



Underground Injection of Coal Slurry

Water, Health, and Alternatives

A Sludge Safety Project Citizens' Report

March 19, 2009

ABSTRACT

Underground injection of coal slurry is a serious threat to public health. Billions of gallons have been pumped underground in West Virginia, and poisonous chemicals found in this waste have been found in nearby well water and in hair samples of local citizens. As coalfield residents voice concerns about contaminated water and health problems, the DEP continues to grant underground injection permits and to excuse companies for violating water standards at injection sites. Our state can be a model of transforming public health and chose alternative means of processing coal, which have been utilized in West Virginia and are utilized across the globe.



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What is Coal Slurry?

Before coal is sent to market it is washed in a mixture of water and chemicals to remove particles of slate, dirt, and trace elements found in the coal seam. The waste slurry is pumped underground into abandoned mines or pumped behind earthen dams into coal waste impoundments, some of which hold billions of gallons of sludge.

EPA reported in one case that slurry injected underground “...contains harmful contaminants which are likely to enter the public water supply, and may present an imminent and substantial endangerment to human health.”¹

“... slurry’s path through the underground mine system is unpredictable... it is likely that slurry will flow to points where water is being withdrawn from the mine by domestic users.”²

Standards for Underground Injection Control (UIC)

“In West Virginia, all ground water is considered to be existing or potential drinking water.

“In fact, if an existing mine pool is being used as a potable water source for even one person, no permit will be issued for injection into it, notwithstanding the requirement that all UIC injection must meet Federal Safe Drinking Water Standards, also called Primary Drinking Water Maximum Contaminant Levels, or MCLs, at the point of injection.

In all other cases, the mine pool is regarded as a potential drinking water source, regardless of its present quality. Therefore, the proposed injection is carefully screened to ensure that the injected material (injectate) is capable of meeting MCLs. If the applicant cannot demonstrate that the injectate can meet these standards, the permit is denied.”³

¹ EPA Docket No. IV-85-UIC-101. “Determination and Consent Order in the Matter of Eastern Coal Corporations.” United States Environmental Protection Agency Region IV. August 30, 1985. Online at http://www.sludgesafety.org/coal_slurry_inj.html.

² EPA Docket No. IV-85-UIC-101.

³ Pettigrew, Pavanne L. “History and Status of Mining Underground Injection Control at the WVDEP Division of Water and Waste Management.” Presented at the 2008 West Virginia Mine Drainage Task Force Symposium, Morgantown, WV.

Enforcement of Standards

West Virginia Department of Environmental Protection (DEP) enforcement of these standards is questionable, and the DEP is unsure whether coal slurry injected underground is contaminating residential wells.⁴ The foundation of the “careful screening” process is the reports issued by the coal companies to the DEP regarding the make-up of the coal slurry injectate. The DEP does not employ inspectors through the Underground Injection Control Office of the Division of Water and Waste Management to inspect underground injection sites into abandoned mines or to sample and analyze the slurry.

Preliminary Results from SCR 15⁵

Senate Concurrent Resolution 15 (SCR 15) passed the 2007 West Virginia Legislature and mandated that the DEP study coal slurry contaminants and impact to ground water.

Though the DEP has missed deadlines for the report mandated by SCR 15, the DEP was willing to share their data with SSP and independent scientists as well as split samples from three of the six test sites. The slurry samples were allowed to settle and were then separated into the solid and liquid portions, which were tested separately.

The independent scientists found that both their test results and the DEP’s results showed high metal concentrations in the solid portions of the slurry. Arsenic, for example was found at 159,000 ppb, nearly 16,000 times the Primary Drinking Water Standard. The solids portion however, while injected underground, does not fall under the regulations of the Safe Drinking Water Act.

The liquid portion of the slurry, which does need to be in compliance with the Primary Drinking Water Standards, was also in violation. The heavy metals Antimony, Arsenic, Lead, Barium, Cadmium and Chromium were all found in the samples sometimes in levels over 100 times the legal limit.

The Drinking Water Standards also set secondary standards, which are not legally binding. Iron, Aluminum, Manganese, Zinc and Copper were found in levels exceeding the recommended concentrations.

⁴ “DEP Unsure if Coal Slurry Poisons Water Supplies: Agency to Ignore Deadline for Study.” Charleston Gazette, February 7, 2009. Online at <http://www.wvgazette.com/News/200902070209>.

⁵ Preliminary report written by Dr. Ben Stout and Mary Ellen Cassidy both of Wheeling Jesuit University. See Appendix 1 for the full report. The WV DEP has not approved this report.

Chemical Constituents of Coal Slurry

The harmful content in coal slurry comes from two sources: chemicals used in the processing facility and from the coal and rock itself. Because of this, the contaminants in coal slurry can vary from place to place depending on the chemical make-up of the coal being processed and the chemicals the processing company used.

Contaminants from Coal

All the heavy metals found in coal and associated rock are found in slurry. These elements are naturally occurring, but they remain safely locked away in the buried rock and coal seams until exposed to air and water at which point they may become mobile.

Coal seams act as filters for drinking water supplies, which provides a useful analogy for coal slurry injections. Imagine taking out a used water filter, grinding up, and pumping it into the water supply. Contaminants are now able to travel through the water supply.

According to the US Geological Survey, “Coal contains toxic organic and inorganic compounds which, if mobilized into the environment, have the potential to impact human health and environmental quality.”⁶

Metal	Concentration (ppm)
Antimony	0.35 to 2.3
Beryllium	1.0 to 13
Cadmium	0.0027 to 0.52
Chlorine	130 to 2,300
Chromium	6.5 to 33
Cobalt	1.5 to 11
Lead	2.7 to 25
Manganese	1.9 to 43
Nickel	3.7 to 24
Selenium	1.3 to 7.3
Arsenic	0.7 to 53
Mercury	0.005 to 0.3

Table 1. Concentration of Heavy Metals in Coal

Source: USGS Professional Paper 1625-C Chapter F

Mercury

Slurry samples analyzed at WVU Tech have found slurry to contain 30 ppb of mercury, which is significantly beyond the Safe Drinking Water Act standard of 2 ppb.^{7,8} All forms of Mercury pose a level of threat to human health, though that

⁶ Orem, William H. Coal Slurry: Geochemistry and Impacts on Human Health and Environmental Quality. (Power Point Presentation). United States Geological Survey. Viewed online March 9, 2009 at http://www.sludgesafety.org/misc/wm_orem_powerpoint/

⁷ Schoening, Richard. West Virginia University Institute of Technology, Chemistry Department. Phone correspondence with Matt Noerpel of Coal River Mountain Watch. October 30, 2008.

level can greatly vary. In the environment Mercury can easily change forms from a relatively safe form to a highly toxic one. Depending on what form it takes, mercury can have a range of effects, including neurological disorders in newborns. There is a need to know more about the composition of mercury in slurry.

Known Exceedances of Heavy Metals in Coal Slurry and Residential Wells

See Appendix 2 for table.

Priority Hazardous Materials

Seven of the top 10 Priority Hazardous Materials outlined by the ATSDR in 2007 are found in coal slurry. These top seven are arsenic, lead, mercury, cadmium, polycyclic aromatic hydrocarbons (PAH), benzo(a)pyrene, and benzo(b)fluoranthene. This list was developed by taking into account the material's impact on human health based on its toxicity and likelihood that it will found on sites on the National Priorities List.⁹

Chemicals used in Processing Coal

Chemicals include coagulants, flocculants, and surfactants, which are sometimes made up of a blend of polymers, which serve to separate the coal from the rock. When ponds are used, the water is recycled, increasing the concentration of these polymers.

According to USGS, "Toxic organic substances used to wash coal include acrylamide, PAHs, aromatic amines, chlorinated hydrocarbons, etc."¹⁰

"Even if a toxic chemical to be used in the process will not be present in the waste stream by the time it reaches the injection point under normal operating conditions, the UIC protocols forbid such substances being used at all to prevent accidents or malfunctions allowing toxic materials to reach the groundwater system."¹¹

⁸ Darst, Paul. "Team Finds New Ways to Strip Mercury from Water." The State Journal. January 3, 2008. Viewed online March 9, 2009 at www.statejournal.com/story.cfm?func=viewstory&storyid=33130.

⁹ CERCLA 2007 Priority List of Hazardous Substances. Agency for Toxic Substances and Disease Registry. Viewed March 9, 2009 online at www.atsdr.cdc.gov/cercla/07list.html.

¹⁰ Orem, William H.

¹¹ Pettigrew, Pavanne L.

Aniline	Dibenzofuran	Hexachloro-1,3-Butadiene
Acenaphthene	Dibutyl phthalate	Hexa-Cl-1,3-
Acenaphthylene	Diethyl phthalate	Cyclopentadiene
Anthracene	Dimethyl phthalate	1,2,4-trichlorobenzene
Benizidine	Dioctylphthalate	1,2-Dichlorobenzene
Benzo(a)anthracene	Fluoranthene	1,3-Dichlorobenzene
Benzo(a)pyrene	Fluorene	1,4-Dichlorobenzene
Benzo(b)fluoranthene	Hexachlorobenzene	2,4-Dinitrotoluene
Benzo(ghi)perylene	Hexachloroethane	2,6-Dinitrotoluene
Benzo(k)fluoroanthene	Indeno(1,2,3-c,d)pyrene	2-Chloronaphtalene
Benzyl alcohol	Isophorone	2-Methylnapthalene
bis(2-ethylhexyl)phthalate	N-Nitrosodi-n-propylamine	2-Nitroaniline
bis(2-chloroethoxy)-methane	N-Nitrosodiphenylamine	3-3'-Dichlorobenzidine
bis(2-chloroethyl)ether	Naphthalene	3-Nitroaniline
bis(2-chloroisopropyl)ether	Nitrobenzene	4-Bromophenyl phenyl ether
Butyl benzyl phthalate	Phenanthrene	4-Chloroaniline
Chrysene	Pyrene	4-Chhlorophenyl phenyl ether
Dibenzo(a,h)anthracene	4-Nitroaniline	
	Acrilamide	

Table 2: Organic Compounds Found in Coal Slurry

Source: Kentucky Division of Water. DOW-DES Analytical Data File.

Polyacrylamide

Polyacrylamide is a commonly used chemical in the coal washing process and the subject of to lawsuits brought by sick prep plant workers. Unfortunately Polyacrylamide is not a stable molecule and is difficult and expensive to test for. It is made up of many smaller molecules called monoacrylamides. Polyacrylamide has a tendency to easily break down into monoacrylamides, which are highly toxic.¹²

Health Concerns

- “At low dose coal-derived toxic organic compounds in water produce excessive cell proliferation (consistent with mutagenic effect); and at high dose, these compounds produce cell death.”¹³
- USGS researchers learned that liver cells exposed to coal slurry water have a higher mortality rate that liver cells exposed to clean drinking water.¹⁴

¹² Personal Correspondence with Dr. Michael Kostenko, M.D.

¹³ Orem, William H.

¹⁴ Bunnell, Joseph E. “Preliminary Toxicological Analysis of the Effect of Coal Slurry Impoundment Water on Human Liver Cells” United States Geological Survey. Open-File Report 2008-1143. Reston, VA. 2008.

- “...water quality studies documented contaminated well water in WV and KY communities are consistent with coal slurry toxins.”¹⁵
- At one site, “The injection operation caused waste water to be distributed over 1,020 acres of abandoned mine working and into the surrounding groundwater system.”¹⁶
- A community survey found abnormally high levels of gall bladder disease in Prenter, WV.¹⁷
- Community concerns in Rawl, Mingo County and Prenter, Boone County report similar health issues of skin rashes, cancer, gastrointestinal problems, kidney, liver and gallbladder disease.
- Results of recent well water testing in Prenter, Boone County are not yet available, though houses smell of hydrogen sulfide gas and water comes out of the tap black, brown and red.
- Residents of Prenter sent in samples of their hair for analysis and found arsenic, beryllium, aluminum, mercury, cadmium, lead, sodium, copper, iron, boron, cobalt and molybdenum.
- Using home test kits, hydrogen sulfide gas has been detected at high levels in houses in Rawl, and in Prenter as high as 30ppm. Hydrogen sulfide gas is highly corrosive. Personal safety detectors used by petrochemical workers are set to alarm at 5 to 10ppm.
- Hundreds of millions of gallons of coal slurry have been injected into abandoned mines near Rawl and Prenter.
- "I am concerned for the health of my family and our community. We know there was slurry injected underground within 3 miles of our home. With what I know about geology I see every reason how slurry could have migrated underground to our wells and drinking water supplies." Maria Lambert, Prenter Resident.
- Physicians are very rarely trained to diagnose for long term chronic toxic exposure. As you can see in the above information, many of these chemicals manifest a wide range of health effects depending on the individual and other environmental factors.¹⁸
- Two communities have filed lawsuits in West Virginia in the past two years claiming that slurry injected underground has contaminated well water and affected their health. Others have as well over the years, but, due to settlement agreements, much of that information is not accessible.
- At least two groups of prep plant workers have filed lawsuits regarding exposure to and health impacts from harmful chemicals in slurry.

¹⁵ Hendryx, Michael. “Hospitalization Patterns Associated with Appalachian Coal Mining.” *Journal of Toxicology and Environmental Health*. Taylor and Francis, 2008. ISSN: 1528-7394 print/1087-2620 online.

¹⁶ Spadaro, Jack. Report of Investigation Larry Brown Et. Al. v. Rawl Sales and Processing Company. Mingo County, West Virginia. Contact: PO Box 442, Hamlin, WV 25523.

¹⁷ Community Health Survey, Coal River Mountain Watch.

¹⁸ Personal Correspondence with Dr. Michael Kostenko, MD

- **Life expectancy in West Virginia counties is declining. Women especially in southern West Virginia counties are losing a decade of their lives compared to the national average.¹⁹**

¹⁹ **“Early Deaths: West Virginians Have Some of the Shortest Life Expectancies in the United States.” West Virginians for Affordable Health Care. Based on a 2008 Report from Harvard Researchers. Online at www.wvahc.org.**

Heavy Metals***	Possible Health Effects**
Aluminum	Irritation of skin, upper respiratory tract. Damage to liver, kidneys, and lungs. Inflammation of the gastrointestinal tract. Skin or tooth discoloration.*
Arsenic	Cancer (liver, bladder, lung, kidney, and skin). Skin Damage, problems with circulatory systems, increased risk of cancer.* As has been recently linked to Alzheimer's.****
Barium	Respiratory paralysis, muscle twitching or paralysis, may effect pacemaker or the heart muscle. Increase in Blood Pressure.*
Beryllium	Lung tumors and lesions, weight loss. Intestinal lesions.*
Cadmium	Causes cancer, anemia, discoloration of teeth, & bone changes. Kidney Damage.*
Chromium	Irritation to nasal cavity and upper respiratory tract, some compounds may cause cancer. Skin problems.*
Copper	Irritation of upper respiratory tract, corneal ulcers and skin irritation, green hair. Short term: Gastrointestinal distress. Long term exposure: liver or kidney damage.*
Iron	Decreased blood pressure, bloody diarrhea or coma, vomiting, mild lethargy.
Lead	May cause cancer. Problems with joints, kidneys, and nervous system. Infertility and birth defects. Delays in physical or mental development, deficits in attention span and learning ability. Kidney problems, high blood pressure.*
Manganese	Loss of controlled movement; weakness, stiff muscles, and trembling hands, hallucinations, forgetfulness and nerve damage, Parkinson, lung embolism and bronchitis.
Selenium	Hair loss, deformed nails; rashes and redness in skin; numbness in arms or legs. Fingernail loss; numb fingers or toes, circulatory problems*
Sodium	Could interfere with blood pressure medication
Zinc	Stomach cramps, nausea, vomiting, anemia, damage to the pancreas, and decreased levels of high-density lipoprotein (HDL) cholesterol.

Table 3: Heavy Metals Found in Coal Slurry and Potential Health Effects of Exposure

(The health effects included in this table are potential effects that may be caused after long term exposure at certain concentrations. Little is know about low-dose, long term chronic exposure. If you have any of these symptoms, talk to your doctor. The purpose here is to share what we do know about exposure to these metals.)

*Health information from: United States Environmental Protection Agency. Office of Water. June 2003. Poster: *National Primary Drinking Water Standards*

**Health information from: Hazardous Substances Databank of the National Library of Medicine online at <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>, Unless otherwise noted by (*).

*** List of heavy metals in coal slurry: Mine Safety and Health Administration

**** Gharibzadeh, Shahriar. "Arsenic Exposure May be a Risk Factor for Alzheimer's Disease."

Mine Sites Known, Suspected or Proposing to Inject Underground	80
Injection Points Known, Suspected, or Proposed as of 2008	649
Injection Points Known, Suspected, or Proposed as of 2006*	478
Injection Points Known, Suspected, or Proposed as of 2004**	430
Sites Presently in the Application/Permitting Process	27
Permits (or Modifications) Issued or Reissued (2006 – 2008)	38
Injection Points Permitted (2006 – 2008)	114
Permits/Injection Points Closed/Abandoned (2006 – 2008)	5/32
Permits/Injection Points Denied (2006 – 2008)	5/34
Permits/Injection Points Invalidated (2006 – 2008)	0
Applications Voluntarily Withdrawn (2006 – 2008)	2
Applications/Injection Points presently “On Hold” (Pending Resolution of Groundwater Problems)	3/6

Table 4. WV DEP’s Underground Injection Statistics as of 2008

All data from WV DEP’s 2008 Biennial Report to the Legislature on Groundwater Programs and Activities unless otherwise noted: http://www.wvdep.org/show_blob.cfm?ID=14320&Name=2008_106_Report.pdf

* WV DEP’s 2006 Biennial Report to the Legislature on Groundwater Programs and Activities

http://www.wvdep.org/show_blob.cfm?ID=10274&Name=Biennial_Report_2006full.pdf

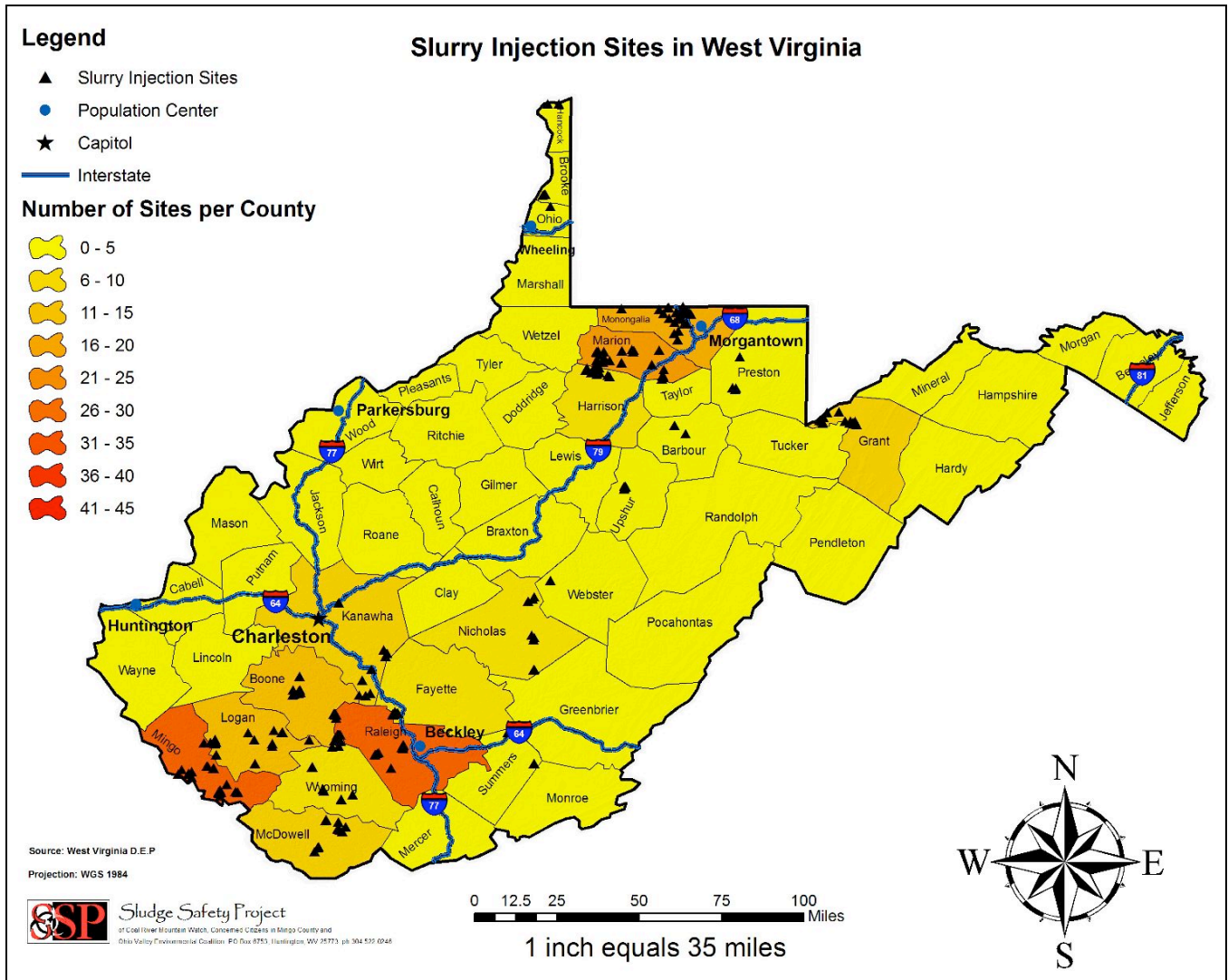
** WV DEP’s 2004 Biennial Report to the Legislature on Groundwater Programs and Activities

http://www.wvdep.org/show_blob.cfm?ID=10545&Name=2004_Biennial_Groundwater_Report.pdf

	Company	County
1	Black Wolf	McDowell
2	Brooks Run Mining	Webster
3	Coresco, Inc.	Monongalia
4	Eagle Energy	Boone
5	Gatling Coal	Mason
6	ICG Beckly	Raleigh
7	Independence Coal Co.	Boone
8	Kanawha Eagle Coal, LLC	Boone & Kanawha
9	Power Mountain	Nicholas
10	Power Mountain	Nicholas
11	Remington, LLC	Kan/Boone
12	Rockspring Development	Wayne
13	Southern Minerals	McDowell

Table 5. West Virginia Counties with Active Injection Permits

Source: DEP email correspondence sent March 11, 2009



Map 1. Injection sites documented by SSP from WVDEP Archive

Alternatives to Coal Slurry

“Dry cleaning methods should generate fewer environmental problems and require less energy than wet washing methods.”

- University of Arkansas²⁰

Many options are available to process coal without creating coal slurry including de-watering and cleaning coal without water.

Latest Development in Dewatering

Virginia Tech scientists have developed a technology that removes water from coal slurry, lowering the amount of toxic waste potentially seeping into the water table and poisoning wells. <http://www.collegiatetimes.com/stories/13009>

Wet cleaning process without the slurry

If coal is washed using a wet process, which creates the coal slurry, the slurry does not need to be disposed of immediately into impoundments or injected into abandoned mines. Dewatering processes press or filter the water from the waste. Several methods are available and fairly widely used. The most appropriate method depends on the slurry composition and planned disposal method.²¹

Companies in West Virginia have already utilized dry press filters. This technology relies on a closed loop of water to wash the coal. Waste slurry is pressed and dry filter cakes are created. These dry filter cakes may then be stored appropriately and more safely in lined landfills.

Marrowbone Development in Mingo County used a dry press filter well into the 1980s. Other dry press systems, and dewatering systems have been utilized in West Virginia.

Existing coal processing plants can be paired with a filter press that will dry the slurry into filter cakes that can be disposed of in a lined landfill. The cost is slightly higher (50 cents to one dollar per ton) for a conventional plant to

²⁰ University of Arkansas, Published by US Department of Energy

<http://www.netl.doe.gov/publications/proceedings/99/99ucr/mazumder.pdf>

²¹ Mohanty, M.K.; Wang, Z.; Huang, Z.; Hirschi, J. “Optimization of the Dewatering Performance of a Steel Belt Filter” *Coal Preparation*, Jan-Apr 2004, Vol. 24 Issue 1/2, p53-68, 16p; (AN 14117371)

operate with a filter press than without.²² This method has been used in West Virginia.

Dry Cleaning Processes

Other methods of coal processing don't involve water at all. Such methods are popular in the Western United States where water resources are scarce and, therefore, highly valued. Dry processes vary from using air and motion to electromagnetism to separate out the coal without water and many have been around for decades. The initial capital expenditure on a dry plant is less than a wet plant and since dry processes use less energy and do away with the need for chemical input and large waste disposal areas, the operating cost is also lower.²³

Advantages of Dry Cleaning²⁴

- No tailings slurry is created.
- No expensive dewatering process, such as screening, pumping, vacuum filtration or centrifuging, are necessary
- Other high cost processes such as thickeners, froth flotation and expensive reagents such as flocculants, collectors and frothers are not required
- Coal prep plants would be smaller, cheaper, require less electrical energy and would have lower operating costs
- Freight payload would be greater and subsequently, freight costs per gigajoule less, due to low levels of moisture.
- Absence of tailing ponds is ecologically attractive and rehabilitation costs of mining areas would be reduced
- Yields of "clean coal" will be relatively higher as ultrafine coal will be included in the product. Many coal preparation plants waste fine coal to tailings due to the cost of recovering it by wet methods and its disproportionate contribution to product moistures.
- Monitoring and control of effluent is not required.²⁵

Electrostatic separation: Mineral matter is relatively conducting, does not retain an electric charge, and is thrown from the drum. Coal is relatively non-conducting and does retain a charge, and it adheres to the drum until being swept off with a brush. Research is being conducted to refine the process and make it more cost-effective.

²² Phone conversation with prep plant company rep.

²³ Donnelly, Jim. "Potential Revival of Dry Cleaning of Coal." *The Australian Coal Review*. October 1999.

²⁴ Donnelly, Jim.

²⁵ "The Production and Management of Dry Tailings in Coal and Uranium." A. MacG. Robertson P. Eng, Ph.D (President, Steffen Robertson and Kirsten (B.C.) Inc. and J.W. Fisher P. Eng. Draft of Paper. September 1981.

Magnetic Separators: The process is somewhat similar to electrostatic separation, using magnets rather than electrical charge. Research suggests that some versions of magnetic separators will reduce costs significantly—the Rare Earth Magnetic Separator (REM) can handle 4-5 tons/hour, offers 13% lower capital cost, and 50% of the operating costs compared to wet system for production of a fine coal product of equivalent energy level.²⁶

Sources of Information

Relatively little is known about the make up of coal slurry. Scientists, including those with the authorization and funding through the U.S. Geological Survey have been denied access to sampling and testing coal slurry impoundments.

The Martin County Coal Slurry spill in Kentucky in 2000 was about 30 times as big as the Exxon Valdez and covered 75 miles of streams. Only a handful of samples were taken.

Our understanding of coal slurry comes from this disaster in Martin County as reported by the Mine Safety and Health Administration and from a 1985 consent order from the US EPA that was based on slurry injection site about 4 miles south of Williamson, WV.²⁷

Since the US EPA sued one coal company, Massey Energy, for thousands of Clean Water Act violations, the DEP has been allowing coal companies to settle past water pollution violations in-state. However, rather than enforcing the law and collecting overdue fines, the WVDEP is settling for much less and only reviewing violations since 2006.^{28 29} While we have not reviewed all consent orders from these settlements, the ones we have seen have allowed us access to a fraction of the violation history of companies that have likely lead to slurry contamination.

We are awaiting the results of a SCR-15, which is a 2007 mandate from the West Virginia Legislature to the WVDEP to study coal slurry and its constituents. After 2 years, the DEP has sampled 5 underground injection sites and one impoundment and not produced a report.³⁰ While the DEP originally agreed to

²⁶ Donnelly, Jim.

²⁷ EPA Docket No. IV-85-UIC-101. “Determination and Consent Order in the Matter of Eastern Coal Corporations.” United States Environmental Protection Agency Region IV. August 30, 1985. Online at http://www.sludgesafety.org/coal_slurry_inj.html.

²⁸ Ward, Ken Jr. “Foundation Coal Hit with Pollution Fines.” Charleston Gazette. November 22, 2008. Viewed online March 17, 2009 online at www.wvgazette.com/news/200811210964

²⁹ “Coal Producer Pays \$20M Pollution Fine.” Associated Press. Filed January 17, 2008.

³⁰ “DEP Unsure if Coal Slurry Poisons Water Supplies: Agency to Ignore Deadline for Study.”

split the samples with independent scientists, they have reneged on that promise and only provided split samples from three sites in the state. However, the DEP has graciously provided us with their data, which has been interpreted by scientists at Wheeling Jesuit University.

We have worked with universities to test citizen wells and streams near coal sludge storage where we have found correlations in water supplies with contents of slurry. We have pieced together information about individual components of coal slurry, though we do not know how these chemicals interact with each other under certain conditions underground, and we have not had the resources to adequately test for many parameters that are of concern, such as organics.

In a 2002 report, the National Research Council of the National Academy of Sciences recommended further study to identify chemical constituents contained in liquid and solid fractions of slurry and to characterize the hydrogeologic conditions near coal sludge storage. The report also stressed the need for research on alternative waste disposal methods.³¹

Recommendations

The Sludge Safety Project urges the WV 2009 Legislature to pass a moratorium on all sludge until studies can prove it is not a public health hazard.

We make the following additional recommendations:

Municipal water and, more immediately, emergency drinking water be provided to residents near coal slurry sites, including Prenter in Boone County, Jones Branch in Nicholas County, Mud River and Harts in Lincoln County, and Bridge Fork in Fayette County.

The WV Department of Health and Human Resources initiate the health portion of SCR-15 with a renewed mandate to focus research where the DEP and DHHR have received complaints of black water, bad water, and health problems near where coal slurry is stored.

Require the DHHR to submit a budget and timeline for the health portion of the SCR-15 study.

³¹ Committee on Coal Waste Impoundments, National Academy of Sciences. "Coal Waste Impoundments: Risks, Responses, and Alternatives." National Academy Press. Washington, DC. 2002. Online at http://www.nap.edu/openbook.php?record_id=10212&page=R1

Cease all settlements for UIC violations and require companies to pay full fines. These fines may be used to provide drinking water projects to impacted communities. One company that settled on Clean Water Act violations was required to pay \$20 Million. Full back fines totaled \$2.4 Billion. The state didn't see a cent.

Expand the coal slurry study, SCR-15 to consider the toxicity and leaching potential of coal slurry impoundments, as ground water and surface waters can be highly interconnected.

WVDEP must employ a minimum of 4 inspectors specifically for enforcement of UIC regulations in regard to coal mines.

Require best practices regarding coal processing, which would only produce dry waste.

Works Cited

- Bunnell, Joseph E. "Preliminary Toxicological Analysis of the Effect of Coal Slurry Impoundment Water on Human Liver Cells" United States Geological Survey. Open-File Report 2008-1143. Reston, VA. 2008.
- CERCLA 2007 Priority List of Hazardous Substances. Agency for Toxic Substances and Disease Registry. Viewed March 9, 2009 online at www.atsdr.cdc.gov/cercla/07list.html.
- "Coal Producer Pays \$20M Pollution Fine." Associated Press. Filed January 17, 2008.
- Committee on Coal Waste Impoundments, National Academy of Sciences. "Coal Waste Impoundments: Risks, Responses, and Alternatives." National Academy Press. Washington, DC. 2002. Online at http://www.nap.edu/openbook.php?record_id=10212&page=R1
- Community Health Survey, Coal River Mountain Watch.
- Darst, Paul. "Team Finds New Ways to Strip Mercury from Water." The State Journal. January 3, 2008. Viewed online March 9, 2009 at www.statejournal.com/story.cfm?func=viewstory&storyid=33130.
- DEP Consent Order No. M-08-023. Consent Order Issued Under Water Pollution Control Act, West Virginia Code, Chapter 22, Article 11. Department of Environmental Protection, Division of Water and Waste Management. September 18, 2008.
- "DEP Unsure if Coal Slurry Poisons Water Supplies: Agency to Ignore Deadline for Study." Charleston Gazette, February 7, 2009. Online at <http://www.wvgazette.com/News/200902070209>.
- Donnelly, Jim. "Potential Revival of Dry Cleaning of Coal." The Australian Coal Review. October 1999.
- "Early Deaths: West Virginians Have Some of the Shortest Life Expectancies in the United States." West Virginians for Affordable Health Care. Based on a 2008 Report from Harvard Researchers. Online at www.wvahc.org.
- EPA Docket No. IV-85-UIC-101. "Determination and Consent Order in the Matter of Eastern Coal Corporations." United States Environmental Protection Agency Region IV. August 30, 1985. Online at http://www.sludgesafety.org/coal_slurry_inj.html.
- Gharibzadeh, Shahriar. "Arsenic Exposure May be a Risk Factor for Alzheimer's Disease." The Journal of Neuropsychiatry and Clinical Neurosciences. 20:501, November 2008.
- Hendryx, Michael. "Hospitalization Patterns Associated with Appalachian Coal Mining." Journal of Toxicology and Environmental Health. Taylor and Francis, 2008. ISSN: 1528-7394 print/ 1087-2620 online.
- Kostenko, Michael M.D. Personal correspondence.
- Mohanty, M.K.; Wang, Z.; Huang, Z.; Hirschi, J. "Optimization of the Dewatering Performance of a Steel Belt Filter" Coal Preparation, Jan-Apr 2004, Vol. 24 Issue 1/2, p53-68, 16p; (AN 14117371)

- Orem, William H. *Coal Slurry: Geochemistry and Impacts on Human Health and Environmental Quality. (Power Point Presentation)*. United States Geological Survey. Viewed online March 9, 2009 at http://www.sludgesafety.org/misc/wm_orem_powerpoint/
- Pettigrew, Pavanne L. "History and Status of Mining Underground Injection Control at the WVDEP Division of Water and Waste Management." Presented at the 2008 West Virginia Mine Drainage Task Force Symposium, Morgantown, WV.
- Schoening, Richard. West Virginia University Institute of Technology, Chemistry Department. Phone correspondence with Matt Noerpel of Coal River Mountain Watch. October 30, 2008.
- Spadaro, Jack. Report of Investigation Larry Brown Et. Al. v. Rawl Sales and Processing Company. Mingo County, West Virginia. Contact: PO Box 442, Hamlin, WV 25523.
- Stout, Ben M. "Well Water Quality in the Vicinity of a Coal Slurry Impoundment Near Williamson, West Virginia" Wheeling Jesuit University. December 10, 2004. Online at www.sludgesafety.org/what_me_worry/wju_report.pdf.
- Stout, Ben M. and Mary Ellen Cassidy. "West Virginia DEP and Wheeling Jesuit University Underground Injection Collaborative Study" Unpublished. Attached as Appendix 1
- "The Production and Management of Dry Tailings in Coal and Uranium." A. MacG. Robertson P. Eng, Ph.D (President, Steffen Robertson and Kirsten (B.C.) Inc. and J.W. Fisher P. Eng. Draft of Paper. September 1981. University of Arkansas, Published by US Department of Energy <http://www.netl.doe.gov/publications/proceedings/99/99ucr/mazumder.pdf>
- Ward, Ken Jr. "Foundation Coal Hit with Pollution Fines." Charleston Gazette. November 22, 2008. Viewed online March 17, 2009 online at www.wvgazette.com/news/200811210964

Other Resources

- Hendryx, Michael. and Melissa M. Ahem. "Relations Between Health Indicators and Residential Proximity to Coal Mining in West Virginia." American Journal of Public Health. April 2008, Vol. 98, No. 4.
- Smith, Barbara J. "Health Consultation: Williamson Sites. Williamson, Mingo County, West Virginia." Agency for Toxic Substances and Disease Registry, West Virginia Department of Health and Human Resources. February 13, 2004. Online at http://www.atsdr.cdc.gov/hac/PHA/williamson/wil_p1.html.