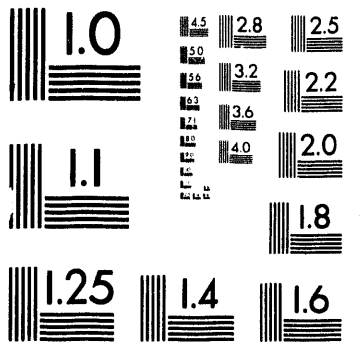
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
7.1

1 of 1

Conf-940312--11

WSRC-MS-93-168

RISK ASSESSMENT DATA BANKS AT THE SAVANNAH RIVER SITE (U)

by
C. S. Townsend

Savannah River Site
Aiken, South Carolina 29808

W. S. Durant
(WSRC)
D. F. Baughman
(WSRC)

A document prepared for:
PSAM-II
at San Diego, CA
from 03/20/94 thru 03/24/94

DOE Contract No. **DE-AC09-89SR18035**

DISCLAIMER

RISK ASSESSMENT DATA BANKS AT THE SAVANNAH RIVER SITE

Christina S. Townsend, William S. Durant, Donna F. Baughman

Nuclear Processes Safety Research
Savannah River Technology Center
Savannah River Site
Westinghouse Savannah River Company
Aiken, SC 29802

INTRODUCTION

In the risk assessment business, it is a well known fact that past mistakes will not be remembered if nothing is done to record them and make them available for future reference and review. The Savannah River Site maintains a computer database system for non-reactor facilities that contains a compilation of the incidents that have occurred since the start up of the Site in 1953. The nationally recognized data banks are highly valued across the U. S. Department of Energy (DOE) complex for their use in risk-related analyses. They provide data for uses such as failure rate analyses, equipment reliability and breakdown studies, project justification, incident investigations, design studies, Safety Analysis Reports, Process Hazards Reviews, consequence analyses, quality assurance studies, trend analyses, management decision, administrative control effectiveness studies, and process problem solving.

Five risk assessment data banks exist in the areas of reprocessing, fuel fabrication, waste management, tritium, and the Savannah River Technology Center. The data banks are comprised of approximately one-third million entries collectively and continue to grow at a rate of about two hundred entries per day.

DATA COLLECTION HISTORY

The incident collection effort was begun in 1973 initially for the nuclear fuel reprocessing and waste management facilities at the Site. Available written information concerning incidents involving equipment failures, process upsets, operating errors, facility and personnel contamination, personnel injuries, environmental insults, etc. was gathered and abstracted into the data bank by a team of five technical analysts. The philosophy of the analysts was that if the event was of sufficient concern to be recorded, then it was important enough to include in the data bank. The analysts used five sources of data: incident reports, daily and monthly status reports, audit records, fire department records, and equipment histories. After a 20 man-month effort, 8000 entries dating back to 1953, when the Savannah River Site was started, were abstracted into the original data bank.

As more value was placed on keeping an incident history for use in risk assessment and as reporting requirements increased, many new sources of information became available to the data bank analysts, and the data collection effort grew. Today a vast collection of internal sources, both published and unpublished, are provided by the facility

managers and reviewed daily by analysts to identify events that should be recorded in the data banks (Table 1).

Table1. Example source documents.

Published data sources	Unpublished data sources
• Operating incident reports	• Senior supervisor log books
• Special hazards investigations	• Health protection department log books
• Plant technical monthly reports	• Burial ground log books
• Daily teletypes	• Waste management log books
• Fire department reports	• Salvage yard receipt records
• Works engineering monthly reports	• Canyon crane log books
• Waste management monthly reports	• Decontamination log books
• Criticality audits	• Maintenance log books
• Power department incident reports	

As the risk-based safety analysis effort at the Savannah River Site grew, the need for data banks for the other major facilities on the site was identified. New data banks were developed for the fuel fabrication facilities, tritium facilities, and the Savannah River Technology Center. Collectively, the data banks contain a compilation of approximately 370,000 events.

DATA DESCRIPTION AND USES

Incident information recorded in the data banks includes a description of the incident, where and when the incident occurred, the source documents from which the incident was abstracted, the type of incident, repair times, and consequences. Some typical examples of information contained in the data banks include data on fires, robots, instruments, nuclear criticality potential, computers, pumps, valves, etc (Table 2).

Table 2. Example events

Acc#	Source	Date	Area	Facility	Operation	Equipment
78571	28	02/04/80	F	I	A6	076
	02				44	066
	49					
MAINT RM - AT APPROX. 10:05 AM, FIRE ALARM BOX NO. 32 SOUNDED. ELECTRIC MOTOR ON ARGON PURIFICATION UNIT UNDER CAB. BURNED INTERNALLY ACTIVATING HALON FIRE SUPPRESSION SYSTEM. 8-4						
44182	27	04/16/80	F	B	44	608
	01					589
	10					412
	07					464
	28					076
	36					030
						216
						153
PIPE WELDING OPERATION INSIDE PLASTIC CONTAINMENT HUT IN JB-LINE CAUSED IGNITION OF PLASTIC TAPE AND CONSUMPTION OF 1.5 SQ. FT. OF HUT PLASTIC. TAPE WAS NOT FIRE RETARDANT IN VIOLATION OF DPSOL. POTENTIAL FOR CONTAMINATION AND BURNS TO WELDER. SI-80-4-46. OI-221-F-JB-80-4. 1046X10-12MICROCI PU/CC.						
102485	28	05/28/80	F	M	86	468
					44	524
						024
						206
						076
SANITARY LANDFILL - BUILDING 740-G - THE FIRE APPARENTLY WAS CAUSED BY FAILURE OF A GASKET AT THE FUEL FILTER WHICH RESULTED IN FUEL SPRAYING ON A HOT EXHAUST MANIFOLD.						

The data banks were originally developed for use in risk-based safety studies at the Savannah River Technology Center, but many other uses for the data have been identified (Table 3).

Table3. Data bank uses.

- Failure rate data
- Equipment breakdown histories
- Generic incident histories
- Dates of specific incidents
- Consequences of incidents
- Repair/response times
- Data for design studies
- Data for quality assurance studies
- Trend analyses
- Data for project justification
- Data for process hazards analyses
- Training
- Process problem solving
- Management decision data
- Administrative controls effectiveness studies
- Incident audits
- Data for reliability studies
- References to source documents

COMPUTER DESIGN HISTORY

The cost of maintaining the data banks has always been a concern to DOE and to the Site managers. Technological advances in the computer industry have contributed to the growth and data retrieval efficiency of the data banks while reducing the cost of maintaining them.

The original data bank was handwritten by technical analysts. In 1974 the data were transferred to punch cards where they were updated periodically by technical personnel. When magnetic storage media were developed, the data banks were stored on an IBM mainframe and manipulated by a collection of FORTRAN and JCL programs. Processing data was cumbersome, and retrieving data for analysis was not interactive and thus had to be done by the data management group upon request. Technical personnel were still needed for much of the data processing, although clerical personnel were handling some of the tasks.

Today all of the data banks, except the classified tritium data bank, are maintained in a state-of-the-art central interactive database system which is supported by a full-time computer scientist. The system resides on a VAX 6620 computer and was developed using a commercial database software package. The processing of information is handled by clerical instead of technical personnel. The data management effort is now handled by a data specialist, who acquires the source documents, tracks the abstracting and input process using a computerized data logging system, and manages the clerical staff.

Expert systems programs have also been developed to analyze and categorize the incidents, choosing from approximately 1000 categories, for data standardization and retrieval efficiency (Table 4). This effort was previously a tedious manual task done by technical analysts, who are now free to concentrate on researching the source documents for events. Such improvements allow the staff to process approximately 200 new entries per day.

Table 4. Example incident categories.

Unit operation identifiers	Equipment and keyword identifiers
• first cycle solvent extraction	• agitator
• second uranium cycle	• air reversal
• fuel storage	• ammonia compounds
• dissolving	• band saw

- ion exchange, canyons
- solvent washing
- cold feed
- solution adjustment
- precipitation
- filtration
- roasting / dehydration
- reduction / calcination
- special recovery
- product storage and accountability
- waste handling
- cask operations
- fuel and target operations
- resin regeneration
- laundry
- GP waste and chem makeup tankage
- transfer tanks
- acid recovery
- crane and hoist operations
- first level
- transport by truck
- sampling
- inspections
- breathing air
- boiler
- chemical addition error
- clothing contamination
- derail
- dropped / fell
- emergency power
- explosion
- fatality
- generator
- hepa filter
- improper storage
- injury
- leaks
- mislabeled
- nitric acid
- release, environmental
- spill
- tank 48
- transfer error
- uncontrolled reaction
- valving error
- warm crane

DATA RETRIEVAL AND MANIPULATION

Retrieval of information can be accomplished by searching the databases using any combination of information that describes common incidents (e.g. all incidents that occurred in the F-Canyon fuel reprocessing facility in June of 1991 involving false alarms but not false nuclear incident monitor alarms). Information can be viewed on-line or by generating hard copy reports. Statistical analyses, such as trending, generating repair times, response times, incident duration, and initiator frequencies can be performed within the system. Such analyses are routinely provided to customers across the Site and the DOE complex (Figures 1 and 2). More extensive analyses, such as calculating failure rates and determining root causes, are also a customer service available using the information stored in the data banks.

Anyone on the site network who has a database account can view the data on-line, produce hard copy reports, and execute statistical programs to perform calculations. A training program is in place to train engineers across the site to use the system. Many customers now retrieve information on their own, which further reduces the cost of providing information from the data banks to customers. At present, the number of users performing their own searches is about half of those performed by the data managing group for customers per month.

Off-site customers can also obtain data bank information. Department of Energy and contractors can contact the data managing group to receive information. All other customers, such as sub-contractors, can request information from the Department of Energy Operations Office at the Savannah River Site.

CONCLUSION

The data banks at the Savannah River Site continue to be recognized by their customers across the DOE complex as invaluable resources to the safety analysis and risk management effort at nuclear facilities. On a scale of 0 to 5, with 4 being excellent and 5 being outstanding, data bank customer service has consistently been rated a 4.5.

The banks will continue to grow, and enhancements are continually made to the system based on overall value to the risk assessment effort, on customer feedback, on cost, and on a continuing goal to increase the utilization of the data banks.

REFERENCES

Durant, W.S., Galloway, W.D., and Lux, C.R., 1988, Data bank for probabilistic risk assessment of nuclear-fuel reprocessing plants, *IEEE Transactions on Reliability* . 37:2.

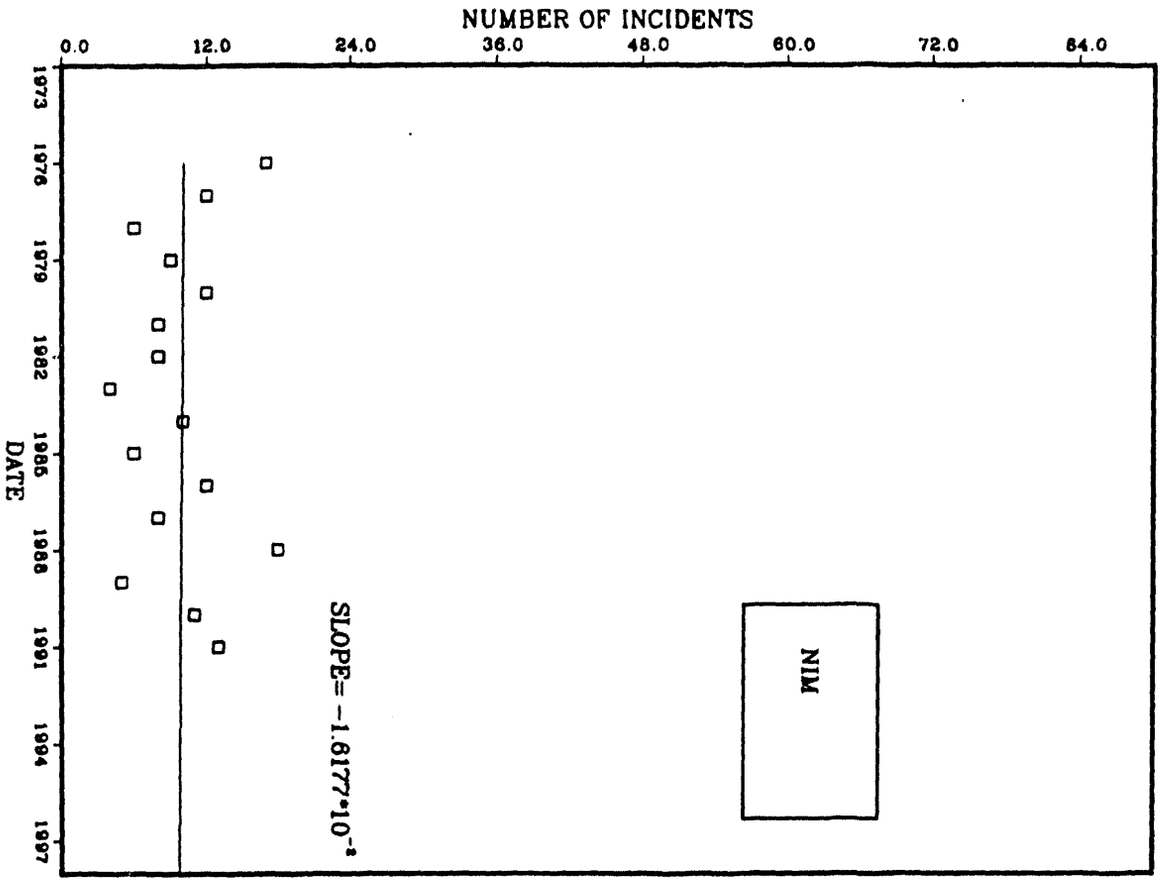

Figure 1. Trend plot.

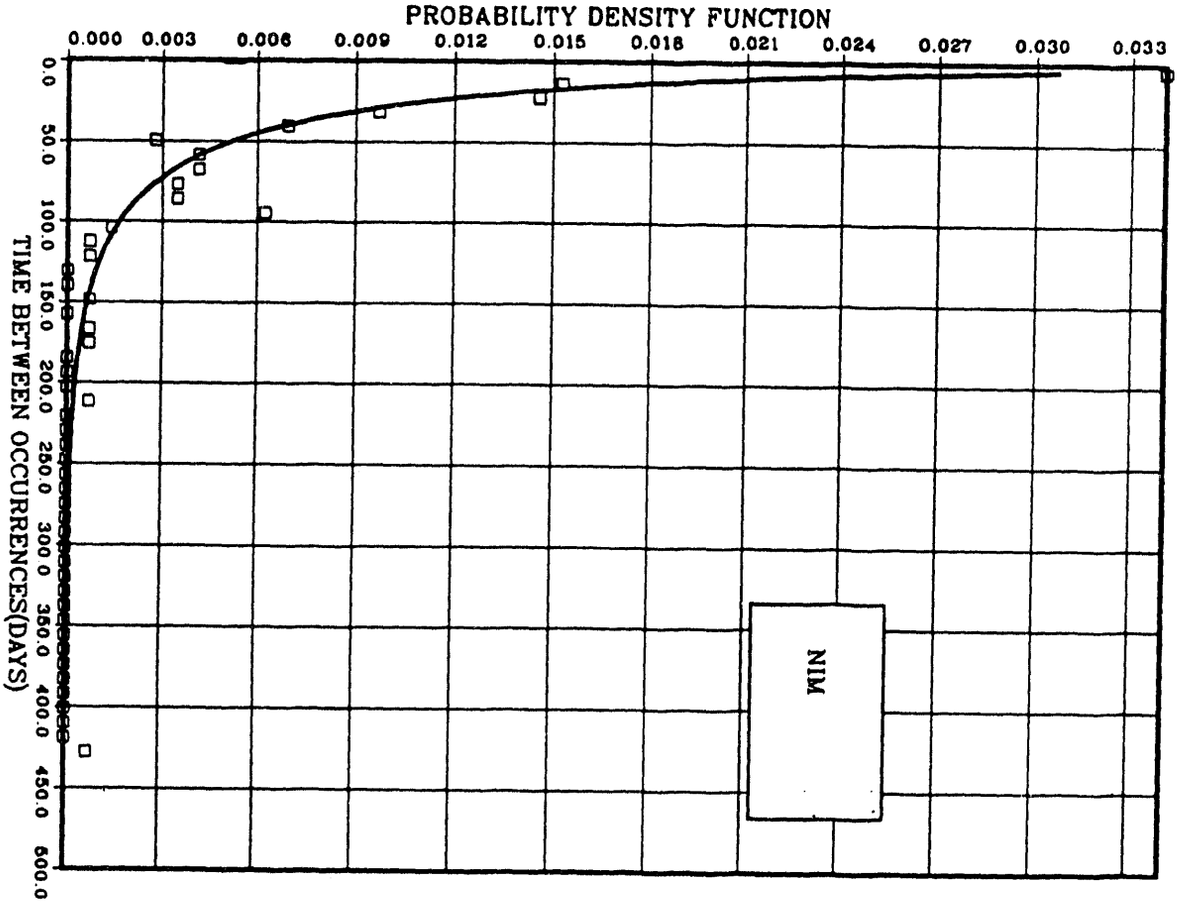

Figure 2. Distribution curve.

DATE
FILMED
2/7/94
END