Resolving DOE'S PCB Issues

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ABSTRACT

The Department of Energy (DOE) continues to manage, generate, store, treat, and dispose of Poly Chlorinated Bi-Phenyls (PCBs) and PCB waste. DOE has many unique facilities and generates many unique waste streams. As DOE has made progress in achieving environmental progress it has become readily apparent that environmental regulations were not developed to address DOE's unique problems and issues. It is therefore incumbent upon DOE to identify those issues that are preventing or hindering environmental progress and work toward resolution. Close cooperation and communication with EPA and state regulatory agencies will be required.

INTRODUCTION

The manufacture of Polychlorinated Bi-Phenyls (PCBs) has been banned in the U.S. since 1979. PCB regulations based on the Toxic Substances Control Act (TSCA) are slowly but surely removing PCBs from their historical use and preventing the development of new uses. The Department of Energy (DOE) has made significant progress in reducing the volume of PCBs still in use in the DOE complex. As the DOE transitions from dealing with the relatively pure product to trying to remove the last vestiges of contamination, the DOE finds itself addressing issues that were not considered when the regulations were developed. This paper identifies some of these issues and suggests a path forward for DOE.

TSCA REGULATIONS

TSCA was passed in 1976 to address a perceived national crisis. This crisis was driven by various incidents such as Love Canal and the Valley of the Drums. TSCA was designed to control chemical wastes still in use. TSCA specified management criteria as well as disposal requirements. TSCA defines very specific management criteria for PCBs. TSCA regulations have continued to evolve. TSCA was most recently modified in 1998 with the promulgation of PCB Disposal Amendments commonly referred to as the PCB Mega rule. This rule made significant progress in addressing many of the issues that had been bothering both DOE and the commercial world since the last set of amendments in 1992. Significant changes included the easing of treatment requirements for remediation waste; waste manufactured containing PCBs, and research and development waste.

PCB USAGE IN THE DOE COMPLEX

PCBs were used in many industrial applications. While everyone is aware of their use in electrical transformers and capacitors, they were also used in hydraulic systems, paint, insulation, cooling systems, and many other minor uses. Until TSCA regulations were passed in the late 1970's, PCB wastes were treated just as other similar wastes at that time. Waste oils were recycled for their lubricating properties, burned for their BTU value, or simply dumped where they were not expected to cause problem for anybody. When mixed with radioactive wastes, these wastes were often sent to radioactive waste management facilities for storage and/or disposal.

PCB WASTES

Most of the early PCB waste that DOE dealt with were the PCB liquids drained from PCB transformers and capacitors. These required incineration and were relatively straightforward to deal with. Spill cleanup material was the next category of PCB waste to be dealt with. TSCA required immediate cleanup of the release of PCB spills and specified the disposal options. However other waste streams containing PCBs were not as clearly addressed in the TSCA regulations. These miscellaneous waste streams included tank bottoms, landfill cleanups, manufacturing process wastes, building demolition waste, contaminated equipment, and analytical laboratory waste.

PROJECTED PCB WASTE GENERATION

PCB wastes continue to be generated in the DOE complex. Minor quantities of PCBs are generated as result of the continued maintenance of PCB products still in use. Other PCB wastes are generated as PCBs are removed from service. However the majority of PCB waste that is expected to be generated in future for DOE is a product of Decontamination and Decommissioning of used facilities and remediation of contaminated areas under the Comprehensive Environmental Response, Cleanup, and Liability Act. As we near the end of that generation, it is imperative that treatment facilities remain available to treat DOE's PCB waste.

PCB TREATMENT AND DISPOSAL

When PCBs are in use they are regulated only by TSCA. TSCA also specifies treatment and disposal requirements. However, once PCBs become a waste the generator also has to consider the Resource Conservation and Recovery Act (RCRA). While RCRA regulations do not rely on PCBs as a method of determining the hazardous nature of a waste, they do require treatment of the PCBs if other hazardous constituents are present.

Treatment

If the PCB waste is not contaminated with radioactive constituents, the DOE relies on the commercial waste treatment industry to treat its waste. However, during the first fifteen years of TSCA regulations there were no commercial treatment facilities available to treat radioactively contaminated PCB waste. DOE strove to meet the PCB treatment requirement by building two incinerators. The Controlled Air Incinerator in Los Alamos, New Mexico was built, permitted, and operated just a short time before being permanently closed. The Toxic Substances Control Act Incinerator was built in Oak Ridge, Tennessee. That unit is still operating.

Recently there have been several attempts by the commercial radioactive waste treatment firms to break into the radioactive PCB waste treatment business. Allied Technical Group built a vitrification unit in Richland, Washington. They were preparing for testing to obtain their permit when financial difficulties suspended operations. Perma-Fix near Oak Ridge, Tennessee is presently in the process of installing PCB treatment options. Envirocare of Utah and Waste Control Specialists of Texas are also considering treatment options.

Disposal

Disposal of PCB wastes has traditionally been problematic. There are no approved radioactive TSCA disposal facilities. Until the PCB Mega rule was promulgated, waste with low concentrations of PCB was the driving force for the development of very costly treatment options for many DOE facilities. However, with the promulgation of the PCB Mega rule, much of this lower concentration PCB waste became disposable in RCRA permitted disposal units.

PCB ISSUES

DOE has made great progress in improving its management of PCB wastes. But as this progress is made and the DOE transitions from the conventional waste streams that are specifically addressed in the regulations, the DOE now finds newer issues where appropriate solutions are just not available. The following issues are a compilation of PCB issues identified in the summer of 2001 that were hindering progress at specific DOE sites.

Analytical Lab Residues

When EPA promulgated the PCB Mega rule in 1998, they simplified the management and disposal of many low concentration PCB wastes. One area that was not addressed was the material left over from the analysis of PCB contaminated wastes. The lab residues at ppb concentration levels must still be treated as if it were the originating waste. Because of the small volumes typically generated per waste stream, the residues from many samples are commingled. According to the rules, the entire volume of lab waste must then be managed as if it were the concentration of the most highly concentrated sample analyzed. This is not consistent with EPA's approach for other wastes that become diluted as the result of research or spills.

Non-authorized Uses

PCBs were included in the formulation of paints to take advantage of specific chemical properties. These paints were used in many areas including those with high radiation. Walls were painted with this type of paint prior to the development of PCB regulations. Many locations still in use have walls that at one time were painted with paints containing PCBs. Many of these walls have been subsequently painted with other types of paints. Leach and wipe tests show that while the paint remains on the walls, there is little to no risk to people or the environment. However, under TSCA regulations, PCBs can only be used for purposes specifically provided for in the regulations. Paint is not included as an authorized use.

PCBs were also included in rubber gasket material and insulating material. These gaskets and insulation are still in use in large-scale one-of-a-kind equipment. Replacing this material would be extremely expensive. Again, there is little to no risk to people or environment while the material continues in use. Replacement would also entail significant radiation exposure.

Stabilization of Liquid PCBs

There is currently only one DOE facility treating PCB radioactive waste. That facility is currently planning to cease operations in 2003. Commercial options are being developed, but are not currently available. As DOE and the commercial sector continue to treat and dispose of PCB waste, there will come a time when there is no longer sufficient liquid PCB waste volumes to support expensive treatment options such as incineration. As DOE approaches this point, treatment options will be necessary for the intermittent treatment of low volume PCB wastes.

One promising option for low volume PCB waste streams is stabilization. Both DOE and EPA have been investigating the stabilization of organic waste streams. As concentrations and volumes decrease it may make sense to stabilize these waste streams rather than keep expensive treatment facilities operational for minor amounts of waste.

Recycling Building Waste

DOE is in the process of decommissioning and decontaminating much of its production capacity. While these facilities were critical during the cold war, most of DOE's production facilities are now excess and are being dismantled. As these facilities are being torn down, there is an ongoing debate at each facility to determine what materials can be disposed of onsite versus what has to be shipped to waste disposal facilities. EPA in the Mega rule provides for the limited use of low concentration PCB waste for roadbed filler. The question has been raised why concrete buildings (with PCB paint) could not be rubble-ized for use as backfill when buildings are removed. Other material with both hazardous and radioactive constituents has been approved for use as backfill when the facility is not being free released.

PCB Management in High Radiation Areas

Some of the PCBs that are still in use in DOE facilities are located in areas exposed to high radiation. Removing these PCBs would be extremely costly in terms of radiation exposure. There is little to no risk to human health or the environment from these PCBs. TSCA regulations typically require periodic inspections and maintenance. These inspections and maintenance are also costly in terms of radiation exposure. TSCA regulations do not provide any alternatives for situations such as this.

TSCA vs. RCRA

TSCA regulations are not consistent with RCRA regulations. Pursuant to the PCB Mega rule PCB remediation waste up 50 ppm in concentration can go into a sanitary landfill and essentially unlimited concentrations can go into either a PCB disposal facility or a RCRA permitted disposal facility. However when these PCBs are mixed with some RCRA constituents, the PCBs must be treated to less than 10 ppm before they can go in that same RCRA permitted landfill. Nothing in the RCRA waste is expected to make the PCBs more toxic, it is just a misalignment of two competing regulations. So while most RCRA wastes have to be essentially PCB free, they will probably be disposed of in direct contact with PCB waste at many thousands of ppm PCB concentration. This obviously points to a need to harmonize these regulations. An obvious approach would be to perform a risk assessment to determine the appropriate acceptance level. The difficulty here is that neither TSCA nor RCRA disposal standards are driven primarily on a risk basis.

This dual regulatory structure is creating questions as to the level of appropriate treatment and the need for TSCA approval of treatment. In certain cases TSCA regulations would let the PCB waste be disposed without treatment, but RCRA requires treatment of the PCB as an Underlying Hazardous Constituent. It is unclear whether or not you have to treat the waste to just meet RCRA standards or now that the waste is being treated if you might have to meet more stringent TSCA standards for TSCA wastes that did require treatment.

Solidified PCB Liquids

Several DOE sites have PCB wastes that were stabilized and placed in storage until treatment and or disposal options could be developed. The emphasis at the time was to promote safe secure storage and transportation. Most of this waste was generated prior to TSCA regulations and is now eligible for direct disposal as a PCB remediation waste under the PCB Mega rule. However some quantities of this waste were generated after the regulations as DOE began to comply with environmental regulations. It is unclear whether these wastes are eligible for direct disposal under the Mega rule.

Incidental Liquid Stabilization

Liquid PCBs over 500 ppm are required to be incinerated. Some of the solidified PCB wastes mentioned above have developed incidental liquids. If these liquids are below 500 ppm, they can be stabilized in place and send for disposal along with the rest of the waste. However if these liquids are above 500 ppm they must be removed or the whole drum incinerated. One important aspect of this problem is the question what constitutes a liquid PCB waste. Obviously the rules were not set in place for one drop, but TSCA regulations are not as definitive as other regulatory criteria.

PCB Spill Cleanup

TSCA regulations specify that only spills of PCB greater than 50 ppm must be cleaned up. However, there is also a decontamination standard that says you must clean spill areas up to less than 10 ug/100 cm2 based upon a wipe test. The problem is that these limits are not comparable. Spills of less than 50 ppm will easily contaminate an area to greater than 10ug/100 cm2. If a spill of material greater than 50 ppm then takes place, there is no way to tell where the new spill stops and the old spill starts. DOE will essentially be stuck cleaning both spill areas up to the standard.

Cleanup Solvents

Sometimes EPA unintentionally gets too specific when writing their rules. For example when wrote that PCB decontamination requires the use of organic solvents in which PCBs are at least 5% soluble. Sounds reasonable, right. The only problem is that in some instances you don’t want to use an organic solvent. New solvents have been identified that easily meet the 5% criteria but that are just not organic. The rules currently prohibit their use.

Congener vs. Aroclor

PCBs are a grouping of chlorinated biphenyl compounds that were manufactured primarily by the Monsanto Corporation in the United States. Each particular combination of a specific number of chlorines arranged in specific locations was called a congener. There are 209 different PCB congeners. Based upon the specific industrial application, a higher or lower number of chlorines were attached to the biphenyl ring structure. Because the manufacturing process did not produce a single congener, each product batch contained a general distribution of different congeners usually centered on a specific molecular weight. These groupings were called aroclors. Numbers generally referring to the number of carbons and the weight percent of chlorine designates Aroclors. Typical designations include 1221, 1232, 1248, 1252, and 1260.

Typical analytical procedures analyze for a standard set of aroclors based upon the laboratory experience and other factors. These analytical determinations are based upon distributions of the specific congeners within each aroclor. The problem lies in that congener distribution within aroclors is not constant. As PCBs age, they weather. Certain PCB congeners lose chlorines while other may grab them. Certain biological processes preferentially destroy certain congeners. This shifting of the distribution may alter laboratory analysis and thus the reported PCB concentrations.

There is also a concern that over-analysis may skew data. It is not required to analyze for every aroclor ever produced by Monsanto, but merely the ones that are reasonably expected to be found. Under certain circumstances when radiation issues limit a laboratories ability to attain very low detection levels, analyzing for congeners that traditionally don't present a problem may cause a problem when the detection levels for non-existent aroclors are added into the total concentration. EPA policy calls for the adding one half the detection limit for samples showing non-detects for specific aroclors. When this happens in situations with high detection limits, you may find yourself exceeding the regulatory limit based purely on the addition of non-detected aroclors. Now that we have the ability to analyze for specific congeners, and better understand the toxicity of each of those congeners, it probably makes sense to develop a toxicity equivalency approach much like EPA has done for dioxins and furans.

WHERE DO WE GO FROM HERE

These issues were identified for the purpose of initiating conversations with EPA and working towards appropriate resolution. The next step is the finalization of white papers on each of the specific issues. When these issue papers are complete they should be shared with EPA to develop a common understanding of the problem. Only then can we work towards a solution. At this time, a meeting with EPA has not been finalized. The process of developing that resolution will take time, but appropriate management of PCB in the DOE system requires that these issues be addressed.

CONCLUSION

While not all of these issues are earth shattering, they continue to present DOE with management challenges. These issues require close cooperation and communication with EPA. Together DOE and EPA should be able to develop a strategy for resolving these issues. Each of these issues appears to have workable solutions that increase DOE's ability to manage waste while maintaining EPA's desire to be protective of human health and the environment. Progress is possible.