Revolutionizing EHS Management:
Web-Based EHS Management Systems

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Abstract

In today's Internet age, surrounded by buzzwords such as *e-commerce* and *e-marketplace,* environmental, health and safety (EHS) professionals in manufacturing environments are often left behind. However, with the increasing pressure on productivity, efficiency and bottom line performance, corporations are realizing that EHS managers need technology and tools similar to those available to other key business functions. As the demands placed on the EHS manager continue to expand from regulatory expert to computer specialist, salesperson, resource manager, and strategic business leader, EHS managers are on a quest for tools that enable them to manage their business more efficiently and cost effectively – tools that make their jobs easier.

As with other business functions, EHS professionals are rapidly discovering that web-based EHS Management Systems provide the best solutions to their needs. Web-based EHS Management Systems have proven themselves to be catalysts for **empowering and evolving the EHS professional** and **integrating EHS management with other critical business functions**. As the Internet continues to revolutionize many industries, so it is now revolutionizing EHS management.

This paper focuses on the use of web-based EHS Management Systems to:

- Standardize processes
- Provide critical, real-time information
- Increase productivity
- Reduce capital and administration costs
- Reduce the level of information technology expertise needed to manage and access the EHS Management System
- Improve communication resources
- Integrate EHS with other business elements

Shaun Booth, P.E. Managing Partner The Solution Foundry 2230 Towne Lake Parkway Building 1200, Suite 100-110 Woodstock, GA 30189 sbooth@solutionfoundry.com	**Joseph Tell** Project Manager The Solution Foundry 2230 Towne Lake Parkway Building 1200, Suite 100-110 Woodstock, GA 30189 jtell@solutionfoundry.com

Introduction – EHS Management Meets The Web

In its roughly 15-year history, the Internet has evolved with one primary objective: to allow networked computers to seamlessly interact to share information. *The Internet is a network of computers. Not just a few computers, but millions of all types of computers. Similarly, it is not just a network, but a network of networks – internetworks – and hence, its name.*[1] With current estimates of global Internet usage at over 240 million users, over 750 million users by the end of 2005[2] and over 35 million registered domains worldwide[3], it is widely accepted by business professionals that the Internet will be the engine that drives economic growth into the future. Management systems and supporting tools based on Internet technology (web-based) have quickly become the preferred approach to solving information and resource management challenges.

As the demands placed on the environmental, health and safety (EHS) manager continue to expand from regulatory expert to computer specialist, salesperson, resource manager, and strategic business leader, EHS managers have realized the need for tools that enable them to manage their business more efficiently and cost effectively. In order to keep up with the furious pace of the Internet age, these tools need to be flexible, customizable and seamlessly integrated into other critical business functions. Whether it's data from a remediation project, schedules for new equipment installations, or EHS permits and plans, EHS managers need efficient mechanisms for collecting, updating, and communicating information.

Add to these demands the increasing pressure for a company to demonstrate environmental responsibility and sound environmental management practices to its stakeholders, including its customers. This is increasingly accomplished through the registration of Environmental Management Systems to recognized international standards. This pressure increased to new level for over 5,000 companies in 1999 when Ford Motor Company and General Motors announced that all of their Tier I manufacturing suppliers were required register their Environmental Management Systems to the ISO 14001 *Environmental Management Systems specification*. This event contributed to the ISO 14001 standard's emergence as the leading international standard for Environmental Management Systems.

ISO 14001 establishes a structural framework for developing and improving a comprehensive Environmental Management System including communication, training, document management, records management, and performance tracking. Analysis of available technologies shows that a web-based approach provides an efficient, cost effective means to communicate and deploy these management systems. This paper describes the benefits of web-based EHS Management Systems, job functions that recognize these benefits in a manufacturing environment, available technologies and approaches, and a case study illustrating a Fortune 50 company's successful implementation of a global, web-based EHS Management System.

Benefits of Internet Technology:

The benefits of Internet technology are most apparent in the growing business-to-business and business-to-consumer electronic commerce (e-commerce) industries. Today, everything from grocery shopping to stock trading is available online. Conducting business over the Internet (or company Intranet) facilitates faster communication between suppliers and customers, eliminates geographic communication barriers, provides users with needed information regarding products and services, and eliminates the limitations of the 8-hour workday. The fundamental benefits of Internet technology in e-commerce are widely recognized as[4]:

- Lower purchasing costs
- Reductions in inventories
- Lower cycle times – less time is required to build and ship products
- More efficient and effective customer service
- Lower sales and marketing costs
- New sales opportunities

These benefits are often recognized by businesses completing e-commerce transactions over the Internet and result from the open architecture, growing geographic coverage, and real time communication of information that only the Internet can provide. A business professional in today's manufacturing workforce is not unlike a private business – interacting with other professionals, or businesses, to share goods and services (information). Therefore, business professionals (including EHS professionals!) can experience these same fundamental benefits by utilizing Internet technology to build and maintain web-based management systems. The following table describes the correlations between the fundamental benefits of Internet technology described above and the benefits realized by EHS professionals utilizing a web-based EHS Management System approach.

Benefits of Internet Technology	
Electronic Commerce	**Web-Based EHS Management**
Lower Purchasing Costs	**Reduced Information Management Costs**
Reductions in Inventories	**Consolidated Information and Resources**
Lower Cycle Times	**More Efficient and Effective Communication of Information Throughout an Organization** • Increased productivity through decreased administration • Real time access to information • Reduced time to ISO 14001 certification
More Efficient and Effective Customer Service	**Increased Efficiency, Reliability, Quality and Customer Service Through Work Process and Information Standardization**
Lower Sales and Marketing Costs	**Successful programs through workforce empowerment**
New Sales Opportunities	**Business improvement opportunities generated from data mining capabilities**

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The following situation represents a typical information management challenge often presented to an EHS professional. This example is used to demonstrate the benefits of a web-based EHS Management System, as identified above.

EHS Information Management Example

An EHS manager at a manufacturing facility is required to implement a new procedure for disposal of oily rags that are in widespread use throughout the operation. This implementation includes communicating the new procedure to affected employees, verifying their review of the procedure and scheduling department meetings to provide hands-on training. The following three scenarios describe the activities required to implement the procedure based on varying levels of electronic EHS Management System infrastructure in place at the facility:

Scenario 1 – Paper-Based System		
Print a paper copy of the procedure for each affected employee and distribute accordingly.	*Obtain a written notification that all appropriate employees reviewed the new procedure.*	*Schedule training meetings using paper-based tools (i.e., bulletin board postings) or verbal communications.*
Scenario 2 – Electronic Mail Network		
Send an e-mail message with an electronic version of the procedure attached.	*Solicit return e-mails for verification of receipt/review.*	*Schedule training meetings through e-mail network.*
Scenario 3 - Web-Based EHS Management System		
Post an electronic version of the procedure to a 'Procedures' web page on the company Intranet. (Employees are instructed to visit the Intranet for EHS information.)	*Review web page hits to verify that affected employees have received the new procedure.*	*Provide employees the ability to schedule training meetings online. Additionally, feedback on the new procedure can be solicited directly through an online form.*

Analysis of EHS Information Management Example

In the EHS information management example, the benefits of Scenario 3 are:

Reduced Information Management Costs – Effort required to produce paper copies of procedures or send multiple e-mails to affected employees and manually keep track of receipts is reduced. Except for the initial 'publishing' of the information, the web-based approach substantially reduces the effort required to disseminate the information and monitor information use.

Consolidated Information and Resources – Consolidating EHS Management System elements into one central location provides facility personnel with simplified access to required information and associated supporting resources. Information regarding training, supporting resources (i.e., links to online training presentations or related procedures) and additional

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instructions regarding implementing the new procedure can be incorporated into the procedure through hyperlinks.

Increased Effectiveness, Reliability, Quality and Customer Service Through Work Process and Information Standardization – Developing a centralized information management system facilitates standardization, and hence increased reliability and quality. The EHS manager ensures that employees are relying on the correct, most recent version of the procedure and all employees have access to the same information.

Improved Communication and Sharing of Information Throughout an Organization – Leveraging the existing networks of the Internet or an existing company Intranet to communicate EHS information increases the availability of information for the members of the network. In large organizations, users in other locations who are members of the company network may be able to leverage this new procedure by accessing the procedure over the company Intranet and using the procedure as a template for their facilities.

Successful Programs Through Workforce Empowerment – Many professionals today are eager to learn the skills necessary to manage web sites and web-based tools. EHS professionals who implement web-based management systems and tools often develop skills that reduce their dependence on support resources (i.e., IT). This decreased need for support typically creates a feeling of accomplishment and ownership of the EHS Management System.

Additionally, the energy and excitement surrounding the Internet can be valuable when implementing web-based initiatives. Providing employees with access to the Internet and/or company Intranet, online feedback tools, and an opportunity to assist in EHS Management System design and maintenance fosters a feeling of inclusion, ownership and empowerment throughout the entire workforce.

Business Improvement Opportunities Generated From Data Mining – The process of analyzing data to determine data relationships and patterns undiscovered by previous analyses is referred to as 'data mining'[4]. The recognition of EHS management as a critical business function in industry is driving the importance of developing data mining capabilities to improve EHS Management System performance and tracking. These capabilities often reveal bottom line impacts (both positive and negative) of EHS programs in a manufacturing facility. A centralized, web-based management system contains information that can be used to better understand EHS performance and cost impacts. Manufacturing locations can leverage this information to improve EHS performance and reduce associated costs. Large companies can leverage this information at a corporate level to evaluate company-wide EHS performance.

Who Realizes These Benefits?

In today's manufacturing environment, EHS management typically impacts many job functions. Each of these job functions experiences benefits from the implementation of a web-based EHS Management System. The following table describes typical manufacturing job functions and

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examples of the primary, job-specific benefits that can be recognized from a web-based EHS management system approach.

Benefits of Web-Based EHS Management Systems	
Job Function	**Benefits**
Line Managers	❑ Optimized communication of EHS requirements to operators ❑ Real time EHS performance feedback
Operators	❑ Real time access to operating procedures ❑ Ability to provide real time feedback to EHS staff
Location EHS Managers	❑ Reduced staff support required in order to maintain and update information ❑ Organization/consolidation of EHS requirements and supporting resources ❑ Real time data to support business decisions and efficient reporting mechanism for communications with facility and corporate management ❑ Decreased administration demands
Location EHS Staff	❑ Reduced staff support required in order to maintain and update information ❑ Organization/consolidation of EHS requirements and supporting resources ❑ Real time EHS performance feedback
Business Unit and Corporate EHS Managers	❑ Efficient information source for review of location-specific EHS performance ❑ More efficient communication of corporate initiatives and requirements over Intranet ❑ More effective EHS support to locations through enhanced information sharing
Plant Managers	❑ Better overall facility EHS awareness ❑ Efficient information source for review of location-specific EHS performance
IT Staff	❑ Reduced support for EHS staff data management needs
All	❑ Consolidated, Intranet source for EHS information including: ▪ Operating procedures ▪ Training materials and schedules ▪ Emergency information ▪ EHS department support ❑ Real-time communication of EHS information to facility personnel over Intranet

Available Technologies/Approaches

Internet technology can be as simple as hosting a web page on a local server used for the company Intranet or as sophisticated as a secure login to access and manage an interactive, web-based data management application on an external server over the Internet. In either case, one fundamental concept is maintained – information is managed and communicated from a central location that can be accessed by any authorized user with a web browser (i.e., Internet Explorer or Netscape Navigator). The following examples describe available technologies and approaches for web-based EHS Management System solutions and tools.

Corporate or Location EHS Intranet

Intranets are internal websites that reside on a server within a company's firewall, protecting the information from external parties. A central corporate Intranet can be a powerful tool for communicating EHS information throughout an organization. Many companies today utilize this technology for communicating information such as human resources policies and procedures, employee benefits information, company announcements and employee contact information. The same approach can be applied to EHS information. Corporate EHS policies and procedures, regulatory requirements, and EHS technical support information can all be managed and communicated using a company Intranet. This approach ensures that important EHS information is available to all employees within an organization through a web-browser and promotes standardization and consistency of EHS information throughout a corporation.

Once installed, EHS staff can often customize, maintain and update the EHS management system using a common, commercially available web development software application. This allows the EHS staff to manage and update their information in a web-based format with minimal IT support.

Web Based EHS Management System Tools

Many customized, web-based tools exist that can be integrated into an overall EHS Management System. Functions such as incident management and reporting, regulatory requirement tracking, EHS planning, and document management can be performed with electronic, web-based applications. These tools often involve designing database applications with web-based 'front-ends' that can be accessed by users through a web browser. This type of application (business logic and database) is typically hosted on a central server that can either be managed internally on a central location or corporate server, or on a secure server external to the organization's network. Hosting the application centrally enables the maintenance and update of the application and data at a single location, improves the consistency of results and enables more efficient data mining and reporting.

Case Study – Alcoa Inc.

Consider the case of Alcoa, a Fortune 50 company that is the world's leading producer of fabricated and finished aluminum products used by customers in the packaging, automotive, aerospace, and construction markets. Highly decentralized, Alcoa's business units and plants have the freedom and the responsibility to develop and implement their own EHS programs to respond to a plant's unique circumstances. Headquarters provides a broad framework of corporate policies, procedures, guidelines, and support. In 1999, Alcoa turned its focus to ISO 14001 and began an initiative to have ISO 14001-compatible systems in half of its plants by the end of 2002. In order to accomplish this goal, Alcoa began implementing a web-based management system product, EMSolution®, at its manufacturing locations worldwide. By January 2001, approximately 50 of Alcoa's manufacturing facilities were using the system. EMSolution, designed using standard Microsoft® Office applications, functions as an EHS

Intranet that is placed on a company's local or remote web server and accessed using a web browser. Its main components provide a seamlessly linked electronic management structure that facilitates establishing and communicating EHS roles, responsibilities and requirements throughout an organization. For Alcoa, this seamless electronic link is intended to eventually span the globe, connecting plants in Arkansas, Australia, South Carolina, and Singapore.

Alcoa's EMSolution® EHS Intranet is hosted on local or corporate servers, is updated and maintained with minimal IT support, and can be accessed with a standard web browser. EMSolution provides:

- Links to available, online laws/regulations and Alcoa policies, procedures, standards, etc.
- Connection of independent information sources within Alcoa (e.g., corporate, business units, locations)
- Integration of EHS management with Alcoa's overall systems (e.g., Quality, Human Resources, Production, etc.)
- Real time communication of EHS Management System elements (plans, permits, policies, procedures, etc.)

Alcoa has recognized the following benefits of implementing a web-based EHS Management System:

- Streamlined development, implementation and maintenance of Alcoa's EHS management system
- Existing management system elements consolidated into an intuitive consistent framework
- Reduced EHS Management System costs and increased EHS staff productivity. *Estimates from sources within Alcoa cite a 40 to 70 percent reduction of effort to complete day-to-day EHS responsibilities.*
- Reduced time to achieve ISO 14001 certification. *Sources within Alcoa estimate that the time to prepare for certification is cut in half.*
- Efficient information sharing between locations using Alcoa's Intranet
- Reduced paper administration

At Alcoa's Bauxite, Arkansas plant, which opened as a bauxite mine in 1897 and is one of the company's original bauxite refineries, Britt Sheer, senior environmental specialist, used to receive data from paper landing on his desk, fax, or e-mail. Now Britt manages all of the site's environmental information and requirements, including ISO 14001 system elements (the facility intends to obtain ISO 14001 certification this year), electronically within the EMSolution Web. His use of EMSolution demonstrates its main objective: **To empower users with technology that can make their jobs easier and increase productivity while minimizing the need for IT support.** Britt has transformed his typical daily workload by reducing administrative time once required to manage and communicate his programs. This increased efficiency has helped Britt increase his value to the organization through focusing on such initiatives as preparing for ISO 14001 certification and identifying pollution prevention opportunities, all while continuing to provide the facility's daily environmental leadership.

Conclusions

As the demands placed on the EHS manager continue to expand and pressures continue from customers, suppliers and the global community to implement formal EHS Management Systems, EHS managers have realized the need for tools that enable them to manage their business more efficiently and cost effectively. Managing and communicating EHS information over the Internet or a company Intranet can provide:

- Reduced information management costs
- Consolidated information and resources
- More efficient and effective communication of information throughout an organization
- Increased efficiency, reliability, quality and customer service through work process and information standardization
- Successful programs through workforce empowerment
- Business improvement opportunities generated from data mining
- Reduced time to ISO 14001 certification

EHS professionals use web-based EHS management systems and tools to **integrate EHS management into the business**.

Web-based EHS management systems empower users with technology that can make their jobs easier and increase productivity while minimizing the need for IT support.

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