

“Black Powder” Contamination in the Gas Industry: Survey & Best Practice Manual



Researchers gathered data on issues, cleanup techniques, and management methods related to “black powder” contaminants sometimes found in pipelines and ancillary equipment. Results are compiled into a “best practices” industry manual.

Project Description

Black powder – a substance composed mainly of iron sulfides and iron oxides – is a major concern for the natural gas industry because it can cause corrosion and create wear on pipelines. It also can clog instruments and reduce the overall gas flow through the pipes. Moreover, the contaminant must be handled properly and carefully because it can be flammable and explosive when exposed to air.

Black powder has been found in dry and wet gas pipelines, compressors, valves, regulators, meters, and other industry equipment. Both iron sulfide and iron oxide in pipelines can come from chemical reactions with or without the involvement of microorganisms. Iron sulfide is also formed from the reaction of hydrogen sulfide or sulfur compounds (frequently found in pipelines) with the iron in the pipe. In addition, mercaptan-based odorants can play a role in the development of iron sulfide.

Black powder comes in many forms, varying from a dry, fine black powder that is “smoke-like” to a semi-solid amorphous tar. The material may also be mixed with a range of other contaminants, including, but not limited to, hydrocarbons, salt, dirt, or chlorides. The variability in the physical and chemical properties of black powder greatly contributes to the difficulties in the handling and elimination of this substance.

To date, there are no general guidelines on how to handle, remove, and dispose of black powder. Each specific circumstance requires a detailed assessment of the problem and a specifically designed treatment. Currently, once black powder has been detected in a pipeline, there is no method available to completely eradicate the substance. Methods used for the removal of black powder from inside the pipe include such physical processes as pigging, filtration and flushing, and chemical and biocide treatments. However, none of these methods alone, or in combination, have resulted in complete removal of the black powder. Some meth-

ods, such as flushing, may even result in increasing the presence and growth rate of microbial corrosion, which can effectively worsen the problem.

To circumvent the flammability concern, several handling and disposal practices have been used by the industry (e.g., wetting the dry powder, placing filters in a steel box, or using potassium permanganate solution); however, these practices are considered either costly, not effective, or inconvenient.



Deliverable

The objective of this project was to compile a “Best Practice” Manual through a survey of the gas industry. The study addressed the problems that have been encountered and the approaches taken to handle the issues.

Benefits

- Centralized knowledge and experience base on black powder for easy industry reference
- Best Practice Manual provides guidance regarding the proper procedures for handling of black powder.

Technical Concept & Approach

A survey of the gas industry was conducted over a six-month period. This survey encompassed various issues related to black powder. In addition, manufacturer suggestions for any product used in the removal or handling process was included.

The Best Practice Manual developed from the data is a compilation of a variety of black powder experiences, including, but not limited to, the identification, removal, handling, and storage of black powder.

Specific goals of the project were to:

- Determine the easiest and most cost-effective way to handle and mitigate black-powder contamination
- Gain knowledge about the various forms and locations of the contaminant
- Reduce the hazards caused by the substances' flammability
- Develop a better understanding of possible prevention methods
- Enhance worker safety
- Reduce environmental impact with proper disposal methods.

Results / Status

The Best Practice Manual is available. It includes information from five survey responses and three sample analyses, as well as other information.

Future research plans include systematically categorizing different types of black powder the industry has encountered based on their physical, chemical, and microbiological properties; updating the practice manual for different types of black powder; and investigating and/or developing more effective and safe techniques to handle and dispose of black powder.

For more information:

Maureen Droessler

Program Administrator

Operations Technology Development, NFP

Phone: 847/768-0608

maureen.droessler@otd-co.org
