Control of Incidental Asbestos Exposure at Hazardous Waste Sites

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This paper discusses asbestos regulations that are not part of Superfund and examines how these regulations can help to identify, evaluate and manage the risk associated with Asbestos Containing Material (ACM) at hazardous waste cleanup sites. Unless one knows where to look for ACM at hazardous waste sites, it may go undetected even after all the traditional sampling is done. Although EPA is currently developing a policy for evaluating risk from asbestos exposure at certain Superfund sites, information from existing regulations can be used to manage hazards associated with asbestos exposure at hazardous waste sites. This paper also identifies where to find governmental agency personnel and consultants who may be retained for site-specific help.

Asbestos may be encountered in several different ways at hazardous waste sites that are slated for Superfund or RCRA mandated cleanups. A review of the Record of Decision System (RODS) database reveals that there has been thirty-six Record of Decisions (RODs) signed before March 1991 that address asbestos contamination (See Table I). At seventeen sites, asbestos has been landfilled. Seven sites had asbestos in debris piles and thirteen sites had asbestos in equipment insulation or building materials. Asbestos, a mineral, may be found in the natural geology of the site, or the site may have been an asbestos mine, such as the Atlas and Coalinga Mines in California. The site itself may be a former landfill where manufacturing or demolition debris was buried, such as the Asbestos Dump in Millington, New Jersey. This paper does not address landfills, former mining sites, or other sites where asbestos is the primary contaminant of concern.

Asbestos is often present elsewhere on the site and it may not be detected in the soil, water, or even air samples. Storage tanks, process equipment (including piping), buildings, and insulation are all clues that a variety of asbestos-containing materials may be present. The focus of this paper will be on Asbestos Containing Material (ACM) that may have been used as insulation on pipes, boilers, storage tanks, process equipment, or found in construction materials. To fully characterize the site and properly evaluate the potential exposure risks, all asbestos-containing material must be identified and properly managed.

ACM is regulated differently than other types of material that may be encountered at hazardous waste sites. Clean-up personnel may not be trained to identify and subsequently manage suspect material. Asbestos is not a RCRA characteristic hazardous waste, however, it is on the CERCLA list of hazardous substances. Costs of asbestos abatement if the asbestos was used in building materials or used as insulation may not be reimbursable if it is performed under Superfund. EPA's Office of Emergency and Remedial Response (OERR) in Washington, DC is developing policy on how to assess the health risk from asbestos at Superfund sites, such as an abandoned asbestos mine. This policy does not appear to address the fact that asbestos is often an incidental, or secondary type of pollutant. EPA does however regulate asbestos under the Clean Air Act (CAA) and the Toxic Substance Control Act (TSCA). In the absence of official Superfund guidance, some of the requirements in these regulations could be a beneficial resource to a Regional Project Manager (RPM), On-Scene Coordinator (OSC), or emergency response personnel. In addition, third-party consultants, who may be accredited by EPA, may be retained to identify suspect material and subsequently identify asbestos-containing material. This consultant can assess the site condition, and develop a management plan with specific recommendations on how to reduce the existing and potential health risk.

Asbestos Primer[1]

Asbestos is a name given to a group of naturally occurring minerals consisting of hydrated silicates, crystalline in nature, forming parallel bundles of small fibers that can be broken down linearly into smaller fibers.[2] These minerals consist of two major types: Serpentine and Amphibole.[3] Chrysotile, a fibrous asbestiform Serpentine, is rolled micaceous structures which form hollow fibers. Ninety-three percent of all asbestos used in products is chrysotile. Amphiboles are chain silicates. Their fibers are much more splintery and more rigid than the Chrysotile fibers. Included in this group (in order of decreasing occurrences in products) are: Amosite, Crocidolite, Tremolite, Anthophyllite and Actinolite.

Although asbestos is being phased out of most consumer products,[4] it is still used commercially in specialty paper products, such as gasket material; certain building materials, such as roofing felts and shingles; and friction products, such as elevator brake shoe lining and automobile clutch disks. In the United States, the Vermont Asbestos Group mines and produces Chrysotile. Other major mining sources of asbestos include Canada, South Africa, China, Australia and the U.S.S.R. Rock containing the asbestos mineral is mined with explosives. The blasted rock and rubble go through a series of crushers and screeners. The asbestos material is separated from the rock for further processing, and the waste rock, or tailings, are disposed of in on site waste piles.

Mined asbestos was usually further processed and mixed with other material, such as cement or paper, or was used as a binder or reinforcer. For example, asbestos was often mixed with dry cement and water. This "mud" mixture was trowelled on to pipe fittings, such as elbows and valves, and trowelled onto equipment, such as residential boilers. Canvas wrapped corrugated cardboard impregnated with asbestos, commonly called air-cell insulation, was often used to insulate straight pipe runs. All mixtures of asbestos with another material, such as concrete or paper, are examples of ACM. If ACM was used as a material of construction it also may be known as Asbestos Containing Building Material (ACBM). Before major diseases were linked to asbestos exposure, asbestos was used extensively. Its unique characteristics, combined with its somewhat low installation costs, made it a "miracle mineral" or "miracle fiber." Asbestos fibers were easily broken down and processed into smaller fibers. These fibers were inexpensive and easy to mix with other materials. As thermal insulation, it dissipated heat slowly. It was commonly used in standard commercial boiler and pipe insulation. Asbestos could withstand somewhat high temperatures and was often used for fireproofing. Most contract specifications for steel-framed buildings built during the 1950's and 1960's required sprayed asbestos on structural steel and decking under ceilings for fireproofing. Cloth containing asbestos was used to insulate electrical wire and was even used between the copper skin and the iron bars in the original (before the early 1980's renovation) Statue of Liberty. Because asbestos is also relatively chemically inert, Transite, a cementicious asbestos containing building material, was ideal for laboratory bench tops, panels between steam radiators and exterior walls, and water supply pipes. Other common applications of asbestos include soundproofing and brake-linings.

However, the "miracle fiber" became the "killer fiber." As early as the turn of the century, young women working in textile mills in England, who regularly handled asbestos, contracted asbestosis and died. Insulators and shipyard workers who regularly handled asbestos (probably the best known case history studies) had increased mortality rates.

Health Hazards Associated with Asbestos

Inhalation is the primary, and possibly the only, exposure route of concern. One way to figure out the likelihood of asbestos fibers becoming airborne is to determine the friability of the material. Suspected material is considered friable if it can be pulverized or crumbled under hand pressure alone.[5] This definition of friability may vary significantly under various state and regional regulations. Generally, the more friable the ACM, the greater the chance of asbestos becoming airborne, and consequently inhaled. Therefore, friable material poses the greatest health risks. Normally nonfriable material may become friable under certain conditions; from water damage or excess moisture, or under impact, such as when hit with a wrecking ball. Most, if not all, asbestos regulations are written to minimize human exposure to airborne asbestos.

The three main diseases associated with asbestos exposure (in order of increasing individual mortality are): asbestosis, lung cancer, and mesothelioma. The latency period of all asbestos related diseases is typically 20 to 30 years from exposure. Asbestosis is the most common lung disease associated with asbestos exposure. This disease causes scarring of the lung tissue, also known as pulmonary fibrosis. Asbestos fibers lodge into the surface of the alveoli, the area of the lung where oxygen-carbon dioxide exchange occurs. This lung tissue scars and the effective surface area of the alveoli decreases, thereby reducing the lung's ability to oxygenate blood. Asbestosis was first found in textile workers in England at the turn of the century. It is also known as the disease that many asbestos insulators[6] and shipyards workers[7] contracted from occupational exposure.

Table I. List of sites with ROD's addressing asbestos (2/11/91).

Site name	EPA region	Location	Landfill	Debris pile	Equipment insulation
Mountain View/Globe	9	Globe, AZ	y		
Atlas Asbestos Mine	9	Coalinga, CA		y	
Coalinga Asbestos Mine	9	Coalinga, CA	y	y	
Purity Oil Sales	9	Malaga, CA			y
Rocky Mountain Arsenal	8	Commerce City, CO			
Broderick Wood Products Co	8	Denver, CO			y
Johns-Manville	5	Waukegan, IL	y		
LaSalle Electrical Utility	5	LaSalle, IL			y
Koppers Co/Galesburg	5	Galesburg, IL	y		
Industri-plex	1	Woburn, MA	y		
Iron Horse Park	1	Billerica, MA	y		
Anaconda Co. Smelter	8	Anaconda, MT			y
Cape Fear Wood Preserving	4	Fayetteville, NC			y
Syncon Resins	2	Kearny, NJ			y
Combe Fill South	2	Chester Twp, NJ	y		
Combe Fill North	2	Mount Olive, NJ	y		
Gems Landfill	2	Gloucester Twp, NJ	y		
Diamond Alkali Co.	2	Newark, NJ			y
Nascolite Corporation	2	Millville, NJ			y
Asbestos Dump–Millington	2	Millington, NJ	y	y	
Roebling Steel Co.	2	Roebling, NJ			y
New Lyme Landfill	2	New Lyme, NY	y		
York Oil Company Site	2	Moira, NY			y
Chem-Dyne	5	Hamilton, OH			y
Hardage Criner	6	Criner, OK	y		
Martin Marietta Corp	10	The Dalles, OR	y		
Publicker/Cuyahoga Wrecking	3	Philadelphia, PA			y
Ambler Asbestos Piles	3	Ambler, PA		y	
Landfill and Resource Recovery	1	North Smithfield, RI	y		
Geneva Industries	6	Houston, TX	y		y
Koppers Co.	6	Texarkana, TX			
Midstate Disposal Landfill	5	Cleveland Twp., WI	y		
West Virginia Ordnance	3	Pt. Pleasent, WV		y	

The second disease associated with asbestos exposure is lung cancer. Asbestos exposure alone can cause lung cancer, or the lung cancer can be caused by asbestos exposure combined with some other exposure, such as cigarette smoking. Asbestos exposure combined with smoking has a synergistic effect on the chances to contract lung cancer.[8]

Mesothelioma, by far the most serious disease associated with asbestos exposure, is cancer of the pleural lining of the lung and/or the lining of the abdominal cavity. Although it has not been proven, route of entry is believed to be from inhalation only. Fibers can be broken down to submicron fibrils and migrate through various types of tissue. Mesothelioma may develop many years after small exposures of relatively short duration. Mesothelioma causes the cancerous area to swell and become hard. Death usually occurs within months of positive diagnosis. This cancer is generally believed to be exclusively related to asbestos exposure.

Existing Asbestos Regulations and Superfund Guidance

Though asbestos is not a characteristic hazardous waste or material, it is a known carcinogen, and as such, the cost of removal and ultimate disposal is justified under CERCLA. As a carcinogen, it is regulated outside of the hazardous waste regulations and is sometimes misunderstood by hazardous waste cleanup personnel. The primary focus of the various asbestos regulations is to prevent asbestos from becoming airborne and subsequently inhaled. EPA considers it a toxic air pollutant under the Clean Air Act (CAA) and as a toxic substance under the Toxic Substances Control Act (TSCA). These regulations are intended to control asbestos exposure to the general populace (including school children and public employees). The Occupational Safety and Health Administration (OSHA) of the Department of Labor regulates workplace exposure. State and local regulation are typically combinations of the two and usually include certification for workers, handlers, supervisors and/or sampling personnel.

Clean Air Act

The oldest asbestos EPA regulation, the National Emission Standards for Hazardous Air Pollutants (NESHAPs) in Section 112 of the Clean Air Act, was promulgated to protect public health and welfare from exposure to airborne asbestos. This regulation applies to, among other things, renovation and demolitions, and consists of notification, work practice and disposal requirements. These regulations, which are found in 40 Code of Federal Regulations Part 60 (40 CFR 60), should be cited as an Applicable or Relevant and Appropriate Requirement (ARAR) when asbestos-containing material will be removed from a facility at a Superfund site.

Toxic Substances Control Act (TSCA)

The TSCA regulations address asbestos in schools and certain public employee workplace exposure. The TSCA regulations do not apply to hazardous waste sites, yet, information in the regulations and associated background documents could be used to assess the potential health hazard associated with ACM at clean-up sites. To understand these regulations better, a discussion of their applicability and requirements is provided.

The Asbestos Hazard and Emergency Response Act (AHERA) regulations apply to most primary and secondary school districts. According to these regulations, an EPA-accredited inspector must determine location and assess the condition of suspect ACM and ACBM in the school. An EPA-accredited inspector (and management planner) is someone who has received formal training and must attend annual refresher courses. The inspector must take bulk samples for positive identification, or must assume suspect material to be asbestos. Once the suspect material is identified as containing asbestos, the inspector must assess its condition, friability, and potential for damage. Based on this assessment, a management plan is developed and becomes a pseudo-regulation for the individual school to follow. For each ACM or ACBM identified the management plan must recommend specific action: (a) remove it, (b) leave it alone (repair and periodically monitor), (c) encapsulate or (d) enclose the material.

EPA Superfund (OERR) Guidance

EPA policy for addressing asbestos issues at Superfund sites is under development by OERR. This policy originated from the problem of estimating the health risk from large area asbestos sources (such as tailing piles of a former asbestos mine) on the National Priority List (NPL). This guidance will help RPMs with asbestos sites in the

Table II. Asbestos NPL sites-removals.

Site name	EPA region	Location
Artic Surplus	10	AK
South Bay Asbestos Area	9	Alviso, CA
Copperopolis Asbestos	9	CA
Purity Oil Sales	9	Malaga, CA
Edmond's Salvage Yard	4	FL
Swainsboro Print Works	4	GA
LaSalle Electrical Utilities	5	LaSalle, IL
Iron Horse Park	1	Billerica, MA
Weldon Spring Quarry/ Plnt/Pits (DOE)	7	MO
Cape Fear Wood Preserving	4	Fayetteville, NC
Shady Lane Asbestos Area	1	NH
Lowell Road Asbestos Area	1	NH
Niquette Drive Asbestos Area 1	1	NH
Niquette Drive Asbestos Area 2	1	NH
Ridge Avenue Asbestos	1	NH
Russell Avenue Asbestos Area	1	NH
Nascolite Corporation	2	Millville, NJ
Roebling Steel Co.	2	Roebling, NJ
NL Industries, Inc.	2	Pedricktown, NJ
Asbestos Farmingdale	2	Farmingdale, NY
Amber Asbestos Piles	3	Ambler, PA
Maltovsky Drum Co.	3	PA
American Street Tannery	3	PA
Publicker/Cuyahoga Wrecking Plant	3	Philadelphia, PA
Geneva Industries	6	Houston, TX
French Limited Site	6	Crosby, TX
Beck Street Salvage	8	UT
West Virginia Ordanance	3	Pt. Pleasant, WV

remedy selection. The strategy behind the policy is delineated in *New Tools for Investigating and Evaluating Asbestos: The Environmental Asbestos Assessment Manual.*[9] The two volumes of the guidance that have been published[10] describe the Transmission Election Microscopy (TEM) method of air sampling and analysis to determine ambient air asbestos concentrations. A good argument for TEM is presented, but the document fails to specify what the results actually mean and how they are to be interpreted. Since TEM can find asbestos in virtually any ambient air sample, a "safe level" is difficult to establish. Under the AHERA regulations, TEM is specified for final air clearance after certain response actions.

Occupational Safety and Health Act (OSHA)

The OSHA regulations are used primarily to determine the level of protection required for workers who are exposed and provide specific guidance for work performance. The OSHA regulations should be complied with during asbestos removals at hazardous waste cleanup sites. Since these limits are for determining the level of personnel protection, they should not be used in the determination of health risks associated with the existence of ACM at sites.

These standards, which can be found in 29 CFR 1910 and 1926, apply to occupational exposure based on the Phase Contrast Microscopy (PCM) method of concentration measurement. This method counts fibers in an air sample with a specified length and aspect ratio, whether or not the fiber is asbestos. Additionally, these regulations specify training and medical monitoring requirements for certain workers exposed to asbestos.

Where Asbestos or Suspected ACM Might be Found at Superfund Sites

Since proper asbestos removal or management may be a significant expense, and since the EPA is encouraging an asbestos survey during the initial Site Investigation (SI) stage of the Superfund process, the earlier asbestos is identified in the site assessment the better economic predictions will be and the more accurate the Hazardous Ranking. A simple removal, one which does not require special considerations (such as scaffolding or rigid containment structure) costs about $25 per square or linear foot.

Since asbestos surveys are being encouraged, a certified AHERA inspector or management planner should be retained. The inspector should be familiar with the site specific conditions and state or local regulations. Additionally, the inspector should be objective and not have future work based on his recommendations. Qualifications should include documented field experience.

All suspect materials should be inventoried. Under the AHERA regulations, the inspector is required to either sample all suspect bulk material for positive asbestos identification, or "assume" the material to contain asbestos. The first materials to be examined should be any process equipment. Storage tanks, piping, and boilers were often coated with friable or nonfriable asbestos-containing insulation. Piping may have one type of insulation on straight runs of pipe and a different type of insulation on elbows and fittings. Patches in the insulation, from maintenance activities or repairs may be a different type of insulation. In boilers and other process equipment, asbestos-containing materials also may have been used in gasket matter, in expansion joints, and in insulating bricks. The next place to look is in buildings. Most buildings provide, or once provided, heat for occupants. If the building had its own boiler, the boiler room should be inspected for insulation and fireproofing material, such as sheet rock and plaster. In addition, buildings may have sprayed-on fireproofing, soundproofing, or decorative finishes. All coatings, including decorative coating, should be inspected. In addition, inspectors should check heating ventilation and air conditioning (HVAC) equipment and ductwork, open plenum areas (which may be found above drop ceilings), all vinyl floor tile, ceiling tiles, sheet rock, plaster, roofing felts and joint compounds.

While taking bulk asbestos samples, certain safety precautions should be taken. Proper respiratory and personnel protection should be worn during sampling. In addition, to minimize airborne asbestos-containing dust, the material should be wetted with a plant spray bottle prior to and during sampling. Samples should be placed in a sealable labelled plastic bag. Record the exact sample location, assess the condition of the material, fill out a chain-of-custody form (if required) and send samples for analysis. A more detailed description of sampling methods and procedures can be found in the October 30, 1987 Federal Register and in EPA's "Pink Book."[11]

The only EPA-approved method of analyzing bulk material to determine the quantity and type of asbestos in ACM is to use Polarized Light Microscopy (PLM). The National Institute of Standards and Technology (NIST) certifies laboratories which use this method. A listing of certified laboratories is available through EPA's Regional Offices and NIST. Laboratories also may be found in local phone directories. Depending on the number of samples, the capacity of the laboratory and its relative location, turn-around time on bulk analysis should be one day or less. The lab should report the type and relative percentage of asbestos content. Once the suspect material is identified as containing asbestos, a yellow warning label should be placed on or adjacent to the asbestos that remains on the facility. Based on the material's assessment and the potential for the material to become damaged during future planned activities, the inspector should make recommendations. These recommendations should be approved and implementable by the Regional Project Manager or On-scene Coordinator.

Managing the Risk

There have been two different administrative ways to control asbestos at NPL sites. Table II lists sites that have had asbestos removals or encapsulation done as an emergency response or removal action. Table III lists NPL sites that addressed the contamination in a remediation, sometimes as a separate operable unit. Three different scenarios are presented based on the future use of an ACM insulated facility. The first scenario is when the facility is to be demolished. The second scenario is when the facility is to remain, but may impede future activities. The third scenario is when the facility is to remain and probably will not impede future activities.

Scenario One

If the ACM is found on facilities (pipes, boilers, process equipment, structural steel, construction material, etc.) which are not in use and these facilities will be removed or demolished as a part of the removal action or remediation, friable ACM must be removed first, according to the NESHAPs regulations. For example, Fike Chemical, an NPL listed site in Nitro, West Virginia, has several buildings and process equipment on site with asbestos insulation and building materials. The buildings and process equipment are obstructing remediation of soils under an existing ROD. Therefore, the buildings were separated into their own operable unit (OU#2) and the selected remedy for the buildings and process equipment is demolition. The primary ARAR identified in the ROD is NESHAPs, which requires removal of friable asbestos insulation prior to demolition.

Although asbestos removal is basically renovation or demolition, removal procedures have developed into a sophisticated scientific art during the 1980's. A typical asbestos removal includes construction of a containment structure (with negative air that is filtered and vented outside the work area), a three-stage decontamination area, and a waste load-out area. Workers don protective clothing and proper respirators as they enter through the decontamination area. ACM is adequately wetted, removed and contained (usually in heavy-duty prelabeled plastic bags). Containers are passed through the load-out area to a transport vehicle. These techniques may be regulated by state or local agencies. In addition, most states require worker, supervisors, and/or monitoring certification. In the absence of state or local regulations, the National Institute of Building Science offers a comprehensive guide specification for asbestos removal that is updated periodically.[12] This guide is an excellent starting point for asbestos removal specification and should be modified to include local regulations and site specific conditions or restrictions.

Scenario Two

If the facility is not going to be demolished or removed, the AHERA regulations offer state-of-the-art guidance for developing a means for managing asbestos material. Once all asbestos material has been identified, and the facilities will remain, a management plan similar to the one required for schools should be developed. This plan should include a summary of the sampling locations, analysis and estimated amounts of each identified material and a timetable for abatement activities. A site-specific management plan will provide excellent documentation as well as a significant reduction of risk from exposure.

If the facility (which contains ACM) is remaining and the ACM is either in the way or likely to be disturbed (hit, cut or punctured) it must be removed or enclosed. Removal is much more expensive, but offers a permanent solution.

Scenario Three

If the facility is to remain and there is little chance of the ACM being disturbed, the existing and potential health risk must be evaluated. Using the AHERA regulations as a guide, the risk assessment should be based on the material's condition, friability, and potential for traffic exposure. Although neither required nor encouraged by AHERA, the assessment may include air monitoring (personal and area).

If a health risk exists, the asbestos should be either mitigated or removed. In the management plan, recommendations for specific action should include one or more of the following: (a) leave it alone (repair and monitor), (b) encapsulate or enclose (once widely accepted abatement techniques—relatively inexpensive but temporary), or (c) remove it (and apply lock-down after removal). A more formal decision process is presented in the Asbestos Hazardous Emergency Response Act (AHERA) regulations dated October 30, 1987.

Technical Assistance

The regional air compliance groups (or their delegated state agencies) are responsible for enforcement of the NESHAPs regulations. Therefore, they are a great resource for the enforcement records of asbestos removal contractors. This should be of primary importance since one would not want to hire a contractor to perform an abatement at a Superfund site at the same time that the EPA's regional air compliance groups are litigating against that contractor. The air compliance groups also maintain a national database which tracks enforcement actions intrastate. The worker protection rule and the various school regulations are enforced by the Regional Asbestos Coordinator (RAC). The RAC is usually given the task of providing technical guidance for abatement projects, at no cost, and should be consulted to answer technical questions regarding containment, removal procedures, or if the removal is unusual. State and local agencies enforce their regulations. They should have information on abatement contractors, air monitoring firms, and third-party consultants, if regulated. Third party consultants also can be found in the following listings: the local yellow pages, the contractor's "blue book," Pollution Engineering's yellow pages, and the National Asbestos Council's membership list. Local training centers may have information on consultants in the area.

Conclusion

Because of its unusual characteristics and its low cost, asbestos was used extensively in fireproofing, insulation and friction products. Materials containing asbestos can be found at hazardous waste sites in a variety of insulation or construction materials. Since asbestos exposure has been linked to a number of diseases, including cancers, early identification and proper management of these materials is necessary to reduce the risk from exposure. To help cleanup personnel identify and manage asbestos, information from existing regulations, and trained personnel, could be valuable resources and should be made readily available.

Table III. Asbestos NPL sites—remediations.

Site name	EPA region	Location
US Alabama Army Ammunition Plant	4	AL
Mountain View/Globe	9	Globe, AZ
South Bay Asbestos Area	9	Alviso, CA
Atlas Asbestos Mine	9	Coalinga, CA
Coalinga Asbestos Mine	9	Coalinga, CA
Rocky Mountain Arsenal	8	Commerce City, CO
Johns-Manville	5	Waukegan, IL
LaSalle Electrical Utilities	5	LaSalle, IL
Cape Fear Wood Preserving	4	Fayetteville, NC
Asbestos Dump—Millington Site	2	Millington, NJ
Hardage Criner	6	Criner, OK
Publicker/Cuyahoga Wrecking	3	Philadelphia, PA
Ambler Asbestos Piles	3	Ambler, PA
Landfill and Resource Recovery	2	North Smithfield, RI
Midstate Disposal Landfill	5	Cleveland Twp, WI

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CONTROL TECHNOLOGY NEWS

DOE Selects New Jersey Firm To Install Pollution Control System in Poland

Responding to President Bush's pledge of U.S. assistance to help fight air pollution in Poland, the U.S. Department of Energy has chosen a New Jersey firm to install a "model" high-efficiency cleanup technology on a coal-burning power plant serving the historic city of Krakow.

The Energy Department said in May that it had selected AirPol Inc., of Teterboro, New Jersey, to install a state-of-the-art scrubbing system on a 50-megawatt coal boiler at the Skawina Power Station. The department will provide $7.7 million to AirPol to install the patented scrubber system.

In July 1989, President Bush called Krakow a city "under siege by pollution." Speaking to the Polish Parliament, Bush pledged U.S. funding for a cooperative venture with Poland to "reclaim" the former royal capital from the damages of air pollution. Poland depends on coal for its electricity, but its coal-fired plants have few, if any, sulfur pollutant controls.

AirPol will install the pollution control system on one of the 11 coal-fired boilers in a 550-megawatt plant outside of Krakow. The system is expected to capture as much as 98 percent of the sulfur pollutants from the boiler's gases. The technology's high degree of effectiveness means the entire plant will be able to meet 1998 emission laws by cleaning flue gas from a few of the plant's 11 boilers, rather than all of them. Under the tightened air regulations, the Skawina plant must cut its overall sulfur emissions by about 43 percent. Nationwide, Polish sulfur emissions must be reduced by about 50 percent.

AirPol was one of five U.S. firms responding to a solicitation issued by the department in September 1990. The call for proposals followed a technical assessment of possible candidate power plants in and around Krakow. A steering committee of U.S. and Polish officials oversaw the selection process.

AirPol will use a technique called the "Thiosorbic Lime Process," currently employed in more than 20 coal-fired power plants in the U.S. "Thiosorbic lime" contains magnesium that enhances its sulfur-absorbing properties. High magnesium lime is available at the Skawina plant site. The "Thiosorbic Lime Process" was developed by Dravo Inc., of Pittsburgh, Pennsylvania, who granted the rights to use it without charge to the project.

The Energy Department is administering the project under an interagency agreement with the U.S. Agency for International Development. It will be overseen by the department's Pittsburgh Energy Technology Center.

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