OIL-PCB MANAGER (OPM) : A RISK EVALUATION AND MANAGEMENT SYSTEM FOR ELECTRICAL CONTAINERS

F. Argentesi[1], S. Cerlesi[1,2] , E. Gonzalez[1],V. La Porta[2] and W. Tumiatti[3]

(1) Commission of the European Communities, JRC Ispra (Va) - Italy
(2) Regione Lombardia Milano - Italy
(3) SEA Marconi Technologies Torino - Italy

Abstract

OIL-PCB Manager is an efficient user decision support system for the various actions planned for the prevention and/or mitigation of risk in installations, sites, containers, oils/fluids containing and/or contaminated by Polychlorinated Biphenyls above the allowed threshold limit (EEC Directive reduced to 50 ppm).

Electrical containers (transformers, condensers, etc.) are potential sources of chemical accidents involving Polychlorinated Biphenyls (PCBs) and their oxidative transformation products (PCDD, PCDF,etc..).

A management system has been developed to provide tools and facilities to control risk in this important area. The system, Oil-PCB Manager (OPM), is a computer based system which permits the acquisition, management, and retrieval of information concerning sites and containers involving PCB and mineral oil contaminated by PCB.

The system is being developed by an interdisciplinary group of experts which includes the following:

- Analytical Chemists
- Government Officials
- Industrial Managers involved with PCB
- Modelling Experts
- Computer Scientists

The information model used is the result of a long process of research on chemical emergency management (1,2,4,5) and of the regulation process put forward by the CEC.

This model describes the containers as part of more complex set which includes the particulars on installation, site and container. At each level data are provided to represent the relevant information features.

At the installation level the following data are defined :

- Address - Map - General info
- Synopsis of hazardous load : site number, container number
- Maintenance - Safety procedures

At the site level the following info are taken into consideration :

- Site type (cabin, room, area, station, etc.) - Location
- Synopsis of hazardous load : container number
- Actions to prevent - Mitigation
- Potential targets in the environment close to the site

Finally at the container level the following data are required:

- Maker - Container type (transformer, rectifier, commutator,tank, etc.)
- Capacity - Voltage
- Accessibility
- Fluid characteristic (type, function, amount)
- Label - Fluid analyses
- Degradation level - Release - Migration
- Containment/barriers
- State of functioning

The system is a powerful data base and an hypertext system [3] with retrieval capabilities integration of different knowledge bases. It provides five forms for data input.

The help menus are integrated into the data base in a navigable hypertext form and include relevant technical information on literature, legislation and accident case histories .

An extensive and flexible reporting system is available to prepare synoptic document for executive review.

In particular at the aggregation level of the site there is all the information required to perform a risk assessment of the site itself. This site analysis can be further refined by aggregating information from the lower levels,e.g. containers.

An expert system to perform this risk evaluation is an integral part of the OPM system.

The information model at the containers level allow their management permitting diagnostic functions for what concern container degradation and tendence to adverse dynamic trends (oil leaks and fire/explosions). These diagnostic features are such that maintenance plans can be defined on short medium terms.

An implementation of a simple emergency management feature is being planned which would specialize in simple emergency accidents : leaks of PCB into the environment and fire/explosion of contaminated mineral oil with creation and atmospheric distribution of oxidative products.

The system provides a standardisation scheme for the data acquisition and knowledge-base and extensive help menus allows rational interpretations even in case of complex situation. The resident expert component of the system provides risk analysis and possible mitigation strategies to the decision making authorities.

The OPM system has been tested with a variety of real data. These data are the result of data collection coordinated by the Lombardy regional authority following the italian regulation of this sector (DPR 216, DMA 1989).

The undertaken testing showed that OPM respond appropriately to the main risk analysis problems of this area.

OPM is currently implemented on MacOS (Macintosh Operative System) and a transfer to the system under OS/2 PM and MS-Windows is in progress.

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