Eastman Kodak Company

FINAL PROJECT AGREEMENT SIGNED SEPTEMBER 14, 2000

Background

The Project Sponsor: The Eastman Kodak Company (Kodak) is a leader in new technology development in the imaging industry. As a result, Kodak submits many new chemical substances to EPA for review each year. Kodak employs 46,300 people in the United States and has manufacturing facilities in Rochester, New York; Windsor, Colorado; Peabody, Massachusetts; and White City, Oregon. Kodak's Health and Environment Laboratory in Rochester, which evaluates materials and equipment involved in manufacturing processes or under consideration for use in new products, is implementing this XL project.

The Experiment: The EPA Office of Prevention, Pesticides and Toxic Substances has developed a set of computerized risk screening tools called the Pollution Prevention (P2) Framework. These tools allow companies to (1) calculate or estimate important risk-related properties based on an analysis of chemical structure and (2) design safer chemicals, reduce waste generation, and identify other pollution prevention opportunities. In this project, Kodak is employing the P2 Framework to prescreen new chemicals early in its product development cycle in order to develop more environmentally benign and cost efficient products. Because new product research and development can be a very expensive process, it is cost effective for Kodak to bring only the best chemical candidates through later phases of the product development process. By using the P2 Framework, Kodak expects to identify problems with the chemical early on in the development process, thereby avoiding carrying problem chemicals through product development cycles and creating irrecoverable costs. In addition to instituting full use of the P2 Framework at its facilities, Kodak is conducting three separate and independent outreach initiatives designed to make other industrial stakeholders aware of the source reduction, pollution prevention and economic benefits that result from use of the P2 Framework. Kodak intends to advocate use of the P2 Framework among its industry colleagues in the following ways:

(1) *Address the scientific community* by demonstrating how use of the P2 Framework can generate information previously unavailable to scientists in the chemical industry.

(2) *Address the business community* by collaborating with EPA on a rigorous environmental cost accounting study to quantify the business and economic benefits gained from using the P2 Framework.

(3) *Address industry senior managers* by communicating the benefits of applying the P2 Framework to chemical development at the highest levels of management within selected large companies.

The Flexibility: The Toxic Substance Control Act (TSCA) governs the manufacture, importation, processing, distribution, use, and disposal of industrial chemical substances, including new chemicals. Section 5 of TSCA requires prospective manufacturers (or importers) to wait 90 days after submitting a premanufacture notice (PMN) before they can begin to manufacture (or import) a new chemical substance. Within the 90-day period, EPA must evaluate the PMN submission and identify potential risks of the new chemical substance. During that 90-day PMN review period, EPA determines whether the substance may present an unreasonable risk to human health or the environment. Often, EPA concludes its review of the PMN after 28 days for chemicals identified as "low-risk drops" (i.e., the chemical substance is determined to present no unreasonable risk). Unless the requirements for an exemption are met, a PMN submitter may not manufacture a new chemical substance until 90 days after it has submitted a PMN to EPA.

Under this project, Kodak and EPA have agreed that PMN substances submitted by Kodak that EPA views as low-risk materials could be manufactured prior to day 90 of the review period pursuant to a test marketing exemption (TME). Additionally, for chemical substances for which Kodak uses the P2 Framework, Kodak may submit combination

TME applications and PMNs for concurrent review by EPA. This allows Kodak to begin manufacturing for test marketing purposes 45 days after the TME is submitted and a full-scale nonexempt commercial manufacture 90 days after the PMN is submitted. Although EPA generally discourages simultaneous submittals, for the purposes of Project XL, EPA will allow such concurrent submissions to be sustained when the TME is granted and the corresponding PMN is dropped from further review during the first 28 days of the review period.

Other Innovations: *(1) Pollution Prevention.* EPA expects that Kodak's use of the P2 Framework to prescreen its product development options will result in increased opportunities for pollution prevention by preventing the generation of pollution rather than controlling pollution once it has been created. *(2) Reducing the Regulatory Burden.* Early use of the P2 Framework allows Kodak and other companies to anticipate and address EPA's concerns prior to PMN submission, greatly decreases the probability of adverse regulatory action later and improves the efficiency of EPA's PMN review process. *(3) Stakeholder Involvement.* Directly involving business and technical stakeholders in the project is key to the goal of encouraging use of the P2 Framework during development of new chemicals submitted as PMNs to EPA. The sharing of this new technological tool by EPA and Kodak's communication of its benefits to other stakeholders represents an unprecedented cooperative approach to pollution prevention.

The Superior Environmental Performance: The experiment strives to show that increased use of the P2 Framework during the early stages of new chemical research and development, and dissemination of information about the P2 Framework within the industry, will improve environmental decision making, ultimately leading to the production of more environmentally friendly chemicals. The Kodak project anticipates superior environmental performance in the following areas:

- Application of the P2 Framework to screen new chemicals to be submitted for PMN review;
- Communicating with, reaching out to, and working with scientific and technical staff from a variety of chemical companies and stakeholders, to support and promote their implementation of the P2 Framework;
- Reaching out to the business audience to promote the use of the P2 Framework as a best business practice; and
- Reaching out to the senior managers of industry counterparts to assist them in understanding what management structures can facilitate the implementation of pollution prevention concepts in their companies.

Progress in Meeting Commitments
(As of August 2001)

- Overall, Kodak has been able to meet all of its environmental commitments to date for the project.
- Kodak committed to applying the P2 Framework in its new product development program and to submit PMNs to EPA based on P2 Framework analysis data.
  - Of the materials that could have been commercialized, 24 percent were dropped early in the product development process. Drop considerations were based on a variety of factors, including potential health and/or environmental issues. By applying the P2 Framework early on in the chemical selection process, Kodak was also able to minimize waste generation, which typically results from lengthy chemical-development programs.
  - Of the materials that were carried through to commercialization as PMN submissions to EPA, all (100 percent) were cleared by the Agency through standard review processes.
  - With each PMN submission, Kodak included hard copies of the computerized P2 Framework analysis for review by EPA staff.

- Kodak committed to conduct outreach to scientific, technical, and senior management components of the chemical industry.

  – *Scientific and technical outreach at chemical industry conferences and workshops:* Kodak gave presentations on the beneficial uses of the P2 Framework at the following chemical industry conferences: (1) Living with TSCA 1999 and 2000: a major annual forum for industry-EPA dialogue regarding key issues associated with industrial chemicals under TSCA; (2) Globe 98: a biannual international conference focused on pollution prevention and risk reduction issues, (3) QSAR 98: a conference series forum for information sharing relating to advances in the use and application of structure activity relationships, such as those employed in the P2 Framework, (4) National P2 Workshops: sponsored by EPA at state and regional locations; (5) Waste Watch Conference 1997 in Woods Hole, Massachusetts; and (6) New York State Department of Environmental Conservation P2 Conference: the 12th Annual Pollution Prevention Conference sponsored by the New York State Department of Environmental Conservation.

  – *Outreach to business audiences:* Kodak and EPA commissioned a study by the Tellus Institute in Boston, Massachusetts, to learn if data generated by the P2 Framework could reduce developmental costs of new chemicals and processes and lead to development of environmentally benign products. The study concluded that the P2 Framework could substantially affect the way companies develop new chemicals and approaches to reformulating existing products. The study found that application of the P2 Framework early in product Research and Development significantly reduced product development cost, reduced the generation of waste, significantly decreased the probability of regulation and decreased time to market. The study by T.J. Votta and A.L. White is entitled *Design for Competitive Advantage: The Business Benefits of the EPA Pollution Prevention Assessment Framework in New Product Development*, Tellus Institute, Boston, Massachusetts (August 2000).

  – *Outreach to senior managers of industry counterparts:* Kodak conducted a management study of pollution prevention programs in selected large companies with the assistance of the Bloustein School of Planning and Public Policy at Rutgers University. The study, entitled *Pollution Prevention and Risk Reduction: Case Studies of Best Practice Companies*, by Professor Michelle Ochsner, highlights state-of-the-art pollution prevention initiatives within leading firms, including the business and risk reduction benefits of the P2 Framework. Kodak and EPA are working with Professor Ochsner to prepare the study for publication.

- The results of the August 2000 report prepared by the Tellus Institute indicate that despite up-front costs associated with the P2 Framework, these costs are fairly minimal when compared to the quantitative and qualitative benefits that are accrued when the P2 Framework is employed. These benefits are described in Table 9.

Benefits for the Environment

- Kodak's significant outreach to senior management of other companies encourages more businesses to apply the P2 Framework to produce more environmentally sound products and achieve cost savings.

- Kodak's use of the P2 Framework to successfully screen chemicals has allowed them to minimize waste generation, increase the number of environmentally benign chemicals that make it through the chemical development cycle, and reduce the number of environmentally harmful chemicals developed.

Table 9: Summary of Benefits of the P2 Framework

Lower Product Development Costs for New Chemicals and Intermediates	
Quantitative Benefits	• Reduced (avoided) costs spent on technical development and research and development of new chemicals. • Decreased resources spent on laboratory tests for human health and environmental testing.
Qualitative Benefits	• A greater number of product combinations and product alternatives can be evaluated early in concept development. This allows for greater technology innovations and is due to the quick and cost-effective nature of the P2 Framework. • Better and earlier information on environmental and health (E&H) impacts allows the product development team to focus resources on technical performance. Knowing the E&H profile early allows the team to anticipate any additional E&H lab testing that may be required for PMN submittal to EPA. Such information may also alert the team to a chemical candidate that it wants to abandon based on E&H concerns before significant resources have been spent on investigating its technical performance. • Better information allows companies to compare competing product alternatives and helps them identify environmentally sound technologies. • Greater awareness of "green design."
Reduced Time to Market for New Products/Chemicals	
Quantitative Benefits	• Faster time to market for new product information by minimizing the chances that a lead candidate will fall out of the product development process for health, environment, or safety concerns. • Avoid 5(e) regulatory action for PMN review, which may require additional information or testing, causing delays in getting EPA approval. • Minimize cycle time for PMN review by submitting an informed and complete application to EPA.
Qualitative Benefits	• Reduced probability that a candidate is dropped at an advanced development stage, delaying the product team as they evaluate another candidate.
Lower Production Costs for Full-Scale Manufacturing of New Chemicals	
Quantitative Benefits	• Decreased costs associated with using hazardous chemicals (e.g., environmental reporting, testing, employee training and personal protective equipment, waste treatment, disposal, handling spills). • Reduced probability the submitted chemical will be subject to 5(e) actions by EPA, which may require either monitoring and tracking or more controls and treatment during manufacturing. • Decreased potential for downstream interventions such as product recalls or major changes to the manufacturing operation (related to unanticipated long-term toxicological effects of a product or technology).
Qualitative Benefits	• Improved performance of the health and environment team is supporting the overall product development process. • Enhanced ability to identify and drive pollution prevention outcomes.

Table is taken from the *Design for Competitive Advantage: The Business Benefits of the EPA Pollution Prevention Assessment Framework in New Product Development*, Tellus Institute (August 2000).

Benefits for Stakeholders

- Kodak has been able to reach senior corporate managers and others in the scientific and technical communities through its work with the P2 Framework. In doing so, Kodak has created a new network of companies, academics, and scientists who are interested in using, testing, and promoting uses of the P2 Framework.

Benefits for the Project Sponsor

- According to the cost accounting study completed in August 2000, the P2 Framework allowed the product development team to consider a larger number of chemical candidates for product development. By having a larger number of candidates to choose from, Kodak had a greater chance of choosing the best possible technical and environmentally preferable chemical candidate. This proved to be economically efficient as Kodak was able to avoid between $13,500 and $100,000 of additional costs for each $100,000 that it spent in testing for a new chemical candidate.

Information Resources: The information in this summary comes from the following sources: (1) the FPA for the Eastman Kodak XL project, September 14, 2000; (2) the *2000 Project XL Comprehensive Report, Volume 2: Directory of Project Experiments and Results*, November 2000; and (3) *Design for Competitive Advantage: The Business Benefits of the EPA Pollution Prevention Assessment Framework in New Product Development*, T.J. Votta and A.L. White, Tellus Institute, Boston, Massachusetts, August 2000.

ExxonMobil Corporation

FINAL PROJECT AGREEMENT SIGNED MAY 25, 1999

Background

The Project Sponsor: The ExxonMobil Corporation (ExxonMobil) is responsible for all domestic oil and gas operations in 12 states, the Gulf of Mexico, and the Pacific Ocean off southern California and Alaska. The Sharon Steel Fairmont Coke Works Superfund Site, located in Fairmont, West Virginia, was placed on the EPA's National Priorities List (NPL) on December 23, 1996. A corporate predecessor of ExxonMobil, Standard Oil of New Jersey, owned the site from 1920 to 1948. ExxonMobil is the only potentially responsible party (PRP) working with EPA and the West Virginia Division of Environmental Protection (WVDEP) under an Administrative Order on Consent to address environmental concerns at this site. ExxonMobil is the first XL project related to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund.

The Experiment: ExxonMobil has committed to achieve superior environmental performance by providing site improvements and enhanced community involvement not typically required by Superfund, while cleaning up the site in less time and at lower cost. ExxonMobil is focusing on the economic redevelopment of the Superfund site to demonstrate that consideration of future beneficial uses early in the Superfund site management process can help improve the local economy. To facilitate and increase the likelihood that interested developers will use the site after cleanup for commercial or industrial development, ExxonMobil proposes to (1) demolish buildings on-site without a finding of environmental risk, (2) engage the services of redevelopment consultants and companies to determine how best to make the site most amenable to development, (3) work with local stakeholders to identify redevelopment options, and (4) provide the redevelopment during the cleanup and restoration of the site.

ExxonMobil has used stakeholder involvement techniques such as public meetings to explain project plans and obtain input on future site uses. In June 1998, ExxonMobil established the Fairmont Community Liaison Panel (FCLP), which meets regularly with ExxonMobil, EPA, and WVDEP to provide input into cleanup and redevelopment actions. In addition, ExxonMobil is employing faster, more efficient cleanup and redevelopment processes, such as streamlining the risk assessment process and reducing the administrative burden.

The Flexibility: Superfund sites are typically approached in a phased process. After a site has been listed on the NPL, a Remedial Investigation/Feasibility Study (RI/FS) is conducted at the site to assess risk and evaluate alternative technologies for remediation. The RI/FS culminates in a Record of Decision (ROD), which outlines the actions to be taken and documents the rationale behind the decision to take action at the site. Subsequently, the remedial design phase determines the specifications for cleanup actions that are implemented during the remedial action phase. These phases involve the submittal and approval of various documents and public comment periods. It is not uncommon for this process to require several years. Another cleanup approach in the Superfund program is the removal action, which can be completed in significantly less time. An RI/FS and ROD are not required for a removal action. ExxonMobil has proposed to conduct the cleanup of this Superfund site as a series of removal actions. With this approach, this project strives to demonstrate a streamlined Superfund process that results in the reduction of potential risk to human health and the environment in a shorter time frame.

EPA and the State of West Virginia will provide ExxonMobil with flexibility regarding the use of streamlined removal processes in order to expedite cleanup actions at the site, the mitigation processes for wetlands created by EPA during previous removal actions, the data validation reporting requirements, and the risk assessment criteria and analyses. Long-term remediation will occur if deemed necessary. This flexible approach is expected to almost halve the time and cost needed to complete the cleanup.

Other Innovations: *(1) Extensive Community Involvement.* The FCLP of local citizens meet with ExxonMobil, WVDEP, and EPA almost every month to provide input into decisions made regarding the cleanup and redevelopment of the Superfund site. *(2) Coordinating Redevelopment Activities with Cleanup Actions.* As cleanup activities continue, ExxonMobil has been working with local and state redevelopment agencies to identify redevelopment options and developers, soliciting the opinions of the community, and has improved the site's aesthetics and marketability by demolishing on-site structures. *(3) Expedited Cleanup.* ExxonMobil is streamlining the cleanup process by implementing a series of removal actions and obtaining stakeholder input upfront. *(4) Paperwork Reduction*. Draft copies of reports required under the engineering evaluation/cost assessment (EE/CA), conducted under the removal process, will be electronically transmitted. Final reports will be distributed on compact disk, and analytical data made available to EPA and WVDEP, through the testing laboratory's data management system. *(5) PRP to Fund State Participation in the XL Process.* Direct funding will reduce the state's financial and administrative burden and increase its ability to participate in Project XL. *(6) Recycling Non-hazardous Waste.* ExxonMobil has access to an innovative technology that is able to render coal waste non-hazardous. This innovative process would enable much of the on-site waste to be beneficially reused as fuel in a power plant.

The Superior Environmental Performance: The goal of the stakeholders for the project is to clean up the site in approximately half the time a normal cleanup would take, which will reduce the exposure time period and expedite risk reduction to human health and the environment. In addition, ExxonMobil is focusing on the future use of the site and will incorporate the redevelopment strategy into site cleanup. Economic redevelopment is critical to the surrounding community, and the site has great potential as it is located on flat land, in proximity to a major interstate highway and the Monongahela River. ExxonMobil is interested in meeting the community need of selling the property to a commercial business that could create jobs in the area. ExxonMobil will continue to work actively to ensure and maintain involvement of key stakeholders and the general public during the site cleanup.

Progress in Meeting Commitments
(As of September 2001)

ExxonMobil has demolished most of the buildings and structures on-site (see Figures 16, 17, and 18).

- Completed in spring of 2000, ExxonMobil conducted an EE/CA of proposed removal actions at the waste management areas located on the western portion of the site known as the Waste Management Area (WMA).

- In June 2000, EPA outlined the non-time-critical removal workplan in an Action Memorandum. The Action Memorandum calls for the consolidation of the landfill materials in the WMA.

  – The waste will be segregated into coal waste to be recycled as fuel and other non-hazardous debris. Since this workplan was approved ExxonMobil has agreed to recycle a much greater percentage of the waste as fuel and subsequently reduce the volume of waste that will be landfilled on-site. ExxonMobil has identified a company that uses an innovative technology to render the coal waste non-hazardous so that it can be burned as fuel in a power plant.

  – During 2000, ExxonMobil removed the oxidation impoundment located to the rear of the site. The impoundment contained approximately 600,000 gallons of acidic water. The water in the oxidation impoundment was slowly trickling into a tributary located in the western part of the site. After the water was neutralized and drained, the oxidation impoundment was closed, graded, and seeded for erosion control. ExxonMobil built a channel constructed of limestone rock to treat the water as it drained out of the landfills. This will provide temporary treatment until the acidic coal material in the landfill is removed and recycled during the removal action.

Figure 16
In January 1999, a backhoe demolishes some of the structures at Fairmont Coke Works in order to prepare the site for redevelopment.

Figure 17
In April 1999, the demolition at the Fairmont Coke Works is near completion, with many of the structures completely leveled.

Figure 18
By winter of 2000 all demolition work is complete at the Fairmont Coke Works. This image shows the snow-covered site, leveled for future redevelopment.

  - During 2001, ExxonMobil completed cleanup of a breeze storage area and sludge impoundment, then closed and regraded the area.

- ExxonMobil has begun an EE/CA has begun to investigate risk in the process area in the eastern portion of the site.

- Wetlands in the area have been surveyed and evaluated. EPA has determined that the wetlands are part of existing drainage systems; therefore, mitigation will not be required. However, during remediation, these areas may need to be graded to improve drainage.

- In order to facilitate redevelopment, a market valuation of the property has been completed. In addition, ExxonMobil has selected a brownfields expert as a real estate broker to facilitate the process of finding an investor interested in redeveloping the site.

- The focus over the next six months will be to complete the non-time-critical removal action in the landfills in the western portion of the site and to complete the second EE/CA to assess the risks in the eastern process area. In addition, the stakeholders will continue to hold meetings approximately every month.

Benefits for the Environment

- Due to the streamlined XL experiment, the risks to human health and the environment at this Superfund site will be addressed in half the time.

- In addition, deed restrictions have been placed on the property to ensure that future activities do not result in exposure to unacceptable levels of risk.

- An innovative process of waste segregation will render much of the coal waste on-site non-hazardous, allowing for a greater percentage of the material to be used as a fuel substitute in a nearby power plant. In addition, this process will segregate the construction and demolition waste for landfilling on-site. Using this process, ExxonMobil expects to recycle 80 percent of the material in the WMA, using it as fuel in a nearby power plant. This waste will not have to be shipped to a hazardous waste landfill, thus conserving off-site landfill space and reducing the volume of material requiring landfilling on-site.

Benefits for Stakeholders

- Stakeholders have the opportunity to influence the implementation of the project by participation in a 25-person FCLP advisory panel that meets monthly to discuss the project. The regular meetings of the FCLP with ExxonMobil, EPA, and WVDEP help invoke a sense of trust and respect among stakeholders.

- This XL project provides benefits to the community that are not typically provided for at Superfund sites, such as demolishing on-site structures to facilitate redevelopment. The stakeholders hope that such aesthetic improvements will spur investor interest in the site.

- Citizens can also discuss concerns directly with ExxonMobil by using ExxonMobil's toll-free project hotline set up explicitly for the community.

- Citizens were given a unique opportunity early on in the project to provide input into matters such as the future use of the property, on-site demolition of buildings, and the site cleanup process.

Benefits for the Project Sponsor

- Reporting requirements have been reduced, and stakeholders have relied on electronic communication, which expedites review of decision documents.

- The streamlined process will result in a shorter cleanup time and will possibly result in long-term cost savings. In addition, the sooner the cleanup is completed, the sooner investors may purchase and redevelop the property.

Information Sources: The information in this summary comes from the following sources: (1) the FPA for the ExxonMobil XL project, May 25, 1999; (2) *Project XL Stakeholder Involvement Evaluation—Final Draft Report*, May 2000; (3) focus group discussions in December 1999 with representatives of ExxonMobil Corporation, federal and state regulatory agencies, and representatives of the local community; (4) the *2000 Project XL Comprehensive Report, Volume 2: Directory of Project Experiments and Results*, November 2000; and (5) Meeting Minutes of the FCLP.

Georgia-Pacific Corporation

FINAL PROJECT AGREEMENT SIGNED MAY 31, 2000

Background

The Project Sponsor: Georgia-Pacific is a leading manufacturer and distributor of paper and building products. Georgia-Pacific Corporation owns and operates a non-sulfur, non-bleaching pulp and paper mill at Big Island, Virginia. The facility sits on 900 acres of land and employs approximately 380 people. Despite the fact that Big Island was the first facility to develop and use this non-sulfur chemical pulping process, eliminating the rotten egg odor associated with pulp mills, it currently uses old technology with smelters dating back to the 1940s. The facility produces corrugating medium, which is used by box plants to make the fluted inner layer of corrugated boxes, and linerboard, which is used for the inside and outside layers of boxes. The mill is located in Bedford County, adjacent to the James River. The George Washington National Forest is located to the north and east of the James River, and to the west is the Jefferson National Forest. The James River Face National Wilderness Area is about three miles to the northwest of the mill.

The wood pulping operation at Big Island involves chipping wood and adding it to a digester that contains a chemical solution called "white liquor" (primarily consisting of sodium carbonate at the Big Island facility). The white liquor is heated in a digester, which cooks the chips and forms pulp by breaking down the lignin, or glue, that holds the wood together. The wood pulp is then recovered from the digester, leaving unusable wood wastes, including fines and knots, in the pulping chemical solution, which is considered "black liquor." Current practice at the mill to recover the useful chemicals in the black liquor is to reduce the volume and concentrate the liquid through evaporation. The liquid is then burned in two smelters, called "recovery furnaces." The smelters recover the sodium carbonate in a molten form, which is dissolved again to produce new white liquor.

The Experiment: While the combustion smelting technique is the current industry standard, Georgia-Pacific is investigating using "black liquor gasification," which is a new and innovative way to recover chemicals used to make wood pulp. The PulseEnhanced™ Steam Reforming black liquor gasification system, believed to be a better, cleaner approach, is intended to eventually replace the existing smelter type of recovery furnaces. The new gasification process uses heat and steam to convert organic compounds (including lignin and wood fibers) in the black liquor into a gas consisting primarily of hydrogen and recovers the pulping chemicals for reuse. The hydrogen gas would then be used as a fuel source to run the gasification process and to produce steam. The pulping chemicals are recovered as pellets of sodium carbonate that will be used to make new solutions of white liquor. The Georgia-Pacific XL project tests whether the installation and operation of this innovative gasification system at its Big Island pulp and paper mill will lower emissions in a defined amount of time, thereby surpassing federal regulatory requirements for pulp and paper mills, and allow for decommissioning of the existing combustion smelters.

The Flexibility: Under the Clean Air Act, the mill at Big Island must comply with the Pulp and Paper Mill Cluster Rule, which is a hazardous air pollution standard that requires installation of maximum achievable control technology (MACT), to limit the amount of air pollutants that can be emitted from regulated areas in the plant. A second MACT standard (MACT II), that would apply to the existing smelters, was proposed in 1998 to control and reduce emissions from combustion sources associated with recovery of chemicals used to make wood pulp. Due to the age and the physical condition of the plant, Georgia-Pacific would have to substantially upgrade or rebuild the smelters and add additional emissions controls to meet the MACT II standards or they would need to replace the smelters with new recovery boilers using conventional technology. Georgia-Pacific expects that its gasifier technology could be operational in time to meet the MACT II standards when they become effective. However, Georgia-Pacific is using Project XL to get flexibility in the following ways:

- To be able to operate the existing smelters past the MACT II compliance date, if necessary while the gasifier technology is brought online;

- To ensure that if the gasifier technology fails, Georgia-Pacific would be allowed to operate its existing smelters, as necessary, past the MACT II compliance date while it constructs a conventional recovery furnace to replace the existing smelters; and

- To allow the existing smelters to operate for a set period of time after the MACT II compliance date while Georgia-Pacific runs trials of the gasifier on black liquor imported from a Kraft pulp mill (these tests are crucial to demonstrating that this new gasification technology can be used in other plants in the pulp and paper industry, which are dominated by Kraft type mills). In addition, Georgia-Pacific has committed to running these trials as a condition for receiving partial project funding from the Department of Energy (DOE). This funding will allow Georgia-Pacific to be reimbursed for certain expenses such as construction costs.

EPA promulgated the MACT II requirements on January 12, 2001, which enacted the law and initiated the compliance schedule. Paper and pulp mills must be compliant by January 12, 2004, and Georgia-Pacific will install, test, and implement the new system within that timeframe. However, if they are not able to meet the schedule due to system failure, EPA has granted contingent regulatory flexibility. EPA amended its regulations in March 2001 (40 CFR Sections 63.861, 63.863, and 63.867) to allow implementation of the gasification system project and to allow contingencies regarding the project's success or failure. This is a preventive, stopgap measure that will be triggered only if the gasification system does not work or more time is needed to test additional aspects of the system. If either of these situations occurs past the compliance date in 2004, Georgia-Pacific will need to operate its two existing smelters, which do not meet the MACT II requirements and invoke this federal regulatory flexibility.

Other Innovations: *(1) Reducing Emissions through Innovative Technological Approaches.* Georgia-Pacific is employing a cutting-edge recovery technology that the scientific community and its suppliers have brought to the point where it is ready for a full-scale implementation. Complying with MACT II requirements will significantly reduce emissions from mills and force companies to rebuild or replace existing infrastructure, thereby effecting an environmental quality change. *(2) Transferable Technologies.* This technology is also transferable and therefore highly useable by other paper and pulp mills. The Big Island facility will test the effectiveness of the PulseEnhanced™ Steam Reforming gasification technology and other pulping facilities facing comparable circumstances could benefit from the technology.

The Superior Environmental Performance: Overall, the gasification system is expected to reduce the mill's consumption of fossil fuel, increase efficiency in energy conversion and chemical recovery, eliminate the smelt-water explosion hazard, reduce maintenance costs, and significantly lower environmental emissions of criteria pollutants, greenhouse gases, and hazardous air pollutants. Other benefits of the system include emissions levels that will be far lower than in conventional smelter and recovery boiler processes and the recycling and reuse of steam generated by the technology.

Without the XL project and the implementation of the gasification technology, newer but conventional recovery boilers will be installed that will meet MACT II requirements, but will not significantly reduce emission levels. The current standard emissions are 2.97 pounds of total gaseous organic hazardous air pollutants per ton of black liquor solids, and with the successful implementation of the gasification system, Georgia-Pacific expects emission levels of 0.02 pounds of total gaseous organic hazardous air pollutants per ton of black liquor solids.

Georgia-Pacific will further extend its superior environmental performance by recovering and reusing the steam generated by the gasification system. In addition to producing steam, this gasification technology will be used to generate its own on-site electricity. The reduction in fossil fuel use from combusting the gas produced by the project is expected to result in a decrease production of greenhouse gases.

Progress in Meeting Commitments
(As of August 2001)

Georgia-Pacific is continuing to work toward meeting all commitments that were set out in the FPA.

- On February 15, Georgia-Pacific received funding from DOE. On March 20, 2001, a signing ceremony was held to commemorate the agreement between DOE and Georgia-Pacific.

- Also in March 2001, EPA published a proposed site-specific rule for the XL Project in the Federal Register. EPA did not receive any comments on the rule and it went final on June 25, 2001. The rule provides Georgia-Pacific with the flexibility they needed to undertake the project.

- On August 1, 2001, Georgia-Pacific hosted a stakeholder meeting at the Big Island Mill to update the stakeholders on the status of the project.

- The construction and commissioning are expected to happen over the next three years and start-up of the gasification system is projected on or before February 15, 2004.

- Decommissioning of the existing smelters will occur when the new gasification system is online and the trials with black liquor from kraft mills are completed.

- Compliance with MACT II requirements will occur when the gasification system is online.

Benefits for the Environment

- The new gasification system ensures that environmental protection will be increased by the reduction in the consumption of fossil fuel; increased efficiency in energy conversion and chemical recovery; elimination of the smelt-water explosion hazard inherent in the operation of conventional recovery boilers; and lower emissions of criteria pollutants (i.e., particulate matter, sulfur dioxide, nitrogen oxides, volatile organic compounds, and greenhouse gases). If implementation is successful and other pulp and paper mills adopt the gasification technology, it will have a far-reaching effect in meeting current and future air quality standards while reducing energy demand for this industry.

Benefits for Stakeholders

- Stakeholders, which include local residents, government officials, other municipalities, and community and nonprofit organizations are learning more through this XL project regarding day-to-day facility operations and ways in which this project can reduce the facility's environmental impacts.

Benefits for Project Sponsors

- The new gasification system may reduce maintenance costs at the Big Island facility. To date, the new gasification system has only been pilot tested; therefore, successful implementation at Big Island facility will provide innovative, environmental, and economic benefits to Georgia-Pacific, as well as the industry and EPA. This first full-scale installation of a gasification system through the XL program is important for the industry as a whole.

Information Resources: The information in this summary comes from the following sources: (1) the FPA for the Georgia-Pacific Corporation Project, May 31, 2000; and (2) the *2000 Project XL Comprehensive Report, Volume 2: Directory of Project Experiments and Results*, November 2000.

HADCO Corporation

FINAL PROJECT AGREEMENT SIGNED OCTOBER 2, 1997
PROJECT CLOSE OUT EXPECTED BY DECEMBER 2001

Background

The Project Sponsor: The HADCO Corporation, now a wholly owned subsidiary of Sanmina Corporation, is a leading manufacturer of printed wiring boards (PWB) and electronic interconnection products. Founded in 1966 as a three-person operation in Cambridge, Massachusetts, HADCO has grown to employ more than 8,000 employees in the United States and Malaysia. Three HADCO facilities are involved in the XL project: Owego, New York; Derry, New Hampshire; and Hudson, New Hampshire. This project is expected to close out from the XL program by December 2001.

The Experiment: The HADCO project was examining whether valuable copper metals could be recovered more safely and cost-effectively through direct reuse by a primary metals smelter rather than through following the current requirement to first ship copper sludge wastes long distances to intermediate processors. Based on HADCO's experiences with this project through close out, EPA can develop a framework to address the potential issues that this type of project may encounter and that can hinder a company's ability to achieve superior environmental performance.

The Flexibility: To improve recycling and reduce risks to the surrounding communities, EPA, the State of New York, and the State of New Hampshire offered flexibility in solid waste disposal to three HADCO facilities. Testing of the facilities' sludge from wastes from electroplating processes indicated that these sludges had a high concentration of several valuable metals, especially copper, and relatively low toxicity in comparison to typical electroplating sludges. New Hampshire determined that the sludge was eligible for a solid waste variance or a conditional delisting. New York determined that the sludge was eligible for a solid waste variance. Although the project is in the process of being closed out, the company intends to proceed with the delisting in Region 1 and the processing of a solid waste variance in Region 2.

The Superior Environmental Performance: Under the original project, HADCO committed to using all savings realized from this project to expand its pollution prevention and recycling programs. HADCO also committed to recycling copper dust, which is another byproduct of its operations, and to examining the potential of installing additional sludge dryers to reduce the volume of sludge wastes as HADCO currently employs some sludge drying in each of the three facilities.

Progress in Meeting Commitments
(Last reported results as of July 2000)

HADCO and EPA began discussions of closing out the project early in 2001. As of July 2000, the following commitments were met by HADCO:

- HADCO met its commitments to submit samples of its sludge waste for analysis.
- HADCO filed a petition seeking a conditional delisting in the State of New Hampshire.
- The New York Owego facility filed for a solid waste variance in the State of New York on September 28, 1999. Updated revisions to the variance application are required to be submitted by HADCO as a result of the closeout of this project from the XL program. Once approved and issued by New York State Department of Environmental Conservation (NYSDEC), HADCO may continue to recycle its F006 sludge at primary metals smelters or other metal reclamation facilities.
- HADCO provided baseline data regarding its voluntary effort to reduce air emissions associated with both direct recycling of F006 sludge and the reduction in the numbers of sludge shipments to processing facilities in its annual report submitted to EPA on January 7, 2000. The report contained data concerning the number of sludge shipments from both the New York and New Hampshire facilities. The Owego, New York, facility had a sludge dryer in operation since mid 1995. A decrease in

sludge shipments from the Owego facility was not apparent because of a substantial increase in production as well as relocation/construction activities at the plant that put the dryer out of service from September 1998 through June 1999.

- HADCO submitted to EPA and the states letters of interest to secure contracts with smelters that can accept the sludge for recycling.

- Once HADCO had the conditional delisting, the solid waste variance, and the appropriate contracts in place, the company would have followed through on the following environmental commitments: direct savings resulting from reduced transportation or recycling under the project to increase copper reclamation activities at the HADCO facilities; voluntarily examine ways its New Hampshire facilities could use additional sludge dryers in order to reduce the quantity of sludge transported; and minimize and reclaim copper drilling, sawing, and edging.

Project Assessment Rationale for Project Closeout

- Given the additional burden of reporting, sampling, and potential capital expenditures that this XL project imposed on Sanmina facilities, the company indicated that a withdrawal would best serve their current needs, especially as both the delisting in Region 1 and the processing of a solid waste variance in Region 2 can continue regardless of the company's XL status.

- HADCO had difficulty identifying smelters that would directly accept its Resource Conservation and Recovery Act-exempt wastewater treatment sludge. F006 sludge is generally a good candidate for raw material substitution at smelters; however, these smelters do not have the administrative support structure to receive relatively small amounts of waste sludges from numerous generators. Although HADCO is a larger generator, some of its sites had difficulty securing contracts with smelters. The metal recovery market has created intermediary companies that aggregate these sludges and are then able to ship quantities of waste sludges that are significant to smelters (e.g., greater than 40,000 pounds/shipment). The Owego facility, which uses conventional precipitation, flocculation treatment has successfully shipped F006 sludges directly to smelters for over four years. The Owego sludge, which has 18 to 22 percent copper by dry weight, is a valued commodity to smelters. Individual companies smaller than HADCO Owego, may not able to ship sludges at such volumes and copper concentrations. Currently, market forces do not strongly support a generator's direct recycling of these sludges without the use of the aforementioned intermediary metals aggregators.

- Over the course of the HADCO XL project term, the delisting process was delegated by EPA Headquarters to the regions and was redesigned to offer decision making within an average of 180 days, versus a delisting process that traditionally took as long as four to six years. These timesaving measures have been achieved through a streamlined application process, more uniform sampling requirements and an updated, user-friendly fate-transport model. Thus, HADCO no longer needs to rely on the XL process to expedite the delisting request.

- Obtaining a solid waste variance from the NYSDEC does not require federal regulatory flexibility, thus eliminating the main incentive for HADCO to retain its XL status.

Benefits for the Environment

- HADCO improved its pollution prevention efforts by voluntarily installing a sludge dryer in its Derry, New Hampshire, facility, which reduced the quantity of electroplating sludge shipped off-site by 16,000 pounds. Owego invested cost savings achieved from direct shipment to the smelter in more extensive resource recovery (e.g., recycling drill dust that formerly was landfilled).

Benefits for Stakeholders

- Stakeholders gained more knowledge about the PWB industry and facility operations.

Benefits for the Project Sponsor

- HADCO experienced some cost savings from reducing the number of sludge shipments by using a sludge dryer.

- The Owego facility experienced significant cost savings by dealing directly with the copper smelter.

Information Resources: The information in this summary comes from the following sources: (1) the December 1999 *XL Project Progress Report—HADCO Corporation* (EPA-100-R-00-008); (2) HADCO Corporation—Annual Report January 2000; and (3) focus group discussions in January 1999 with representatives of the federal and state regulatory agencies, HADCO Corporation, and stakeholders involved in the project.

Imation Corporation

FINAL PROJECT AGREEMENT SIGNED DECEMBER 20, 1999

Background

The Project Sponsor: Imation Corporation is a global technology company and the world's largest manufacturer of magnetic data storage tape, a product used to backup electronic data. To keep in step with the ever-changing computer industry and technologies, magnetic tape manufacturing requires frequent and timely changes to plant operations.

Imation's magnetic tape manufacturing process involves spraying a solvent-based magnetic coating onto the tape, a process which releases volatile organic compounds (VOCs) into the air, including some VOCs classified by EPA as hazardous air pollutants (HAPs). Imation's Camarillo plant is located in Ventura County, California, which is in violation of federal air quality standards for ozone (classified as severe nonattainment for ozone), as well as California state standards for ozone and particulate matter (PM). VOCs are precursors to the formation of ozone, so their release in Ventura County is of particular concern. The federal Clean Air Act (CAA), major nonattainment New Source Review (NSR) regulations, and the county's minor NSR regulations require most changes to Imation's manufacturing processes to be reviewed and approved in advance. Under these rules, Imation must apply for a preconstruction permit for each change and the county must issue the permit before the change can be made.

The Experiment: The Imation XL project builds upon the 1996 covenant between Imation and the State of California and is testing whether innovative permitting and NSR strategies can be used to enable the company to make facility changes without delay (i.e., avoiding case-by-case approvals) while producing superior environmental performance. To avoid potential delays and streamline approval, this experiment is employing two principal mechanisms. First, the company has accepted a plant-wide cap on VOC emissions, and second, the company's Title V permit (required by the CAA) was designed to characterize Imation's anticipated changes as alternative operating scenarios.

Imation Camarillo will be subject to a voluntary VOC emissions cap (called a plant-wide applicability limit, or PAL) for VOC emissions of 150 tons per year (tpy). The PAL will ensure that the emissions from the plant do not overly contribute to regional air pollution, do not interfere with reasonable further progress toward attainment of the ozone National Ambient Air Quality Standards (NAAQS), and do not trigger the major NSR process. In addition to the 150 tpy cap on VOC emissions, Imation must meet a minimum control efficiency of 95 percent and a 100 percent capture efficiency for all organic compounds (VOCs and HAPs) emitted from coating manufacturing operations at the facility, regardless of whether the amount emitted is below 150 tpy. This will ensure that Imation meets any emission standards that will apply to any of the changes contemplated by the company. To meet the capture efficiency standard, the coating and drying system is totally enclosed so that no VOCs escape to the atmosphere.

As long as Imation's actual VOC emissions do not exceed the PAL, modifications can be made at the facility without triggering major or minor NSR approval processes. In addition, Imation has agreed to facility-wide emission caps for other CAA criteria pollutants: 30 tpy of carbon monoxide (CO); 8.34 tpy of nitrous oxides (NO_x); less than 15 tpy each of PM and sulfur oxides (SO_x), but will not be receiving NSR flexibility in these cases.

The Flexibility: Under the CAA, relief from the Ventura County Air Pollution Control District's (VCAPCD's) NSR program can be granted by revising the Ventura County portion of the California State Implementation Plan (SIP), which details how NSR is implemented in California. EPA has approved a site-specific revision to the California SIP, which in effect, establishes an alternative approach to the VCAPCD's NSR program for new and modified sources at Imation's Camarillo facility. In addition, EPA has worked with Ventura County to characterize anticipated changes as alternative operating scenarios in Imation's operating permit. These scenarios can be put into effect without further approval from Ventura County or EPA. All of the federal and state standards addressed by Imation's preapprovals regulate coating operations that emit VOCs and HAPs, and the

preapproved operations will be identical or very similar to the existing coating operations at the facility.

Other Innovations: *(1) Limited Preapprovals for Air Permits.* By focusing on the total emissions of a facility, Project XL is testing and confirming flexible emission reduction strategies that may be both duplicated at similar facilities across the country and integrated into EPA's existing regulatory regime. Imation Camarillo intends to share pollution prevention successes it discovers with others in the industrial community. *(2) Increased Flexibility in Facility Operations.* In addition, these projects are testing alternative major NSR applicability systems that allow PALs instead of traditional NSRs for determining whether modifications are subject to major NSR. Through a proposed NSR rule, EPA would make PALs more broadly available, enabling plants to establish capped limits on their total emissions in exchange for increased flexibility to add and subtract production units without having to go through NSR and the associated permitting. This would provide communities with certainty that emissions will not increase above permitted levels. EPA is also developing guidance on flexible permitting approaches that will allow a facility to permit alternative operating scenarios, establish limits on emissions, and use other techniques to provide them with operational flexibility for the life of the permit.

The Superior Environmental Performance: Imation Camarillo voluntarily reduced facility-wide VOC emissions by 43 percent by operating under the PAL (which calls for a voluntary reduction of VOC emissions from 263 tpy to 150 tpy), ensuring that the emissions from the plant do not overly contribute to regional air pollution and do not interfere with reasonable further progress toward ozone NAAQS attainment. In addition to the reductions in VOC emissions, Imation Camarillo will cap CAA criteria air pollutants, including CO, NO_x, and SO_x, which can contribute to acid rain, damage plant life, and cause adverse health effects such as respiratory problems.

Progress in Meeting Commitments
(As of September 2001)

- Imation agreed to comply with federally enforceable caps on emissions under the CAA. Emission levels have met all federal caps since the implementation of the project.
  - Criteria Air Pollutants: Under the FPA, the following limits for criteria air pollutants were established: 8.34 tpy for NO_x, 15 tpy for PM, 15 tpy for SO_x and 30 tpy for CO. For 2000, Imation's emissions for criteria air pollutants were much lower than the limits set. Imation reported emission rates of 4.683 tons of NO_x, 0.0267 tons of SO_x, 0.143 tons of PM, and 1.636 tons of CO. For January through September 2001, emissions for NO_x (3.503 tons), SO_x (0.019 tons), PM (0.106 tons), and CO (1.227 tons) continued to be far below the permitted level and are below 2000 levels. The permit limits and emissions are presented in Figure 19.
  - VOCs: Total VOC emissions for 2000 measured only 24.38 tons, 83.75 percent below the limit set by VCAPCD (150 tons). Actual emissions for January through May 2001 are well below the permit limit (see Figure 20).
  - HAPs: Since the FPA was signed, Imation has come into full compliance with the maximum achievable control technology (MACT) standard requirements under the CAA for HAPs produced during magnetic tape manufacturing, even though some facility operations are not subject to the standard. While Imation would otherwise be subject to the federal New Source Performance Standards for magnetic tape, they agreed to comply with the more stringent MACT standards resulting in lower total emissions (see Figure 21).
- Imation agreed to meet a minimum control efficiency of 95 percent and a 100 percent capture efficiency for all organic compounds emitted.

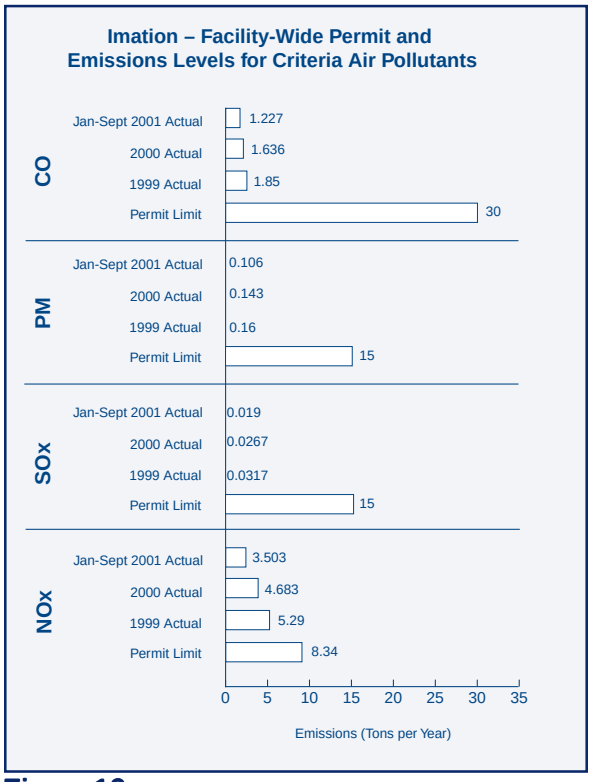

Figure 19
Imation's permit limits and emission levels for criteria air pollutants.

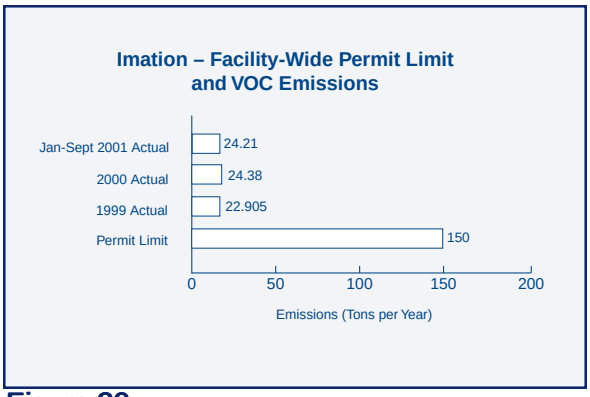

Figure 20
Imation's permit limits and emissions for volatile organic compounds.

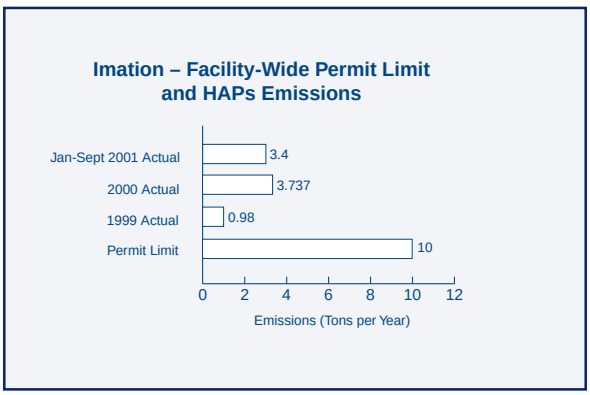

Figure 21
Imation's permit limits and emissions for hazardous air pollutants.

  - The facility has met these requirements every month between February 2000, when reporting began, and January 2001. Most months, control efficiency exceeded 99 percent for each of the adsorbers.

- A state-of-the-art monitoring system will be used by Imation to quantify and differentiate VOC and HAP emissions.
  - A continuous emissions monitoring system measures the efficiency at four locations along the manufacturing process.
- Monthly reports will be provided to EPA and VCAPCD by Imation documenting facility emissions.
  - Monthly reports have been submitted for February 2000 through January 2001.
- Stakeholder involvement will be increased by establishing a Project Stakeholders Group and providing monthly reports.
  - The Imation Community Stakeholders Group was established in October 2000 and has been meeting semiannually.
- Imation agreed to design and implement an ISO-14001-style environmental management system (EMS).
  - The Imation EMS is frequently updated to improve environmental performance at the Camarillo facility.
- VCAPCD agreed to adopt a site-specific rule that will revise the Ventura County's portion of the California SIP.
  - Rule 37 was adopted September 14, 1999 by VCAPCD, authorizing a PAL, and requiring best available control technology and/or best available control technology for toxics analyses and tiered health risk assessments for any change in operations.
- EPA committed to acting on Ventura County's proposed SIP revision.
  - Final approval of revision to the California SIP was published in the Federal

Register December 13, 1999, acknowledging the compliance of VCAPCD's Rule 37 with the requirements of the CAA.

Benefits for the Environment

- Between 1996 and 1999, Imation Camarillo voluntarily reduced its annual emission of VOCs from 263 tpy to 150 tpy, a 43 percent reduction. As a result, VCAPCD granted Imation an emission reduction credit (ERC) certificate for 113 tpy of VOC. Such ERCs can usually be sold to other emitters within the VCAPCD. In this case, Imation agreed to donate the credits back to VCAPCD to sell or retire. VCAPCD is planning to use the proceeds of selling the ERCs to finance environmental projects.

- The ISO 14001-style EMS for the Camarillo facility, which includes an integrated set of environmental goals, procedures, and assessments, is frequently updated to improve environmental performance.

Benefits for Stakeholders

- Community members are involved in the implementation of this project through the Imation Community Stakeholders Group. Following the signing of the FPA, Imation formed the Imation Community Stakeholders Group to evaluate implementation of the project during the initial five-year term of the XL project. The group is charged with evaluating the ongoing activities under the project and providing a link between the community, the regulatory agencies, and Imation Camarillo facility. The group will advise Imation on local community concerns and maintain an open dialogue with Imation to ensure transparency of facility operations related to the project.

- Imation makes its monthly reports available on the Internet and sends a copy of them to the local public library. Imation also sends a copy of their monthly report directly to persons or groups who identify themselves as interested parties to the project.

- The PAL provides communities with certainty that emissions will not increase above permitted levels.

Benefits for the Project Sponsor

- Since changes have been anticipated and provided for in the Title V permit, Imation may make changes without further Title V permit revision.

- As long as Imation's actual VOC emissions do not exceed the PAL, modifications can be made at the facility without triggering major or minor NSR approval processes.

- Through a proposed NSR rule, EPA would make PALs more broadly available, enabling plants to establish capped limits on their total emissions in exchange for increased flexibility to add and subtract production units without having to go through NSR and the associated permitting.

Information Resources: The information sources used to develop this progress report include: (1) the FPA for the Imation Camarillo XL Project (December 20, 1999); (2) stakeholder review materials; (3) Imation's monthly and annual reports on the XL Project (several are available online through Imation's Web site at *http://www.imation.com/en_US/main.jhtml?Id=10_07_04_02_01);* and (4) the *2000 Project XL Comprehensive Report, Volume 2: Directory of Project Experiments and Results*, November 2000.

Intel Corporation

FINAL PROJECT AGREEMENT SIGNED NOVEMBER 19, 1996

Background

The Project Sponsor: Intel Corporation, the world's largest semiconductor manufacturer, has operated the 720-acre Ocotillo site in Chandler, Arizona, since 1996. The Ocotillo site has two chip fabrication facilities. Fab 12 was Intel's first facility operating on the Ocotillo site. Intel is currently building a second chip fabrication facility (Fab 22) capable of manufacturing 300-millimeter chips. Intel's Project XL agreement applies to the entire Ocotillo site, including any new semiconductor-related facilities that may be built at the site. In the highly competitive semiconductor industry, success is directly related to a manufacturer's ability to bring new technologies to the marketplace quickly.

The Experiment: The Intel project's goal is to implement an Environmental Management Master Plan that includes a facility-wide cap on air emissions to replace individual permit limits for different air emission sources. The Intel project provides a test case for two innovations for improving air permitting: the elimination of case-by-case review of specific manufacturing process changes, if emissions remain under a capped amount; and pre-approval of a major plant expansion, if emissions remain below a capped amount for the entire site.

The Flexibility: The Intel XL project establishes a long-term plan to minimize the Ocotillo facility's environmental impact on local air, land, and water quality; to minimize both its use of fresh water and its generation of waste; and to undertake a number of other actions to enhance the overall environmental quality of the community. As an incentive to achieve environmental performance at the Ocotillo facility, EPA, the Arizona Department of Environmental Quality (ADEQ), the Maricopa County Bureau of Air Pollution Control, and the City of Chandler will provide a more flexible and cost-effective process for regulatory management. The FPA provides regulatory flexibility in the areas of air quality permitting, environmental performance reporting, and innovative technology. The FPA and the revised air quality permit provide Intel with the flexibility to make equipment and process changes and construct new facilities at the site without air quality permit reviews, as long as the plant site emission limits are not exceeded and all other FPA and permit limits are met. To provide an additional safety factor, Arizona Ambient Air Quality Guideline limits for hazardous air pollutants (HAPs) will not be exceeded at the Intel facility property line or elsewhere on the site. This flexibility in air quality regulation allows Intel to eliminate potentially 30 to 50 permit reviews a year and bring new products to market faster. This is exemplified by Intel's plan to build a new production manufacturing facility. Early in 2000, Intel announced it would build its first high-volume production manufacturing facility capable of producing 300-millimeter chips at the Ocotillo site in Chandler, Arizona. The company said it would invest $2 billion to build and equip the wafer fabrication facility. It is expected that Intel will seek this expansion under the Ocotillo facility's existing air emissions cap, which was established by the original Project XL permit in 1996. Intel has noted that the new facility will allow the company to maintain its leadership in the extremely competitive world of semiconductors.

Other Innovations: *(1) Consolidated Reporting.* The project allows Intel to consolidate reporting for federal, state, county, and city permitting and regulatory programs into one annual and four quarterly reports. This project will serve as a test for sector-wide collection of higher-quality information from regulated industries and directly influence the development of the comprehensive information management plan to be developed by EPA's Office of Environmental Information. *(2) Internet Reporting and Stakeholder Input.* The new data and reporting formats were designed in conjunction with the EPA, the ADEQ, the Maricopa County Bureau of Air Pollution Control, the City of Chandler, the Gila River Indian Community Department of Environmental Quality, and area residents who are part of the stakeholder team. Based on input from the team, Intel agreed to put routine environmental reports and accountability measures into a single, integrated report that is publicly available on the Internet via Intel's Project

XL Web site (*http://www.intel.com/intel/other/ehs/projectxl/*). Now citizens, as well as regulatory officials, can routinely monitor the facility's progress toward its environmental commitments. *(3) Computer-based Emergency Planning and Preparedness.* The emergency requirements will be incorporated within the Chandler Fire Department Hazardous Materials Management Plan (HMMP) for Intel. The information in the HMMP will be integrated into the computer-based emergency information system maintained by Intel and the Chandler Fire Department. The benefits associated with this innovative approach are enhanced preparedness and prevention activities by Intel and the Chandler Fire Department due to increased clarity of requirements, and enhanced emergency response by the City of Chandler Fire Department due to an on-board HMMP emergency information system computer on emergency response vehicles. *(4) Air Permits.* The Intel XL project is testing preapproval and elimination of review of specific manufacturing process changes to see if emissions remain under a capped amount for the entire site, even with the possibility of plant expansion. These emission caps are set at levels low enough for the entire site to remain a minor source of criteria and HAPs under the Clean Air Act. These tests will directly influence EPA's sector-based action plan and the Agency's permit reform efforts.

The Superior Environmental Performance: As long as Intel remains within the air emissions caps, the site will remain a minor stationary source of criteria air pollutants. Intel has also committed to meet other environmental goals that are designed to improve the area's water quality, conserve water, reduce the generation of hazardous and nonhazardous waste, and improve the general environmental performance of the facility.

Progress in Meeting Commitments *(As of August 2001)*

Intel has been very successful in meeting its environmental commitments under the project.

- Intel committed to capping the air emissions for the entire facility as follows: volatile organic compounds (VOCs) at 40 tons per year (tpy) (see Figure 22), nitrogen oxides and carbon monoxide (CO) at 49 tpy; sulfur dioxide and particulate matter at 5 tpy; phosphine at 4 tpy, sulfuric acid at 9 tpy; and organic HAPs and inorganic HAPs capped at 10 tpy. For all of these commitments, Intel's facility has remained well under the limit for 1997, 1998, 1999, and 2000.
  - Intel has fulfilled its commitment to cap CO emissions at less than 49 tpy for the entire site, by achieving a total of 4.3 tpy in 1997, 6.1 tpy in 1998, 6.2 tpy in 1999, and 5.2 tpy in 2000 (see Figure 23).
  - Intel has far exceeded its commitment to cap aggregate combined organic HAPs at 10 tpy by achieving a total of 0.5 tpy in 1997, 1.3 tpy in 1998, 0.7 tpy in 1999, and 1.5 tpy in 2000 (see Figure 24).
  - Intel has far exceeded its commitment to cap aggregate combined inorganic HAPs at 10 tpy by achieving a total of 0.7 tpy in 1997, 1.7 tpy in 1998, 2.1 tpy in 1999, and 2.3 tpy in 2000 (see Figure 25).
- Intel has achieved its water quality and water use commitments, with one minor exception. Intel originally committed to use 100 percent treated effluent water for its semiconductor cooling-manufacturing towers and for landscaping. Although the facility achieved only 80 percent of wastewater reuse in 1997, Intel achieved 97 percent of wastewater reuse in 1998. The company informed stakeholders that it would not likely be able to achieve more than 95 percent due to the intermittent need to use small quantities of fresh city water when treated effluent cannot be made available due to unforeseen treatment plant interruptions. Stakeholders agreed to change the goal from

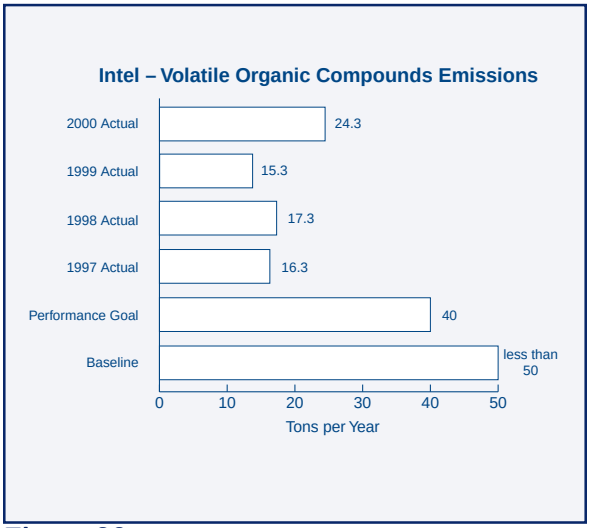

Figure 22
Intel's emisions of VOCs from 1997 to 2000.

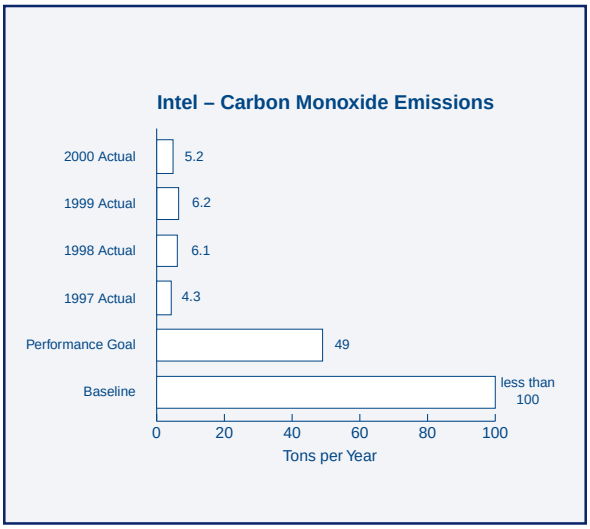

Figure 23
Intel's emissions of CO from 1997 to 2000.

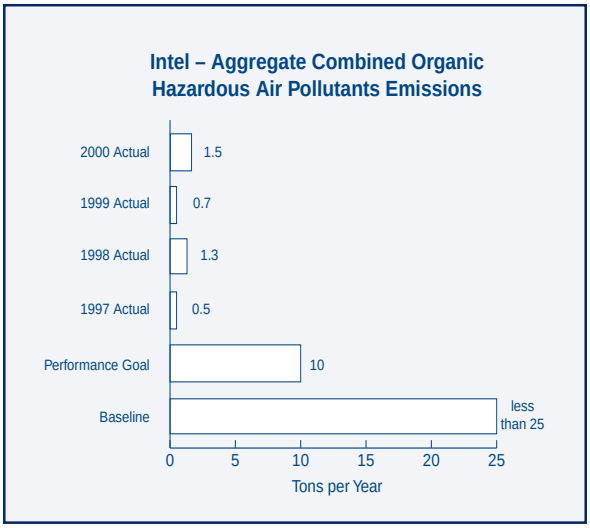

Figure 24
Intel's emissions of aggregate combined organic HAPs from 1997 to 2000.

100 percent to 95 percent. Intel was able to reach a level of 99 percent in 1999 and 96 percent in 2000.

- Intel achieved its solid waste recycling goals. Intel's goals are to increase recycling to 40 percent in 1997, 55 percent in 1999, and 60 percent in 2001. In 1997, the facility exceeded its recycling goal, and by the end of 1998, Intel had already exceeded its commitment for 2001. In 1999, Intel continued its progress toward increased recycling by achieving a level of 67 percent. In 2000, Intel recycled 17,788 pounds of solid waste for a level of 84 percent of waste recycled (see Figure 26). At the beginning of the project, the company struggled to meet these goals, which led to creative, effective solutions. For example, to meet the solid waste recycling commitments, Intel found a box manufacturer that transforms packaging wood into landscaping tree boxes.

- Intel's goals are to recycle 60 percent of hazardous wastes generated at the facility in 1997, 50 percent in 1999, and 40 percent in 2001. The specified percentages in the recycling goals decrease because Intel anticipates reducing the hazardous waste generated at the facility through pollution prevention measures. The facility achieved beyond the 60 percent recycling goal for 1997. In 1998, the company started a new manufacturing process module that produced a non-recyclable waste stream. Intel executed several projects to reduce these wastes, and as a result almost achieved the 1999 goal by the end of 1998 (it achieved a 53 percent recycling rate). In 1999, Intel continued its aggressive hazardous waste recycling efforts and exceeded its recycling goal by achieving a level of 65 percent. Intel again exceeded expectations in 2000 by recycling 55 percent of hazardous waste (see Figure 27).

- Intel's goals are to recycle 25 percent of non-hazardous chemical waste in 1997, 50 percent in 1999, and 70 percent in 2001. The facility exceeded its 1997 and 1999 goals and is on track to exceed 2001 goals. Intel achieved a rate of 58 percent in 1997, and 78 percent in 1999.

- In addition to the site-wide cap on air emissions, Intel voluntarily established a production-based performance standard called the production unit factor (PUF). The purpose of the PUF is to ensure that air emissions per unit of production will not increase. The PUF is expressed annually as tons of emissions (VOCs or HAPs) per year per unit of annual production. Each year, Intel reports the annual PUF for the reporting year relative to the base year, which is 1997. The VOC and HAP PUFs for 1998 relative to the base year index of 1.0 were 0.3 and 0.7, respectively; the value for VOCs for 1999 relative to the base year was 0.26; the HAP PUF for 1999 relative to the base year was 0.84; and the 2000 VOC and HAP PUFs relative to the base year were 0.27 and 0.64, respectively. This means that VOC and HAP emissions per unit of production were less than the baseline year in all subsequent years.

- The FPA for the Intel XL project will expire at the end of 2001. After five years of successful operation under the existing FPA, Intel, EPA, the State of Arizona, Maricopa County, and the other involved stakeholders are interested in renewing the agreement for five additional years. To that end, in June of 2001 Intel convened the first of a series of stakeholder discussions. The goal is to have the renewal agreement signed before the existing agreement expires on December 31. Intel is proposing to leave much of the existing agreement intact, making relatively minor adjustments based on operating experience to date and to accommodate plans for the Ocotillo facility for the next five years.

Benefits for the Environment

- Air emissions for criteria and HAPs are being maintained at levels that ensure that the current site remains a minor air emissions source, as defined by the Clean Air Act.

- Intel's recycling activities for hazardous waste, solid waste, and water are successful. In particular, water conservation is a priority environmental goal in this arid Arizona region, and Intel's activities in this area are well regarded

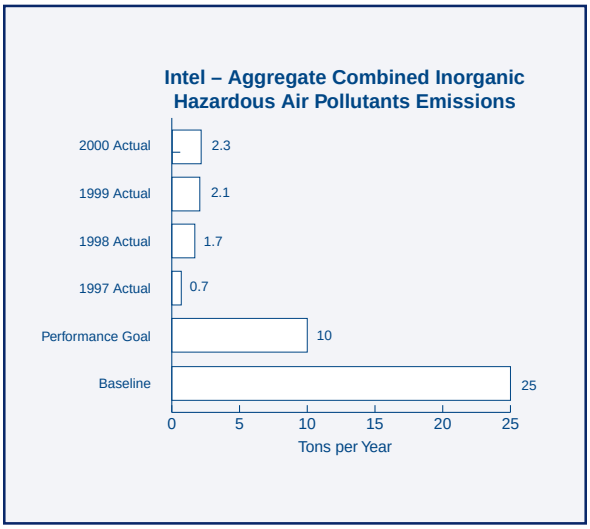

Figure 25
Intel's emissions of aggregate combined inorganic HAPs from1997 to 2000.

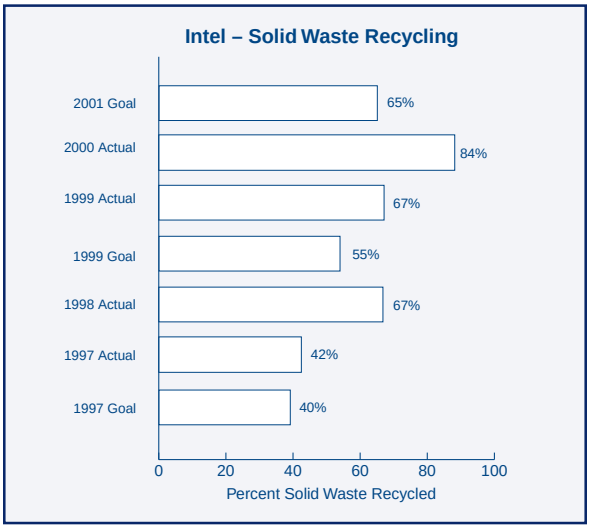

Figure 26
Intel's solid waste recycling percentages from 1997 to 2000.

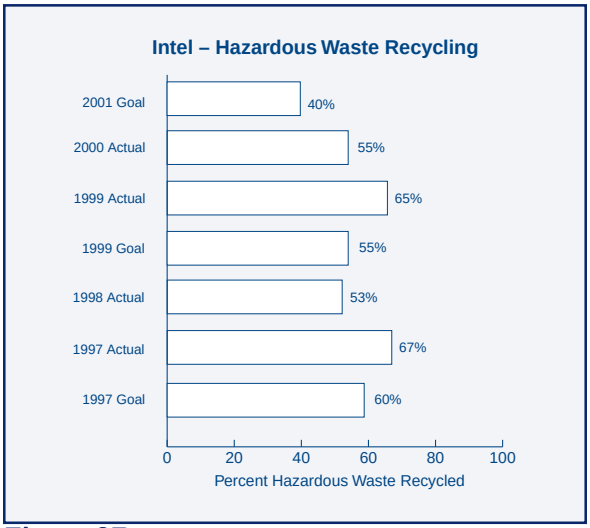

Figure 27
Intel's hazardous waste recycling percentages from 1997 to 2000.

by the City of Chandler. Intel has expanded its commitment to increase water conservation for the community with its newest high-volume production manufacturing facility (Fab 22) by introducing a new Innovative Water Conservation Treatment System. This treatment system will continue to take advantage of the external recycling benefits introduced with its first manufacturing facility (Fab 12) while adding the ability to capture internal recycling and reuse further avoiding fresh water use. A new water conservation indicator is being developed to demonstrate the positive environmental impact, which will be reported in quarterly reports.

Benefits for Stakeholders

- Stakeholders are able to be involved in the project through a stakeholder team, which ensures that national, regional, and local regulatory authorities and private citizens can participate as full partners in the project's implementation. This team meets once a quarter to review the project's progress reports.

- Local stakeholders and the surrounding community will continue to enjoy increased economic benefits by Intel's decision to build another semiconductor manufacturing facility at the Ocotillo site. This decision was due in part to the success of the innovative Intel XL project facility emissions cap.

- The community has better access to information through Internet reporting and a stakeholder-developed, easy-to-understand format for the consolidated reports.

Benefits for the Project Sponsor

- Intel is building its first 300-millimeter chip, high-volume production manufacturing fabrication facility at the Ocotillo site under its existing air emissions cap, which was established under the 1996 XL permit.

- Intel has found the innovations being tested at the Arizona facility to be so beneficial that the company is implementing performance-based concepts for air emissions at two other company facilities.

- Intel is renewing its FPA with national, regional, and local stakeholders so it may continue to receive the flexibility benefits provided in Project XL. Negotiations of this process are expected to be complete in December 2001.

Spin-off Benefits

- The City of Chandler has received a grant to study the industrial reuse of wastewater. The XL project was used to advance the study.

- The project prompted the City of Chandler's fire department to establish a new overall approach to hazardous waste handling.

Information Resources: The information in this summary comes from the following sources: (1) the December 1999 *XL Project Progress Report—Intel Corporation* (EPA-100-R-00-005); (2) focus group discussions in December 1998 and December 1999 with representatives of the federal, state, and local regulatory agencies, Intel Corporation, and stakeholders involved in the project; (3) data from Intel Quarterly Reports, and the 1997, 1998, 1999, and 2000 Annual Reports; and (4) *Project XL Stakeholder Involvement Evaluation—Final Draft Report*, May 2000.

International Business Machines East Fishkill Facility

FINAL PROJECT AGREEMENT SIGNED SEPTEMBER 29, 2000

Background

The Project Sponsor: The International Business Machines (IBM) East Fishkill facility is located in the Town of East Fishkill, New York, and is located approximately 10 miles east of the Hudson River. The facility currently houses various research and development operations as well as the facilities and operations involved in the manufacturing of semiconductor and electronic computing equipment.

The Experiment: As a result of various manufacturing operations, including electroplating, wastewater containing dissolved heavy metal and fluoride compounds is produced in a number of buildings throughout the facility. Currently, IBM East Fishkill generates approximately 825 tons of sludge annually in two separate wastewater treatment systems and transports the material approximately 350 miles to Canada for disposal in a permitted landfill. This waste is designated as F006 (i.e., electroplating sludge) and regulated under the Resource Conservation and Recovery Act (RCRA). After careful evaluation of the chemical constituents of the sludges, IBM believes that the sludge generated in one of the wastewater treatment systems (approximately 300 tons annually) can be recycled and used as an ingredient in the manufacture of commercially available cement. The waste contains high concentrations of calcium (a necessary ingredient in cement production) and very low levels of hazardous contaminants, comparable to levels found in typical raw materials used to produce cement.

The Flexibility: Under the RCRA regulations, IBM's sludge is classified as F006, a listed hazardous waste. Although EPA does not prohibit the use of sludge in the production of cement, this type of "use constituting disposal" (UCD) scenario would require the cement kiln to obtain a RCRA Subtitle C permit and the cement product would be required to meet the land disposal restrictions (LDR) treatment levels and would still be considered a hazardous waste. Therefore, without the site-specific exclusion afforded in this XL project, IBM's sludge is subject to RCRA requirements while being stored at the IBM site, transported to a cement kiln, and stored at the cement company while awaiting recycling. The cement kiln company would be required to obtain a RCRA permit to store hazardous waste and also monitor its cement kiln dust and cement product, which would be considered a hazardous waste-derived product, and be required to meet the applicable LDR treatment standards. These requirements are a disincentive to cement kilns for using F006 sludge as a component in cement. The regulatory flexibility granted by EPA and New York State Department of Environmental Conservation (NYSDEC) in this project supercedes both the RCRA and UCD requirements that would ordinarily be applied.

To overcome this disincentive, EPA and NYSDEC proposed a site-specific conditional exclusion to the solid waste definition for the duration of this XL project. EPA, NYSDEC, and IBM have set parameters for the concentrations of hazardous waste in the sludge, defined management conditions to ensure that the sludge is not released to the environment, and established a means of assessing the effectiveness and safety of using the sludge as an ingredient in cement. This flexibility will allow IBM the opportunity to test the appropriateness of recycling its sludge outside the jurisdiction of state and federal hazardous waste regulations.

Other Innovations: *(1) Demonstrating Regulatory Relief and Environmental Benefit.* The IBM East Fishkill Project XL, using F006 as an ingredient in cement production, will provide an opportunity for EPA to examine the need for RCRA regulation of a subset of recycling scenarios involving the production of products that can be applied to the land. The experience and data gained from this project may be useful to EPA in assessing whether broader regulatory relief for this type of recycling practice may be feasible and environmentally protective on a statewide or national level. *(2) Transferability.* According to a 1998 EPA study, current estimates of F006 sludge generation in the

United States range from 360,000 to 500,000 tons per year on a dry weight basis. Should the experiment be assessed as widely transferable, EPA could eliminate existing disincentives to recycling types of F006 waste that can be safe, effective substitutes for other feedstock material. This action could translate to a significant reuse of F006 sludge and thereby increase national landfill capacity.

The Superior Environmental Performance: By using the F006 sludge in the manufacture of cement, several superior environmental benefits are expected. Using the sludge as an ingredient in the manufacture of a commercially available product can offer an environmentally beneficial alternative to the disposal of the sludge in a permitted hazardous waste landfill. This would also conserve expensive and valuable landfill capacity for the environmentally protective disposal of hazardous wastes that cannot otherwise be recycled at the present time. An additional environmental benefit of this project would be the reuse of waste material in lieu of continued consumption of a non-renewable resource, which would conserve resources and help decrease invasive mining and quarrying operations.

To further ensure superior environmental performance, IBM has agreed to continue to meet the RCRA management standards and conduct RCRA-type inspections. In addition to the ongoing monitoring of sludge quality, IBM has committed to continue providing proper storage of sludge material at the East Fishkill facility as if it were still regulated as a RCRA waste.

IBM will also ensure the proper transport of sludge from the East Fishkill facility to the cement kiln and will provide its sludge only to cement kilns that agree to provide the proper storage, handling, and utilization of the sludge. Further, IBM will prepare and submit to EPA and NYSDEC an annual report providing a summary of transportation and reuse activities associated with this XL project.

Progress in Meeting Commitments
(As of September 2001)

- IBM committed to an ongoing monitoring of sludge quality by collecting sludge samples for analysis of specific constituents identified by EPA. IBM will collect and analyze a sludge sample quarterly until 12 samples have been collected, after which the frequency of sampling events will change to every six months.
  - In September 2000, IBM submitted the analytical results of three sludge samples to EPA and NYSDEC. IBM also agreed to conduct an analysis of fluoride concentrations on the remaining nine sludge samples.
  - As of September 2001, IBM has provided analytical results of 13 additional samples to EPA Region 2. Fluoride concentrations in five of the sludge samples were analyzed, but have not yet been submitted. Since November 2000, all sample analyses have included fluoride concentrations.
- IBM agreed to provide its sludge only to cement kilns that agree to provide the proper storage, handling, and utilization of the sludge.
  - IBM is currently in the process of identifying and selecting cement kilns and sludge transporters.
- EPA published a proposed rule in the Federal Register on June 6, 2001. The proposed rule, once finalized, would provide the IBM East Fishkill facility with site-specific regulatory flexibility under RCRA required to implement this XL project.
- A supplemental proposal is being developed by EPA and is expected to be promulgated by December 31, 2001. This supplemental proposal is needed to amend a specific threshold level that was originally proposed as a condition of the site-specific exclusion from the regulatory definition of hazardous waste. This supplemental proposal is needed to reflect more current data received on the sludge.

- IBM has submitted a request for a Beneficial Use Determination for this project to NYSDEC in July 2001. Processing of the request is pending finalization of the EPA proposed rule.

Benefits for the Environment

- Recycling the F006 sludge into cement achieves a higher position on EPA's hierarchy of waste management options, from ultimate disposal to a recycling scenario. This waste-minimization practice will result in an increase in landfill capacity for other hazardous wastes that cannot be recycled at the present time.

Benefits for Stakeholders

- Through meetings with IBM, local environmental groups, Dutchess County Environmental Management Council, and the Town of East Fishkill Conservation Advisory Council have had the opportunity to have a deeper involvement in understanding the environmental management of the facility, ask questions, and participate in the implementation of this XL project.

Benefits for the Project Sponsor

- The sludge recycling process will result in some cost savings to IBM. The transport and disposal of the F006 sludge to a landfill in Canada is costly. Depending on the location of the cement kiln facility, significant cost reductions from transportation may result. Also, the elimination of the need for export notification, hazardous waste manifests both in the United States and Canada, and an annual generator report will result in an overall reduction in paperwork.

Information Resources: The information in this summary comes from the following sources: (1) the September 2000 FPA for the IBM East Fishkill Facility F006 Sludge Recycling Project; and (2) the *2000 Project XL Comprehensive Report, Volume 2: Directory of Project Experiments and Results*, November 2000.

International Business Machines Semiconductor Manufacturing Facility

FINAL PROJECT AGREEMENT SIGNED JULY 31, 2000

Background

Project Sponsor: International Business Machines (IBM) Essex Junction, Vermont, is a semiconductor facility located in Chittenden County near Burlington, Vermont. The facility property encompasses approximately 735 acres, which are divided by the Winooski River. The manufacturing facility lies on 243 acres west of the Winooksi River in Essex Junction, and the remaining property contains non-manufacturing buildings. The Essex Junction facility manufactures and tests semiconductor logic devices through a complex, multistep manufacturing process. In addition to the 7,500 IBM employees working at the site, there are approximately 1,500 contractors working onsite on any given day.

The Experiment: IBM has recently developed an innovative copper metallization process to create electrical interconnections between device levels for new semiconductor technologies. This process replaced the aluminum chemical vapor deposition process, a dry process used in previous generation semiconductor device technologies. This innovative metallization process is environmentally superior to the old process. This new process greatly reduces the use and emission of perfluorinated compounds (PFCs), a cleaning agent for the aluminum deposition process, which are significant global warming gases. In addition, the process is also 30 to 40 percent more energy efficient and produces chips that are approximately 25 percent more energy efficient.

In designing the process, IBM worked with the manufacturers of the plating solutions and the manufacturer of the plating tool to minimize waste and increase efficiency. The copper metallization process uses this specialized tool to bring the microchips into contact with the copper plating solution and apply an electrical current to plate the copper onto the chip surface. During the process, the semiconductor chips are rinsed with sulfuric acid and deionized water. The rinse water resulting from the copper metallization process, approximately 3,000 gallons per day, is combined with the other wastewater generated at the facility, approximately 4 million gallons per day. These wastewaters are sent to the facility's wastewater treatment plan, which produces sludge as a byproduct of wastewater treatment. EPA currently considers IBM's process a traditional electroplating process for purposes of the Resource Conservation and Recovery Act (RCRA). Under RCRA regulations, sludge or solids created from the treatment of wastewaters that include rinse waters generated from an electroplating process are listed as F006 wastes and are therefore considered hazardous wastes (40 CFR 261.31).

IBM believes that the classification system used by RCRA artificially inflates the company's hazardous waste generation numbers, fails to provide additional environmental protection, and increases the paperwork and reporting burden. EPA and IBM believe an evaluation of the "production side" of the sequence of operations that results in the wastewater treatment sludge would be more useful. The wastewater treatment sludge is considered hazardous due to an "upstream" production unit that meets the definition of a RCRA electroplating operation. With this project, EPA will evaluate the upstream production unit to determine whether the engineering and chemistry associated with the process in question contains any constituents or conditions capable of producing a hazardous waste. EPA will focus on the key parameters on the production side to make a determination of the regulatory status of the waste materials generated.

The Flexibility: In September 2000, EPA exempted the copper metallization manufacturing process at the Essex Junction facility in a site-specific rule, rather than delisting the wastewater treatment sludge, which would normally occur through EPA's delisting process under 40 CFR 260.22. The exemption was based on the fact that the new process is significantly different from the industrial

processes evaluated to establish the regulation on wastewaters and sludge resulting from plating processes. Additionally, the chemicals used in IBM's process do not contain any of the contaminants listed in Appendix VII of 40 CFR 261, which are the focus of the original F006 definition. This exemption does not apply to the spent plating bath, which will continue to be drummed and disposed of as required by RCRA regulations.

The Vermont Department of Environmental Conservation (VTDEC) has also adopted a site-specific rule for the state that will exempt the wastewater sludge from IBM's copper metallization process through a site-specific exemption, contingent on any federal standards that are adopted (under Section 7-203 of the Vermont Hazardous Waste Management Regulations). In addition, the State of Vermont had previously waived its hazardous waste tax, saving IBM approximately $225,000 per year.

Other Innovations: *(1) Testing Regulatory Approaches.* This XL project offers EPA the opportunity to test a different approach to reevaluating whether a specific wastestream is appropriately subject to regulatory controls as a listed waste. This process exemption approach is innovative in that EPA is evaluating an upstream manufacturing process to see whether it is capable of producing a hazardous waste, rather than delisting the wastewater treatment sludge, which would normally occur through EPA's delisting process under CFR 260.22. *(2) Testing New Technology.* This XL project may help semiconductor chipmakers accelerate their transition to the higher-speed, lower-cost, copper-based devices that are manufactured through an innovative process that is environmentally superior to the old process, aluminum chemical vapor deposition. In addition, an industry-wide switch to the copper metallization process would significantly reduce greenhouse gas emissions because the copper metallization process requires fewer cleaning steps that use certain greenhouse gases.

The Superior Environmental Performance: The implementation of the copper metallization process results in reduced greenhouse gas emissions at the IBM Burlington plant, especially PFCs. In addition, this process is 30 to 40 percent more energy efficient than the traditional process and produces microchips that are approximately 25 percent more efficient. This XL project may help semiconductor chipmakers accelerate their transition to the higher-speed, lower-cost, copper-based devices that are manufactured through the innovative copper metallization process that is environmentally superior to the old process, aluminum chemical vapor deposition. An industry-wide switch to the copper metallization process would significantly reduce the emissions of PFCs because the copper metallization process requires fewer cleaning steps that use those greenhouse gases.

The exemption of the copper metallization process results in treatment sludges that are not regulated under RCRA and have the potential to be reused. The reuse of this sludge would result in conservation of landfill space and the conservation of raw materials that would be used in place of the sludge. IBM has also decided to redirect the cost savings for this exemption, along with an additional $2.0 million, into an effort, which will result in a 40 percent (normalized to production) reduction in greenhouse gas by 2002, using 1995 as a base year.

Progress in Meeting Commitments
(As of July 2001)

- EPA finalized a site-specific rule on September 12, 2000, via the Federal Register, that will provide a site-specific exemption of the wastewater treatment sludge produced from IBM's copper metallization process from 40 CFR 261.31.
- The VTDEC issued a site-specific rule for the IBM facility on March 15, 2001.
- IBM has already implemented the copper metallization process on some lines and is expanding it to others. The sludge from the copper plating process became exempt from the RCRA F006 classification on March 15, 2001.
  - IBM submitted its first report regarding the monitoring of copper metallization plating bath, rinse waters, and PFC emissions on July 12, 2001.

- IBM is discussing use of the sludge as an ingredient in the manufacture of cement with a cement kiln.

- IBM will channel its cost savings from not having to handle the sludge as hazardous waste to supplement an additional voluntary effort to reduce greenhouse gas emissions from its chamber cleaning processes.

  – IBM is investing an additional $2 million at its Vermont facility to significantly reduce the facility's overall greenhouse gas emissions and expects that these efforts will help reduce the overall greenhouse gas emissions at the facility by approximately 40 percent in the year 2002 when measured against 1995 emissions of 93,000 metric tons of carbon equivalent.

Benefits for the Environment

- The exemption of the copper plating process at this IBM facility reduces the amount of defined hazardous waste generated by the facility. This, in turn, results in a reduction of the amount of waste to be transported and placed in RCRA-regulated hazardous waste landfills.

- Implementation of the copper metallization process results in reduced greenhouse gas emissions. The use of PFCs, which are greenhouse gases, as chamber cleaning agents in the manufacturing process is minimized in the copper metallization process.

- The new copper metallization process is 30 to 40 percent more energy efficient than aluminum vapor chemical deposition. The new technique produces semiconductor chips that are 25 percent more energy efficient.

- IBM is voluntarily channeling its cost savings from the reclassification of the sludge as non-hazardous to supplement an additional voluntary effort to reduce greenhouse gas emissions from its other chamber cleaning operations.

Benefits for Stakeholders

- IBM continues to keep an open dialogue with interested stakeholders about the development of the project. This process gives stakeholders the opportunity to gain more knowledge about the semiconductor manufacturing facility.

Benefits for the Project Sponsor

- IBM will realize a decrease in the administrative requirements and taxes associated with the generation of hazardous waste.

Information Resources: The information sources used to develop this progress report include (1) the FPA for the IBM XL Project: Copper Metallization, dated July 31, 2000; (2) the Project XL Site-Specific Rulemaking for the IBM Semiconductor Manufacturing Facility in Essex Junction, Vermont, dated September 12, 2000; and (3) the *2000 Project XL Comprehensive Report, Volume 2: Directory of Project Experiments and Results*, November 2000.

International Paper Effluent Improvements

FINAL PROJECT AGREEMENT SIGNED JUNE 29, 2000

Background

The Project Sponsor: International Paper's (IP) Androscoggin Mill is a large integrated Kraft pulp and paper mill and a major manufacturer of coated paper and specialty paper. The facility includes a wood yard, two wood rooms, utilities, two continuous pulp digesters, two bleach plants, and five paper machines. The plant is located in Jay, Maine, adjacent to the Androscoggin River and has been in operation since 1965. It produces approximately 1,860 tons of paper per day and has 1,200 employees. The facility was in EPA New England's (Region 1) 1996 Environmental Leadership Program, was a participant in the StarTrack Program, and has won numerous Governor's Awards for Environmental Excellence. The facility is currently a charter member of EPA's national Performance Track program.

The Experiment: IP seeks a regulatory exemption from the best management practices (BMPs) required under the water portion of EPA's Pulp and Paper Cluster Rules (40 CFR 430.03) in order to reinvest resources to implement effluent improvement projects. These effluent improvement projects will be designed specifically to reduce final effluent discharge of chemical oxygen demand (COD) and color through process modification to the black liquor cycle—a chemical cycle that is used to break down wood fibers to create pulp and paper. The exact mix of projects will be identified through a collaborative process with IP, EPA, Maine Department of Environmental Protection (ME DEP), the Town of Jay, and active stakeholders. EPA and IP anticipate that implementation of these effluent improvement projects will yield greater COD and color reduction than compliance with the Cluster Rule's BMPs. The facility will design and implement the effluent improvement projects with the assistance of the Technical Assessment Group and Collaborative Process Team, and the facility's effluent discharge permit will later be modified to reflect the resulting performance gains.

The Flexibility: Through this experiment, IP will receive a regulatory exemption from applicable BMP requirements, which will be replaced with targeted, facility-specific effluent improvement projects and with quantitative, enforceable permit limits. This exemption would be in effect as long as IP continues to implement the XL project as outlined in the FPA. In exchange for this exemption, IP is taking a number of steps designed specifically to improve the mill's effluent quality for COD and color beyond levels to be attained through implementation of BMP requirements.

Other Innovations: *(1) Use of Collaborative Process and Technical Teams for Continuous Improvement*. Environmental decision making and planning is often an insulated process, which often only involves facility personnel. This project provides an innovative feature that guarantees input from stakeholders, regulators, and facility representatives throughout the life of the project. Most importantly, they are allowed to play a distinctive role in environmental decision making and planning for the facility—an approach never tested before to this extent in Project XL. *(2) New Technologies to Improve Effluent Limits.* This project provides a concrete opportunity to evaluate applicable new effluent technologies that are tailored to a mill's specific operations and to determine the extent of environmental improvement beyond what would be attained by more rigid adherence to existing regulations. Beyond the impact on the IP Androscoggin Mill, the results of this project may help clarify the parameters for applying new effluent technologies at other similar pulp and paper mills through technology transfers (such as presentations at conferences). In addition, this project may serve to inform EPA's future rule making regarding regulations for COD and color relevant to pulp and paper mills.

The Superior Environmental Performance: The superior environmental performance in this project will be derived from the following efforts: (1) Use of the collaborative partnership between

regulators, industry, and environmental groups to work together to identify the most important pollution projects; (2) the effluent improvement projects described in the FPA (that IP plans to implement at the facility); (3) the Phase 1 COD and color limits that IP will accept into their discharge permit representing the baseline from which superior environmental performance will be measured; (4) the performance goals (in place of the more flexible BMPs otherwise required by EPA's applicable regulations); and (5) the more stringent Phase 2 COD and color limits IP will accept once the effluent improvement projects have been implemented and monitored.

In proposing its XL project, IP considered its current activities and practices taking place at the Androscoggin Mill advanced enough to be functionally equivalent to performance expected to result from compliance with the BMPs required under the Pulp and Paper Cluster Rules.

Progress in Meeting Commitments
(As of August 2001)

Overall, IP has been able to meet all of its environmental commitments to date for the project.

- IP accepted Phase 1 permit limits for COD and color into its National Pollution Discharge Elimination System (NPDES) permit when it was reissued.
- IP will work in good faith towards identification, implementation, and completion of the effluent improvement projects within three years of signing the FPA.
  - IP is fully participating in all aspects of project identification and implementation.
- IP will provide biannual reports to the Collaborative Process Team on progress made toward implementing the effluent improvement projects and achieving the associated milestones and performance goals.
  - Progress reports on the IP project are being prepared quarterly by the University of Maine.
- EPA will reissue IP's NPDES permit (if ME DEP does not receive authority to implement the water permitting program).
  - EPA gave ME DEP NPDES permit delegation authority in late 2000.
- EPA will promulgate a site-specific rule when the FPA is signed that exempts IP's Androscoggin's Mill from the BMP requirements for 40 CFR 403.03 (subject to consideration of public comment).
  - EPA signed the site-specific rule on July 27, 2000.
- EPA will participate in good faith on the Technical Assessment and Collaborative Process Teams and make decisions expeditiously.
  - EPA representatives participate in monthly meetings of both the Collaborative and Technical teams.
- ME DEP will amend IP's state discharge license.
  - ME DEP is currently working on the discharge license.
- ME DEP promulgated a site-specific rule pursuant to this XL project after the FPA was signed, which exempted IP's Androscoggin mill from the BMP requirements of 40 CRF 403.03 (subject to consideration of public comment).
- ME DEP will participate in good faith on the Technical Assessment and Collaborative Process Teams and make decisions expeditiously.
  - ME DEP participates in monthly meetings of the Collaborative and Technical project teams.

In addition to meeting the commitments in the FPA, IP has accomplished the following:

- *Effluent Improvement Project Identification.* The mill has been active in identifying and reducing waste streams that contribute to black liquor COD and Color. IP has spent

approximately $350,000 of the $780,000 it allocated for capital and this XL project to date.

- *Implementation of Effluent Improvement Projects*. Overall, the effluent improvement projects implemented under the XL project have resulted in a reduction in COD discharge of about 36 percent relative to the situation that existed in 1999. These projects have reduced the COD discharge of the pulp mill from about 57 to 36 kilograms COD/metric ton pulp. The projects implemented to date have resulted from closing up the screen rooms in the A and B pulp mills. Implementation of the two remaining approved projects will reduce COD discharge further.

Benefits for the Environment

- Replacing generic BMPs with targeted, facility-specific effluent improvement projects based on COD and color limits and performance measures represents major progress in reducing toxic effluent levels from pulp and paper mills. These effluent improvement projects ultimately will contribute to improved ambient water quality downstream in the Androscoggin River.

- The methodology developed to identify COD and color point sources is transferable and can be used by other paper mills seeking to improve effluent.

- The facility-wide study has led IP to investigate other methods to reduce pollutant discharges from the paper mill portion of the facility independent of the XL project.

Benefits for Stakeholders

- The Collaborative Process Team represents an innovative feature that guarantees input from stakeholders, regulators, and facility representatives throughout the life of the project. Most importantly, they are allowed to play a distinctive role in environmental decision making and planning for the facility—an approach never tested before to this extent in Project XL.

Benefits for the Project Sponsor

- Implementing the effluent improvement projects has resulted in significant costs savings for IP from recovery and recycling chemicals used in pulp and paper mill. Furthermore, IP is demonstrating its continued commitment to environmental innovation and leadership in the pulp and paper mill industry.

Information Resources: The information in this progress report comes from the following sources: (1) Final Project Agreement; (2) *2000 Project XL Comprehensive Report, Volume 2: Directory of Project Experiments and Results*, November 2000; and (3) three quarterly reports (August 9, October 18, December 28, 2000) on the project prepared by Professor Joseph M. Genco and Adriaan van Heinigen, Department of Chemical Engineering, University of Maine, Orono, Maine.

International Paper Predictive Emissions Monitoring

FINAL PROJECT AGREEMENT SIGNED APRIL 20, 2000

Background

The Project Sponsor: International Paper's (IP) Androscoggin Mill is a large integrated Kraft pulp and paper mill and a major manufacturer of coated paper and specialty paper. The facility includes a wood yard, two wood rooms, utilities, two continuous pulp digesters, two bleach plants, and five paper machines. The plant is located in Jay, Maine, adjacent to the Androscoggin River and has been in operation since 1965. It produces approximately 1,860 tons of paper per day and has 1,200 employees. The facility was in EPA New England's (Region 1) 1996 Environmental Leadership Program, is a participant in the Star Track Program, and has won numerous Governor's Awards for Environmental Excellence. The facility is currently a charter member of EPA's national Performance Track program.

The Experiment: IP's Androscoggin Mill will develop, test, and validate a state-of-the art innovative computer model that can accurately predict pollutant [particulate matter (PM), sulfur dioxide (SO_2), and nitrogen oxides (NO_x)] emissions on a continuous basis. The computer model is called a predictive emissions monitoring system (PEMS). The PEMS will be installed on the waste fuel incinerator (WFI)—a type of boiler that burns paper mill paper, sludge, bark, and fuel oil to produce steam—and is monitored for emissions annually at the stack. The PEMS would develop a relationship between the WFI operating conditions (i.e., burn rates and fuel type), steam production, and emission rates to continuously predict pollutant emissions. The PEMS technology may also be able to optimize the relationship between emission rates and steam production rates identifying the operational setting so the WFI can be operated at minimum emissions and with maximum steam production. IP will also test PEMS to see that it is providing instant compliance information, allowing mill operators to prevent potential noncompliance situations and stay within permitted limits. PEMS have been developed and used for simple stacks such as gas-fired boilers, but until recently have had only limited application for complex stacks such as the WFI. The PEMS will be developed and tested on the WFI for 30 months. Three formal validation tests, developed by EPA's Office of Air Quality Planning and Standards, will be performed on the PEMS model. The formal validation tests will test emissions in order to collect data to develop and evaluate the accuracy and precision of the PEMS. At the completion of the annual model specifications test—which comes after the third validation test—the project will have tested the PEMS in the following ways:

- To determine if the PEMS technology can provide accurate, continuous information for PM emissions from a complex boiler (WFI);
- To determine if PEMS can assist in reducing emissions while maintaining a high rate of steam production;
- To determine key operating parameters that affect emissions and potential exceedences; and
- To determine if PEMS technology is transferable to other complex emission sources including those with high moisture content.

The Flexibility: This project seeks regulatory flexibility under Title V, section 502 of the Clean Air Act, as necessary, through a Testing Agreement. The agreement allows IP to briefly exceed its air pollution license limits under controlled and limited circumstances on the WFI during the testing of the PEMS computer model. As specified in the FPA, IP will offset any emissions exceedences by emission reductions at the mill's other stacks. The ability to exceed license limits during model development, testing, and modification of PEMS is the only way that IP can ensure that the PEMS model will accurately predict actual exceedances if they occur once the PEMS is operating. The FPA provides the terms and limitations of any potential exceedances during the testing of PEMS. IP will also be allowed to replace their continuous

emission monitors with PEMS if it is shown that PEMS does accurately provide continuous emissions data.

Other Innovations: *Pollution Prevention.* PEMS identifies operating parameters and uses them to predict emissions and link them to statistically significant parameter settings, which represents a change from traditional "end-of-pipe" monitoring techniques. This project promotes pollution prevention by identifying opportunities for source reduction and allowing IP to set voluntary goals to reduce emissions through preventative measures.

The Superior Environmental Performance: The primary environmental benefit of this project is the increased information on environmental emissions, especially on particulate matter, and the enhanced ability to adjust emissions before any exceedances actually occur. IP also voluntarily agrees to commit to maintain operations at a level equal or less than 90 percent of its maximum permitted emission limits. In addition, IP will seek to optimize production so that emissions decrease while production remains the same or increase.

Progress In Meeting Commitments
(As of August 2001)

Overall, IP is meeting its project commitments to date.

- IP committed to develop, implement, and evaluate the PEMS in accordance with the terms of the FPA, the Testing Agreement, and the Test Plan.
  - These processes are ongoing and are underway at the Androscoggin Mill.
- IP committed to supplying monitoring and summary reports on project progress.
  - The summary reports will be included in an IP Progress Report, which is in development and will be completed when test data are final. This is expected to occur within 25 months of the testing, or summer 2002.
- IP voluntarily committed to keep emissions from the WFI at equal to or less than 90 percent of permitted limits for the duration of the project term and to invoke the necessary process adjustments when predicted emissions approach 90 percent of permitted limits on the WFI.
  - Unofficial data were collected during Formal Data Validation Test #1 for two months in the fall of 2000, including over 370 15-minute separate tests and 93 separate conditions. These data indicate that emissions are far below the 90 percent of permitted limits; WFI emissions during testing indicate that emissions will be half of the permitted limits. Unofficial data also indicate that the WFI can operate at maximum production in terms of steam and not exceed emissions limitations. In December 2000, data from sampling were calculated and tabulated for use in developing the PEMS model. Currently, the data are being statistically compared to determine how well the model can predict emission rates. During testing, there were the expected exceedences of emissions license limits; however, these did not last longer than 15 minutes and they did not impact National Ambient Air Quality Standards.

Benefits for the Environment

- The PEMS model, once fully developed, will be able to forecast and prevent air emission exceedances before they occur at the Androscoggin Mill plant.
- The ability to predict emissions from a complex, saturated stack on a continuous basis is significant to IP and other facilities. There has been very limited application of PEMS for complex stacks with high moisture content. This project will help demonstrate if this technology can be transferred to complex boilers, kilns, and incinerators. The goal is to have PEMS-generated information used by operators to decrease emissions while maximizing production.

Benefits for Stakeholders

- IP has been active in engaging stakeholders from the local community and non-governmental organizations. Most noteworthy is IP's involvement with the Town of Jay High School, which is encouraging students to be interested in science and environmental technologies with this project. The IP project manager has given presentations to the Jay High School Science Club regarding the project, and in turn a student presented information on the project to the Androscoggin Watershed Council. The students have also had the opportunity to observe work conducted during the testing at the mill.

Benefits for the Project Sponsor

- Currently under the Clean Air Act, IP is required to conduct continuous emissions monitoring (CEM) for applicable pollutants. This project will provide IP with flexibility to remove the CEM requirement for SO_2 and NO_x. If the PEMS implementation is successful, it will provide continuous monitoring for all of the WFI pollutants, thereby eliminating the need for CEM.

- If PEMS proves to be successful, IP can implement PEMS to monitor SO_2, NO_x, and PM and replace the requirement to stack test for PM emissions every two years. The testing required by IP would then be an annual test of the PEMS.

Information Resources: The information in this summary was obtained from the following sources: (1) the FPA for the International Paper PEMS Project, April 20, 2000; and (2) the *2000 Project XL Comprehensive Report, Volume 2: Directory of Project Experiments and Results*, November 2000.

Jack M. Berry Corporation

FINAL PROJECT AGREEMENT SIGNED AUGUST 8, 1996
PROJECT CLOSED OUT JUNE 2, 1999

Background

The Project Sponsor: Jack M. Berry is a mid-size citrus juice-processing company. The company's facility in LaBelle, Florida, is the site of the Project XL pilot. It is located 30 miles east of Fort Myers at the site of Berry's largest grove, consisting of about 10,000 acres of orange and grapefruit trees.

The Experiment: The Berry project's goal was to establish a process by which Berry would prepare a Comprehensive Operating Permit (COP) in partnership with the Florida Department of Environmental Protection, South Florida Water Management District, and EPA. The COP would have been a multimedia permit that was part of a streamlined permitting approach that was expected to better integrate plant operation and compliance procedures, as well as eliminate unnecessary administrative requirements.

The Flexibility: Under the COP, the State of Florida and EPA would have relieved Berry of administrative and procedural rules that require the preparation and certification of multiple permit renewal applications every few years. Flexibility in Florida regulations governing the permit application process would have allowed Berry to accelerate its permit application process. The streamlined permitting approach was anticipated to result in cost savings that Berry would have reinvested in new environmentally beneficial operating procedures. The burden on EPA and the State of Florida to review and issue permits would have been reduced as well.

Other Innovations: *(1) Reduction in Reporting Burden.* The State of Florida would have allowed Berry to use nonstandard forms for reporting environmental performance, which would be simplified and part of the approved COP. The State of Florida might not have required Berry to have its environmental reports certified by a professional engineer, because the COP would have been more comprehensive than a certified professional engineer's application. *(2) Environmental Management System (EMS).* Berry had committed to instituting the International Organization for Standardization (ISO) 14000 EMS program as a means to systematically manage continuous environmental performance, including pollution prevention and source reduction strategies. *(3) Standard Operating Procedures.* Berry had intended to complete detailed, yet easy-to-follow, work instructions for implementing the COP that ultimately would have been linked to the EMS, to raise the level of employee environmental awareness and contributions to permit compliance.

The Superior Environmental Performance: Berry would have reduced air emissions of volatile organic compounds (VOCs), sulfur dioxide (SO_2), and nitrogen oxides (NO_x) through voluntary installation of updated equipment and implementation of updated citrus-processing procedures. Berry would have also reduced the amount of hazardous and solid waste generated by the facility through pollution prevention, reduction, and recycling.

Progress in Meeting Commitments
(As of closeout on June 2, 1999)

The Berry project was unique in that it experienced a change in management. Through a lease agreement signed in 1997, Cargill, Inc.,[8] became the new operator of Berry's LaBelle, Florida, facility. As a result, for the Berry XL pilot project to continue, Cargill would have had to become a party to the FPA. Work on development of the COP was put on hold in late 1997 pending a decision by Berry and Cargill regarding continuing the project. Getting to a final decision on the project's future, however, proved elusive. Since further progress appeared unlikely, three years after the project agreement was signed, EPA and the State of Florida chose to terminate the agreement in June 1999.

[8] Cargill is an international marketer, processor and distributor of agricultural, food, financial and industrial products with some 80,600 employees in more than 1,000 locations in 65 countries and with business activities in 130 more.

Therefore, the LaBelle facility remains part of the traditional regulatory system under federal, state, and local regulations.

- The Berry facility met some of its project commitments even though work on the COP was not completed. In 1997, Berry reported that the facility had:
  - Developed some standard operating procedures and detailed work instructions;
  - Eliminated an 88-acre spray field in 1997 that had been used for wastewater disposal since 1974;
  - Reused treated industrial wastewater produced by the facility for irrigating a 1,400-acre section of citrus groves;
  - Installed a more efficient peel dryer to reduce citrus processing VOC emissions;
  - Begun work on meeting commitments to reduce disposal of solid waste and increase scrap metal recycling; and
  - Begun work to reduce the number and types of solvents and lubricants used on-site.
- Because the COP had not been completed, there was no progress by Berry on:
  - Preparing an emissions reduction strategy for SO_2, NO_x, and VOCs and reporting on its results;
  - Providing information on the amount of solid waste and scrap metal recycled by December 1998. (In February 1997, the company reported that solid waste recycling was initiated and scrap metal recycling was increased.);
  - Providing information on the quantities of hazardous materials eliminated through a self-audit program, on the preparation of an inventory of spray-can solvents and lubricants used on-site, and on the replacement of some hazardous materials with environmentally friendly alternatives;
  - Establishing a target date for completing the documentation of implementing the new ISO 14000 EMS;
  - Involving stakeholders in the development and implementation of the final COP; and
  - Voluntarily meeting drinking water standards equal to half of the maximum contaminant levels (MCLs) allowed under the Safe Drinking Water Act (SDWA) and the Florida Administrative Code. Test data indicated that, except for radionuclides, Berry either met a voluntary drinking water standard equal to half of the MCLs allowed under the SDWA or was not able to detect the contaminant. However, there was information on progress toward reducing radionuclide levels.

Benefits for the Environment

- In 1997, the company reported that the effort to develop easier-to-follow work instructions had led to continuous improvement in environmental performance by reducing incidences of minor environmental violations.
- The elimination of the 88-acre spray field removed an odor problem.
- Treated industrial wastewater produced by the facility was reused to irrigate a 1,400-acre section of citrus groves.

Benefits for Stakeholders

- The stakeholder participation for this project was not evaluated because it would have been linked to the COP development, which never occurred.

Benefits for the Project Sponsor

- In 1997, Berry reported that the preparation of standardized work procedures increased the Berry facility staff's awareness of the environmental aspects of their jobs. The improved work procedures also standardized environmental testing at the facility and raised its level

of compliance by reducing its incidences of minor violations of environmental regulations.

Information Resources: The information in this summary comes from the following sources: (1) the March 1998 *XL Project Progress Report—Jack M. Berry, Inc.*, (EPA-100-F-99-003); (2) focus group discussions in December 1999 with representatives of the federal and state regulatory agencies, Jack M. Berry, Inc., and Cargill, Inc.; and (3) the *Project XL Preliminary Status Report* (EPA-100-R-98-008).

Labs21

FINAL PROJECT AGREEMENT SIGNED SEPTEMBER 7, 2000

Background

The Project Sponsor: Growing out of efforts to improve the environmental performance of their own laboratories, EPA and the U.S. Department of Energy (DOE) developed Laboratories for the 21st Century (Labs21), a voluntary program designed to improve the environmental performance of our nation's laboratories. The primary guiding principle of the Labs21 program is that improving the energy efficiency and environmental performance of a laboratory requires examining the entire facility from a "whole building" perspective. Adopting this perspective allows laboratory owners to improve the efficiency of the entire facility, rather than focusing on specific laboratory components. Labs21 is dedicated to the pursuit of sustainable, high-performance, and low-energy laboratories that will (1) minimize overall environmental impacts, (2) protect occupant safety, (3) optimize whole building efficiency on a life-cycle basis, and (4) establish goals, track performance, and share results for continuous improvement.

The Experiment: EPA's Office of Administration and Resources Management (OARM) and the Office of Environmental Policy Innovation (OEPI) in the Office of Policy, Economics and Innovation have set in place a customized and expedited review process to provide regulatory or administrative flexibility under Project XL to enable laboratories to maximize environmental performance under Labs21. Although flexible incentives are available to laboratories through the existing XL program, laboratories under the Lab21 program will enjoy a streamlined application and selection process. In the first phase of this project EPA is working internally and with laboratories to synchronize the Labs21 and Project XL applications and review processes. The second phase of the Labs21 XL project will be to develop and issue case-specific agreements for testing innovative ways to maximize environmental performance at laboratories.

The Flexibility: The project signatories to the Labs21 FPA are EPA's OEPI and OARM. The FPA functions as an "umbrella FPA" and does not describe any specific federal regulatory flexibility. Rather, Labs21 seeks to create environmental showcase laboratories by encouraging laboratory owners, operators, and designers to partner with EPA and DOE and to adopt the Labs21 approach. Specific regulatory flexibility will be negotiated in the second stage of the project, including specific details on regulations, policies, or programs under which the flexibility is to be granted, since the wide range of research activities conducted by laboratories are subject to a variety of EPA regulations; for example, Resource Conservation and Recovery Act, Emergency Planning and Community Right to Know Act, Clean Air Act, Clean Water Act, and Toxic Substance Control Act. Because the agreements may be with single or multiple Labs21 partners, flexibility may be granted on a facility, group, or media level.

Other Innovations: *Promoting Energy Efficiency Lessons in Other Agency Innovation Programs.* While the Labs21 program is innovative in its focus on laboratories in the United States, its emphasis is on improving the energy efficiency of the whole building rather than the components of the lab individually. Examining energy and water requirements from the comprehensive building perspective promoted by Labs21 can identify significant opportunities to improve efficiencies across all types of commercial structures. EPA intends to take what it learns from the Labs21 XL project and transfer lessons learned to other innovative Agency programs designed to help reduce pollution by promoting energy and water efficiency such as EPA's ENERGY STAR and Water Alliances for Voluntary Efficiency (WAVE) programs.

The Superior Environmental Performance: The Labs21 program is establishing partnership agreements with over a dozen public and private sector pilot partners. EPA and DOE are working with each partner to define a specific project, set voluntary energy reduction and environmental performance goals, and measure and report the success of their efforts. The lessons learned from the pilot phase will be applied once the Labs21 program is fully implemented. The following is a sample of

the types of projects these partners have committed to:

- Bristol-Myers Squibb is planning an 80,000 square-foot addition to its existing facility in Wallingford, Connecticut. Of that, 56,000 square feet will be new laboratory space. Bristol-Myers Squibb has made a commitment to design, install, and operate equipment to reduce both energy and water consumption at this site.

- Wyeth-Ayerst (Wyeth) Pharmaceuticals has two projects in the Labs21 program. The first is a renovation of its 1.2 million square-foot Collegeville, Pennsylvania, headquarters and research and development campus. Wyeth intends to make the campus a benchmark for resource efficiency and sustainability among similar facilities worldwide.

- The second project is Wyeth's new Vaccine Discovery Research Facility in Pearl River, New York. This laboratory will be designed, built, and commissioned to achieve a LEED™ gold rating or better. LEED™ is a rating system created by the U.S. Green Building Council to evaluate the sustainable design and performance of a given facility.

- The National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service is in the process of renewing its 50-year old laboratory in Honolulu, Hawaii. NOAA is planning to construct a state-of-the-art fisheries research laboratory that fully embraces sustainable design and energy conservation measures. In addition to taking the whole building philosophy to design, NOAA is maximizing energy-efficient equipment and "green" building products.

- The National Renewable Energy Laboratory's Science and Technology Facility, located in Golden, Colorado, will take a whole building approach to design; incorporate daylighting in most areas, including most labs; develop and implement an aggressive energy budget; and allow for easy future additions of building integrated photovoltaics as an electricity source.

Progress in Meeting Commitments
(As of November 2001)

The Labs21 program is still in its initial stages. To date, no Labs21 partners have expressed an interest in pursuing regulatory flexibility through the XL program. OARM will continue to promote the XL component of the Labs21 program to participating partners. Once a partner expresses interest, OARM will coordinate with OEPI to take advantage of the Labs21 XL framework and ensure the partner has access to the resources of the XL program. If project partners use regulatory flexibility potentially available to them under XL, the following commitments would be applicable:

OARM

- Cooperating with EPA's OEPI to ensure that information requested under Labs21, including enforcement and environmental information, is sufficient to support the analytic needs of the XL review.

- Outlining environmental commitments for Labs21 partners.

- Forwarding requests from Labs21 partners for flexibility to OEPI, including proposed commitments for achieving superior environmental performance.

- Reviewing Labs21 partners' progress in achieving environmental commitments under Labs21.

- Notifying OEPI if a lab fails to achieve the stated goals.

- Participating in discussions with OEPI regarding any possible need to revoke flexibilities granted to Labs21 partners.

- Adhering to additional commitments as outlined in any subsequent addenda.

- Coordinating implementation of a nationwide support system to build regional capacity for Labs21 and a referral process to coordinate the Project XL implementation.

OEPI

- Cooperating with OARM to ensure information requested, including enforcement and environmental information, is sufficient to support the analytic needs of the XL review.
- Reviewing requests from Labs21 partners for flexibility and completing any rule makings necessary.
- Upholding the XL process, including commitments to involve stakeholders and ensure sponsors have satisfactory compliance records.
- Revoking any previously granted flexibility if such an action should be necessary as a result of a joint determination by OARM and OEPI.
- Adhering to additional commitments as outlined in any subsequent addenda.

Labs21 Partners

- Submitting information necessary to complete the Labs21/XL review.
- Striving to achieve the environmental goals outlined in any case-specific agreements.
- Undertaking specific actions such as capital improvements or operational changes that were agreed to as part of demonstrating pursuit of improved environmental performance.
- Reporting on progress towards enforceable commitments and compliance with any enforceable requirements.
- Notifying OEPI if the laboratory is likely to fail or is failing to achieve the stated goals.
- Adhering to additional commitments as outlined in the FPA addendum.

Benefits for the Environment

- It is estimated that the typical laboratory currently uses five times as much energy and water per square foot as the typical office building. EPA and DOE estimate that laboratories using the Labs21 approach can decrease energy consumption by 60 to 75 percent.
- Assuming that 50 percent of U.S. laboratories achieve a 30 percent reduction in energy consumption, the U.S. could reduce its annual energy consumption by 84 trillion British thermal units (Btus), equal to the energy consumed by 2.2 million households.
- Conserving 84 trillion Btus of energy would decrease carbon dioxide emissions by 16.7 million tons, equivalent to removing 3 million automobiles from highways or preserving 56 million trees from harvest. Reducing carbon dioxide emissions can help alleviate potential human-influenced, adverse effects on the global climate. An efficiency improvement of this magnitude would save $1.2 billion annually.

Benefits for Stakeholders

- In addition to protecting the environment and saving money, more funds would be made available for scientific research, and the potentially large pool of participants would drive the demand for energy-efficient and renewable energy building technologies and building concepts.

Benefits for the Project Sponsor

- Laboratories making modifications to their facilities to improve environmental performance and increase energy efficiency have access to flexible incentives through the XL program. OARM and OEPI have a customized and expedited review process to provide regulatory or administrative flexibility under Project XL to enable laboratories to maximize environmental performance under Labs21.

Information Resources: The information in this summary comes from the following sources: (1) the FPA for Labs21 Project, signed September 7, 2000; and (2) the *2000 Project XL Comprehensive Report, Volume 2: Directory of Project Experiments and Results*, November 2000. Additional information on the Labs21 program can be found at *http://www.epa.gov/labs21century.*