical Constraints and Limitations That Discourage States From Attaining Total Compliance With Federal Guidance and Requirements for Emission Inventory Data**

[11] **Source Classification Codes (SCC); http://www.epa.gov/ttn/chief/codes/index.html#scc**

[12] AP-42, **Compilation of Air Pollutant Emission Factors**, 5th Edition, as updated on CHIEF, USEPA, Research Triangle Park, NC 27711(http://www.epa.gov/ttn/chief/ap42/index.html )

**KEYWORD**
Emission Inventory Data
Computer System
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CERR
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