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Using Database Software to Manage IH Exposure Data

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Introduction

National Grid, a major electric and gas utility with approximately 18,000 employees, had over 20 years of hardcopy industrial hygiene (IH) exposure assessment-related data, located in file cabinets across five states in the Northeast. The ability to easily access this IH exposure data was essential to allow us to make informed decisions regarding the health and safety of our customers (e.g., National Grid management and employees).

Since sifting through paper reports to locate relevant data was inefficient, National Grid's goal was to find a software solution that would assist in implementing a comprehensive IH management framework. A means to both securely store volumes of IH data, as well as the ability to quickly and efficiently retrieve it electronically, was needed.

National Grid procured a commercially available IH software product and has successfully integrated it as an important tool in structuring the IH management framework.

This paper summarizes how the selected software was procured, modified, implemented, and utilized, and also presents some of its on-going benefits.

The software obtained by National Grid was simply a tool that we used to assist in managing the IH program, by helping us create a framework that included all the key program elements. The selected software did not replace our professional judgment, but instead, helped to organize the data in ways that gave a great "snapshot" of program areas that were being serviced adequately, and areas that needed to be addressed.

When properly implemented, the IH software facilitated an improved quality of service delivery, and reduced the effort in accessing and managing the IH data. We recognized that an important by-product of a well-organized IH program is that our customers came to rely on and perceive the IH program as having a high level of professionalism.

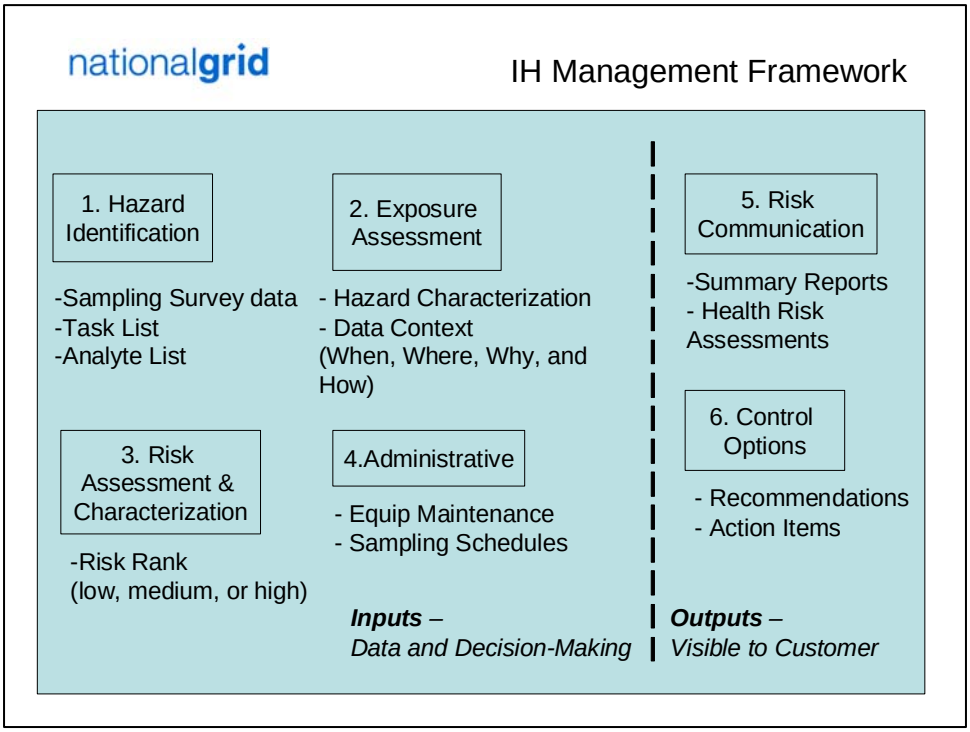

Figure 1. The National Grid Industrial Hygiene Management Framework

Figure 1 illustrates the components of the IH framework applied at National Grid (Webb 3). The functions to the left of the dashed line are on-going activities that are inputs to the system, and must be routinely re-assessed. Collectively, they form the database portion of the software, are managed internally by the corporate industrial hygienist, and serve as the basis for industrial hygiene decisions. The outputs generated from this database are various reports with recommendations for controlling health hazards, which are shared with the customer. The combined components serve to provide a consistent framework that documents the industrial hygiene decision-making process.

Although we were frustrated by our inability to adequately sort and query the data, as industrial hygiene professionals, we considered the data a valuable asset Over many years, we had accumulated several hundred sample data points, and sifting through volumes of hardcopy reports to sort data by task, location, analyte, sample type, and employee name, was difficult and time-consuming. Accessing data electronically appeared to offer clear advantages to the "file cabinet" approach. The IH software has enabled us to evaluate the data from many different perspectives.

The following sections of this paper will focus on the approach used to determine the best software solution that would be compatible with our IH management framework.

Methodologies

Program Implementation

There were four (4) basic functional areas that were addressed during the installation and application of the database:

- Needs assessment;
- Project support;
- Software selection; and
- Staging

Needs Assessment

In order to assess our needs for the IH database software, we had to define the scope of industrial hygiene within the organization. The IH management framework contained the following components that were linked together: the IH database, health risk assessments, reporting, and corrective action item tracking. Overall, this framework made it easier to rank health risk and to manage those areas that were most prone to non-compliance.

Project Support

Before selecting, buying, installing, and utilizing the software, it was necessary to secure the support of key stakeholders within National Grid, including management, the information technology (IT) department, and the industrial hygiene staff. Support of management was essential, and once secured, it was easier to get acceptance from the IT department. For organizations with large IH staffs, user acceptance would be necessary for ultimate success. However, the small staff at our company allowed for very quick implementation and application. In other words, the more people involved, the greater the challenge to implementation. If the program is only supported by one IH, then it will most likely end when the IH leaves the organization. For this reason, the program must be embraced by the IH staff as well as other levels of the company

A common implementation pitfall is the negative experience from past failures of software applications. Few people like change, and when it comes, there is little patience for the time and effort required to get familiar with the new application. There are many reasons for this inertia and reticence of changing an existing process. Industrial hygienists tend to believe that their problems are unique, or they do not have an understanding of how to go forward with managing an information system. It can be difficult to understand and fully embrace the advantages of an IH software program until you have actually worked with it for several months. This project was no different, since there was a learning period associated with implementing this information system. Overall, it was well worth the effort.

Software Selection

The available software options ranged from custom-built to off-the-shelf models. The three selection variables that were considered included cost, time to construct the database, and features. Given enough money and time, an IH software program can be built with all the features needed by the industrial hygienist to support the IH management framework. However, that process may take years to complete.

Building a customized software program is very cost-prohibitive, since a large part of the cost is associated with software development and on-going and intensive IT support.

When purchasing an IH software solution, you buy the years of development time and experience that has gone into the software development. The software solution that was purchased for National Grid had over 10 years of web-based software developmental experience. A practical decision was made to select a proven software package that was commercially successful for many years, instead of trying to re-invent the wheel. The commercially available off-the-shelf software was purchased for less than $10,000, and required very little customization to provide a workable program.

Staging

The staging process involved the logistics of when and how the software would be downloaded, and introduced to the staff. The progression was further broken down to a pilot phase, selective implementation, and full-scale application. Once a test server was secured, the software developer's staff assisted the National Grid IT department with the software installation. This isolation of the new IH software from the rest of the company's servers ("enterprise environment") proved to be very beneficial, as we were able to troubleshoot any software problems without impacting other industrial hygiene program areas.

During the pilot phase, data from approximately 10 different types of exposure assessment reports, such as air monitoring, noise dosimetry, and wipe sampling, were used to populate the database. These test samples were used to evaluate how the parts of the software program fit together to generate functional information. This step also helped us to develop a formal process for data entry and to determine the "business rules." Business rules can best be described as written protocols that provide specific instructions on what and how to include company-specific information in the database and are discussed further in the "Discussion and Conclusions" section of the paper. Full implementation and application of the software only began after everyone was trained, and developed a level of competence with the program application.

Software Criteria

The selected software solution that is purchased should be IH-focused, and have an adequate level of software support services.

Technical Content

A software company that has professional industrial hygienists on staff to provide development input and client training is a good indication that the software will be appropriate as an IH management tool. A software package that promises too many functions may not deliver any of them very well. Avoid software products that are not primarily focused on industrial hygiene, as there are feature-specific categories (e.g., TWA calculations) that need to be programmed in the database.

Software Support

Software support for the project was provided by both internal and external resources:

- *Internal Support*: This is critical for any software-based program. The software provider's IT group was involved in the initial installation of the software application onto an enterprise server in the National Grid system; subsequent to that, many of the updates were done by the National Grid IH staff.

- *External Support:* The software package that was purchased by National Grid included on-going technical support services. The software solution provider has certified industrial hygienists (CIHs) who understood both the software and how best to apply it to industrial hygiene issues.

The Software

The selected software solution must have the capability to be accessed at more than one location simultaneously. A decision also had to be made on where the IH exposure assessment and related data would be stored. The choices for storage were a web-based version via the organization's virtual private network (intranet) with the data stored on company servers or externally via the Internet with the data being stored by a web-hosted service. Each option carried its own advantages and disadvantages as described below.

External IT support can be provided through an outside application service provider (ASP), which supports all aspects of the software, and stores your data on their servers. This transfers the server and IT maintenance costs to the ASP. This approach is appealing for situations where it is difficult to coordinate with your company's IT group or where you have limited quality control of your company's server environment. External implementations rarely have internal support. The root cause of the problem is that the internal IT staff may not have individuals trained to support the software,

The software solution selected was supported in-house, since we believed that the internal implementation would be far more cost-effective in the long run. The data would be stored on servers maintained and monitored by the National Grid IT Department. As stated before, cooperation of the IT Department was secured only when we had received the support of the National Grid senior management team. Throughout the project, we had to remain persistent and educate them about the importance of the data to the business.

Discussion and Conclusions

Once the four (4) phases of program implementation were complete (i.e., needs assessment, project support, software selection, and staging, we were ready to customize the design of the software to fulfill our needs. Part of implementing any "enterprise system for information management is determining your company-specific guidelines and business rules around the sampling process" (Sherrill 8). Developing a system of business rules is very important in the field of industrial hygiene database management, due to the extensive variability of sample methods and types. The guidelines set forth in the business rules helped us to maintain data consistency, to ensure quality assurance, to define roles and responsibilities, to determine access levels, and to develop a reference for users.

Business Rules

As stated above, establishing business rules is essential to ensure data consistency and quality. Some examples of the rules that were incorporated for National Grid included guidelines to:

- Attach lab reports and photos;
- Generate sample numbers manually or allow the software to generate them for you;
- Classify user access levels for management and IH staff;
- Define the procedure to update software;
- Identify criteria for data entry; and
- Include all historical data, or just data with significant regulatory consequences.

Historical Data Entry

The decision was made to populate the database with over 20 years of historical IH sample data. However, the quality of the data varied greatly, and some was not necessarily suitable for entry into the database. For example, screening samples for indoor air quality surveys and bulk sample data from building materials were not included, since this information was not deemed as a priority for the specific needs at National Grid. The sample reports were prioritized, and only the data that was most aligned with our business needs were selected. The collective information generated by the program validated many of our industrial hygiene decisions currently practiced throughout the company.

An industrial hygiene consultant was hired to assist with historical data entry. The extra resources devoted to this effort greatly increased the speed at which the system was fully implemented and added value to the IH program. All of the IH exposure assessment and related data entry is still performed by trained industrial hygienists. There is a feature for review and quality analysis of each entry; it is recommended that the IH staff develop a system to check each other's entries as a quality control measure.

Lessons Learned

There were many lessons learned during this project, including:

- One needs to budget for IH consultant's time to assist with on-going data entry, as well as support from the IH software vendor (e.g., software updates and follow-up needs). Due to the technical nature of the data, it proved to be most beneficial to hire an IH consultant or designate an internal IH to populate the database.
- It is easy to get overwhelmed. Try to avoid ramping up all aspects of the IH program at once. It is better to focus on a single, small priority and work toward completing that goal.
- All IH surveys must be recorded on a standardized field data sheet that matches the IH database fields in the software.
- You should expect a transition period as users learn the nuances and get familiar with the software.
- Quality IH data is an asset that needs to be protected and available for continued use. However, not all IH data is of equal value.
- You should not feel compelled to enter all or save all data. Only historical and current IH data that has regulatory relevance and context should be retained (e.g., who, what, where, how much and why).
- The file attachment function of the software should be used to include PDF format copies of lab reports, digital photos, and other supporting information.

Benefits

The benefits of an IH software program include the ease of: (1) analyzing and retrieving data, (2) developing reports, and (3) documenting IH decisions. With organized data comes the ability to quickly generate summary reports as requested by the customer. The ability to answer IH questions and back them up with well-organized reports improves the overall appearance and credibility of professionalism of the IH group. Storing the data electronically preserves the corporate knowledge better than relying on any one person to remember where data is located and the context in which it was collected. We are also able to highlight professionalism in the work place when exposure assessment information is delivered in a timely manner.

Summary

At National Grid, we used a commercially available IH data management software package to assist us in structuring the industrial hygiene management framework. Written business rules were developed for the use of this web-based IH management database. The implementation of the IH software facilitated an improved quality-of-service delivery, and reduced the effort in accessing and managing the IH data. We realized that an important by-product of a well-organized IH program was that our customers came to rely on and perceive the IH program as having a high level of professionalism. The major problems encountered with the IH software were associated with the many details of implementation. Promoting the importance of the IH function falls to the industrial hygienist. It is unlikely that there would be anyone else within the organization that understands the importance of your work more than you. It is essential that IH and safety professionals be persistent and educate others about the business importance of IH data.

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