

Database System for Management of Health Physics and Industrial Hygiene Records.

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Introduction

This paper provides an overview of the Worker Protection System (WPS), a client/server, Windows-based database management system for essential radiological protection and industrial hygiene. Seven operational modules handle records for external dosimetry, bioassay/internal dosimetry, sealed sources, routine radiological surveys, lasers, workplace exposure, and respirators (Figure 1). WPS utilizes the latest hardware and software technologies to provide ready electronic access to a consolidated source of worker protection.

Prior to WPS, several independent, stand alone systems which were developed in the mid to late 1980s were in use to support these functions. The original systems were developed using a combination of mainframe and PC technologies but eventually became PC based as the personal computer offered larger storage capacity and faster processing. As a result of moving to stand alone systems, the use of common data in many of the systems, the sharing of information among the systems for reporting, and the ability to analyze large volumes of data became increasingly more difficult. In addition, the proprietary nature of these separate systems restricted the number of knowledgeable users. WPS is the integration of these separate functions into a single

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centralized system. It was decided to keep the development in-house to maintain compatibility with existing ANL business policies and procedures. In addition, following the guidelines of the ANL lab-wide administrative systems would ensure that interfaces with other systems would be easily accomplished. The WPS development effort began in 1996. Sufficient time to anticipate Y2K issues was an important consideration.

WPS is a PowerBuilder™ application operating on a Windows NT™ server; WPS accesses data records residing in a single Oracle 8™ relational database on an HP 9000 - series Unix server (Figure 2). WPS is accessible by all laboratory-wide networks. Data from the previous systems were migrated into the new database. Personnel information is obtained by a link to the Human Resources database. Approved users may query, filter, and sort data, and generate reports. With only a single database, system maintenance is simplified and a single security model may be applied.

There are 50-100 individual users at ANL, including industrial hygienists, health physicists, sealed source custodians, and safety coordinators. Security is an important issue: personnel monitoring data is protected by the Privacy Act of 1974; personal data such as age and social security number are privacy protected; ANL division/department level data are considered proprietary and are not normally shared. A user accesses WPS with a username and password. Several levels of access control protect records. Account access and database selection are established at the level of the HP9000/Oracle system. Selective access to specific windows is controlled by the PowerBuilder application.

External Dosimetry

This module provides on-line external radiation dose information to authorized users. Data is electronically up-loaded from dedicated computer systems connected to automated and manual thermoluminescent reading systems. The module provides shallow, deep and neutron dose equivalent values with references to badge issue date, retrieve date, read dates, user type, and work location. Currently over 200,000 records are accessible. More than 1000 records are added monthly. We plan to integrate external and internal dosimetry to provide on-line CEDE and TEDE data.

Bioassay/Internal Dosimetry

The bioassay functions are embedded within the Internal Dosimetry Module. The objectives are to provide mechanisms for electronic transfer of sample analysis requests to the measurement laboratory and for electronic return of sample analysis results to the Internal Dosimetrist. A unique number automatically assigned when a sample is logged in identifies samples and results. Transfers of sample analysis requests to the measurement laboratory are performed in conjunction with sample submission. Chain of custody is documented through reports. The data transfer protocol provides the Internal Dosimetrist with preliminary results, thus allowing an opportunity for re-evaluation.

The Internal Dosimetrist makes use of the assessed dose submodule on a daily basis. This submodule provides a mechanism to retrieve bioassay results, track and assess doses, and report results to individuals. It is possible to associate samples to an incident or project. The ability

exists to specify an initial assessment, which can be updated as additional samples are received. When sufficient samples have been received the final dose can be assessed and marked for release. The lifetime dose assessment for each individual is maintained.

Sealed Sources

It is required under 10CFR835 to maintain an inventory of accountable sealed, radioactive sources, and to perform inventory verification and integrity testing at intervals every six months. The major objectives for the Sealed Sources Module were to provide a unified inventory and maintenance database for the entire ANL-E site, to make it accessible to each individual source custodian, and to provide automatic e-mail notification to ensure timely compliance. Source integrity testing surveys are also required to be permanently archived.

There are 55 source custodians and delegates responsible for source maintenance. Area health physicists and division coordinators in each of the 17 owning divisions have read-only access and can generate reports. A site-wide coordinator provides overall monitoring and quality control. Unique inventory keys are automatically generated upon new source entry, derived from manufacturer, model, and serial number. Data fields provide for full descriptive information and notations. Custodians are prompted to perform source maintenance by automatic e-mail messages sent weekly. Leak test results are entered by the Custodian, and are archived with all records daily. Decay corrections to source activities are automatically performed each day. There are currently over 900 sources tracked, one half of which are accountable sealed sources. Each source maintenance operation creates a new record with a current total of over 4000 records.

The Sealed Sources Module provides a unified and straightforward source data management for a variety of custodians working in different environments across the site. It eases the burden of periodic maintenance by prompting the users, and by providing automated lists of sources needing to be leak-tested or inventory checked. The implementation of this module has significantly facilitated the sealed source maintenance process.

Routine Radiological Surveys

This module provides a unified database for scheduling, monitoring, reporting, and archival storage of routine health physics surveys. Routine surveys are those which are performed at pre-determined intervals. Depending on radiological status and space utilization, surveys may be performed in specific building spaces, or on specific objects. The module allows health physicists to enter schedules with any interval and start date. Survey reports are designed as worksheets for RCT's. Survey measurement data may be entered. A link is provided to the Health Physics instrument maintenance database to validate instrument serial numbers and calibrations. All types of radiological surveys are accommodated, including radiation field, surface contamination, and air monitoring. Summary reports for specific site areas may be viewed or printed by "customer" line management representatives. This module has been successfully deployed in limited areas.

Lasers

In order to comply with the ANSI Standard Z136.1 on Safe Operation of Lasers and regulations of the State of Illinois, it is necessary to keep a detailed inventory of Class 3 and Class 4 lasers.

The ANL Laser Safety Officer previously maintained a single-user PC database with descriptions, inspection records, and user names of all lasers. This database was migrated into the new Laser Module on WPS. Several improvements were made in the form of additional descriptive fields and report formats. This module contains about 400 records. Access is now provided to a limited number of divisional safety representatives as well as to the Laser Safety Officer. WPS provides a much more secure and reliable location for the laser safety records, under the common umbrella of WPS support, maintenance, and archival preservation.

Workplace Exposure Monitoring System (WEMS)

Accurate exposure data recording and retrieval are primary responsibilities of the Industrial Hygiene Group. Exposure data is shared with the Medical Department for decisions on appropriate testing and follow-up care. Regulatory drivers include OSHA Permissible Exposure Limits (PEL), ACGIH Threshold Limit Values (TLV), NIOSH Recommended Exposure Levels (REL), and AIHA Workplace Environmental Exposure Levels (WEEL).

WEMS is used by 15 members of the IH group to enter sampling data from routine and nonroutine operations and to prepare reports monthly or by specific operation. Module functions include Direct Read Air and Material samples, Lab Analysis Air and Material samples, Confined Space, Noise, Regulatory Limits, and Equipment Calibrations. Reports are produced for Exposure Sampling Summaries and Equipment Calibrations. WEMS currently holds over 7800 records.

Respirators

The Respirator System was designed to aid appropriate decision making on protective equipment, and incorporate an older database into a common searchable format for multiple users. Reporting functions facilitate compliance with OSHA standards for specific substances, respirators, personal protective equipment, and hazard communication.

Three industrial hygienists currently use the module to provide up to date information on respirator recall for service, fit test results, training, and type of respirator issued. Data recorded includes: badge number, name, division, building, phone number, supervisor, medical exam date, training date, fit factor, and respirator issued by brand, model, and cartridge. Standard reports for Recall Notices, Training, and Division Respirator User have been incorporated. The module currently contains records on over 700 respirator users. The module is in daily use; some data entry and reporting refinements have been identified.

Conclusions

The ANL Worker Protection System has been successfully deployed with all seven modules in production. In the future, it is expected that WPS will be integrated with additional ANL lab-wide databases such as the training management system. It is expected that the number of users will continue to increase. Additional system modules may be added as the need arises.

Acknowledgements

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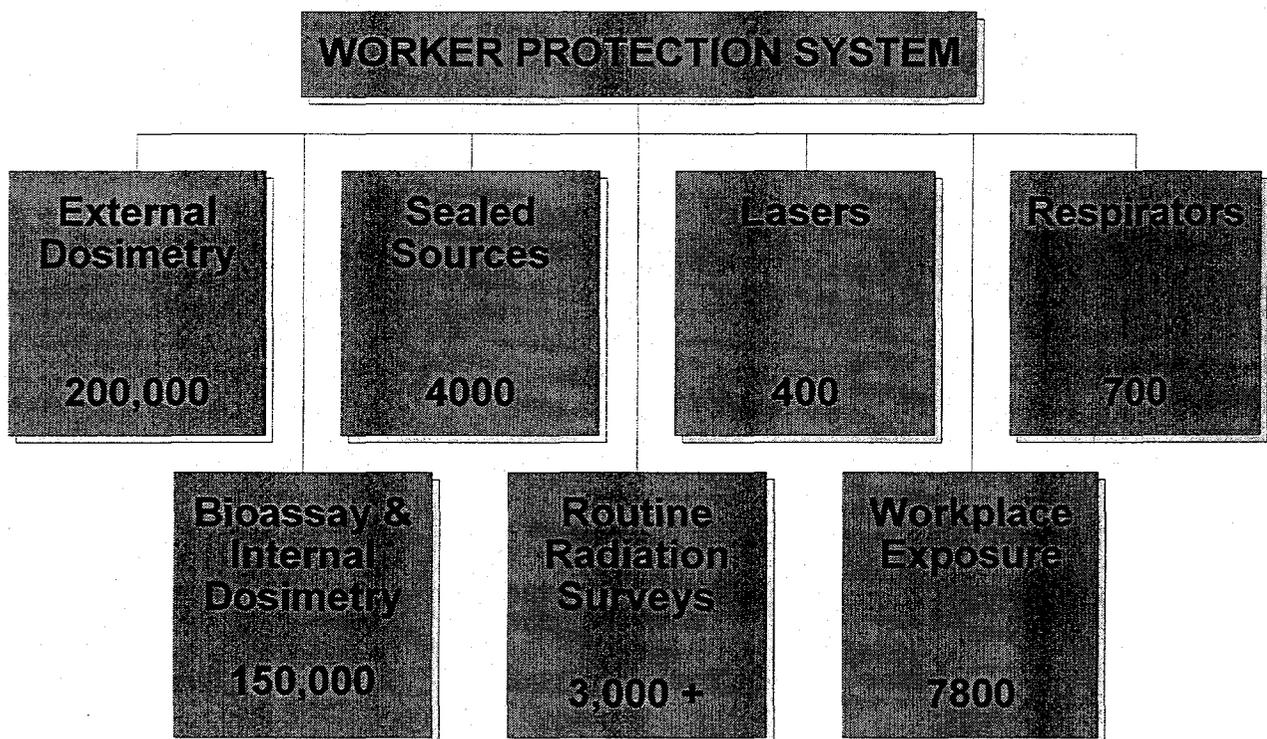


Figure 1. Functional Modules and Numbers of Records.

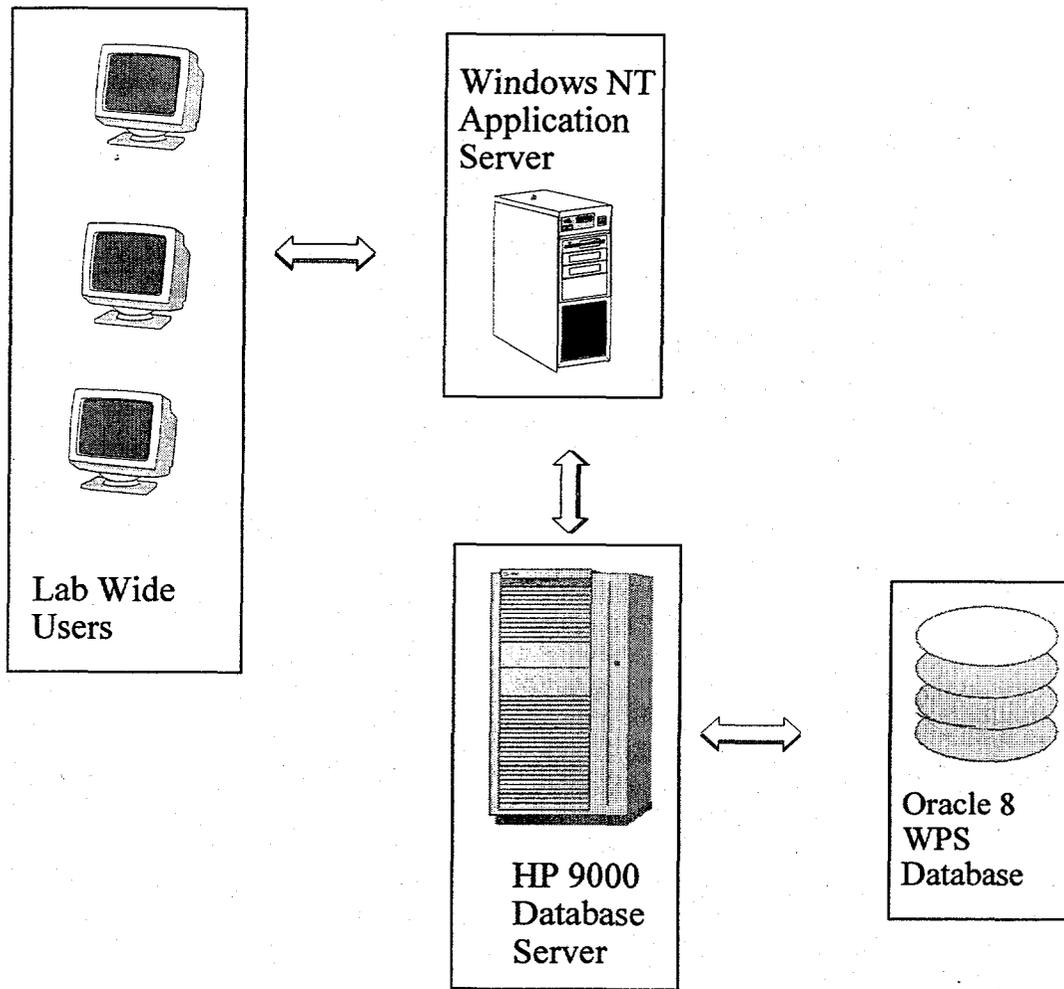


Figure 2. WPS System Architecture