

POWER PLANT AND LABORATORY INTERFACE AND DATA MANAGEMENT IN THE ELECTRONIC WORLD

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Utilities in the nuclear industry strive for 0% errors in all aspects of their programs. Concerted efforts are made by both utilities and their vendors to not only find ways to reduce costs, but more importantly, reduce errors. One of the more common human errors is incorrectly transferring data from field logs to sample collection sheets and Chains-of-Custody (COCs). The culmination of sampling and analysis for power plants is the Annual Radiological Environmental Monitoring Program (REMP) report. This document also required transfer of large amounts of data to create the required tables and graphs. Manual transcription and review during all of these processes has typically been very cumbersome, time consuming and costly. The following is a discussion of the steps taken by Exelon, Teledyne, and Normandeau to streamline and automate this process.

Normandeau has been collecting REMP samples for Limerick Generating Station since 1970 and in 1990, began collections for Peach Bottom Atomic Power Station. From the beginning, data sheets supplied by Teledyne Isotopes were used. The original data sheets were not very user friendly and contained hundreds of single character boxes. The field information needed to be entered by hand. In addition to field data, air sample locations required sample volume calculations and conversions. These factors, along with the potential problem of legibility of the sample collectors writing, created a situation that was ripe for errors. And over that period of time, a few were made. In an attempt to reduce the possibility of errors, in 1999, Normandeau began using an in-house created computer data sheet containing formulas to complete the calculations for the Limerick REMP Program. This immediately reduced transcription and calculation errors and sample receiving personnel at Teledyne found the sheets easier to read.

Once Normandeau sample collectors became comfortable with the new Limerick sheets, data sheets were created for the Peach Bottom REMP program. The data sheet format was the same for all sample media and only the actual sample collection information needed to be added. With some reluctance, Normandeau's Peach Bottom REMP sampler began using the sheets. Initially, there were several obstacles to overcome. The Normandeau sample collector, a retired science teacher and school administrator, had no prior computer experience and to further complicate things, worked from his home, approximately two hours from the Normandeau office. After some elementary computer training at the office, most of the trouble-shooting was conducted over the telephone. Soon the sample collector became more comfortable with the computer and the spreadsheets. The spreadsheets eliminated calculation errors and allowed for easier record retention and less paperwork.

In 2001, Exelon began the process of issuing a new REMP contract for their four Mid-Atlantic (Exelon East) nuclear plants. One of the primary goals for the new contract was

to make the four mid-Atlantic plants as procedurally uniform as possible. Another goal was to establish a streamlined system for paperwork that would allow easier accessibility of collection information between the client, laboratory and sample collectors.

At the same time, Teledyne was already working on their own projects to improve the laboratory process from receipt through report delivery. Some of the areas identified for improvement were:

- ◆ Reduction in transcription error
- ◆ Increased efficiency and improved turn-around time
- ◆ Improved report format and content.
- ◆ Improved notification for Anomalous results
- ◆ Compliance with detection limit requirements
- ◆ Improving the Annual REMP report process

The new contract presented an opportunity to design systems to accomplish some of these goals. An additional challenge to the laboratory was the requirement for a detailed electronic file to be submitted with the reports. This file included field and collection information that had not previously been included in the login of samples. TBE wanted to be able to provide this service for Exelon without additional and costly data entry. The simplest solution was to receive the information electronically from Exelon and store the information for later inclusion in the electronic file. It soon became obvious that if some of the data was to be received electronically, then all of it could be. This would allow the development of an automatic login procedure and eliminate manual data entry. There were many advantages to the automatic login including the elimination of all transcription errors, reduction in login and review time, and quicker throughput for the laboratory. It also meant, however, that Exelon and the Normandeau sampling teams would need to develop a field data sheet that contained all the required information, could be delivered to TBE in electronic form, and be downloaded to the TBE database. Since all four Exelon plants would need to use the same format for the field data, this project fit well with Exelon's ongoing effort to standardize their REMP programs.

The key element to the program success was and is cooperation between the power plant, the field sample collectors and the laboratory. Doug Wahl the Exelon Corporate Contract Task manager coordinated this effort among the four power plants and the vendors. Using the existing Limerick computer data sheets as a model, Teledyne and Normandeau personnel began to create a new form called a "Sample Collection/Receipt Sheet". Normandeau offered suggestions, from a sample collector's point-of-view, as to what information blocks they would need or like to see on the sheets. Teledyne programmers began to create the program that would receive the data sheet and initiate the analytical process without the need to manually transpose collection data into their computer system – again reducing the potential for human error.

For a few weeks, the original data sheet went through several modifications as both Teledyne and Normandeau fine-tuned the process. Eventually, a template was finalized, which was then used to create individual plant-specific data sheets for each of the various

sample media. The newly created data sheets included all information necessary to log the samples into the database. In addition, the laboratory was able to capture additional field data, such as flow rates, air pump running time, and frequency of sampling data required in the electronic deliverable. A “set print area” command allowed the samplers to print only the collection information portion of the data sheet. This section of the sheet now serves as the actual collection data sheet and the COC, which is retained for Normandeau records and provided to the Exelon Task Managers for each plant. A hard copy of the collection sheet is delivered along with the samples, serving as the COC.

After all the programming was completed and the forms were finalized, it was necessary to work out a way for the field samplers to deliver the electronic field data to the laboratory. Initially, the data sheets were being sent to certain Teledyne personnel via e-mail. However, if the recipients of the e-mail were not in the office that particular day, sample-receiving personnel could not access the sheets for sample log-in.

To eliminate this problem, Teledyne created an FTP site on the internet to be used specifically for the receipt of the Sample Collection/Receipt Sheets. This allowed responsible personnel in the sample-receiving department to access the data sheets whenever the samples arrived. In addition, Teledyne has now created a generic email site that is accessible by multiple users. In the end, to accommodate different sampling team preferences, both methods are used. Currently, files are either emailed to the laboratory or posted on a password protected ftp (internet) site.

After receipt at the laboratory, inconsistencies in the file format or incorrect codes entered into the electronic chain-of-custody are corrected at an intermediate step in the TBE download program. The download program checks for valid values and correct formatting for key fields and the download stops if errors are found. At this point, the login technician is able to delete extraneous header rows or columns or make whatever corrections are necessary to complete the login. The samplers are contacted and the formatting problems corrected.

The culmination of sampling and analysis for power plants is the Annual Radiological Environmental Monitoring Program (REMP) Report (or the AREOR – Annual Radiological Environmental Operating Report) required by the Nuclear Regulatory Commission (NRC). The REMP report is another joint effort between the power plant and TBE. While REMP reports contain essentially the same type of information – graphs, maps, tables, land use census, exceptions, etc, they are power plant specific, with each report unique to the needs and requirements of the plant generating the report. With the start of the program at TBE, Exelon made the decision to standardize the four Exelon-East nuclear power plants’ REMP reports. The Limerick report was chosen as the template for all the plants.

TBE had developed programming to query, or extract data from, the LIMS database. The files from the query were opened in Excel and the results used to populate the tables designed to the Limerick template. The tables were set up in Excel to allow automatic calculation of the numbers required for the summary table and graphs (figures) and to

take advantage of the uniformity of formatting. The direct download of files into the tables virtually eliminated data entry errors. TLD data was received in Excel and the results were copied into the TLD table. Once the text and graphs were updated, the document was ready to compile in its entirety and send for customer review.

In the past, the text, tables and graphs files were emailed, faxed, or mailed for review. Upon acceptance, the document was manually put together and a hard copy was mailed over night to the customer. The document was reviewed and a marked hardy copy was mailed back for correction. Corrections were made and a new draft was over nighted to the customer for review. This process continued through all levels of review, up to the deadline for sending the report to the NRC. To improve this process, TBE purchased Adobe Acrobat, which provided the tool needed to combine Word, Excel, Bit Images, and Power Point files into one paginated pdf document. The complete REMP report could then be emailed as a draft for review. This greatly reduced the amount of time required to put the reports together – a critical area when producing multiple REMP reports – and made review of the document easier for the Exelon REMP Program Manager.

With Limerick's report in for review, work began on the three other Exelon-East plants. Peach Bottom's report was similar to Limerick's and required a very small amount of modification, but the Oyster Creek and TMI reports were extremely different. TMI's report, the most extensive, was modified first, beginning with the tables. Data tables were added where needed, due to the difference in sampling requirements, and other types of tables not consistent with the Limerick format were deleted. Graphs were updated and renamed or deleted, a new cover page was made, the land use census table was modified and the exceptions were written in the Limerick format. The table of contents and text from Limerick's report were modified with TMI information. TMI's draft REMP report was formatted as a pdf with text, graphs, maps, and tables and emailed to the plant for review and comment. The same process was followed for Oyster Creek and Peach Bottom.

Summary

Everyone has benefited from this project.

Normandeau is able to complete sample collection process in less time and more importantly – more accurately. Now Normandeau uses similarly formatted data sheets for all sample media and Exelon has a uniform Sample Collection/Receipt Sheet for its mid-Atlantic nuclear plants.

All Exelon REMP Chain-of-custody forms are now received electronically at the laboratory with a printed version accompanying the samples. An automatic login program has eliminated data entry at login and streamlined the entire process. Transcription errors have been eliminated. Login review has been reduced to a brief check for possible errors in the field data and conformance with the sampling plan. Samples are in process in the

laboratory at least a day earlier. The laboratory is able to process the samples and produce the required electronic deliverable easily and economically.

Because of the success of the Exelon program, TBE has designed a standardized electronic chain-of-custody based on the design developed for Exelon. In addition, for clients who are unable to modify their existing forms, macros are designed to convert the data to the format needed by the download program.

The four Exelon-East power plants now have a standardized REMP format, yet each is customized to the individual plant. The consistent field data can easily be electronically accessed for production of the REMP report tables and graphs. Transcription errors have been eliminated. Time spent reviewing the draft REMP reports has been drastically reduced for both Teledyne and Exelon. The draft reports are ready for review as early as February of each year. Transfer of the reports and comments via email has streamlined the entire review process.

Table A summarizes the cost benefits and savings.

TABLE A

ELECTRONIC DATA MANAGEMENT

BENEFITS AND SAVING

	NORMANDEAU	EXELON	TBE
BENEFITS	<ul style="list-style-type: none"> ➤ ELIMINATION OF CALCULATION ERRORS ➤ ELIMINATION OF DATA ENTRY ERRORS ➤ REDUCTION OF PAPER WORK ➤ EASE OF RECORD RETENTION 	<ul style="list-style-type: none"> ➤ UNIFORMITY OF PAPER WORK ➤ STANDARDIZED DATABASE ➤ IMMEDIATE NOTIFICATION OF MISSED LIMITS ➤ IMMEDIATE RECEIPT OF REPORTS OF ANALYSIS ➤ STANDARDIZED REMP REPORTS 	<ul style="list-style-type: none"> ➤ 75% REDUCTION OF LOGIN TIME ➤ ELIMINATION OF LOGIN TRANSCRIPTION ERRORS ➤ 95% REDUCTION IN TIME REVIEWING LOGIN ➤ IMMEDIATE DELIVERY OF REPORTS OF ANALYSIS ➤ 95% REDUCTION OF TRANSCRIPTION ERRORS IN REMP TABLES ➤ 50% REDUCTION IN TIME REVIEWING REMP TABLES ➤ COMPLETE DRAFT REMP REPORT DELIVERABLE IN FEBRUARY, PROVIDED THAT ALL DATA FROM CLIENT RECEIVED
SAVINGS	<ul style="list-style-type: none"> ➤ > 50% MAN-HOURS SAVED DURING SAMPLE COLLECTION AND SHIPPING 	<ul style="list-style-type: none"> ➤ 108 MAN-HOURS, PER PLANT, SAVED PRODUCING AND REVIEWING ANNUAL REMP REPORT 	<ul style="list-style-type: none"> ➤ 145 MAN-HOURS, PER PLANT, SAVED PRODUCING AND REVIEWING ANNUAL REMP REPORT