XVI. Reducing Silica Exposures Through Engineering Controls and Work Practices

The C.A. Lawton Co.(Case Study)

AFS- 25th EHS Conference
Pittsburgh, PA
August 14, 2013

Katherine Donner
Compliance Coordinator
The C.A. Lawton Co. CIH
DePere, WI

Bob Scholz, PE, CIH
Sr. Project Manager
TRC Environmental Corp
Brookfield, WI

AFS - EH&S Conference

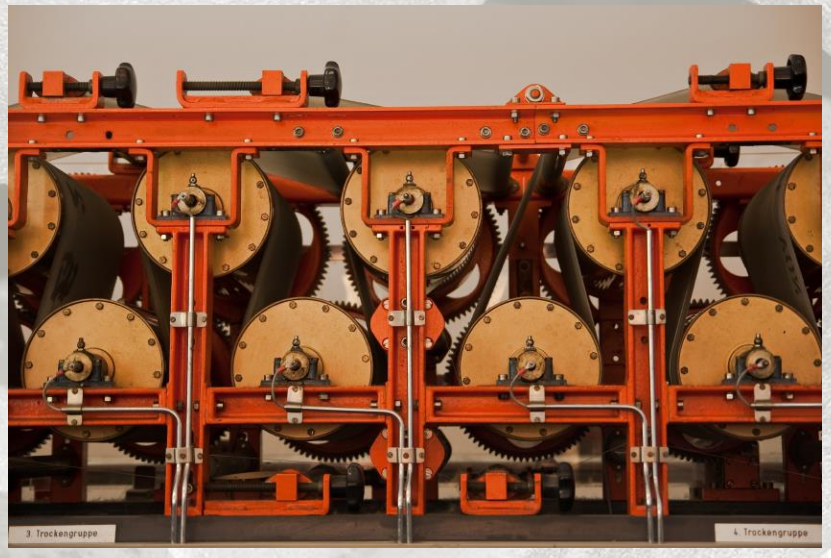
CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices



AFS - EH&S Conference

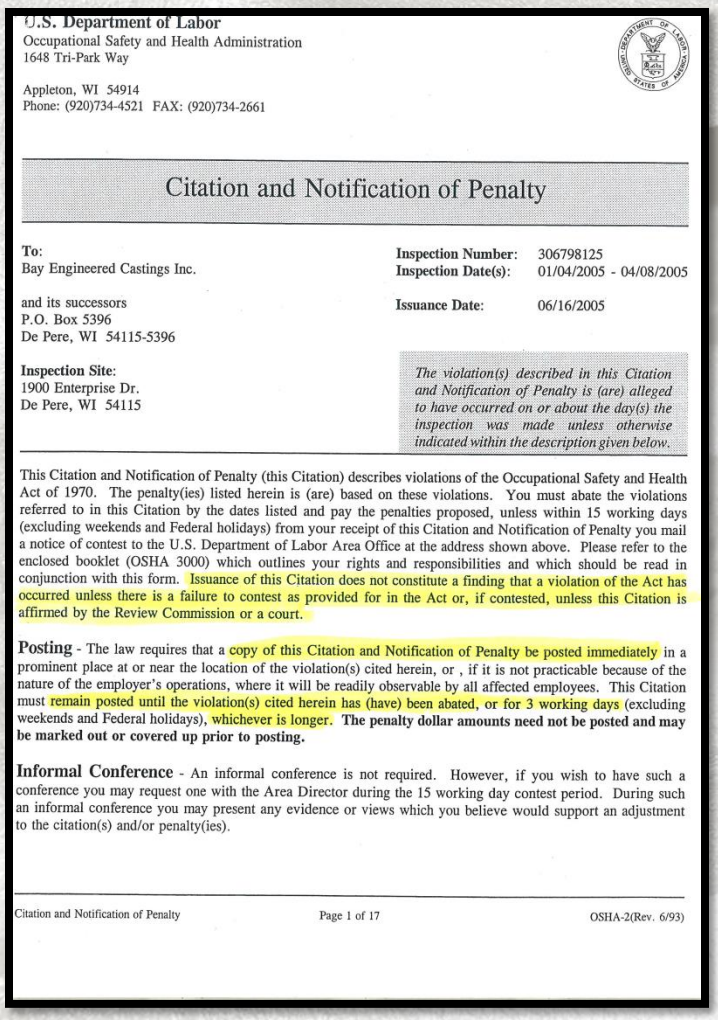
CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Continuous Respiratory Protection:

Until the Company has documented data demonstrating respirable crystalline silica levels are low enough to eliminate the need for personal protection equipment (respirators), we will follow our respiratory protection program and continue to protect our workforce with appropriate, fit-tested, PPE to minimize the risk of overexposure to silica dust.

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices



U.S. Department of Labor
Occupational Safety and Health Administration
1648 Tri-Park Way

Appleton, WI 54914
Phone: (920)734-4521 FAX: (920)734-2661

Citation and Notification of Penalty

To:
Bay Engineered Castings Inc.

and its successors
P.O. Box 5396
De Pere, WI 54115-5396

Inspection Site:
1900 Enterprise Dr.
De Pere, WI 54115

Inspection Number: 306798125
Inspection Date(s): 01/04/2005 - 04/08/2005

Issuance Date: 06/16/2005

The violation(s) described in this Citation and Notification of Penalty is (are) alleged to have occurred on or about the day(s) the inspection was made unless otherwise indicated within the description given below.

This Citation and Notification of Penalty (this Citation) describes violations of the Occupational Safety and Health Act of 1970. The penalty(ies) listed herein is (are) based on these violations. You must abate the violations referred to in this Citation by the dates listed and pay the penalties proposed, unless within 15 working days (excluding weekends and Federal holidays) from your receipt of this Citation and Notification of Penalty you mail a notice of contest to the U.S. Department of Labor Area Office at the address shown above. Please refer to the enclosed booklet (OSHA 3000) which outlines your rights and responsibilities and which should be read in conjunction with this form. Issuance of this Citation does not constitute a finding that a violation of the Act has occurred unless there is a failure to contest as provided for in the Act or, if contested, unless this Citation is affirmed by the Review Commission or a court.

Posting - The law requires that a copy of this Citation and Notification of Penalty be posted immediately in a prominent place at or near the location of the violation(s) cited herein, or , if it is not practicable because of the nature of the employer's operations, where it will be readily observable by all affected employees. This Citation must remain posted until the violation(s) cited herein has (have) been abated, or for 3 working days (excluding weekends and Federal holidays), whichever is longer. **The penalty dollar amounts need not be posted and may be marked out or covered up prior to posting.**

Informal Conference - An informal conference is not required. However, if you wish to have such a conference you may request one with the Area Director during the 15 working day contest period. During such an informal conference you may present any evidence or views which you believe would support an adjustment to the citation(s) and/or penalty(ies).

Original Citation:

-10 instances of actual exposure > TWA limit

-10 instances of not applying engineering controls

Positions cited:

- Chipper/Grinders (4)
- Shot Blast Operators (2)
- Shakeout & Reclaim (1)
- 40-Ton Crane Operator (1)
- Mold Line Rammer (1)
- Sand Reclaimer (1)

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2005 - Casting Shakeout and Sand Reclamation Operations:

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2005 - Casting Shakeout and Sand Reclamation Operations:

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2005 - Casting Shakeout and Sand Reclamation Operations:

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

GOAL: Apply scientific and methodic approach to identify and address airborne silica dust generation at the source and to determine the root causes of silica exposure; then minimize worker exposure to respirable crystalline silica dust through implementation of various engineering and administrative controls.

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2005 - Silica Sand Team Brainstorming Ideas - RESULTS:

- Established & formalized housekeeping procedures throughout the foundry
- Alternative sand options for silica were cost prohibitive
- "Punch out" method of casting removal ineffective
- Improved performance of dust collection systems with regular PMs, bag replacement, and pressure monitoring
- Contain & control mold residuals at shakeout in separate building with shakeout cabinet & dust extraction

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2006-2008: Designed, built, and commissioned an integrated, mechanized & automated casting shakeout and sand reclamation system; reducing operator requirements to one person (formerly required minimum of four operators).

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Construction of casting shakeout & sand reclamation building

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Construction of casting shakeout & sand reclamation building

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Construction of casting shakeout & sand reclamation building

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Casting Shakeout

Reclaiming Sand

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Collected personal air samples of operators:
Shot blast operator, Mold floor molder (2), Crane operators (2), Mold line molder, Shakeout/reclaim operator, Chipper/grinders (2)

All samples exceeded OSHA PEL!

Confused by continued overexposure; questioned validity of effectiveness of isolating casting shakeout & sand reclamation

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Summer 2009: Hired consultant to identify the root causes of operator exposure to airborne respirable crystalline silica.

Evaluations Conducted:

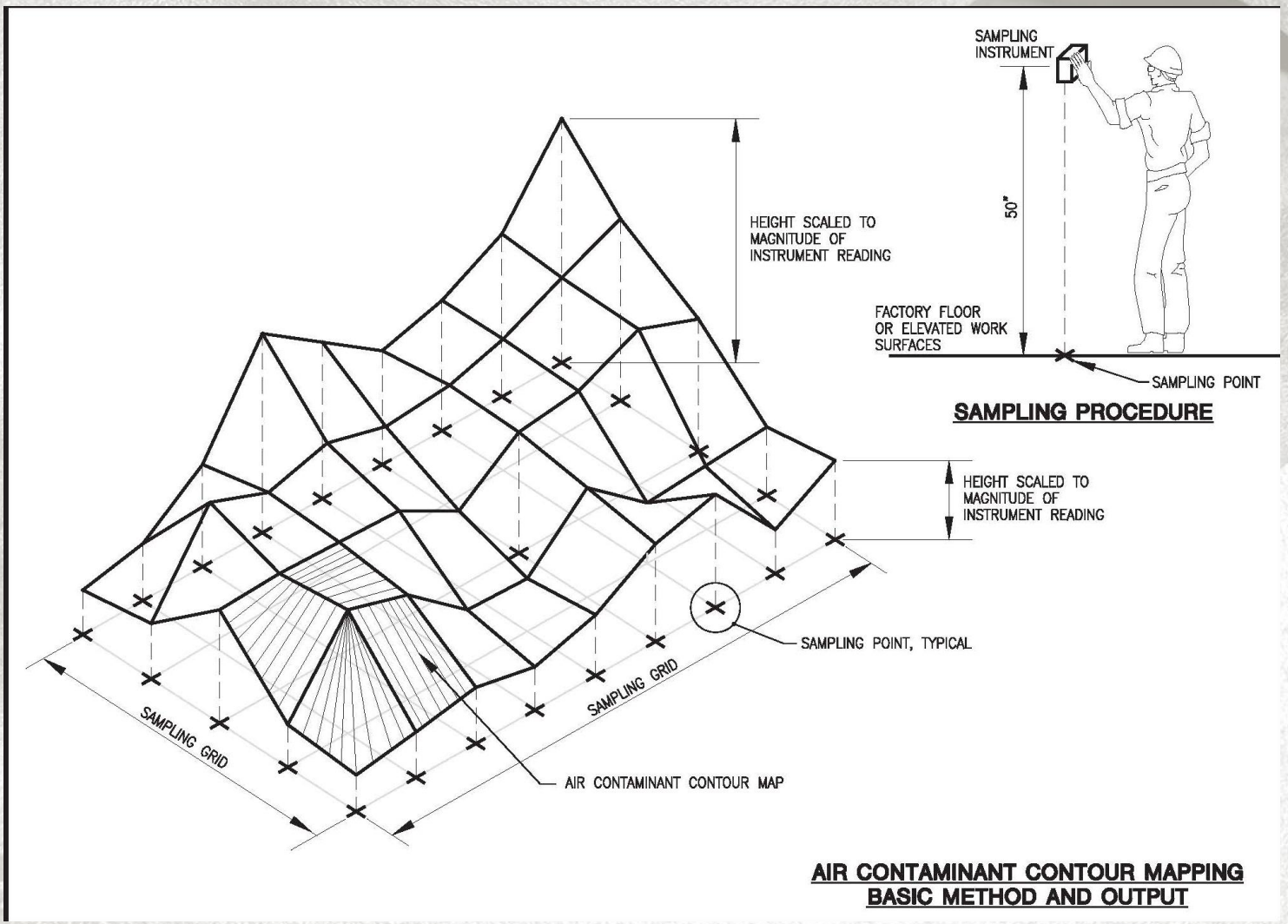
- **Plant-wide contouring of respirable particulate matter**
- **Air mass balance & ventilation pattern analysis**

Instruments used to collect data included:

- **Personal air monitors**
- **Hand-held real-time instruments (data RAM)**

AFS - EH&S Conference

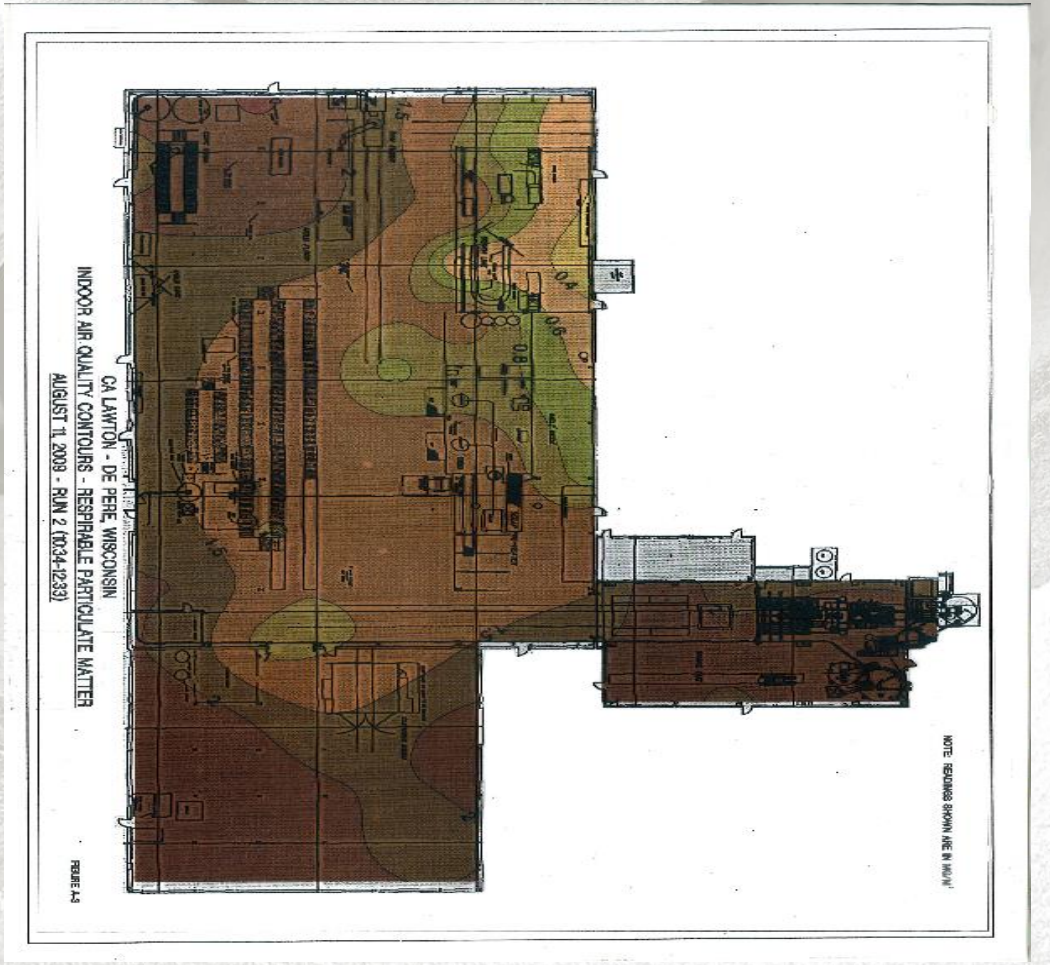
CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices



AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

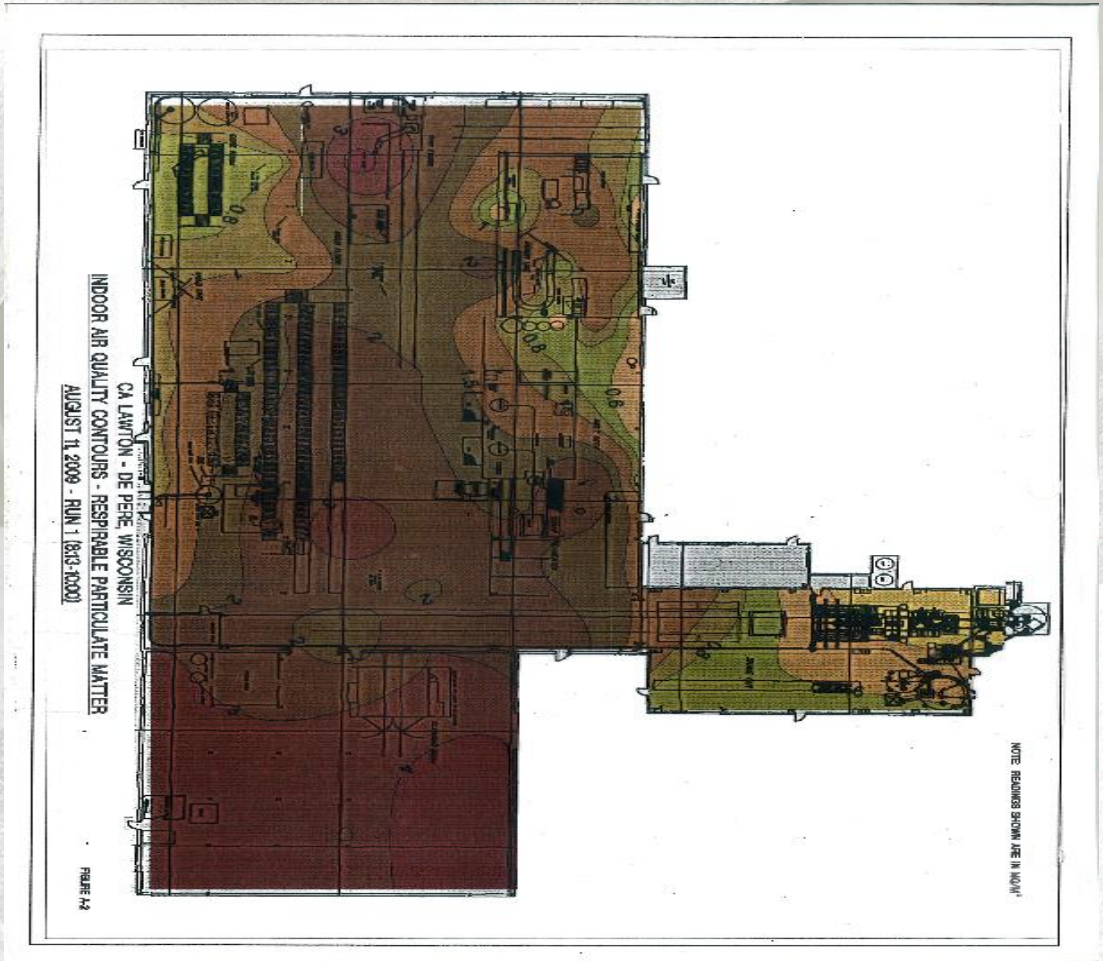
2009: Results of facility-wide particulate concentration profile



AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2009: Results of facility-wide particulate concentration profile



AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

June thru August, 2009: RMT, Inc. on-site measurements, observations, & data:

Findings:

Air Quality Profiles at Working Level

2.2.1 Profiles of Respirable Particulate Matter (Appendix A-1 to A-3).

Silo leakage of dust during pneumatic sand transport to the coremaking and large floor molding areas was found to be a major source of respirable dust which affected the entire foundry, with the exception of the shakeout and sand reclamation area.

There were substantial dust sources in the casting cleaning and finishing area which, along with cross-contamination from the main pouring and cooling bay, acted to elevate background dust concentrations in this stagnated and negatively pressurized end of the foundry.

From RMT Report, September 2009

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2010-2011: Installed new sand transportation equipment utilizing plug method versus pneumatic transfer.

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2010-2011: Installed new sand transportation equipment utilizing plug method versus pneumatic transfer.

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2010-2011: Installed new sand transportation equipment utilizing plug method versus pneumatic transfer.

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2010-2011: Installed new sand transportation equipment utilizing plug method versus pneumatic transfer.

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

November, 2011: TRC Environmental Corp. repeated 2009 study of operator exposure to airborne respirable crystalline silica to measure effectiveness of investments.

Collected personal air samples of operators:
Shot blast operator, Mold floor molder (2), Crane operators (2), Mold line molder, Shakeout/reclaim operator, Chipper/grinders (2)

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

The C.A. Lawton Co.
Foundry Air Sampling
Sample Taken: November 15, 2011

Sample #	Position	mg/m3	Calc'd PEL (Personal Exposure Limit)	Under/Over	Actual Exposure % of PEL
1	Chipper/Grinder		2.04	Over	
2	Chipper/Grinder		1.11	Over	
3	Mold Floor	0.61	1.56	Under	39%
4	Mold Floor	0.97	1.59	Under	61%
5	Mold Line	0.65	2.13	Under	31%
6	Shakeout	0.60	0.85	Under	71%
7	Shotblast	1.40	1.47	Under	95%
8	30-ton Crane	0.51	1.61	Under	32%
9	40-ton Crane	0.61	2.13	Under	29%

NOTES:

Air samples were taken of nine (9) first shift foundry operators on November 15th for approximately eight (8) hours. The purpose of the sample collection was to measure the levels of respirable crystalline silica dust in the air of the various areas of the foundry (main bay, shakeout/reclaim and cleaning room). The PEL ('Personal Exposure Limit') for respirable silica dust varies with the total respirable weight and the concentration of silica quartz.

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

November, 2011: RMT, Inc. on-site measurements, observations, & data:

Findings:

3.1 Respirable Crystalline Silica (Silica)

1. **Focus the attention of the silica exposure control program on dust control in the casting cleaning and finishing room, in particular, addressing the current fugitive dust issues associated with removing debris from castings after shot blasting and throughout chipping and grinding and other casting finishing processes including preparations for shipping.**

   In particular, the high silica exposure levels of the chipping and grinding operators place priority on this issue

2. **Pursue, through demonstration involving a single work station unit, the feasibility of reducing worker exposure to grinding dust through equipment and/or ventilation changes to the chipping and grinding processes. It is proposed that the objectives of the demonstration be the following: 1) to reduce, to the extent feasible, silica exposures of workers who currently grind with portable tools; 2) to prevent cross-contamination of grinding emissions among the grinding stations; and 3) to prevent migration of fugitive dust from the grinding operation into the general foundry environment.**

   A thorough review of casting finishing equipment and ventilation possibilities is warranted. There are no standard ventilation solutions for work on large castings and a customized approach should be demonstrated before it is adopted.

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Finally got clarity on dynamics occurring in the foundry!

Now able to appropriately address cleaning room respirable silica exposure levels

Brought in process consultant to collaborate with existing consultant to design effective work station addressing:

- **Material handling**
- **Ventilation**

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2012: Replaced shot blast cabinet

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2012: Replaced shot blast cabinet

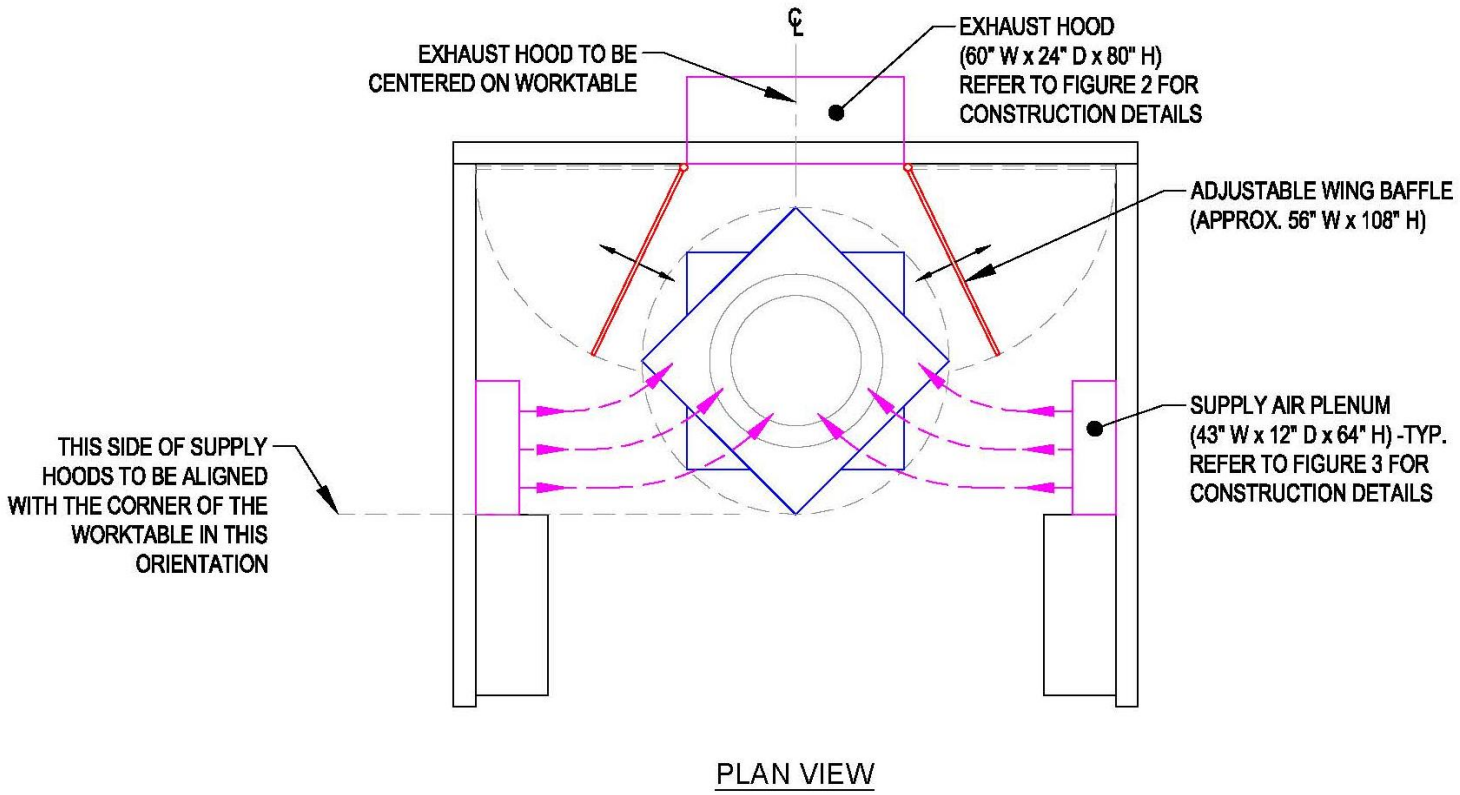
Significant intangible benefits of shot blast cabinet replacement:

- **Utilizes new blasting technology and ventilation system design, which reduces particulate residue on castings moving to cleaning room**
- **Operation now isolated in segregated building**

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

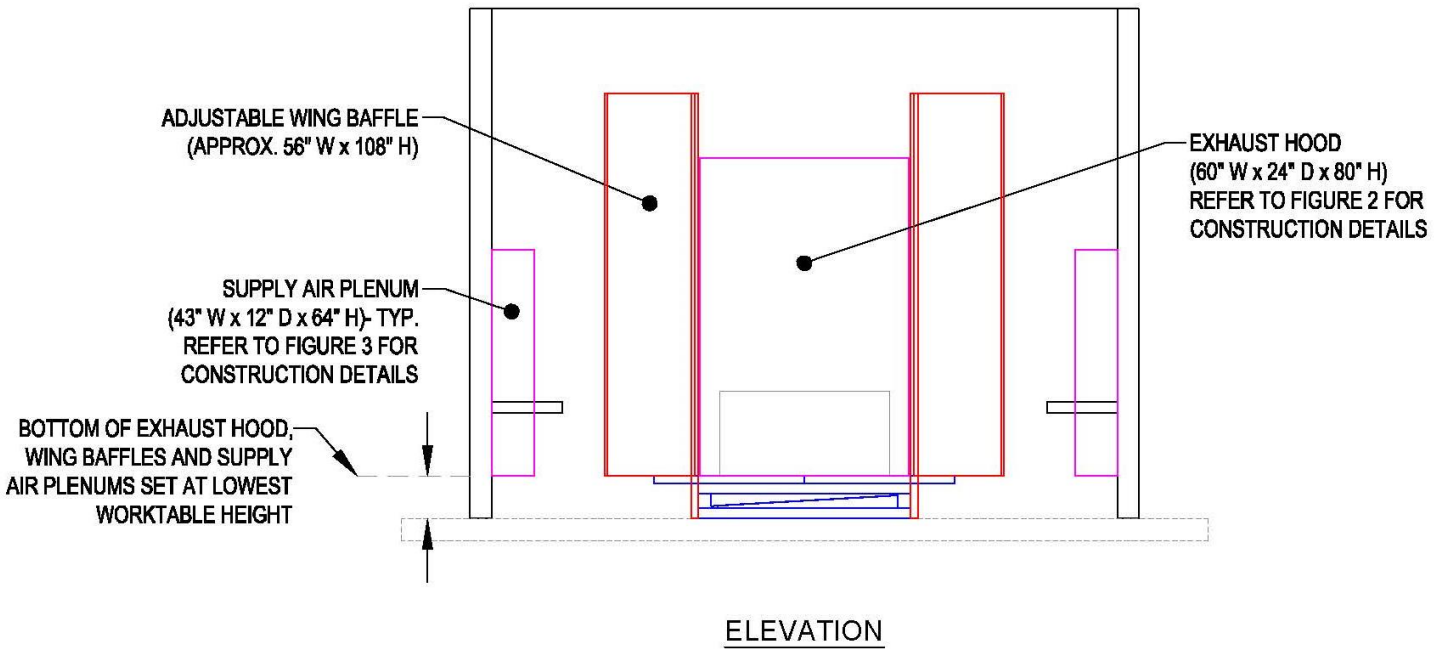
2012: Designed prototype ventilated work station



AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2012: Designed prototype ventilated work station



AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

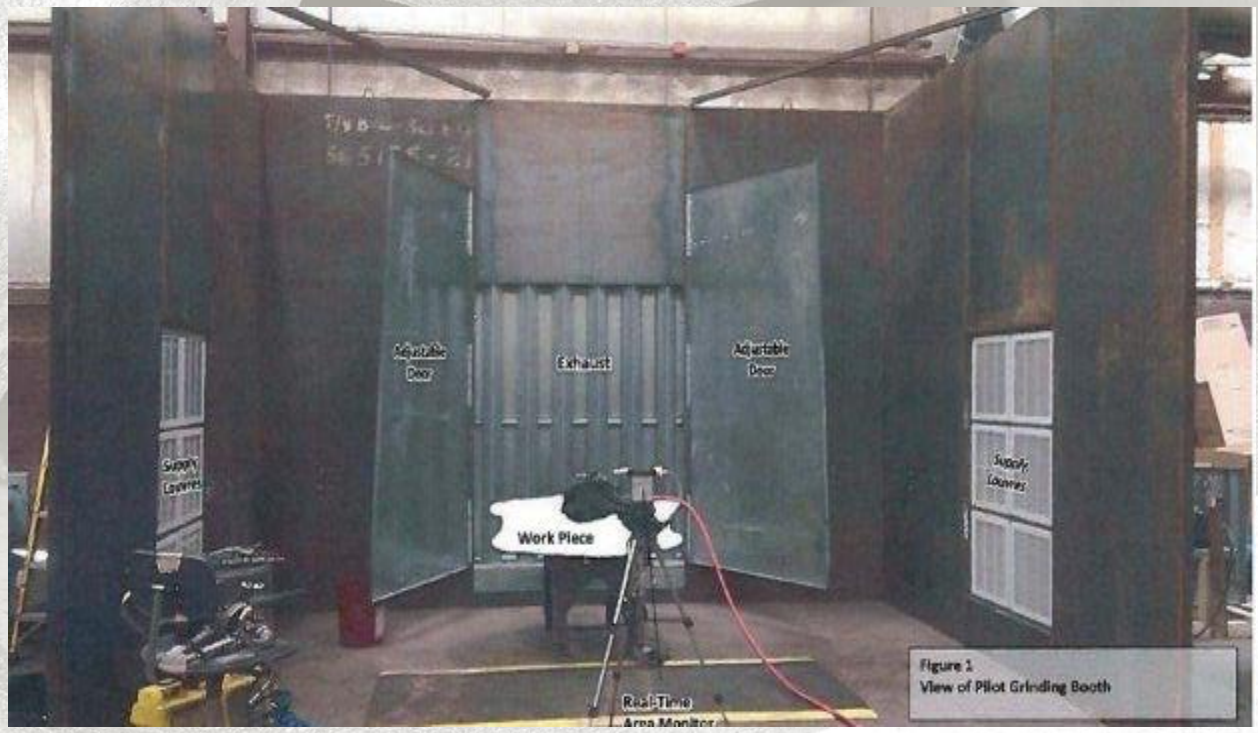
2012: Prototype Chipping & Grinding Workstation

Features of booth include adjustable supply louvers & exhaust deflectors; three (3) walls and no roof

AFS - EH&S Conference

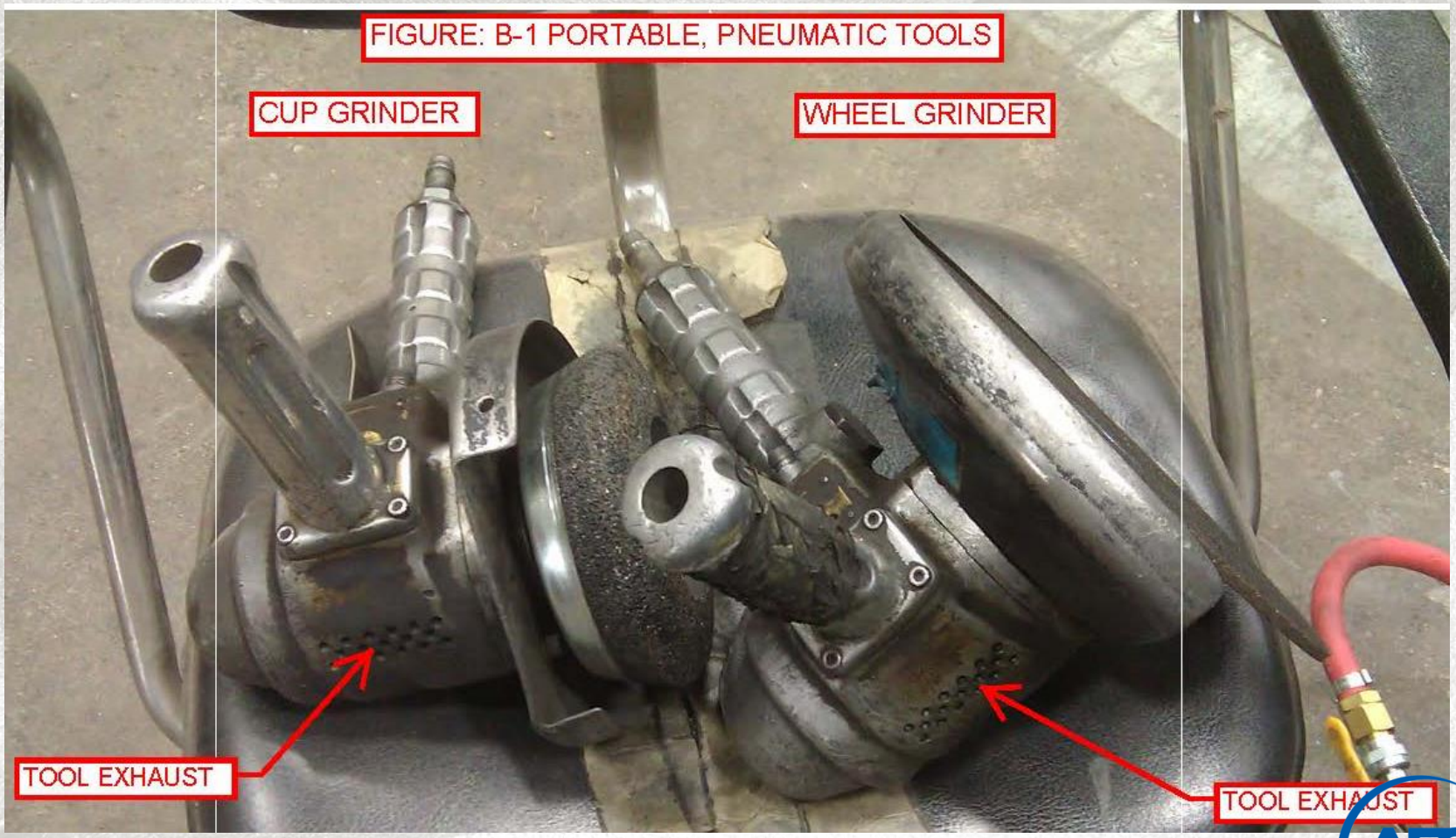
CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2012: Prototype Chipping & Grinding Workstation



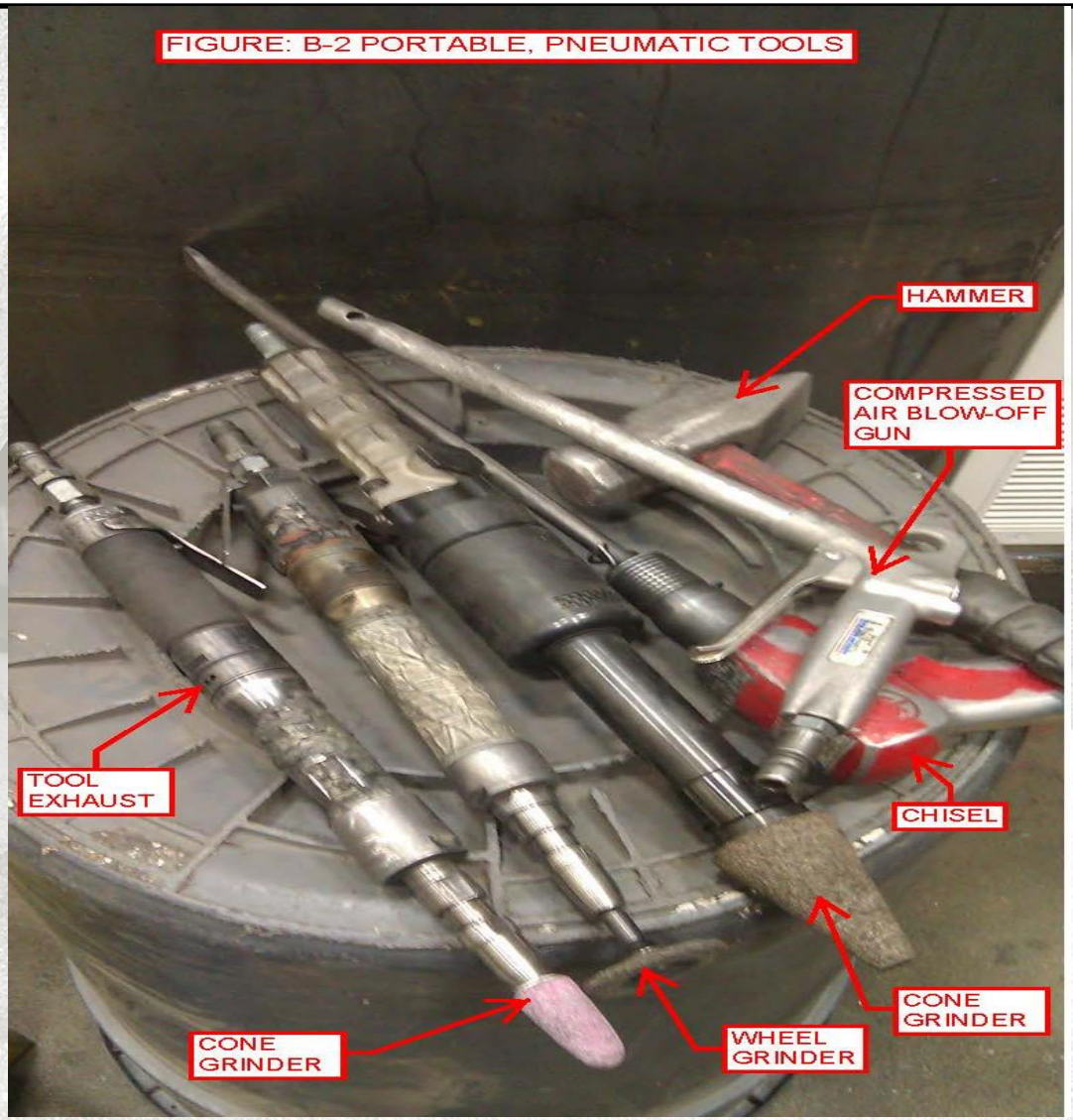
AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices



AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices



AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Worker wearing portable real-time monitor for respirable dust.

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Trial Observations:

- Rotating lift table critical to proper positioning of casting and operator in relation to supply air & exhaust

- Exposure protection dependent on several factors (tools, tool exhaust, duration of task, operator position, swarf discharge, interior or exterior work, etc.)

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Trial Observations (continued):

- Increased air supply did not translate to increased exhaust effectiveness, but caused turbulence of settled dust (determine "sweet spot")
- Compressed air blow off produced significant exposure concentration
- Booth design success variable with part configuration

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

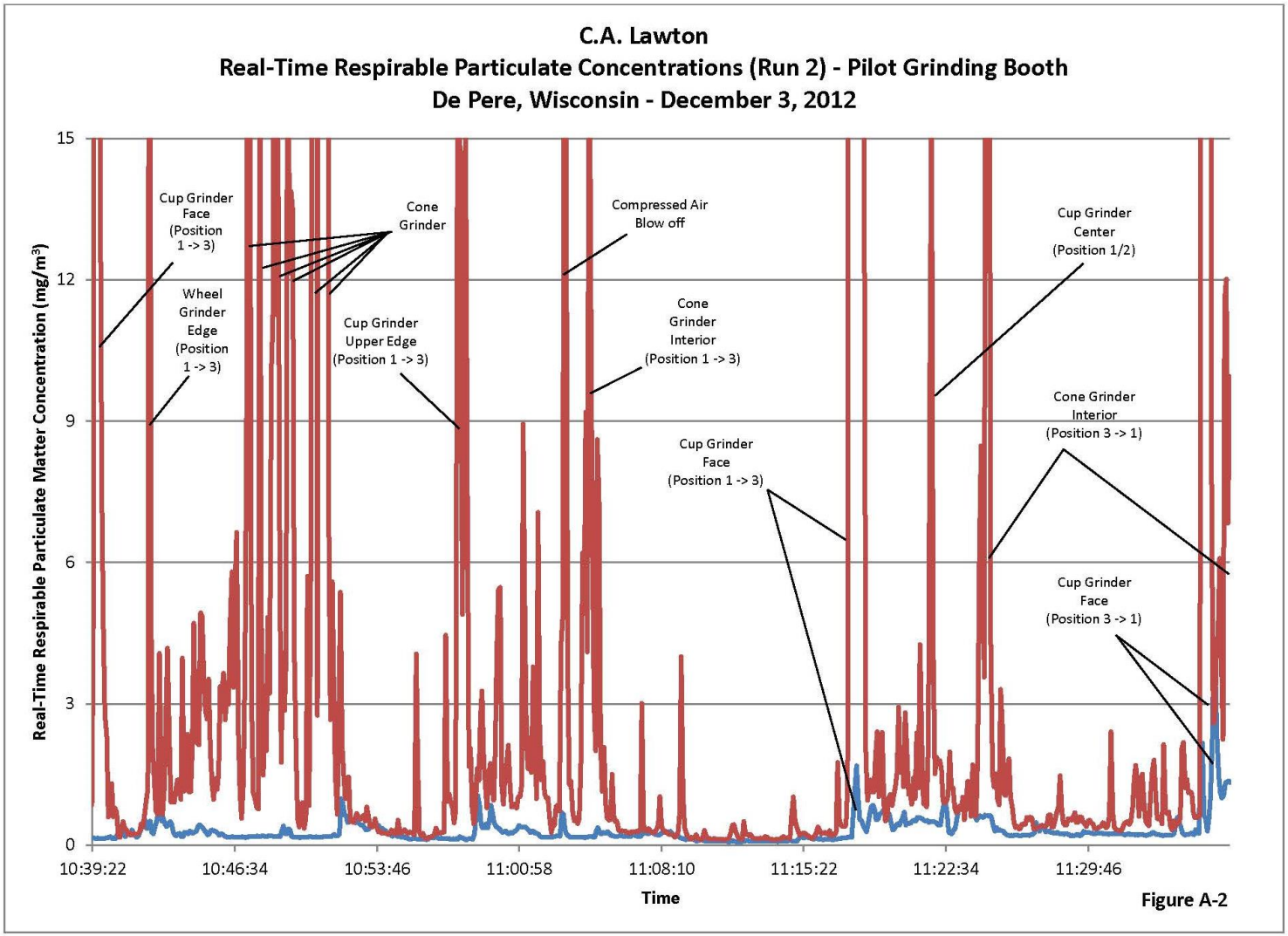


Figure A-2

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

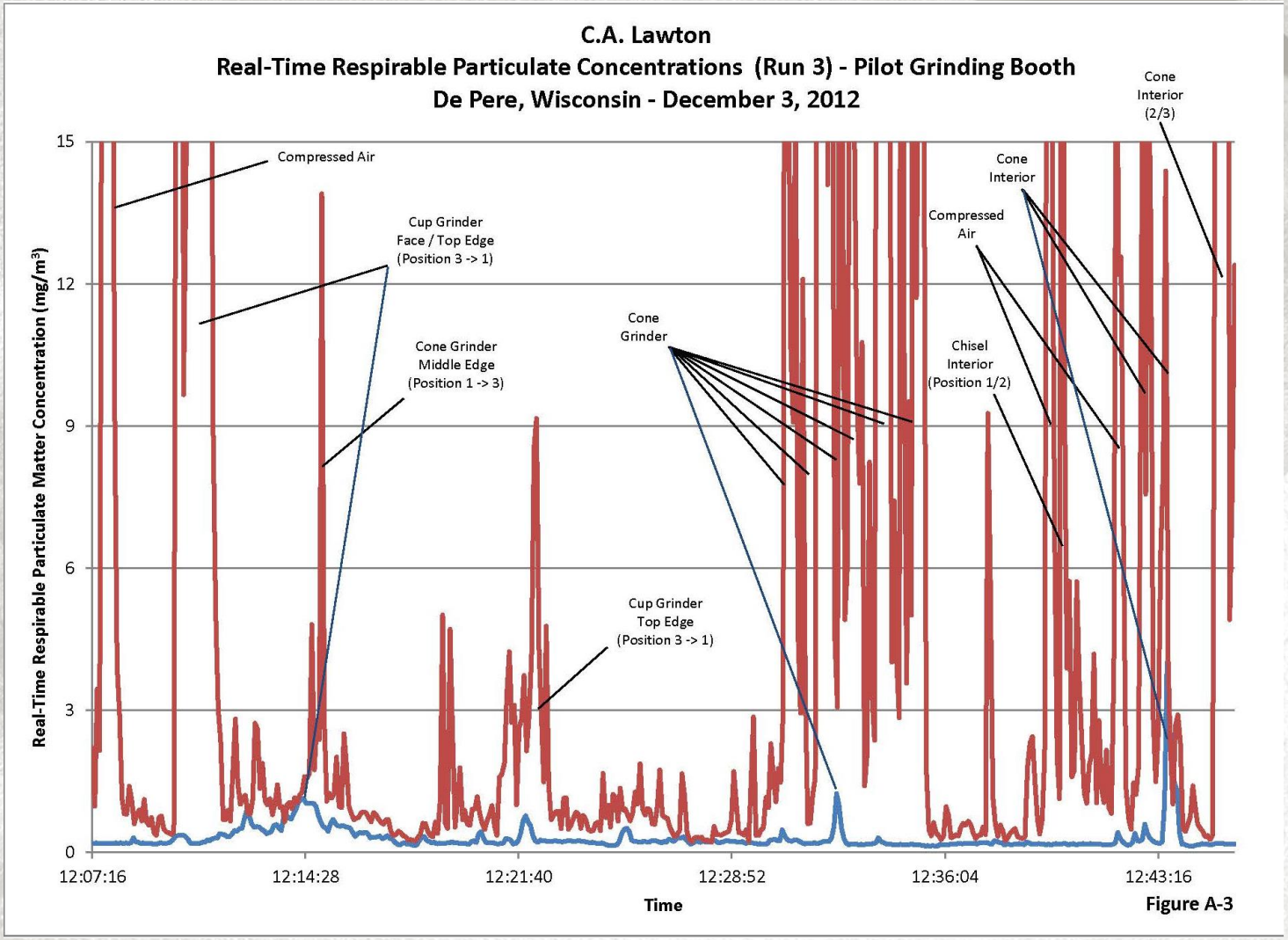


Figure A-3

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

Trial Outcomes: Root Cause Analysis & Ventilation Assessment

1. Successfully defined booth as an effective control method for worker exposure protection under certain circumstances.
2. Identified limitations of current engineering controls (internal grinding, directing swarf at hood, disruptive tool exhaust, housekeeping, etc.).
3. Emphasized need for consistent work practices.

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

2013 and Beyond:

Petition for Modification of Abatement extended to December, 2014 to allow time to:

- **Break ground for building addition**
- **Construct building**
- **Create and install ventilated work stations**
- **Re-assess investment impact with quantitative testing**
- **Evaluate test results & close citation**

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

AFS - EH&S Conference

CASE STUDY: Reducing Silica Exposures Through Engineering Controls and Work Practices

QUESTIONS?