

**David Gossman**  
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Zwingle, IA 52060

David Gossman has a B.S. and M.S. in Interdisciplinary Physical Science, is a Fellow of the American Institute of Chemists (FAIC) and is a Certified Fire and Explosion Investigator (CFEI). He is President, Gossman Consulting, Inc., President, ChemRight Laboratories, Inc., Chief Investigator, Gossman Forensics (a division of ChemRight Laboratories, Inc.), Owner, Hidden Bluffs Farm and Sole Proprietor, TreeFarmProducts.com. He has been Manager, Cement Kiln Services for Safety Kleen Corp.; Manager, Business Development for McKesson Envirosystems; and Technical Director for Systech Corp. During his professional scientific career, he developed a large number of the commercially available systems for utilizing waste as fuel in cement kilns. Over the last sixteen years he has provided expert witness and investigation services in matters of fires, explosions, chemical releases, personal injury, enforcement actions and similar issues related to litigation support. Prior to entering the hazardous waste management field in 1980, he held a faculty position at the Michigan State University Heavy Ion Laboratory where he worked as an instrumentation engineer. He is currently serving on the American Institute of Chemists Editorial Review Board. He is on various committees for ASTM International including: Air Quality; Waste Management; Molecular Spectroscopy and Separation Science; Occupational Health and Safety; and Environmental Assessment, Risk Management and Corrective Action. Over the years David Gossman has been involved in the process of developing, reviewing and approving numerous ASTM standards. He is a member of the American Chemical Society, the American Association for the Advancement of Science, the International Society of Environmental Forensics, the National Fire Protection Association, the National Association of Fire Investigators, the Forensic Expert Witness Association and is an Associate Member of the American Bar Association (ABA)-Section of Environment, Energy & Resources and Section of Tort Trial & Insurance Practice. He is a licensed Private Investigator and is on the Technical Advisory Board of Core Technology Development Group, LLC. He is a named inventor on five patents granted by the US Patent Office.

<b>EDUCATION</b>	College of Natural Science	Michigan State University
1977 to 1979	<b><u>Master of Science</u></b> , June 1979. Interdisciplinary Physical Science: advanced analytical chemistry, exploration geophysics, climatology, management/communications and thesis.	
1975 to 1977	<b><u>Bachelor of Science</u></b> , June 1977. Major in Interdisciplinary Physical Science: extensive background in chemistry, physics, mathematics and geology. Additional courses in engineering, cartography and climatology.	
1973 to 1975	Hanover College <b><u>First two years of B.S.</u></b> – Courses in chemistry, physics, geology and mathematics.	Hanover, Indiana

**EXPERIENCE**

Self Employment Maquoketa, Iowa and Hampshire, Illinois

2015  
to  
Present **Chief Investigator, Gossman Forensics.** Gossman Forensics, a division of ChemRight Laboratories, Inc., provides chemical and environmental forensic and expert witness services both nationally and internationally.

2004  
to  
Present **President, ChemRight Laboratories, Inc.** ChemRight Laboratories, Inc. provides laboratory testing services to local communities in eastern Iowa.

2000  
to  
2005 **Managing Partner, ERAtech Group LLC** ERAtech Group LLC developed multiple international waste fuel blending and fuel use facilities in Europe, South America and Asia.

1994  
to  
Present **Owner, Hidden Bluffs Farm** Hidden Bluffs Farm is a 670 acre corn, soy bean and timber farm located in eastern Iowa, including active forest, savanna and prairie ecological restoration as part of the farming operation.

1988  
to  
Present **President, Gossman Consulting, Inc.** Gossman Consulting, Inc. provides technical, regulatory and scientific consulting services to industry both nationally and internationally.

Safety-Kleen Corp. Elgin, Illinois

5/1987  
to  
9/1988 **Manager, Cement Kiln Services.** Continued to manage and expand hazardous waste fuel use in cement kilns after McKesson Envirosystems acquisition by Safety-Kleen.

McKesson Envirosystems Fort Wayne, Indiana

3/1986  
to  
5/1987 **Manager, Business Development.** Developed and managed cement kiln outlet for waste fuels including state of the art on-site laboratory. Fuels outlet permitted overall corporate growth to record levels. Also assisted in corporate development of standard company analytical procedures, QA/QC program and health and safety evaluation system. Negotiated corporate purchase of Perkin-Elmer GCs and minicomputers to standardize plant labs.

7/1985  
to  
3/1986 **Marketing Manager.** Assisted in technical development and marketing of cement kiln waste fuels outlet in Puerto Rico. Conducted systems analysis of three plant labs to improve operations. Developed and implemented a new waste stream qualification program, providing a 50% increase in number of qualifications and adding \$500,000 in corporate revenues for qualification analysis services.

	Systech Corp.	Xenia, Ohio
10/1982 to 6/1985	<b><u>Technical Services Director and Safety &amp; Regulatory Manager.</u></b> Transferred to corporate staff of vice president. Assumed added responsibilities of corporate safety and regulatory compliance. Originated and performed early design of computerized, plant level system for receiving, invoicing and other real time data management activities.	
	Systech Corp.	Paulding, Ohio
3/1982 to 10/1982	<b><u>Technical Services Director.</u></b> Responsible for all technical aspects of the Waste-to-fuels Division. Analyzed and specified analytical equipment and computers for labs in Ohio, California and Kansas. Responsible for the design and set-up of each of the new labs. Continued training of all new chemists and other technical personnel. Additional research and development of faster and more accurate methods of analysis.	
2/1980 to 3/1982	<b><u>Site Manager and Chemist.</u></b> Built, developed methods for and operated pilot project laboratory for analyzing waste solvents prior to their use as fuel in a cement kiln. Project involved extensive research into cement chemistry and industrial waste solvent chemistry in order to determine appropriate analytical criteria and methods. Hired, trained and managed staff of up to five chemists and technicians. Trained two future site managers. Position involved extensive communications with cement plant personnel, industrial waste generators, waste haulers and corporate sales and management staff. Also responsible for on-site interactions with federal and state regulatory personnel.	
9/1979 to 2/1980	Self Employed	E. Lansing, Michigan
	<b><u>Private Tutor.</u></b> Tutored college students in chemistry, math and physics.	
	Science and Mathematics Teaching Center	Michigan State University
9/1978 to 6/1979	<b><u>Graduate Assistant.</u></b> Taught lab and recitation section of Sophomore Physical Science. Supervised one undergraduate employee. Provided academic advising for undergraduate students enrolled in interdisciplinary science programs. Responsible for helping students deal with numerous academic and bureaucratic problems.	
	MSU-NSF Heavy Ion Laboratory	Michigan State University

- 6/77  
to  
4/78
- Specialist** (university faculty position). Systems engineering work involved design, construction and operation of instrumentation systems. Implemented computer controlled magnet mapping system and was involved in design and operation of cyclotron control systems. Technologies included digital and analog electronics, mini-computers, cryogenics, RF systems, super-conducting magnets and vacuum systems. Wrote the in-house biweekly engineering newsletter "Cyclotron News" updating technical changes and developments in operating and future systems.
- 6/1975  
to  
6/1977
- Research Aid.** Same as above. Also performed computer assisted analysis of nuclear spectra; occasionally supervised other student employees doing computer analysis. Gave tours of the cyclotron lab to school groups and the general public.
- 1/1975  
to  
5/1975
- Shaw High School Madison, Indiana
- High School Teacher** (temporary). Taught one class of high school chemistry.
- Hanover College Hanover, Indiana
- 9/1973  
to  
4/1975
- Teaching Assistant.** Assisted teaching college freshman chemistry. Supervised and prepared labs. Graded lab reports and tests.
- Systems Technology Corp. Dayton, Ohio
- 7/1974  
to  
8/1974
- Skilled Laborer.** Implemented the conversion of a mothballed sewage digester to a methane producing solid waste/sewage digester. Included supervising one other employee, purchase of all needed equipment and supplies and implementation of drawn up designs.

### PROFESSIONAL AFFILIATIONS

- Air and Waste Management Association
- American Chemical Society
- American Association for the Advancement of Science
- American Bar Association
- American Institute of Chemists Fellow (Certified Chemist)
- ASTM International, various committees including: Air Quality; Waste Management; Molecular Spectroscopy and Separation Science; and Occupational Health and Safety; and Environmental Assessment, Risk Management and Corrective Action
- Forensic Expert Witness Association
- International Society of Environmental Forensics
- National Association of Fire Investigators
- National Fire Protection Association

## ASTM STANDARDS DEVELOPMENT

ASTM standard development is a consensus based process involving the input and contributions from numerous individuals. David Gossman has been involved in the process of developing, reviewing and approving numerous ASTM standards. Following are ASTM standards for which he was either principal author or had substantive input and involvement in developing:

D 4978	Test Methods for Screening of Reactive Sulfides in Waste
D 4979	Test Method for Physical Description Screening Analysis in Waste
D 4980	Test Methods for Screening of pH in Waste
D 4981	Test Method for Screening of Oxidizers in Waste
D 4982	Test Methods for Flammability Potential Screening Analysis of Waste
D 5057	Test Method for Screening Apparent Specific Gravity and Bulk Density of Waste
D 5058	Test Methods for Compatibility of Screening Analysis of Waste
D 5177	Guide for Waste Acceptance at Hazardous Waste Incinerators
D 5283	Practice for Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning and Implementation
D 5368	Test Methods for Gravimetric Determination of Total Solvent Extractable Content (TSEC) of Solid Waste Samples
D 5468	Test Method for Gross Calorific and Ash Value of Waste Materials
D 5513	Practice for Microwave Digestion of Industrial Furnace Feedstreams and Waste for Trace Element Analysis
D 5530	Test Method for Total Moisture of Hazardous Waste Fuel by Karl Fischer Titrimetry
D 5681	Terminology for Waste and Waste Management
D 5792	Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives
D 5830	Test Method for Solvents Analysis in Hazardous Waste Using Gas Chromatography

D 5839	Test Method for Trace Element Analysis of Hazardous Waste Fuel by Energy-Dispersive X-Ray Fluorescence Spectrometry
D 5928	Test Method for Screening of Waste for Radioactivity
D 6050	Test Method for Determining of Insoluble Solids in Organic Liquid Hazardous Waste
D 6052	Test Method for Preparations and Elemental Analysis of Liquid Hazardous Waste by Energy-Dispersive X-Ray Fluorescence

## **PATENTS**

### **Patent Holder and Sole Inventor**

US 8,980,205  
Mar. 17, 2015      “Method for Reducing the Mercury (Hg) and Other Metal Emissions from a Plant for Manufacturing Cement Clinker and Other Industrial Processes”

### **Coinventor**

US 8,100,789  
Jan. 24, 2012      “Method and System of Making a Burnable Fuel”

US 8,163,045  
Apr. 24, 2012      “Method and System of Making a Burnable Fuel”

US 8,268,073  
Sept. 18, 2012      “System and method for making cement and cement derived therefrom”

US 8,324,443  
Dec. 4, 2012      “Secure Containers having unidirectional apparatuses for used or unused materials and methods for making and using same”

### **Specific self employment experience includes the following:**

- Investigated trans-Atlantic cargo ship fire and explosion that resulted in multiple fatalities.
- Investigated railcar derailment, fire and chemical contamination following mishandled cleanup.
- Investigated personal injury caused by chemical burn which occurred in the workplace.
- Investigated explosion at waste water treatment plant which caused a fatality and resulted in a wrongful death lawsuit.
- Investigated city waste water treatment system which was inadequately maintained and subsequently caused damage to several parties and their property.
- Investigated and determined causation of fire in oxygen tank regulator resulting in personal injury lawsuit due to burns to the individual’s lungs.
- Investigated explosion in home caused by an acetone-based cement stain in which individuals were badly burned, and determined there were inadequate warnings regarding

the products.

- Investigated zirconium explosion and fire at hazardous waste incinerator, resulting in a multi-party lawsuit, and determined causation was due to mismanagement of the waste materials prior to delivery at the facility.
- Investigated potential offensive odor contamination in a liability lawsuit.
- Provided technical analysis in a personal injury case involving chemical burns caused by hydrofluoric acid in an aluminum cleaner.
- Provided technical analysis for the Department of Justice in a case involving potential violations of the Clean Air Act from an industrial source.
- Determined causation in a personal injury lawsuit involving explosion of aerosol paint can.
- Determined causation in an investigation of a propane related home explosion.
- Investigated explosion of automobile air conditioner Freon refill aerosol can in a personal injury lawsuit.
- Investigated causation for an industrial fire involving a methane digester.
- Provided an environmental forensic investigation of soil PCB contamination.
- Conducted sampling and testing for an investigation into possible workplace heavy metal contamination.
- Performed chemical analysis to determine causation of an industrial chemical flash fire at an incineration facility in a multi-party workplace personal injury lawsuit.
- Investigated possible illegal processing of RCRA hazardous waste in potential violation of federal hazardous waste laws in a criminal lawsuit.
- Performed investigation of dust contamination and ground water impact related to personal property adjacent to a quarry in a civil lawsuit.
- Investigated health and safety of working conditions and potential environmental regulation violations on behalf of a labor union.
- Investigated and determined causation of an industrial pipeline rupture and fire at a hazardous waste plant in a multi-party wrongful death lawsuit.
- Provided analysis and testimony for a personal injury lawsuit concerning an individual burned by industrial furnace material.
- Performed environmental forensic analysis to determine causation and actual source of dioxin emissions in an enforcement action.
- Provided expert witness report in patent dispute.
- Investigated and provided testimony in a civil case concerning contamination of private property following containment failure of a lagoon in which oil field waste had been dumped.
- Provided technical reports and supporting materials concerning emission modelling to assist attorneys in adjudicated permit hearings in New York State.
- Investigated hazardous waste violations in an enforcement action by the EPA.
- Performed chemical forensic examination and determined causation as part of an investigation into a large industrial railcar explosion and fire.
- Determined causation of an explosion and fire in the flammable liquids tank farm of a waste management facility.
- Provided expert report and testimony in an adjudicated permit hearing for a hazardous waste facility in Texas.
- Assisted in obtaining patents for client on conversion of medical waste into industrial fuel.
- Assisted client in specifying new GC systems for PCB determinations.

- Lead the successful effort to permit a new cement plant in the city of Chicago – the first new cement plant permitted in a major city in decades.
- Taught class in Dubai on Occupational Safety and Health for high risk industries.
- Taught class in Shanghai, China on HAZOPs.
- Developed safety manual for regional oil and gas pipeline construction firm.
- Designed hazardous waste regulations for potential use in a developing country.
- Evaluated a draft waste fuel supply contract between a cement manufacturer and a waste management company.
- Managed HWC MACT compliance testing programs.
- Managed PC MACT compliance testing programs.
- Provided expert witness report on the source of a fire and fatality at a hazardous waste management facility.
- Performed a company-wide environmental compliance audit including management strategies for more effective compliance.
- Provided an expert witness report on the cause of a railcar explosion at a cement plant HWF facility.
- Provided an expert witness report on the cause of an explosion in the vapor hood space at a hazardous waste fuel storage facility in a cement plant.
- Managed a comprehensive, 2 phase, 4 day RCRA trial burn at a cement plant.
- Evaluated numerous cement plants in Taiwan, United Arab Emirates, Kuwait, Australia, Philippines, United Kingdom and Malaysia for potential use of alternative fuels and raw materials.
- Provided expert witness report and testing regarding an accident in a cement plant clinker cooler.
- Provided expert witness report on a waste recycling patent dispute.
- Supervised the QA/QC for a Risk Test Burn at a cement plant under the BIF regulations.
- Wrote and supervised testing at numerous cement plants for dioxin emissions relative to preparing for compliance with the MACT rule.
- Assisted in the development of strategies for compliance with dioxin emission limits under the MACT rule at numerous cement plants.
- Assisted in the preparation of testimony for permit hearings.
- Testified at adjudicated hearings required for a Part B permit for a cement plant using hazardous waste fuel in Texas.
- Set up the laboratory and trained operating personnel at a waste fuel blending facility in Chile.
- Assisted in the preparation of a permit application for a new cement plant in the US, specifically made calculated emission estimates for metals and organics based on raw material inputs and process design.
- Assisted in the development of a dynamic model for predicting metal emission rates from a cement plant as a tool for developing operating modes designed to reduce mercury emissions.
- Trained international teams for the performance of feasibility studies for the potential use of waste derived fuels and raw materials in cement plants in developing countries.
- Developed corporate standard quality control procedures for alternative raw materials and fuels for cement plants.
- Assisted in writing a number of Initial Comprehensive Performance Test Plans for plants



- complying with the new HWC MACT rule.
- Evaluated maximum feed rates for the use of spent aluminum potliner in specific cement plants.
  - Developed a report on emissions from cement plants using tire derived fuels compared with baseline emissions.
  - As part of a team, performed a comprehensive review of proposed MACT standard for hazardous waste combustors.
  - Evaluated three cement plants in Argentina for potential use of hazardous waste fuel.
  - Assisted with negotiations to set Part B permit operating conditions for a cement plant burning hazardous waste fuel in Texas.
  - QA/QC review of a HAP test for a cement plant using tire derived fuel.
  - External QC for EPA funded test to fully characterize PIC emissions from a cement kiln burning hazardous waste fuel.
  - QA/QC review of comprehensive testing of a Canadian cement kiln utilizing chlorine containing waste as an alkali reducer.
  - Comprehensive lab operations review for on-site hazardous waste testing laboratory.
  - Trial burn review for commercial BIF facility.
  - Performed a study of metal and particulate emissions for cement kilns using hazardous waste fuel.
  - Prepared a Waste Analysis Plan for an oil/solvent recycling facility in Chile.
  - Assisted in a study comparing proposed HWC (MACT) rules with existing BIF regulations.
  - Acted as QA/QC manager for one of the first comprehensive RCRA Trial Burns at a cement plant.
  - Performed a comprehensive review of a proposal update to SW-846.
  - Performed a detailed QA/QC review of mercury emission data used by EPA to develop/justify MACT controls on cement kilns.
  - Performed a detailed QA/QC review of dioxin emission data from cement plants not utilizing hazardous waste fuels.
  - Assisted in development of a comprehensive waste oil/solvent waste fuel program for Chile.
  - Acted as QA/QC manager for 1995 update to ROC tests at multiple cement plants.
  - Evaluated three cement plants in Spain for potential use of hazardous waste fuel.
  - Assisted in the review of a cement plant's waste water run off plans.
  - Reviewed the EPA draft Combustion Emissions Technical Resource Document (CETRED) and assisted various clients in providing technical comments and corrections to EPA.
  - Performed a detailed QA/QC review of dioxin emission data comprising over 20 tests at a single cement plant, both under baseline conditions and while burning hazardous waste.
  - Made a presentation at a technical seminar on hazardous waste combustion presented to waste generators and regulatory authorities in the United Kingdom.
  - Evaluated two cement plants in Chile for potential use of hazardous waste fuel.
  - Assisted with a community information program for an existing facility undergoing Part B permitting. Helped the public in attendance to understand the Trial Burn Plan process.
  - Assisted with the preparation of Trial Burn Plans for a number of cement kilns using hazardous waste. Plans incorporated latest EPA guidance on data required for multi pathway risk assessments.

- Provided hardware support and maintenance for in-house state of the art network system including the networking of the latest 486 and pentium based computer technology, high-end laser printing, CD-ROM, and optical character and voice recognition technology.
- Provided conceptual oversight to the design of a corporate level multi plant emissions database for a major U.S. cement manufacturer.
- Assisted in the review and preparation of client comments on the EPA draft Dioxin Assessment. Assisted international clients in dealing with erroneous EPA conclusions found in the draft report in order to prevent the erroneous conclusions from negatively impacting local permitting decisions.
- Designed and set up a new GC/MSD system for testing organic hazardous waste.
- Prepared a new Waste Analysis Plan and QA/QC Plan for a cement plant using both liquid and solid hazardous waste fuel.
- Prepared an analysis of existing metal emission data from cement kilns and incinerators burning hazardous waste, and recommended technology based metal emission standards which have been presented in a petition for rule making to the USEPA by the Cement Kiln Recycling Coalition.
- Assisted in a critical review of QA/QC data from an EPA study of cement kiln dust.
- Assisted in responding to regulatory allegations and potential fines for cement plants using hazardous waste fuel.
- Evaluated a number of cement kilns in the United Kingdom for hazardous waste fuel potential and made recommendations to help set project priorities.
- Assisted in the development of a “green grass” waste fuel burning facility in the United Kingdom with special emphasis on appropriate quality control measures, process monitoring permitting and stack testing.
- Developed a detailed GC-MSD technique for determining volatile and semivolatile organics in hazardous waste fuel.
- Assisted in the development of a petition for rule making submitted to EPA by the Cement Kiln Recycling Coalition.
- Provided technical support on various issues in support of the cement industry’s lawsuit against EPA regarding certain aspects of the BIF regulations.
- Evaluated cement plants in Thailand for potential hazardous waste fuel projects.
- Assisted in the development of hazardous waste fuel specifications and laboratory testing methods for a cement kiln using hazardous waste fuel in Australia.
- Evaluated and made recommendations regarding a potential hazardous waste fuel project for a cement plant in Indonesia.
- Performed comprehensive audits of contractor operated laboratories testing hazardous waste fuel at three cement plants.
- Assisted in the preparation of an ISO 9000 (British Standard 5750) certification application for a hazardous waste fuel laboratory in the United Kingdom.
- Prepared a comprehensive report compiling the results of all BIF compliance testing at industrial furnaces commercially burning hazardous waste fuel in the United States.
- Prepared a comprehensive report compiling the results of 20 trial burns at commercial hazardous waste burning incinerators.
- Assisted with presentations to a community advisory panel for a cement plant using HWF in Indiana.
- Prepared a study of recycling opportunities utilizing cement kiln technology for refineries

in Venezuela.

- Assisted in drafting two requests for hydrocarbon extensions under the BIF regulations.
- Assisted in presentations to EPA regions and headquarters regarding the BIF regulations and the HC/CO issue in cement kilns.
- Subcontracted metal spiking and process sampling/testing at two BIF compliance tests.
- Managed and wrote the reports for BIF compliance tests/trial burns at four cement plants.
- Prepared revised BIF Precompliance Certifications for three cement plants.
- Developed sample preparation methods for homogenizing non-homogeneous samples of liquid and solid HWF prior to analysis.
- Developed and wrote a screening method for radioactive material contamination of HWF.
- Developed laboratory testing methods to screen HWF for selected pesticides.
- Updated RCRA Operating Plans for three cement plants using HWF to comply with new BIF regulations.
- Prepared BIF Precompliance Certification for a cement manufacturer using HWF.
- Prepared and made presentations at public meetings in Texas and Colorado regarding the use of HWF in cement kilns.
- Provided expert witness testimony during legislative hearing in Texas regarding bills on hazardous waste management and facility permitting.
- Developed and wrote a comprehensive laboratory operations manual for use at multiple HWF testing laboratories.
- Designed and set up a new laboratory for HWF testing in Ohio. Subsequently trained the new lab manager to operate and maintain the lab in accordance with EPA guidelines.
- Performed studies of the impact of the proposed Boiler and Industrial Furnace regulations and other regulations on the hazardous waste/cement kiln market.
- Prepared and made presentations to representatives from the oil refining industry regarding opportunities for reusing hazardous waste in cement kilns.
- Developed laboratory operating procedure that allows for the determination of sub-ppm levels of mercury in HWF in less than two hours using EPA SW-846 methodology.
- Developed a comprehensive database of health and safety information on over 400 compounds known to have been found in hazardous waste fuel.
- Designed and set up a new laboratory for HWF testing in Tennessee. This is the first HWF laboratory designed specifically to comprehensively test solid HWF prior to acceptance and is the first to use x-ray fluorescence spectroscopy to determine metals.
- Assisted client companies in evaluating technical personnel for positions involved in hazardous waste operations and laboratories.
- Co-directed a series of courses on Solvent Recycling and Reuse taught in the United States and Europe.
- In conjunction with Southdown Corp., performed a study to determine the viability of proposed EPA stack testing methodology for HCl emissions. Results indicate that ammonium chloride and other chloride salts produce false positives using the methodology.
- Performed technical and market evaluations to determine the suitability and made recommendations regarding the resource recovery opportunities available to various cement plants throughout the United States as well as Great Britain, Venezuela, and South East Asia.
- Performed comprehensive laboratory based study, including field sampling, of cement kiln

- dust and cement clinker stored and generated at cement plants throughout the country.
- Developed and managed the implementation of stack testing plans for cement manufacturers using or planning on the use of hazardous waste fuel. Tests were performed to satisfy state air permit authorities as well as provide data to be used for future EPA requirements.
  - Performed a comprehensive evaluation of the potential for utilizing spent aluminum potliner as a fuel in cement kilns. Evaluation included facility design criteria and concepts based on the study's technical findings.
  - Evaluated various resource recovery opportunities for client companies relative to technical feasibility, worker health and safety impact, environmental impact, and regulatory requirements.
  - Helped to design a system to perform a detailed market analysis of selected types of hazardous waste within a regional market.
  - Performed RCRA and CAA audits of existing cement kilns utilizing HWF.
  - Performed a study of various alternatives for the introduction of solid hazardous wastes into cement kilns including the potential for pyrolysis or thermal separation prior to cement kiln introduction.
  - Provided detailed calculations of potential limits on metals in hazardous waste fuel based on proposed BIF regulations and stack dispersion models.
  - Wrote a complete set of RCRA operating plans for a RCRA interim status hazardous waste fuel storage facility located at a cement plant.
  - Guided the engineering design of a bulk liquid HWF facility for a client cement company including tank farm, truck and rail transfer, and laboratory.
  - Developed a comprehensive community information program and implementation plan for a client cement manufacturer considering the use of hazardous waste fuel.
  - Performed the first comprehensive, published study on the fate of trace metals in the cement manufacturing process. The study provided special insight on how recirculating loads, as well as the point of introduction, can effect the fate of metals in cement kilns.
  - Authored a series of published reviews of proposed EPA Boiler and Industrial Furnace regulations. These included specific technical analysis of potential impacts on cement kiln waste fuel operations with suggestions and guidance for providing comments to EPA.

## **PUBLICATION LIST**

### **Publications That Have Been Presented At Various Technical Conferences And In Various Journals And Trade Magazines**

- "Safe Alternatives," International Cement Review, July 2013, pg 54-58.
- "The Compatibility Of Farm Income Generation With Ecological Restoration", The 5th World Conference on Ecological Restoration of the Society of Ecological Restoration (SER), October 6-11, 2013.
- "Polychlorinated dibenzo(p)dioxin and furan (PCDD/F) congener profiles in cement kiln emissions and impacts.", Science of the Total Environment, 2012 March 1;419(20):37-43.
- "Emissions of metals and polychlorinated dibenzo(p)dioxins and furans (PCDD/Fs) from Portland cement manufacturing plants: inter-kiln variability and dependence on fuel-types," Science of the Total Environment, 2011 Sep 15;409(20):4198-205.

- “Alternatives to ACI”, International Cement Review, May 2011, pp 70-72.
- “Alternate Fuels and Economic Downturns” World Cement, March 2009, pp 75-78.
- “A Review of Potential Solutions to Control Dioxin (PCDD/PCDF) Emissions from Cement Kilns,” A&WMA Hazardous Waste Combustors Specialty Conference, April 2003.
- “HWC Operating Limit Determination for Lone Star Industries Greencastle Facility”
- “Innovations in Permitting or Is the Use of “Common Sense” Permitting an Innovation?,” The 2003 Environmental Innovations Summit July 14-16, 2003.
- “The Use of a Comprehensive Facility Operations Review and Hazop Study to Limit Liabilities and Risks in the Operation of Hazardous Waste Fuel Facilities,” A&WMA Conference, 2002.
- “Evaluating the Consequences of Mercury Emissions from a Point Source,” A&WMA Specialty Conference on Mercury Emissions Fate, Effects, and Control, August 2001.
- “Factors Influencing Emission Levels of PCDD/PCDFs from Cement Kilns,” A&WMA 2001.
- “Development and Design of Hazardous Waste Fuel Blending Facilities in Developing Countries,” A&WMA 1999.
- “Data Quality Objectives at Resource and Recovery Act Treatment, Storage and Disposal Facilities (DQOs at RCRA TSDFs) ,” A&WMA 1999.
- “Practical Quality Assurance/Quality Control in the Commercial Thermal Treatment Facility Laboratory,” A&WMA Boiler and Industrial Furnace Conference, 1998.
- “Community Relations via The World Wide Web,” A&WMA Boiler and Industrial Furnace Conference, 1998.
- “BIF Testing - Is There Anything Else To Learn?,” A&WMA Boiler and Industrial Furnace Conference, 1998.
- “An Analysis of Selected NOD Issues Related to Waste Analysis Plans,” A&WMA Boiler and Industrial Furnace Conference, 1998.
- “An Evaluation of a Cement Kiln’s Emissions While Under Worst Case Operating Conditions,” Rock Products Conference, December 1997.
- “A Model Waste Analysis Plan for Commercial BIF Facilities,” AWMA International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces April, 1997.
- “The Design of A Custom Database System for Storing and Accessing Point Source Emission Test Data and Associated Process Conditions,” AWMA International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces April, 1997.
- “An Analysis of Potential Changes to Operations and Waste Analysis Requirements for Commercial Facilities Regulated Under EPA Proposed Hazardous Waste Combustor Regulations,” AWMA International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces March, 1996.
- “A Comparison of Normal and Worst Case Cement Plant Emissions,” AWMA International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces March, 1996.
- “Quality Control Review of Mercury and PCDD/PCDF Emissions Data From Cement Kilns Used for MACT Evaluations,” AWMA 89th Annual Meeting, 1996.
- “The Added Risk to Health, Safety and the Environment Due to the BIF Regulation,” AWMA International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces March, 1995.
- “A Review of the Usefulness of Various ASTM and SW-846 Methods Which May Be Used

- by the Thermal Treatment Industry,” AWMA International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces March, 1995.
- “The Effect of Process Differences on System Removal Efficiencies (SREs) and the Fate of Metals in Cement Kilns,” AWMA Waste Combustion in Boilers and Industrial Furnaces Conference, 1995.
  - “2,3,7,8-TCDD Equivalent Emissions from Cement Kilns Burning Hazardous Waste,” AWMA International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces April, 1994.
  - “Comparison of Metals Spiking Systems and Metal Compound Selection Among the Cement Kilns Conducting Compliance Tests,” AWMA International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces March, 1993.
  - “A Method for the Rapid Semi-Quantitative Identification of Hazardous Organic Constituents in Liquid Organic Hazardous Waste Streams,” AWMA International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces March, 1993.
  - “Comparison of Metal Emissions from Cement Kilns Utilizing Hazardous Waste Fuels with Commercial Waste Incinerators,” Rock Products Conference, December 1993.
  - “Metal Equilibration and Process Capture Efficiencies in Cement Kilns,” A&WMA 1993.
  - “Suitability of Hydrocarbon and Carbon Monoxide Measurement as Combustion Indicators in Cement Kilns,” AWMA International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces March, 1993.
  - “Typical Metal Concentrations in RCRA Waste Burned in Cement Kilns,” A&WMA Incineration Conference 1993.
  - “Metal Precompliance for Cement Kilns,” A&WMA International Specialty Conference on Waste Combustion in Boiler and Industrial Furnaces, March 1992.
  - “The Use of Monochlorobenzene as a Principal Organic Hazardous Constituent for Destruction Efficiency Determinations in Cement Kilns,” A&WMA Specialty Conference on New RCRA Regulation, March, 1992.
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