Case Study: American Wood Fibers Circleville, OH Facility Plant Safety Review: One Year Later

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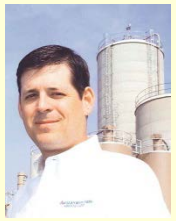
Pellet Fuels Institute

AMERICAN WOOD FIBERS

Exponent®

Who Are The Authors



- Justin Bishop – Electrical Engineer, Fire and Explosion Investigation, Hazard Analysis
- Mark Fecke – Mechanical Engineer, Fire and Explosion Investigation, Hazard Analysis
- Stephen Faehner – VP of Industrial and BioEnergy Sales

Outline

- Who is Exponent
- OSHA General Duty Clause
- Plant Overview
- Scope of 2012 Inspection (3-4 hr looking at general plant safety, dust issues, electrical issues)
- One Year Later
- Good Practices & Needs Improvement
- Conclusions

Engineering Sciences

- Biomedical Engineering
- Electrical Engineering & Computer Science
- Engineering Management Consulting
- Mechanical Engineering
- Materials & Corrosion Engineering
- Polymer Science & Materials Chemistry
- Thermal Sciences

Environmental Sciences

- Ecological & Biological Sciences
- Environmental & Earth Sciences

Health Sciences

- Chemical Regulation & Food Safety
- Epidemiology, Biostatistics & Computational Biology
- Exposure Assessment & Dose Reconstruction
- Occupational Medicine & Environmental Health
- Toxicology & Mechanistic Biology

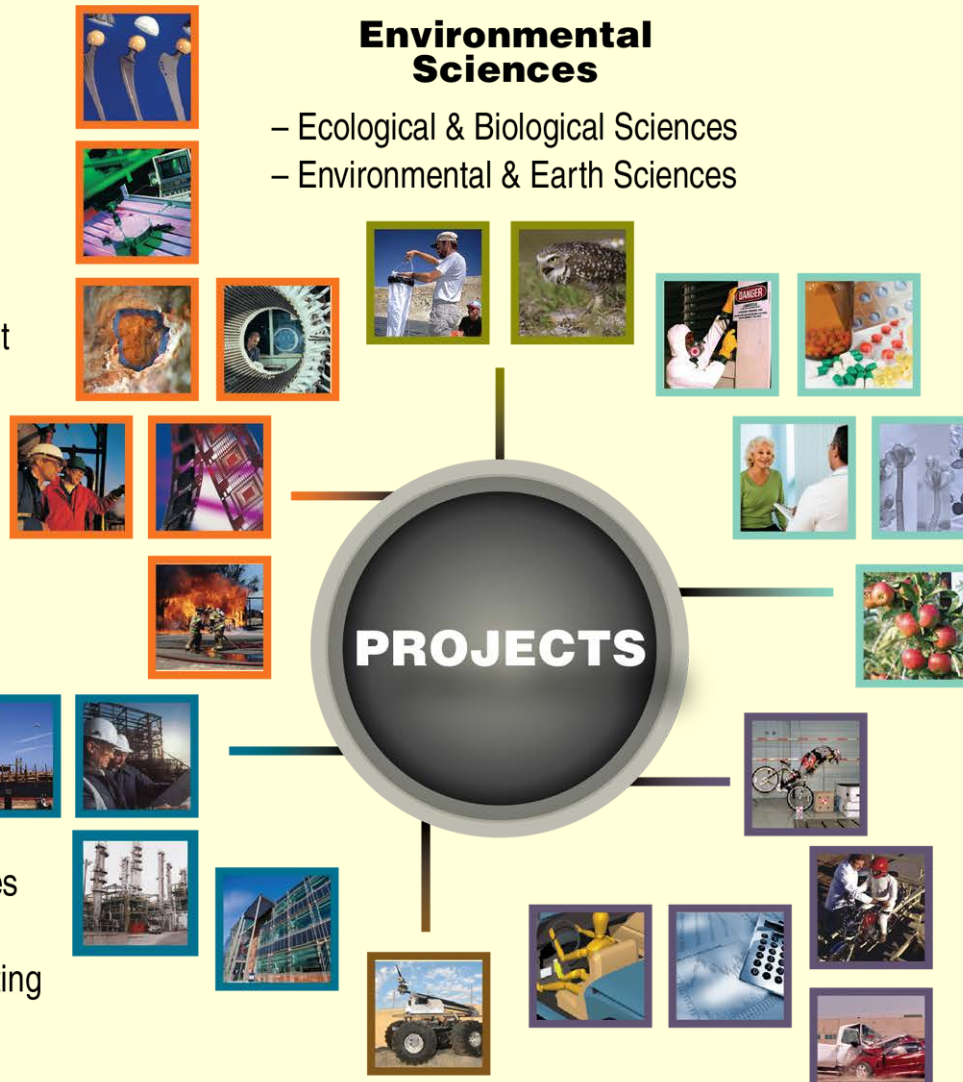
Civil & Construction

- Buildings & Structures
- Civil Engineering
- Construction Consulting
- Industrial Structures

Transportation

- Biomechanics
- Human Factors
- Statistical & Data Sciences
- Vehicle Engineering
- Visual Communications

Technology Development



Exponent Offices

Hangzhou

Derby and Harrogate

Düsseldorf

Basel

OSHA General Duty Clause

- OSHA General Duty Clause (Section 5(a)(1)):
  - Each employer […] shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees
- General duty clause citations
  - Reference consensus standards such as NFPA standards and guidelines
- The hazard caused or was likely to cause death or serious physical harm
- Feasible means to correct the hazard were available

Identifying Hazards

- Structured Analysis
  - Process Hazard Analysis (PHA)
    - Checklist Evaluations
    - What-If Studies
    - Hazard and Operability (HazOp) Studies
    - Fault Tree Analysis
    - Failure Modes Effects Analysis
  - Gap Analysis
  - Quantitative Risk Assessment
- Site Inspection
  - Typically one day on site
  - Review of site safety and hazards
  - Based on non-conformance with
    - Industry Guidelines
    - Codes
    - Standards
    - OSHA Regulations
    - Good Engineering Practice

Exponent performs all of the above

AWF - Circleville, OH

- Receives raw material used to create pellets is delivered via trucks
- Several SBU's handling 125,000 tons annually
- 20 Tractor Trailers in / out of the plant per day
- Pellet Fuel & Wood Flour production

Scope: 2012 Plant Inspection

- 3 hours on-site
- High-level review focused on:
  - Best Practices
  - Hazard Identification
  - Safety
  - Fugitive Dust
  - Electrical Systems
  - Sensors and Control
- Standards and Recommended Practices
  - NFPA 664, 70, 499, 505 • OSHA NEP • 29 CFR 1910….

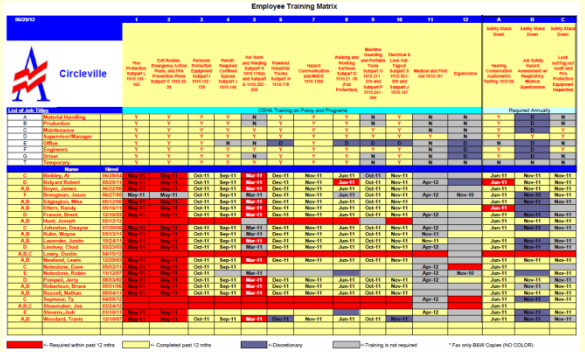
Documentation: 2012

Good Practices

- Incident reporting
- Safety review
- Process flow diagram (PFD)
- Employee training schedule
- Accident and safety correction reports
- Housekeeping

Needs Improvement

- Raw Material Housekeeping
- Process Hazard Analysis
- Classified (Hazardous) Locations
- Preventative Maintenance
- Sensor/interlock testing/review
- P&ID



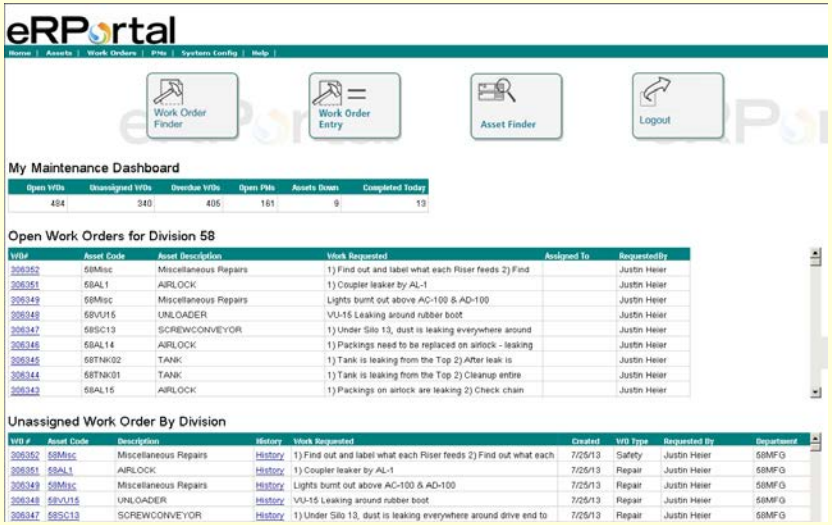
Documentation: 1 Year Later

Good Practices

- Preventative Maintenance*
  - New PM system (eRPortal)*
    - System tracks work orders and generates PM work orders*
- Sensor/interlock testing/review*
  - Starting to test interlocks and sensor operations*
  - Verifying LOTO program*

Needs Improvement

- Preventative Maintenance
- Sensor/interlock testing/review



*Based on conversations with plant representative

Prevention of Fugitive Dust: 2012

Good Practices

- Dust collector outside
  - Deflagration vents
  - Isolation
- Repair leaks instead of increasing housekeeping

Prevention of Fugitive Dust: 2012

Needs Improvement

- Dust collector inside the plant
- Identifying leaks and areas of potential leaks is an on going process
- “Duct tape” repairs

Prevention of Fugitive Dust: 1 Year Later

Needs Improvement

- Dust collector inside the plant
- Identifying leaks and areas of potential leaks is an on going process
- "Duct tape" repairs

Good Practices

- No more "Duct tape" repairs*
- When leaks are found, the process is shut down and the leak is repair with a long term fix*

*Based on conversations with plant representative

Housekeeping: 2012

- Good Practice
  - Brooms and shovels to clean fugitive dust
  - Clean spills/leaks when they are found
- Be Careful
  - Compressed air to blow down surfaces
    - Can create airborne combustible dust
    - Tests to determine allowable pressures
    - Not at the Circleville, OH plant
- Needs Improvement
  - Still some trouble areas
  - Raw material area
- Key Comment
  - Vacuums may be APPROVED for a combustible dust…
  - BUT may not be approved/certified for use in a classified area

Housekeeping: 1 Year Later

- Needs Improvement
  - Still some trouble areas
  - Raw material area
- Working towards a solution*
  - Need economical solution*
  - Evaluating vibratory shakers and oscillating fans to knock down dust from ledges/rafters*

***Based on conversations with plant representative**

Process Hazard Analysis (PHA): 2012

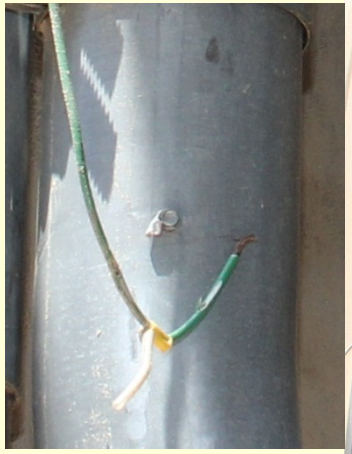
- Required by Section 4.3 of the 2012 version of NFPA 664
  - "A process analysis is a methodical review of the facility, each operation housed within, and the identification of where a hazard exists."
- Good Practices
  - Safety review Checklist generated based on best practices 5 years ago
  - Each AWF facility was inspected for compliance with this Checklist
  - Identified major areas for improvement
- Needs Improvement
  - Checklist based on best practices is not necessarily a "methodical review of the facility"
  - Checklist should be reviewed and updated to include current standards and guidelines
  - Audits should be performed on a routine basis

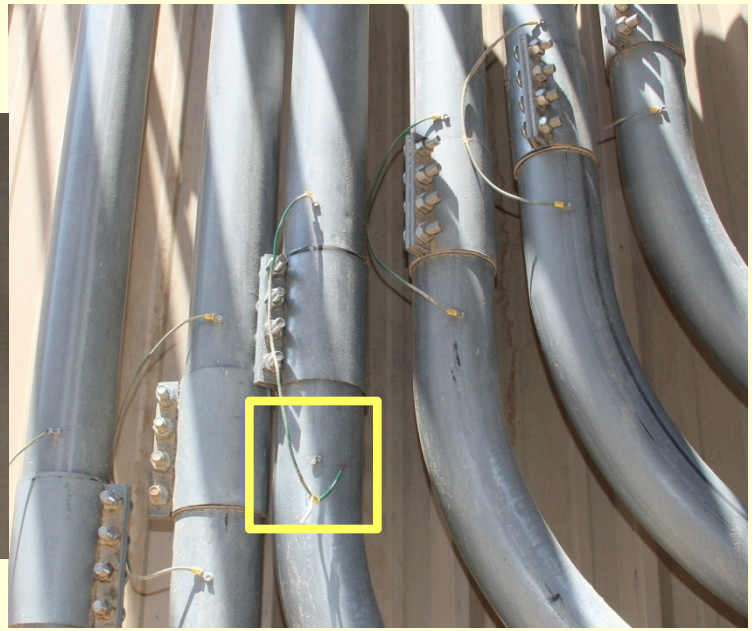
Emergency Action Plans and Fire Fighting: 2012

- Required by NFPA 664 Section 10.12 Emergency Planning and Response
  - "A written emergency plan shall be developed for preventing, preparing for, and responding to work-related emergencies including but not limited to fire and explosion."
- Good Practices
  - Specific written procedure for pellet mill fires.
    - Typical ignition sources identified
    - Combustible dust hazards explained
    - Emergency actions listed
    - Training enhanced by use of case studies
  - Specific written procedure for silo fires.
    - Same as above
    - Use inert gas to smother fire; do not use water
    - Experienced fire suppression contractor utilized
- Needs Improvement
  - Communication with local fire departments in pre-planning exercise
  - Training with local fire departments in pre-planning exercise
  - Increased awareness of silo fire hazards within the fire protection community.

Bonding and Grounding: 2012

- Good Practices
  - Grounding structures and equipment
  - Bonding equipment and piping
- Needs Improvement
  - Scheduled inspections and maintenance
  - Scheduled testing of grounding/bonding system





Bonding and Grounding: 1 Year Later

- Good Practices
  - Grounding structures and equipment
  - Bonding equipment and piping
  - Scheduled inspections and maintenance*
    - Outside contractor used to evaluate complete grounding/bonding system*
    - Based on their assessment, new procedures will be implemented*
  - Scheduled testing of grounding/bonding system*
    - Outside contractor used to evaluate complete grounding/bonding system*
    - Based on their assessment, new procedures will be implemented*

- Needs Improvement
  - Scheduled inspections and maintenance
  - Scheduled testing of grounding/bonding system

***Based on conversations with plant representative**

Electrical Classified (Hazardous) Locations: 2012

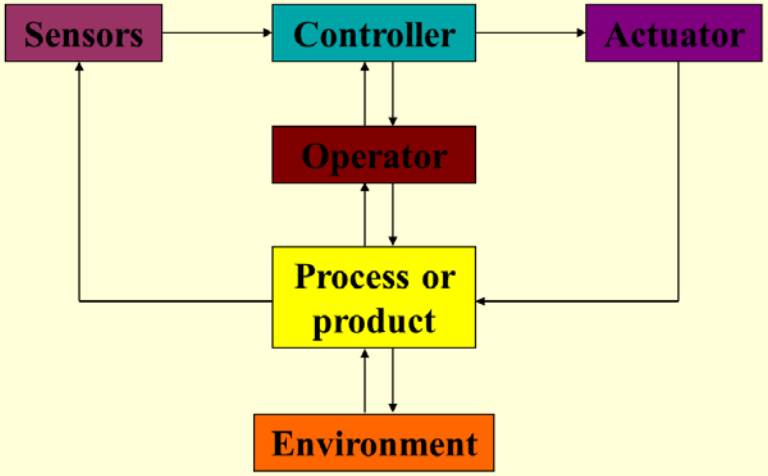
- Good Practices
  - Most locations have been electrically classified
  - Equipment in classified locations is certified for the area
- Needs Improvement
  - Re-evaluation of locations
    - Locations that should be classified are not
  - Some equipment is not certified for use in the classified area

Industrial Trucks: 2012

- Used to move raw material into and out of raw material storage
- **Wood Flour → Group G Dust**
- Type DX (diesel) or EX (electric) industrial trucks required (NFPA 505)
- AWF modifies their mobile equipment to reduce the likelihood of an incident
  - Non Flammable Hydraulic Fluid
  - Automated Fire Suppression
  - Jet Coating Hot Surfaces

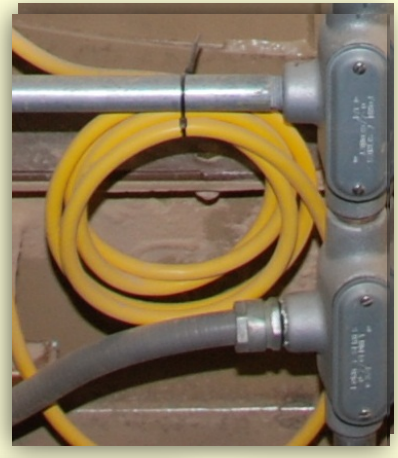
Sensor Loop Testing and PLC Functional Checks: 2012

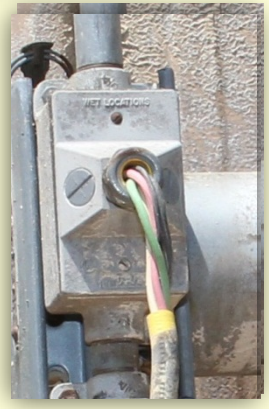
- Good Practice
  - Check sensor loops when installed
- Needs Improvement
  - Regular sensor wiring checks
  - Regular PLC functional checks
    - Verify if sensor/wiring fails, it fails safe and alerts operator
  - Jumping out sensors
  - Temporary sensor wiring is not a long term solution



General and Equipment Wiring: 2012

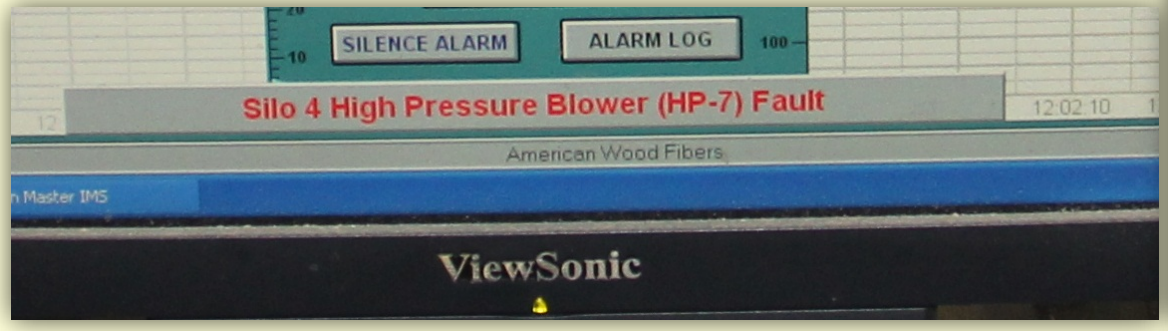
- Issues observed





Labels and Operator Warnings: 2012

- Good Practices
  - Identifying labels on switches
  - Some labeling on PLC/sensor wiring
- Needs Improvement
  - Identifying labels on switches and PLC/sensor wiring
  - Descriptive warnings for the operator



Elimination and Detection of Ignition Sources: 2012

Good Practices

- CCTV
- Spark detection
- Rock Trap
- Magnetic separators
- Raw Material Room Lighting
- Abort gate
- Rotary valves
- CO_2 extinguishing bottles on Pellet Mills
- Dust Collection

Needs Improvement

- Any unclassified sources inside classified area prohibited
- Dust Collectors placed outside
- Temperature Sensors on bearing

Conclusion

- A 3-hour high level plant review was conducted in 2012.
- The AWF plant review identified procedures that were good practices and others that need improvement.
  - Best Practices
  - Hazard Identification
  - Safety
  - Fugitive Dust
  - Electrical Systems
  - Sensors and Control
- Over the last year the plant focused on improving bonding/grounding, eliminating duct tape repairs, and scheduling preventative maintenance.
- AWF is trying to facilitate a safe work environment by identifying and mediating potential safety issues and bad practices.

Thank You

- Jennifer Hedrick, Executive Direct of Pellet Fuels Institute
- Stephen Faehner, VP - Industrial and Bio Energy Sales
- Edward Owens, P.E., VP - Operations Support
- Brian Mischnick, GM of AWF-Circleville
- Jason Brengman – AWF-Circleville Plant Engineer

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