

**ACCIDENTAL RELEASE AUDIT
INTERNATIONAL PAPER COMPANY
ANDROSCOGGIN MILL
JAY, MAINE
APRIL 20-27, 1988**



PREPARED BY:

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EXECUTIVE SUMMARY

On April 20-27, 1988, the U.S. Environmental Protection Agency (EPA) conducted an in-depth Accidental Release Audit of International Paper Company's Androscoggin Mill (IP). The facility is an integrated bleached kraft mill which manufactures coated and uncoated white and colored papers for magazines and business applications. It also produces carbonizing tissue and forms paper.

The purpose of the audit was to investigate the causes of the releases at this specific facility and the equipment, procedures, training, and management techniques utilized to prevent or mitigate these releases. The evaluations made were based on a comparison with available release potential technology and not on the general practices of the paper industry. The intent of this audit was to provide IP with information to enhance chemical safety practices at the facility and reduce the likelihood of future releases.

The mill utilizes a multitude of chemicals in the manufacturing process. Many of these chemicals are considered hazardous and extremely hazardous, and their use can result in serious safety and environmental consequences unless proper safeguards and prevention measures are routinely implemented. A firm commitment to preventing chemical releases, beginning with high-level corporate management, is a prerequisite to health and safety and environmental protection at IP. This is especially important because the facility is located within one mile of businesses and residences. Schools are located within two miles of the mill. There are approximately 5,000 people within a five-mile radius of the facility, and more than 1,000 people are employed at IP. The mill is located on the banks of the Androscoggin River, a sensitive environmental area. The populace and environment are within the impact area of chemical releases.

The audit results demonstrate the lack of adequate performance by IP management and staff on chemical emergency preparedness and accident prevention. This report describes numerous accidental releases at IP which have occurred over the past two years. Some of these releases posed a direct threat to the surrounding community and environment. The number of releases and their frequency of occurrence shows the lack of proper prevention systems. Field observations document that sufficient corrective measures have not been implemented to minimize the probability of future chemical releases. Recommendations to improve safety are contained in Section 13.0 of this report.

Our observations provide a snapshot of the conditions that existed at the mill during the audit period, and are not a substitute for a comprehensive safety evaluation program. International Paper has informed EPA that safety enhancements have been made since the audit and that many of the Audit Team's recommendations have been followed.

The audit was conducted under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA); Clean Air Act (CAA); Resource Conservation and Recovery Act (RCRA); and EPA's Accidental Release Information Program. It was fully coordinated with the numerous State and Federal agencies having jurisdiction over the facility. Comprehensive information sharing occurred among the various agencies so as not to duplicate efforts and to maximize utilization of the limited amount of resources devoted to the audit. The Federal Emergency Management Agency (FEMA) conducted the alert and notification portion of the audit; their report is available from the FEMA Region I office. FEMA is located at the J.W. McCormik Post Office Building and Courthouse in Boston, Massachusetts.

International Paper cooperated in the Accidental Release Audit and provided EPA with all necessary information upon request. The facility has made significant improvements in preparedness and prevention systems over the past several months. Many improvements were being made during, and as a result of, the State and Federal audits and investigations that have occurred at IP over the past several months. Although improved safety may have resulted from the audit process, additional measures are necessary because of the history of releases at the facility and the potential for severe environmental and safety consequences, both at the mill and in the community.

The audit team identified twenty-one major chemical emergency preparedness deficiencies. These deficiencies are discussed in the body of the report and are summarized below:

1. ACCIDENT INVESTIGATIONS AND FOLLOW UP

Accident investigation procedures are inadequate. International Paper does not adequately investigate potential and actual chemical releases using checklists, codes, standards, or formal techniques. Their existing accident investigation techniques fail to adequately assess system reliability, state-of-the-art technology, and the magnitude and probability of the accident reoccurring. Appropriate investigation and follow up was not initiated for major releases that involved significant worker safety issues and major community impact. The documentation of several accidents which occurred at the mill over the past two years was incomplete.

Accident investigation techniques at IP must be improved to reassure the public that appropriate changes to defective equipment, training, and policy are implemented and that long-term safety considerations are paramount in the accident investigation process.

2. CHLORINE DIOXIDE STORAGE AND TRANSFER DESIGN CHANGES

On February 5, 1988, IP released approximately 100,000 gallons of chlorine dioxide from a storage tank over a two-hour period. The release occurred when maintenance workers cut an overhead steel support without having first properly secured their work area. This caused the pipe to fall and shear an FRP dump nozzle on a 158,616-gallon chlorine dioxide storage tank. The gas plume reportedly migrated beyond property lines within minutes after the release. Chlorine dioxide is a highly unstable, toxic health hazard which can spontaneously, and under certain conditions, react explosively with air. See Section 9.3.3 for further details.

The long-term prevention technique used by IP was to permanently block off the broken valve. International Paper failed to provide adequate assurance that the chlorine dioxide storage and transfer system is likely to continue operating in a failsafe mode. The mill did not determine how the valve removal impacted overall system safety. This important design change was completed without the necessary hazard assessment. The changed design does not allow for efficient product transfer in the event of a process upset or emergency.

It is necessary that IP reevaluate the chosen prevention strategy and determine the need to implement further failsafe design to the chlorine dioxide storage and transfer operation. The study and design changes should, at a minimum, consider the following:

- o smaller tanks with more total capacity for emergency pulldown and balance;
- o backup pumping capacity;
- o close fit, protected valves, discharge blanked;
- o dump procedures and secondary containment; and
- o floating roof and vapor control.

3. AMMONIA STORAGE AND TRANSFER DESIGN CHANGES

On November 6, 1987, IP released 3,700 pounds of anhydrous ammonia in approximately ten minutes. Ammonia gas is flammable, toxic, and can be explosive. It is considered an extremely hazardous substance. The release was caused when personnel failed to follow a proper lock-out tag-out procedure prior to recommissioning the ammonia transfer system (see Section 9.2.2). International Paper did not provide the Audit Team adequate documentation to assure that reoccurrence of the event is not likely. The arrangement of pipes and valves could not be adequately explained by IP. Supervision of the unloading operation, lock-out tag-out procedures, pipe and valve identification, and safety equipment remained deficient at the

time of the audit.

International Paper must assess measures and implement design changes to prevent a similar incident from occurring. The assessment should, at a minimum, include the following:

- o improved lock-out tag-out procedures;
- o improved unload supervision;
- o proper written unload procedures;
- o process and load line separation;
- o backflow check valve installation;
- o labelling and color coding;
- o overfill protection; and
- o provisions for fire extinguishing.

4. V-BRITE HANDLING

On April 18, 1987, IP released approximately 100 pounds of sulfur dioxide (SO₂) over a six-hour period. This release occurred as a result of a fire in a sodium hydrosulfite (V-Brite) tote bin (see Section 9.1.3). V-Brite is used by the mill as a bleaching agent. The product is relatively stable provided it does not contact moisture. A small amount of water in the tote bin, along with the presence of oxygen, can cause flammable and explosive decomposition and the release of SO₂ gas. Sulfur dioxide gas is immediately dangerous to life and health at concentrations of 100 parts per million (ppm). Vapors may cause burns, dizziness, and suffocation.

International Paper implemented major design changes to prevent future V-Brite accidents. These included the weatherizing and enclosing of the V-Brite storage and dispensing areas. However, the mill failed to complete an acceptable safety review and final certification for the new design.

International Paper must initiate a post-modification safety review which should, at a minimum, address the need for the following:

- o activation of a reaction detector thermocouple in the bin discharge system;
- o temperature and humidity monitoring;
- o relocation of the emergency exhaust vent (vent should not exhaust into a traffic area);

- o improvement of training programs and warnings for V-Brite powder and SO₂ gas; and
- o implementation of additional measures to keep the V-Brite dry during transport from storage and dispensing areas.

5. CHLORINE AND CHLORINE DIOXIDE SCRUBBING SYSTEMS

Hazardous chlorine and chlorine dioxide gases from process and upset conditions throughout the mill are scrubbed by a primary and secondary packed, countercurrent spray tower. The units are located in series, with primary and secondary units for both the A and B plants. The scrubbing medium is caustic from the washer 35 Filtrate tank.

International Paper did not provide sufficient evidence to demonstrate the effectiveness and efficiency of the scrubbers in removing hazardous chlorine and chlorine dioxide emissions. Operational deficiencies observed during the audit are listed below:

- o Water is substituted for washer 35 Filtrate on occasion (e.g., during startup and shutdown), resulting in inadequate gas scrubbing on routine and upset emissions.
- o Plugging, gas channeling, and maintenance problems are likely due to fiber buildup from the washer 35 Filtrate.
- o No stack emissions tests or efficiency test information was available to certify acceptable gas emissions under normal and accidental loads.
- o No limiting operating parameters have been established as set points for proper removal efficiency.
- o No parameter monitoring gauges have been installed to assure and record proper operation. The system should be equipped with the proper instrumentation, for example, flow, pressure, pH, oxidation reduction potential (ORP), temperature, etc. A recorder should be available to monitor off-specification parameters and bypass conditions.
- o The A plant primary scrubber was not in operation during the audit.
- o Excessive moisture, condensate, and system leaks were observed (e.g., from duct work).
- o Numerous bypass lines were observed entering the system.
- o The drain sections of the B plant primary and secondary scrubbers were improperly vented to the atmosphere.
- o The efficiency of the scrubbing medium needs improvement.

International Paper should carry out comprehensive scrubber design evaluations and stack testing to determine the extent of modifications or design changes necessary to assure that chlorine and chlorine dioxide gas releases from the scrubber stacks are within acceptable levels.

6. ENVIRONMENTAL COMPLIANCE

The Audit Team conducted a review of government files to determine IP's environmental compliance status. Results of this review indicate that the mill is operating with air and water licenses and permits that require revision and renewal. There have been numerous wastewater violations and treatment plant bypasses. Past environmental problems were identified, including contaminated groundwater wells MW78 and 8B and hazardous waste storage and disposal problems. The Team collected complaints from previous employees, alleging past illegal hazardous waste disposal in landfills owned by IP.

These compliance issues should be pursued by multi-media government enforcement teams. Enforcement of delegated programs is the primary responsibility of the State of Maine. The EPA provides enforcement assistance to the State upon request.

7. HAZARDS ANALYSIS

Although initial steps have been taken to identify plant hazards, the size, complexity, and off-site ramifications require more sophisticated hazards analysis capabilities at IP. These capabilities did not exist at the time of the audit. Improved methods of analysis must be available for certain hazardous material lines at the research and development stage and conceptual and detailed design, as well as operational, phases. Methods include checklists, independent safety audits, "what if" analysis, failure modes, effects and criticality analysis, and hazard and operability studies. For example, a comprehensive hazards/risk analysis should be conducted prior to any implementation of changes to the chlorine dioxide storage and transfer lines.

8. DISPERSION MODELING

Dispersion modeling has not been conducted satisfactorily to determine potential community impact from releases. This type of analysis is necessary given EPA's preliminary dispersion calculations conducted in conjunction with the audit and the nature of operations at IP. Properly selected and calibrated modeling must be completed using accepted methods and techniques. Release geometry, heavier-than-air gases, terrain and phase change effects, and downwash should be considered.

9. FIRE BRIGADE AND HAZARDOUS MATERIALS RESPONSE

The Fire Brigade does not have the necessary expertise, training, and equipment to effectively deal with hazardous chemical releases. Although significant improvements have been accomplished in these areas, IP must continue efforts to build capabilities in accordance with an acceptable timetable. Mutual Aid capabilities need improvement as well. Inspections and drills must be conducted in conjunction with Mutual Aid responders on a regularly-scheduled basis. Hazardous materials controls, such as foam, are not available at the Brigade, and more emphasis should be placed on personal protective equipment and monitoring instrumentation for Brigade and Hazmat Team members.

10. CONTINGENCY PLANS

Contingency plans are not sufficient to prepare the mill and the community for a hazardous materials emergency. Although significant advances have been accomplished by IP over the past several months, the existing contingency plans must be completed, coordinated, certified by company and community officials, tested, and maintained.

11. ALERT AND NOTIFICATION

Alert and notification procedures within the mill are deficient. Procedures and equipment must be upgraded to ensure that notification is provided to affected parties for all stages of alerts. Deficiencies observed included failure of personnel to hear signals and malfunctioning beacons. Additionally, critical area alarms are manually actuated and subject to human error. There are no set criteria for determining when the alarms should be sounded.

Alert and notification for the community is inadequate. For example, the community was not notified of an ammonia release which occurred on 4/9/88. The community fire department is not automatically placed on standby or even notified, depending upon the release situation. Community relations, Mutual Aid notification, and response need major improvements. Additional observations and conclusions can be found in the FEMA report.

12. HAZARDOUS MATERIALS UNLOADING OPERATIONS

Hazardous materials unloading operations need improvement. Surveillance, supervision, and security need upgrading. Leak detection procedures should be routinely used for hydrogen gas hookup in the power plant. Bulk chlorine derailleurs and valves should be locked when not in use. The use of unload supervision, escorts, written procedures, and checklists should be implemented for dangerous unloading operations.

13. TRAINING

International Paper has been training their employees in on-the-job safety for many years, but a formal, written training program is still in the early stages of development. Some training courses have not been completely developed, and employee training records appear to be sporadic. A more complete written training program and recordkeeping procedure should be provided to ensure that all employees receive the required training.

Some of the training materials requested by the Audit Team were not reviewed because they were not immediately available at the time of the audit. These include employee training records, course content lists, and refresher training information. The information that was provided included: a general training manual; a safety practices guide; the International Paper Safety Policy Manual, the Pulp Mill Safety Manual; and other general training documents.

14. DECONTAMINATION

No formal program for decontamination procedures or training was in place at the time of the audit. It is recommended that IP institute a comprehensive, mill-wide program, to include the following: planning, training, implementation, and establishment of designated decontamination zones.

15. ACCOUNTABILITY FOR CONTRACTORS

Training and safety must be improved for contractors and outside visitors during both routine and emergency situations. International Paper should assume more responsibility to protect these groups and must enforce standards similar to those required of IP personnel.

16. REACTIONS TO SIMULATED EMERGENCIES

The emergency drill conducted at the request of the Audit Team identified deficiencies in the following areas: command and coordination; communication; notification; and response. Simulations involving community planners and responders are not conducted. Regular drills are necessary to improve safety implementation and coordination consistent with the provisions of SARA Title III.

17. MONITORS AND ALARMS

The one chlorine monitor currently in operation in the pulp area does not provide adequate monitoring coverage. International Paper is presently installing sixteen sensors throughout the area. However, they will all operate with the same central

alarm. This system will require testing and evaluation once installation is complete. Area sensors should be activated automatically rather than from the control room. International Paper needs to develop a system for inspecting, maintaining, and calibrating the detectors. A backup alarm or other provisions should be considered to reduce the possibility of central alarm failure. The expanded network installation schedule should be "fast tracked" to provide increased release detection and safety.

18. EMERGENCY BACKUP POWER

Adequate provisions have not been made for emergency, uninterruptible power on hazardous materials alarms, sensors, and other emergency services. International Paper has significant flexibility in obtaining power through three manually-switched two-way busses. Wood, oil, and hydroelectric capabilities, as well as the mill's ability to purchase from the power grid, are available. However, area power outages have caused water treatment plant bypasses and chemical releases to the environment. International Paper should initiate a study to identify improvements in power shedding and utility reliability. Emergency standby power should be available for the alarm and notification system. As a part of their emergency backup power study, IP should review solid state controlled automatic switching of their present manually-switched two way busses.

19. FAIL-SAFE INTERLOCKS AND VALVING

A cursory review of critical interlocks and valves identified possible deficiencies in both A and B bleach plants. Drawings and follow up discussions indicated that upon power failure, several valves may fail to an unsafe position. Many of the diagrams presented to the Audit Team were outdated or inadequate for conducting an accurate interlock and valve safety review. Because of the issues raised, we recommend that IP conduct a comprehensive interlock and valve safety study. Modifications should be initiated, where necessary.

20. OPERATION AND MAINTENANCE PROCEDURES

The Preventative Maintenance program for equipment used in hazardous materials lines should be upgraded to include routine replacement of critical parts based on the history of failure rather than waiting for the equipment to fail while in service. This program will require time to implement because IP has only recently begun to keep accurate records on corrosion allowance, release valve checks, and other critical maintenance items.

21. METEOROLOGICAL MONITORING

Realtime meteorological monitoring data from the 100-meter tower is not currently available at the mill's emergency response command post. This information would be critical in the event of a serious emergency release. International Paper should prioritize this project and bring the system on line as soon as possible.

CONCLUSION

The primary purpose of the Accidental Release Audit was to identify imminent or potential hazards to the community and the environment and to recommend corrective measures. As a result of recent multi-media agency inspections, IP has improved risk management procedures and has demonstrated an effort to improve release prevention and safety. However, several potentially serious safety problems were identified within the plant and its environs. International Paper should evaluate the outlined recommendations in this report as a means to substantially reduce the risk of occupational and community-related injuries which may occur as the result of a chemical accident or release.