NIOSH OIL & GAS EXTRACTION SAFETY & HEALTH RESEARCH

Research Partnerships in Development of an Engineering Control for Respirable Crystalline Silica

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CDC Workplace Safety and Health
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The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

Overview

- How partnerships made possible the development of the NIOSH mini-baghouse retrofit assembly (NMBRA)
- Generation 3 of the NMBRA
- Future work

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Chemical Exposure Risks

Background – NORA Oil and Gas Council

- South Texas Exploration and Production Safety (STEPS) Network started in 2003, as a collaborative effort between oil companies and OSHA in Corpus Christi, TX.
- The first meeting of the NORA Oil and Gas Council took place in February 2008. Nicolle Mode was the first coordinator of the program.

Background – The Alliance

- Some of the founders of the STEPS Network became strong supporters of the NORA Oil and Gas Council from the beginning, including Marianne McGee from OSHA and Rick Ingram from BP.
- The Alliance was established between the National STEPS Network, OSHA and NIOSH in 2014.

Background –NIOSH Research

- NIOSH researchers were the first to systematically evaluate occupational exposures to workers at hydraulic fracturing sites [1]
  - Personal breathing zone air samples were collected for workers at 11 sites in 2010 and 2011.
  - Out of 111 samples, 93 exceeded the NIOSH REL action level for respirable crystalline silica (RCS).
  - RCS exposures for sand mover operators/T-belt operators can be 10-50 times greater than NIOSH REL.

[1] Esswein, Breitenstein, Snawder, et.al,. *Occupational Exposures to Respirable Crystalline Silica in Hydraulic Fracturing* Jour. Occ. Env. Hyg. Vol. 10, Issue 7, May, 2013

Sources of RCS in Hydraulic Fracturing

- NIOSH researchers identified at least 7 major sources of RCS generation/release:
  - Thief hatches on top of sand movers
  - Uncapped side fill ports
  - Vehicular traffic
  - Transfer belt under sand movers
  - Sand dropping or mixing in belt or blender area
  - Transfer belts from sand movers to blenders
  - End of sand mover conveyor belt

Control of RCS Release from Sand Movers

The NIOSH Mini Baghouse Retrofit Assembly (NMBRA) was developed to control dust emissions from thief hatches on sand movers

Photo courtesy of Eric Esswein, NIOSH

Prospective Partners

$ Exploration and Production (E&P) Companies (Oil and Gas Companies) – "The Operator" $

- Drilling Contractors
- Equipment Manufacturers
- Energy Service Companies (Testing, construction, completion, stimulation, production)

Development of the NIOSH Mini-Baghouse Retrofit Assembly (NMBRA)

- Eric Esswein from Western States Division (WSD) took his ideas and sketches for the NMBRA to Mike Gressel in the Division of Applied Research and Technology (DART).
- With help from many others in NIOSH, they developed Generation 1 of the NMBRA.

NMBRA Generation 1, a bolt-on engineering control

- Inexpensive
- No moving parts
- Installed at an Encana production site near Rifle, Colorado in 2013.

Generation 2 was tested on a sand mover

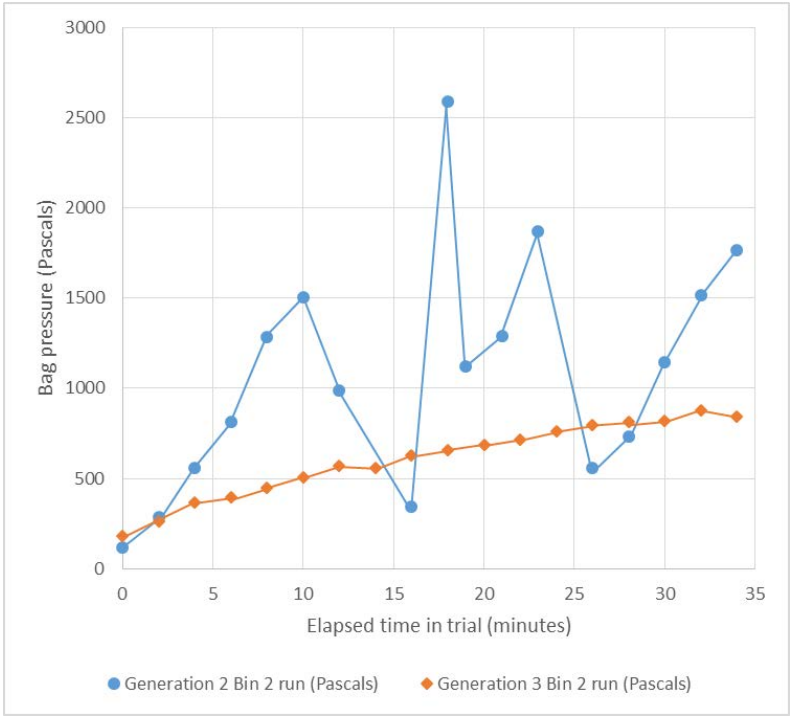
- Southwestern Energy (SWN) executive called and wanted to partner.
- Test was conducted November, 2013.

Generation 3 design was refined

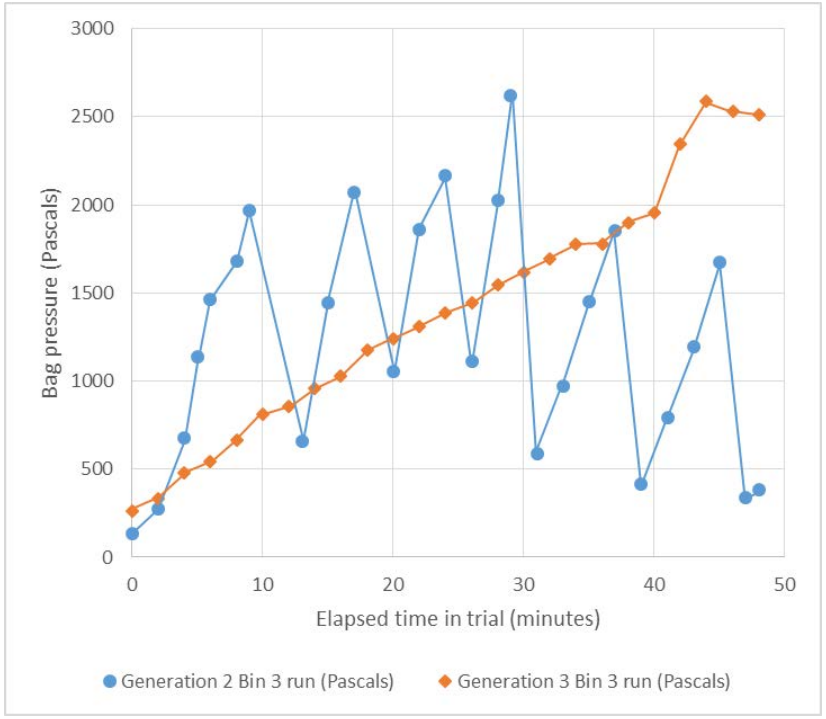
- SWN was contacted, and volunteered once more to host the test.
- Tested in May, 2015.

Improvements noted in filter pressure drops

Bin 2 Run



Bin 3 Run

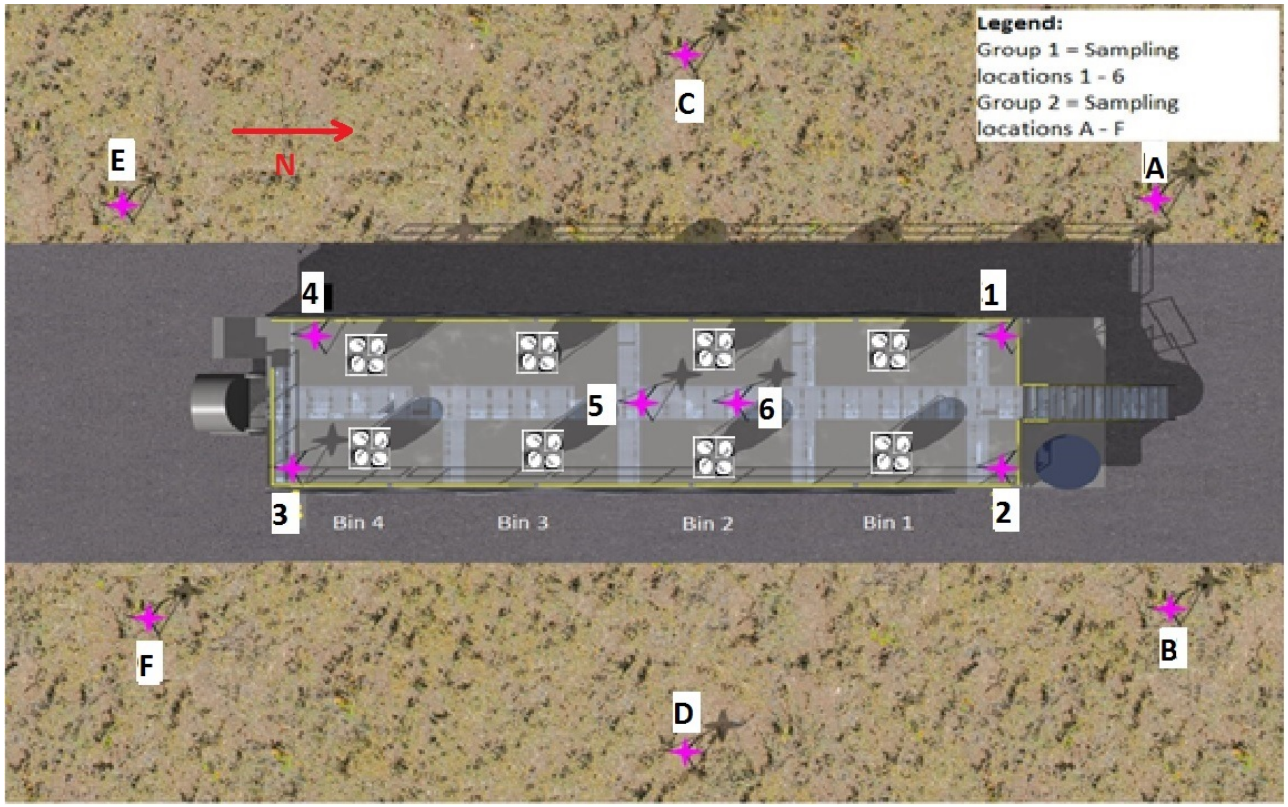


* During 2013 test, operations had to be shut down, and bags shaken, when pressures exceeded ~2000 Pa.

Effectiveness of Mini Baghouse Retrofit Assembly Generation 3 was demonstrated

Effectiveness of Mini Baghouse Retrofit Assembly Generation 3 was Evaluated

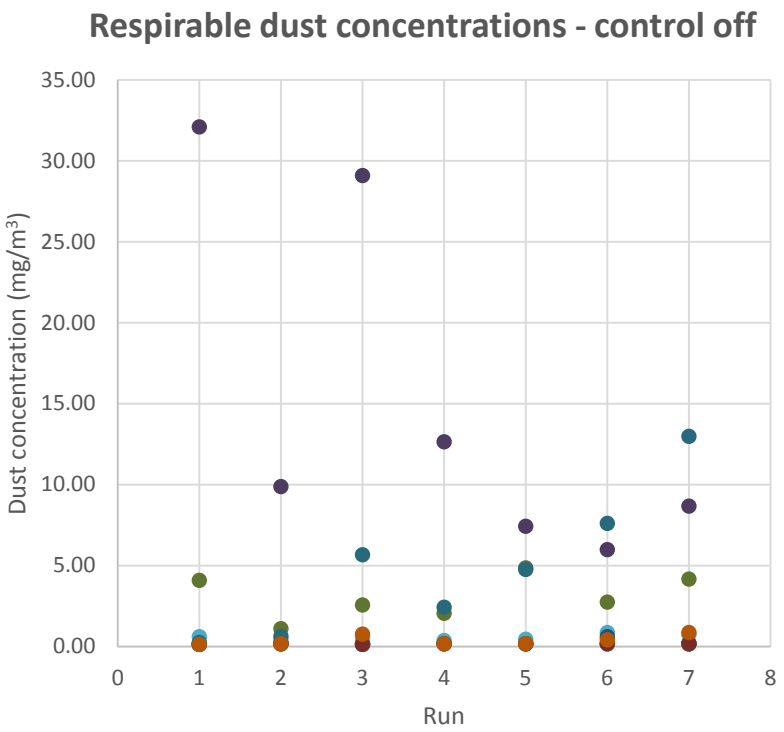
- 168 area air samples were collected at 12 locations

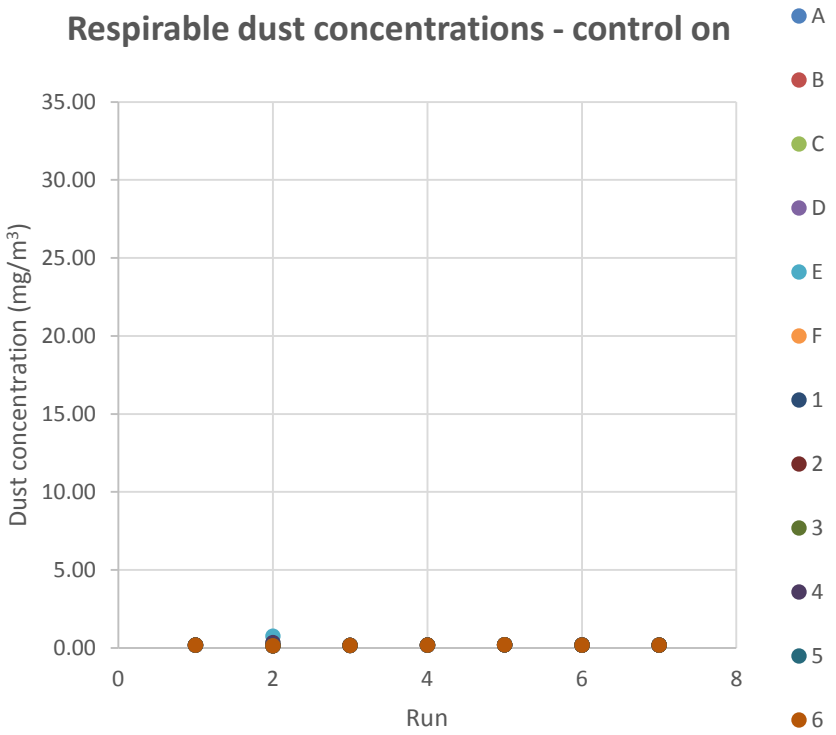


Computer rendering by Kenneth Strunk, NIOSH

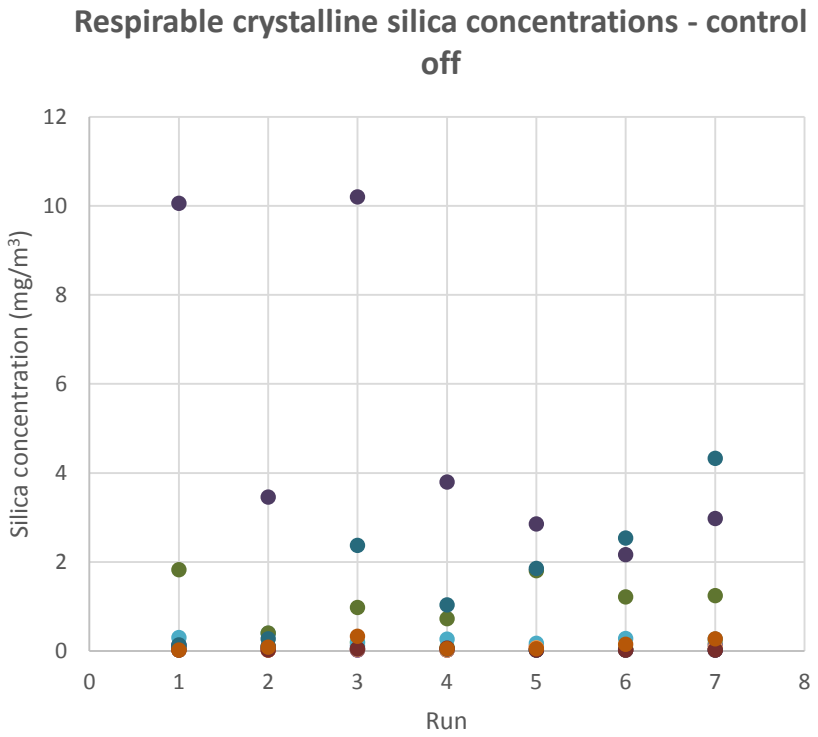
Samples were collected for respirable dust and RCS

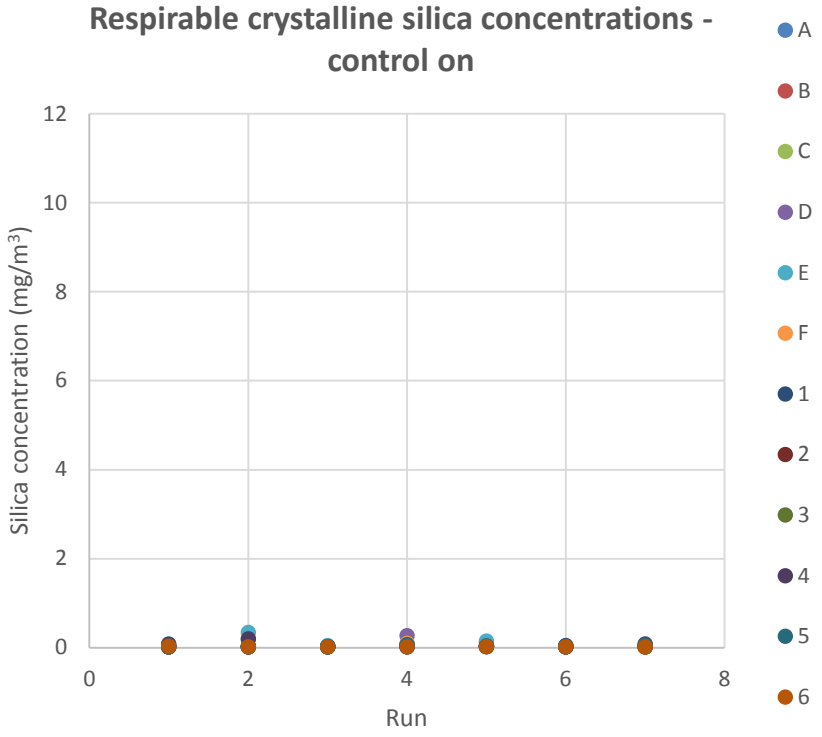
Effectiveness of Mini Baghouse Retrofit Assembly Generation 3 was demonstrated for Respirable Dust





Effectiveness of Mini Baghouse Retrofit Assembly Generation 3 was demonstrated for RCS





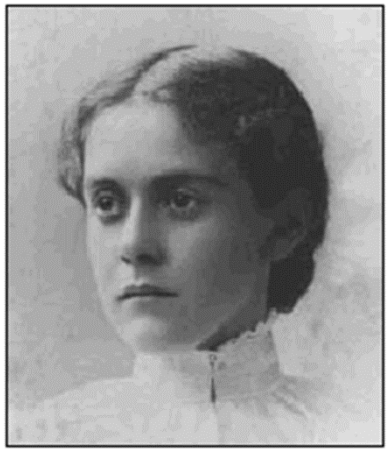
Real-World Experience was needed

- Contacts made at NORA Oil and Gas Council meetings helped in finding partners.
- Small companies proved easier to work with than large companies.

Mini-Baghouse - Next steps

- Communicate results in reports, presentations and peer-reviewed journal articles
- Request additional industry partners to assist in evaluating a range of respirable silica control technologies
- Possible improvements include clamping mechanism and weather enclosure
- Patent pending
- Form partnership for implementation

Questions?



Alice Hamilton, M.D.
Mother of U.S. Occupational Medicine
1869–1970