Assessing the Safety Culture of Mines: Methods and Preliminary Findings

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Project Background

• NIOSH-sponsored research study
• Explore and evaluate the existing safety culture of the underground coal mining industry
• Approximately 6 coal mines will participate
• NIOSH has contracted with Human Performance Analysis, Corp. to ensure that a demonstrated and validated methodology is used for the Safety Culture Assessment.
• Project outputs:
  – Individual mine safety culture assessment reports
  – Master report summarizing findings from 6 sites and presenting industry recommendations
  – Safety culture assessment “tool kit”
What is Safety Culture?

• Safety culture refers to the characteristics of the work environment, such as the values, rules, and common understandings that influence employees’ perceptions and attitudes about the importance that the organization places on safety.
  – Haber & Barriere, 1998
Safety Culture Characteristics

- Safety is a clearly recognized value
- Accountability for safety is clear
- Safety is integrated into all activities
- A safety leadership process exists
- Safety culture is learning-driven

- A process for establishing a strong and effective Safety Conscious Work Environment (SCWE) exists.
Organizational Behaviors Impacting Safety Culture

- Attention to Safety
- Coordination of Work
- Decision-making
- Formalization
- Goal Setting/Prioritization
- Intradepartmental, Interdepartmental, External Communication
- Organizational Culture
- Organizational Learning

- Organizational Knowledge
- Performance Evaluation
- Performance Quality
- Personnel Selection
- Problem identification
- Resource Allocation
- Roles & Responsibilities
- Time Urgency
- Training
Relationship between Safety Culture Characteristics and Organizational Behaviors

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Why Assess Safety Culture?

“Perhaps the most important element in improving safety is the relentless focus on ‘safety culture.’…In those companies with outstanding safety performance, safety is emphasized at every shift at the mines and is an integral part of the business model.”

Bruce Watzman, VP Safety, Health, and Human Resources for the National Mining Association (2007)
Why Assess Safety Culture?

- Conducting a safety culture assessment demonstrates to employees management’s commitment to safety as well as their interest in understanding and improving safety culture.

- Mine management may have misperceptions of the strength or weakness of the safety culture at the mine.

- The assessment team can interpret assessment results and highlight specific areas of strength in the mine’s safety culture as well as areas on which to focus in order to improve safety culture.

- It is important to periodically assess safety culture to detect improvement or deterioration.
How to Assess Safety Culture

Multi Method Data Collection
1. Functional Analysis
2. Interviews and Focus Groups
3. Behavioral Anchored Rating Scales (BARS)
4. Behavioral Observations and Checklists
5. Organizational and Safety Culture Survey

• Goal: Triangulation
  – The use of 2 or more methods to obtain results.
  – We can be more confident with the results if different methods lead to the same results.
Methods: Functional Analysis

• Review and analysis of documents provided by the organization and available via MSHA database.
• Conducted 2-4 weeks prior to on-site data collection.

• Documents can include: (examples)
  – Existing safety policies & procedures
  – General technical information
  – Organizational charts
  – Strategic plan, mission and vision statements
  – Significant events (1 yr)
  – Root cause assessments (1 yr)
  – Performance indicators (1 yr)
  – Administrative procedures
  – Description of safety culture related activities
  – Results summary from other internal or external assessments

• Guides selection of key Organizational Behaviors for on-site assessment.
## Selected Organizational Behaviors

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Methods: Interviews

- Sample size: 10-20% of employee population
- Participants:
  - Hourly: cross section from each job type and shift
  - Salaried: shift foreman, fire boss, and at least one section foreman from each shift
  - Managers: mine, safety, underground production, above ground production, corporate safety
- Focus on 4 organizational behaviors per interviewee
- Ask 3-4 questions per organizational behavior
- Standard opening and closing questions for every interview/focus group
- Interviewer has freedom to “pull threads”
Sample Interview/Focus Group Questions

Opening:
1. Tell me about how you got to the job you have today.
2. What are your roles and responsibilities as (a continuous miner operator)?

Sample Questions to Investigate Communication Behavior:
1. How well informed are you about what is going on at the mine site?
   – How do you obtain most of your knowledge regarding mine site activities?
2. Describe for me how you receive information from upper levels of management.
   – What would you do to change this?
3. Tell me how you go about transmitting information to upper management.
   – What could be done to make this process more effective?
4. Tell me about the last time you got together with other workers and supervisors to discuss problems that were going on in your work group.
   • Continue with questions about other 3 organizational behaviors

Closing:
1. If you were king/queen for the day, what three things would you change to make working at this mine better and/or safer?
Methods: BARS

- **Behavioral Anchored Rating Scales**
- **Participants:** All interviewees

- Behavioral examples anchor various levels of each behavior and facilitate interpretation

- 4 BARS corresponding to behaviors explored administered at interview conclusion

- BARS provide interviewee another method of expressing his/her opinion regarding the behaviors

- Interviewee selects the single behavioral example which best describes his/her perception of the overall facility
Attention to Safety refers to the characteristics of the work environment, such as the norms, rules, and common understandings that influence site personnel’s perceptions of the importance that the organization places on safety. It includes the degree to which a critical, questioning attitude exists that is directed toward site improvement.

- Individuals at the site believe safety is the number one priority and that perspective is reinforced by senior (high-level) management and clearly disseminated to all individuals at the site.

- Personnel make an effort to correct problems in a timely and effective manner to ensure that safety levels are not compromised at the site. Individuals have a clear understanding that safety is a top priority.

- Site management reflects a delicate balance of emphasizing safety, while at the same time, making it clear that there is a need to keep the site operating.

- At times, the interests of the stakeholders seem to take priority over concerns regarding the safe operation of the site and the lack of organization wide support for safe site operations is clearly evident.

- Questions regarding safe operations are not welcome or addressed. Management's attitude is to keep running coal regardless of evident safety issues.
Methods: Behavioral Observations

- Structured methodology used to record observational data.
- Non-intrusive method to obtain data on an organizational behavior.
- Key work activities and meetings are identified and attended.
  - Shift Turnovers
  - Management Meetings
  - Safety Meetings
  - Personnel Evaluation Meetings
  - Daily Work Activities
- Observer non-intrusively takes notes about the processes going on.
- Observer makes observations with the selected organizational behaviors in mind.
Methods: Organizational and Safety Culture Survey

- Participants: All mine site employees
  - Minimum 70% response rate
  - Survey process sends message regarding importance of employee views on topic.

- Supplements information collected regarding organizational behaviors with attitudinal information.

- Work with Mine Management to develop demographic questions to facilitate meaningful data analysis.

- Provides baseline data to track future performance.
Survey Scales

- Commitment
- Cohesion
- Coordination
- Job Satisfaction
- Hazard
- Safety
- Environment, Safety & Health

- Communication Trust
- Communication Accuracy
- Communication Interaction
- Communication Satisfaction
- SCWE
Sample Survey Questions

Please mark the number below each statement or question that best describes your opinion:

1) I talk up this organization to my friends as a great organization to work for.
   
   strongly disagree 1 2 3 4 5 6 7 strongly agree

2) I find that my values and the organization's values are very similar.
   
   strongly disagree 1 2 3 4 5 6 7 strongly agree

3) I am proud to tell others that I am part of this organization.
   
   strongly disagree 1 2 3 4 5 6 7 strongly agree
PRELIMINARY FINDINGS
Survey Results Interpretation

• Statistically significant differences between mines on many of the survey scales.
  – We aren’t being invited to just the “best of the best” mines.
• Look for trends across mines: grouping of bars that are lower or higher than other groupings.
  – Indicates areas where the industry is excelling or struggling.
• No standard level to determine positive and negative or good and bad safety culture, but can use thirds rule of thumb:
  – Above 5
  – Between 3 and 5
  – Below 3
Survey Results

* p < .05, ** p < .01
Survey Results

Coordination **

Cohesion **

Hazard *

Safety **

Mine 1
Mine 2
Mine 3

$p < .05, ** p < .01$
Survey Results

** Job Satisfaction**
** Org Commitment**
** SCWE**

- Mine 1
- Mine 2
- Mine 3

** p < .01
SCWE Items: All Mines

- Responsible to ID problems: 6
- Openly challenge mgmt decisions: 4
- Approach mgmt with concerns: 5
- Mgmt wants concerns reported: 4
- Concerns are addressed: 4
- Helpful criticism encouraged: 4
- Retaliation not tolerated: 4
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BARS Results Interpretation

- 10 people complete BARS for Attention to Safety
  - 2 people “X” in red zone
  - 3 people “X” in yellow zone
  - 5 people “X” in green zone
- Horizontal bar shows percentage of total number of responses given for each of the categories.
BARS : All Mines

- Attention to Safety
- Formalization
- Goal Setting & Prioritization
- Communication
- Org Learning
- Performance Quality
- Problem ID & Resolution
- Training
PRACTICAL APPLICATION
Markers of Greater Emphasis on Safety

• Safety goals are concrete, clearly articulated, and retained
  – Simple, straightforward safety goal(s)
  – All levels of management review safety goal(s) with employees
  – 100% of interviewees able to tell us what the safety goal was

• Consistency between management’s espoused values and actions
  – Safety is communicated as #1 value and #1 goal
  – Little to no emphasis placed on production when communicating with miners
  – Employees are empowered to shut down if there is a safety concern

• Implementation of additional safety measures
  – Tracking systems, roof and rib mesh, roof and rib bolting in excess of requirements, and safety training in addition to requirements
Markers of Lesser Emphasis on Safety

• Frequent changes and informal change management
  – Changes enacted frequently (e.g., leadership, scheduling, policy, bonus distribution, etc.)
  – Formal channels are not used to announce and implement change (e.g., miners know about changes before bosses, new policies are enacted before being thoroughly explained)

• Lack of a Safety Conscious Work Environment
  – Employees do not feel that management wants safety concerns raised
  – Employees fear retaliation for reporting problems

• Inconsistencies between espoused values and behaviors
  – Statements made that safety is the #1 priority
  – Actions are taken that contradict those statements (e.g., forced overtime, lofty production bonuses, unrealistic timelines).