Safety Culture as an Ongoing Process:

Culture Surveys as Opportunities for Inquiry and Change

John S. Carroll

MIT Sloan School of Management

50 Memorial Drive

Cambridge, MA 02139 USA

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Abstract

In their efforts to enhance performance and use resources efficiently, the nuclear power industry along with many other industries has turned to the improvement of "culture." I present an example of one department at a nuclear power plant that faced an apparent problem with its safety culture. They responded in a creative way that opened possibilities for self-assessment and learning. In particular, although they used a safety culture survey as a key part of self-assessment, the survey was understood as an entry point into group interviews and collective discussions with change implications. The safety culture project revealed some surprises about the safety culture and work culture of the plant. In an atmosphere of mostly-positive improvements following an earlier crisis, there were some issues that needed management attention. The safety culture survey and group interviews found that safety was not understood consistently and comprehensively, communications up and down the hierarchy were not always effective, and supervisors were being placed in weak positions without the resources to carry out their expanding roles. Management took steps to address these issues and continues to rely on a variety of feedback and communication mechanisms. Management holds these survey and inquiry techniques in reserve as a reactive response when issues arise, although they could also be used as a periodic opportunity for dialogue.

Keywords: safety culture, inquiry, communications, surveys

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Managers as well as workers are faced with conflicting demands and higher workload in the new industrial environment of downsizing and continual improvement (e.g., Perron & Friedlander, 1996; Rosenzweig, 1996). This is exemplified by the US nuclear power industry, which faces extreme cost pressures from competition with other energy sources, the challenge of reducing staffs that multiplied in the decade following Three Mile Island (see Kemeny et al., 1979 for a report of the accident and the investigation), and pressure from regulators and publics for increased safety.

In their efforts to enhance performance and use resources efficiently, the nuclear power industry along with many other industries has turned to the improvement of "culture" (IAEA, 1991). Employees are being asked to do more than what they are told: They are increasingly expected to be proactively aware of potential problems and areas for improvement and to be personally committed to corporate goals such as safety, quality, and profitability. Managers who used to pass messages down to the troops and to monitor compliance are now expected to solicit suggestions and criticisms from below and to be communicators and facilitators rather than controllers. As Lee (1997) states, "the only way to continue to improve is to address the *hearts and minds* of the management and workers" (p. 1). These cultural and organizational evolutions are associated with changing measurement and control systems: Organizations are shifting from a focus on meeting targets and enforcing rules to measuring beliefs and values and

creating open dialogue to encourage collective learning (cf., Simons, 1995).

In this paper I present an example of one department at a nuclear power plant that faced an apparent problem with its safety culture. They responded in a creative way that opened opportunities for self-assessment and discussion. In particular, although the project team (of which I was a member) used a safety culture survey as a key part of self-assessment, we constructed the survey as part of a more extensive inquiry and change process. We used the survey to identify areas for further discussion and clarification through a series of individual and group interviews. The inquiry process was understood not only as information gathering pursuant to corrective actions, but also as an intervention to signal the importance of safety culture and to model a more open and collaborative approach to self-assessment and change.

The Nuclear Power Industry Context

A shift in regulatory emphasis has occurred in the nuclear power industry. The older style of direct prescriptions of required behavior is being reconsidered. There are signs of a new style that attempts to force plant management to have appropriate priorities and procedures in order to meet safety objectives (as exemplified by the U.S. Nuclear Regulatory Commission's Maintenance Rule, 10CFR50.65).

Self-assessment by plants (in the line and in quality control) is perceived to be a crucial capacity for safety assurance and continued improvement. Regulators are insisting that plants find their own problems. For example, the Chairman of the U.S. Nuclear Regulatory Commission (NRC), Dr. Shirley Jackson, attributed improvement over the past decade to "increased emphasis by both the NRC and the industry in the following three areas: 1) improved maintenance practices, 2) consideration of risk in the

operation and maintenance of nuclear plants, and 3) self-assessment of events to identify root causes of problems and ensure effective corrective actions" (1996, p. 2). She goes on to say that self-assessment "should be an ingrained part of every licensees' way of doing business" (p. 5) and that it will become increasingly important "as we move to more performance-oriented regulatory approaches" (p. 6). In an effort to develop leading indicators of performance (that will give warnings prior to serious incidents and reportable events), plants have turned to lower-level incident reports with subcategories such as procedure noncompliance, and various kinds of self-assessments such as culture and climate surveys (e.g., Cox & Cox, 1991; Lee, 1997).

Two important indicators of self-assessment capability are the extent to which employees bring problems to management and management's openness to critical feedback. If employees focus on production and ignore minor problems, or try to avoid blame by not bringing up problems, then a profusion of small problems may create the conditions for serious trouble later. A lack of feedback or unwillingness to hear critical feedback may short-circuit proactive efforts at prevention or rapid response (March et al, 1991; Rasmussen, 1990).

In March, 1996, Millstone Nuclear Power Station made the cover of Time magazine because of allegations of harassment and intimidation of employees who had tried to bring their concerns to management and subsequently "blew the whistle" to the NRC. This was the final signal, along with other problems, that led the NRC to close all three Millstone units. The NRC itself was criticized vigorously for failing to take action earlier, when problems at Millstone began to surface. In response, the NRC has taken a tougher stance with the entire industry. As the utility that operates Millstone works to

overcome numerous physical, technical, programmatic, leadership, and cultural issues, one key regulatory criterion for restart is that the plant can demonstrate that employees are willing to bring problems to managers who then take appropriate action.

The Nuclear Power Plant Setting

The setting for this study is an operating nuclear power plant with a history of uneven performance since its start-up over 25 years ago. Sporadic improvement efforts yielded short-term performance gains but problems returned. Sustained attention to problems and resources to support change efforts were scarce after the utility nearly went bankrupt trying to build an additional nuclear power plant in the 1980s. Finally, several years ago, the Nuclear Regulatory Commission conducted an extensive diagnostic evaluation and presented a long list of problems and recommendations to the company.

The company responded by changing most of top management including the Vice President in charge of nuclear operations. They were replaced by people from outside the company (some of whom had worked at the plant prior to taking jobs elsewhere). Additionally, considerable new work was commissioned to address the specific concerns noted by the NRC. The new team began a long and painful process of organizational restructuring and rebuilding of the physical equipment, the written procedures, the work practices, and the culture.

In 1995 the plant Engineering organization was restructured to move the remaining nuclear plant support out of corporate headquarters to the plant site, to bring together the design, systems, and nuclear fuels groups into a single organization, and to eliminate redundant positions. Not surprisingly, there were some hard feelings among the engineering workforce.

In the late spring of 1996, the Vice President in charge of nuclear operations observed a lack of willingness among some engineers to participate in department stand down discussions (when all Engineering employees are assembled for announcements and dialogue). He also heard in personal conversations that some Engineering employees felt inhibited to discuss problems with a couple of managers who were perceived as verbally aggressive. He believed that the existing communication practices of regular group meetings at various levels and encouragement for managers and supervisors to be out talking to people had produced a possible early warning signal. In the context of the Millstone plant closing, due in part to managers who harassed and intimidated employees who brought up issues, the Vice President wanted to assess and prevent any such situation in Engineering. Initially, the VP thought that the plant should develop an employee concerns program, and therefore provide a mechanism for dealing with any reluctance to bring problems to Engineering management.

The Engineering Safety Culture Project

The VP established a team to conduct a survey of the Engineering department around willingness to raise issues and other aspects of safety culture. The team was led by an engineer from the oversight and quality control organization and included two external consultants: (1) myself, an MIT Sloan School faculty member with experience conducting research in the industry and who also had served on the external review committees for nuclear power plants and (2) a consultant who had worked with senior management regarding organizational development, management development, and personnel assignment. There was no direct Engineering department representation.

As discussions and planning for this assessment continued, the team reoriented its

strategy to use this opportunity to explore a new way to conduct inquiry and change processes. We believed that the use of a safety culture survey for diagnosis, lacking a series of prior surveys or other benchmarks, was inherently equivocal (Carroll, 1995; Weick, 1995). It is difficult to interpret the meaning of simple rating-scale responses. Further, the team agreed with the consensus at the plant that there were no standard, established criteria for judging the health of a safety culture. Although we could use the survey in an exploratory fashion by asking more open-ended questions, people vary widely in their responsiveness and ability to write about complex and emotional issues.

More importantly, the very act of conducting a survey constitutes an intervention -- a signal sent to the department about the safety culture. People are likely to wonder what is happening, how they can help, and how it will affect their work and their employment. They are likely to look carefully at the outcomes and the process: Is this a genuine attempt to listen and make changes or a way to please the regulators? Are employees participating in authentic conversations and collaborations or are they being manipulated by management? Argyris and Schon (1996), for example, document how different modes of inquiry may either reinforce dysfunctional management behaviors or lead to changes in behaviors and beliefs.

In thinking about the role of safety surveys and other forms of feedback, we considered James Reason's work with British Rail and British Air (Reason, 1997). He helped them develop a system of safety indicators that feeds data to first-line supervisors on a weekly basis. The data compare different geographical units and give temporal trends. The feedback is then discussed, interpreted, and reacted to by a wide range of personnel up and down the hierarchy. These conversations are intended to be the source

of insights and improvements. Of course, depending upon how it is implemented, any communication process can facilitate change or reinforce existing dysfunctional relationships. One observer of this process at British Rail reported that, in practice, it is still hard to get resources from management to make changes suggested by lower-level personnel (Perin, 1995).

Method

With the above ideas in mind, the project was structured in several phases. First, a safety culture questionnaire was designed, pilot tested, and delivered in early July to all 130 employees in the Engineering organization. Anonymity was provided, with only departmental affiliation (design, systems, or fuels) and hierarchical level (supervisor-manager or not) requested. Second, following analysis of the questionnaire data, interviews were conducted in the latter half of July by one or more team members, with questions based on issues that emerged from the questionnaires. All employees were invited to participate in the interviews, and respondents were grouped into supervisors and non-supervisors interviewed in peer groups of four to ten; the three department managers were interviewed individually. Third, the results of the analyses of questionnaires and interviews were reported to senior management, along with a discussion of recommendations. Finally, results were reported back to the Engineering organization through normal departmental stand down meetings. This served to acknowledge the inputs, support willingness to raise such issues in the future, and encourage consideration of improvements.

Safety Culture Questionnaire

The safety culture questionnaire included two cover letters. The first, from the

VP, emphasized the importance of getting an "honest, unbiased look" at Engineering given the many changes of the past few years. The letter emphasized relating one's true feelings, and guaranteed confidentiality: "It is crucial that we are completely honest with ourselves, if we hope to deal with the issues that hinder, or demotivate us from achieving the level of engineering work we all want. My personal commitment to you is to communicate to you the collective results of your input, and my intentions for acting upon them." The letter closed with the hope that they would participate in the follow-up interviews, while emphasizing that this was not mandatory: "However, I certainly hope that you will use the interviews as a way to clarify your feelings about the questionnaire results."

The second cover letter, from the team leader, gave the goals for the safety culture assessment: "to assess the strength of the safety culture within Engineering, and to encourage discussion of safety culture and human performance that will increase awareness and reinforce positive aspects." The letter offered definitions of safety culture and safety:

> safety culture refers to a high value (priority) placed on worker safety and public (nuclear) safety by everyone in every group and at every level of the plant. It also refers to expectations that people will act to preserve and enhance safety, take personal responsibility for safety, and be rewarded consistent with these values. Safety refers to worker safety or industrial safety on the job, and to public or nuclear safety in regard to releases into the environment that pose a risk to the public.

The safety culture questionnaire consisted of two parts: (1) 45 closed-ended

questions, each answered with a four-category scale (disagree strongly, disagree, agree, agree strongly) and a "don't know" option, and (2) two open-ended questions. Some closed-ended questions were taken from a prior research questionnaire, some were taken from a safety culture questionnaire used by other consultants at the plant, and some were written by the team for this project. Illustrative questions are: "Too many people at the plant are worried about being blamed for mistakes," "We try hard to avoid conflicts and public differences of opinion," "Talking about near-misses and minor problems just wastes time and gets people in trouble," "Senior Management makes workers feel uncomfortable about raising concerns," "I feel personally responsible for the safety of the whole plant, not just for doing my job," and "The safety culture has substantially improved over the last few years."

The two open-ended questions were: (1) Think of something that happened at the plant recently that shows how strong or weak the safety culture is. By this we mean: how much focus on safety, prevention of unsafe situations, recovery from safety-related problems, and effort to improve safety. This could involve you, your work group, or anyone at the plant including management and contractors. Please give a description and explain why it illustrates a strong or a weak safety culture. You should not use any names. Please note whether any of the following should be held in confidence. (2) If you were the Vice President in charge of nuclear operations, what would you do to improve the plant safety culture?

There were four responses that requested confidentiality, which were deleted from the public report; each of these respondents was contacted individually to discuss their observations. There were two responses that were edited out of the report because they

contained assertions about specific individuals that could not be validated due to anonymity.

Individual and Group Interviews

Rather than draw conclusions directly from the questionnaire responses, the team used these data to structure the interviews, and to allow us to be sensitive to questions and comments during the discussions. We adopted and conveyed the attitude that we did not know what the questionnaire responses meant, and we needed to ask groups of respondents to help interpret their meaning. This was consistent with our intent not simply to "evaluate" or measure safety culture, but to create an opportunity for discussion of values and behaviors, and therefore to send a message about its importance and hopefully to enhance the culture.

The interviews were designed around seven questions, mostly based on themes arising from the questionnaire responses:

1) What does "safety culture" mean for Engineering? Tell us how feelings of responsibility and ownership translate into action.
2) Give some examples of ways management expectations for safety are stated, and how they are backed up or inconsistent with performance reviews, rewards, and punishments.
3) What happens when workers raise concerns about safety? What happens when other concerns are raised?
4) Why are people worried about being blamed for mistakes? What does accountability mean? Give examples of accountability without blame.
5) Do your supervisors and managers understand your work and how it

contributes to safety?

6) How well is information shared freely across work groups and up and down the hierarchy?

7) What keeps the plant from correcting problems that have been identified?

In carrying out the interviews, we were very conscious of the need to create an atmosphere of open inquiry, and to avoid any inhibiting features. Managers, supervisors, and non-supervisory employees were interviewed separately to avoid any authority issues. We explained that the purpose of the interviews was a self-analysis of safety culture -- what we pay attention to, what we value, what we talk about, how we act, and what kinds of feedback we get.

The interviews were a step in a process to improve safety culture by calling attention to it, creating more opportunities to talk about safety culture behaviors, and generating more feedback and effective communication. We emphasized that the only notes from the group interviews were those taken on a flip chart in public view; this reassured participants that we were getting their story the way they had given it, without any names. At the end of each interview session, participants were given a follow-up anonymous questionnaire on one page, asking three open-ended questions: 1) Is there anything you would like to add to the interview discussion? 2) Is there anything you would like to emphasize as particularly important? and 3) Do you have any suggestions for ways to improve the safety culture and encourage employees to raise concerns?

Results of the Survey

The intent of this paper is to present and discuss the inquiry and change process, of which the survey responses are one component or phase. In this results section, therefore, I

describe the logic of the approach, illustrate the kinds of observations and inferences that were drawn from the questionnaire and interviews, and show the bases for the major conclusions. It is unnecessary and possibly distracting to provide a detailed description of the responses and analysis. I urge the reader to avoid re-assessing the safety culture from the sketchy description provided below.

Closed-Ended Questionnaire Responses

One important result of the survey was that 115 of the 130 individuals (88%) returned the questionnaire. The analysis collapsed the four responses to each of the 45 closed-ended questions into agree vs. disagree and examined how favorable each of the items was to safety culture. The single most favorable response was that 99% of respondents agreed that, "Safety and quality are as much my responsibility as anyone's." The most unfavorable response was that 85% of respondents agreed that, "Too many people at the plant are worried about being blamed for mistakes" (a reverse item in that disagreement is supportive of a healthy safety culture).

Such results, lacking a context for interpretation, illustrate the need to provide insights and specific examples through interviews and group discussion. For example, what does it mean that too many people are worried about being blamed for mistakes -- is there a blaming culture, or is there a worrying culture, or are there too many mistakes? Or, what are some specific illustrations behind 50% of respondents disagreeing that, "Senior Management expectation for safety are clearly stated and consistent with performance reviews, rewards and punishments" or 50% agreeing that, "Senior Management makes workers feel uncomfortable about raising concerns"? Even items that had generally positive responses could still be considered potentially troubling: 37%

of respondents disagreed that, “My manager is sufficiently knowledgeable of my work, how it is conducted, and how I contribute to safety.”

The analysis also examined differences between supervisor/managers and non-supervisors and between the design, systems, and fuels departments. The largest difference between supervisors/managers and others was on the item, “Procedure problems and work-arounds are located and fixed in a timely manner,” with agreement from 91% of the supervisors/managers but only 48% of the non-supervisors. The item most closely related to the presenting symptom, “Senior Management makes workers feel uncomfortable about raising concerns,” was agreed to by 25% of supervisors/managers but 53% of non-supervisors. The largest difference among departments was on the same item about Management making workers feel uncomfortable about raising concerns, with 65% of Design agreeing, 42% of Systems, and only 11% of Fuels. The next largest was “My level of accountability is greater than my direct degree of control,” with 76% of Design and 76% of Systems agreeing, and only 30% of Fuels.

Open-Ended Questionnaire Responses

The narrative responses to the open-ended questions were particularly valuable for collecting examples and challenging the team’s own preconceptions. 66 of the 115 respondents gave an example of safety culture, and 73 gave a suggestion. For example, a positive example of safety culture was,

> At a recent stand down meeting the plant manager emphasized that ‘we’ needed to set the example for safety in the plant, and that being conscientious about wearing personal Protective Equipment was the start. I had been putting off getting a pair of safety glasses, until that day, when I saw that what he was saying

was right. I went about getting my safety glasses without further delay, and now wear them anytime I am in the plant. For what it's worth, I feel safer.

A negative example was,

> The Appendix R (NRC Fire Protection rule) problem shows how weak our safety culture is. And it will probably get worse. This upcoming outage we will have a lot of contractors on site doing work that used to be done by company employees. Most of the evidence I have seen shows that a lot of the contractors don't do as good work (either because of a lack of site-specific experience/training or because of a "don't care -- I'm only here for 3 months" attitude) as permanent employees.

An example of a suggestion is, "Find a way to recognize and reward people who work safely and to the schedule. Not people who constantly delay work but people who have foresight to get everything in place to work safely. Planners could do better in this area."

Individual and Group Interview Responses

Our impressions were that the interviews stimulated many candid comments, criticisms as well as praise, differences of opinion, and genuine dialogue. We were told repeatedly by participants that they appreciated the opportunity to talk about safety, that they lacked such opportunities in their work, and that they felt a need for more such conversations.

The flip chart notes from the interviews were transcribed and analyzed in the context of the questionnaire data. Given the goal to produce a report initially to the VP and subsequently to the Engineering group, the data were grouped into important topics and themes for presentation. Rather than repeat the details of the interview analysis, we have incorporated the interview data into our description of the report that was presented

to senior management (the Vice President and Plant Manager) and subsequently presented by them to Engineering.

Reporting Back

Six general conclusions and three recommendations were given to senior management, as shown in Table 1. Accompanying these main points was a briefing paper linking specific questionnaire (rating scale and narrative) and interview responses to each point. The briefing paper was intended to provide detail to senior management, but also to provide examples they could use in conveying the report to Engineering.

The first conclusion in Table 1 is that the safety culture of the plant Engineering group is essentially healthy. The briefing book summarized and illustrated the information that the research team had used to arrive at this conclusion. Consistent with our definition of safety culture, we sought evidence that Engineering employees give high priority to safety issues, take personal responsibility, bring issues to management attention, and that management responds appropriately. From the closed-ended questionnaire responses, we noted that 99% of the respondents agreed that, "Safety and quality are as much my responsibility as anyone's." A questionnaire narrative response described how a safety problem during a calibration of radiation detectors was raised and discussed proactively with the plant safety committee until a resolution was achieved. In the interviews, one employee commented that he feels he now has management's ear -- a big change; another said that at the last departmental stand down meeting, the manager cared and was sincere -- it was the first time he believed this manager cared.

Despite the overall conclusion that the safety culture is healthy, the team concluded that there are vulnerabilities because safety is understood narrowly and

inconsistently. Direct threats to safety are recognized, but related conditions such as inappropriate schedule pressure are not always recognized as influencing safety performance. It seemed that safety is typically partitioned into nuclear vs. industrial "bins" and thought of in different and inconsistent ways: The reactions to safety issues depended on how they were categorized. One narrative described a job in which outside vendors were to clean a tank, yet the pre-job briefing and job scope lacked confined space rescuers or contingency plans. When this was pointed out to a Maintenance Supervisor, they were told that according to written procedure this was not a confined space and vendors did not fall under plant rules. Several comments suggested that workers believed managers want a safe environment but do not always act appropriately or consistently, nor always understand the resources needed to do the work. The interviews brought up issues regarding how difficult it is to manage with both schedule and safety issues, that management stress on safety depends on particular problems and situations, and that some things related to safety such as low morale are dismissed as unimportant.

A particularly important issue surfaced about relationships between managers, supervisors, and other employees. Communication in general is perceived to be weak. Decision processes and management behaviors are perceived as too hierarchical. Many people commented that too many decisions are being made at too high a level -- supervisors are unwilling to make decisions without management review, there is rhetoric of empowerment but little evidence of it, supervisors are used as "list enforcers," etc. Engineering workload is too often adjusted without regard to current loading. Supervisors are not always able to effectively balance the workload of their sections. Some management behaviors tend to inhibit the raising of concerns by engineers. This

topic included observations about how a "crisis management" style continues despite the need to transition to a style of sustaining improvements (e.g., "Management heightens focus on 1-2 issues for a few weeks and then on to next issue"). Also, senior management behavior was perceived to be ambiguous or abrasive and to instill fear of being blamed for mistakes.

The 1995 Engineering reorganization created some bad feelings and performance problems. Productivity was reduced in some areas due to the perceived lack of pre-planning and communication that accompanied the change. Participants commented that the organizational changes in Engineering, including downsizing and creation of the Design Engineering Group, were accompanied by disorganization, backlogs, overwork and forced overtime. Management changes led to instability and difficulty in communication; many new supervisors did not understand the work and how much resources were required. There are now too few supervisors to do effective coaching and counseling. Accountabilities changed, for example, design modification packages that were the responsibility of one group were now spread among four groups. The poor communication about downsizing led to cynicism and fear that if you have any mistake on your record, then you are vulnerable to the next cut: "an unknown number of mistakes and you're gone."

There was supportive evidence that Engineering employees are concerned about being blamed for problems, although we are uncertain whether these fears are warranted. Several comments expressed the sense that, despite overall good performance, management tends to focus on rare mistakes which may have a delayed and unpredictable impact on careers: "Accountability is appreciated. But management 'never forgets'

mistakes and sometime later you may pay for the mistakes"; "Some people are afraid to make a decision because of the fear of being wrong"; and "Managers getting together to rate folks -- maybe all they remember was who got blamed." The team discussed the need to achieve accountability without inappropriate consequences.

There is a lack of positive reinforcement of positive safe behaviors. This is a missed opportunity to encourage desired behavior. Several participants observed that it is easier to get recognized for fixing problems and handling crises than for avoiding problems and crises through proper planning and preparation: "Management makes heroes and rewards people who work long hours. People are promoted for meeting schedule and getting work done -- even though the individual 'safety quotient' is low"; and "Hard time rewarding steady performers who prevent events."

Recognizing that the overall conclusion of the assessment was that the safety culture was basically sound but with need for improvement, we intended the recommendations to be implemented through normal organizational means. More directly, the nature of the improvements needed argue against a specific 'project' approach," i.e., a punchlist of tasks that can be checked off and attention then directed to other issues. The report argued that the issues should be addressed through changes in normal business conduct, and thus would require a more thoughtful and deliberate approach.

However, the team identified three specific issues that should be discussed, with appropriate departmental actions adopted and implemented to address the issues. Those issues appeared to be most central to any efforts to improve safety culture and work culture more generally: (1) Make the engineering supervisor the workload "gatekeeper"

and thereby strengthen the supervisory role; (2) Enlarge the safety culture concept to include all work; and (3) Enhance accountability without inappropriate consequences.

In addition to the three major organizational and cultural issues, specific personnel safety issues that were raised in questionnaire narrative responses were thought to deserve near term action. Such responses would send clear signals about the importance of raising such concerns and management's willingness to respond. These recommendations were to: (1) limit the use of alcohol during offsite company functions (serving alcohol at offsite "safety meetings" seemed to undercut the safety message), (2) discourage excessive auto speed on the access road and in the parking lot, and (3) ensure prompt shoveling of walkways during winter on the night shifts and weekends.

These analyses and observations led the team to recommend a communication strategy for disseminating the report back to Engineering. First, there should be a report back to the engineers who provided the inputs, including expectations for addressing raised issues. Reporting back accomplishes the simple task of acknowledging the inputs, which supports willingness to raise such issues in the future. Second, stand down meetings should be employed prior to the next refueling outage to report and begin to process the results as they specifically relate to Design and System Engineering. Further, we thought that the recommended process for addressing the above concerns should become a regular part of the current management model: a) Senior management addresses the issues, makes decisions, and communicates results and expectations down; b) Individual departments process the decisions through stand down meetings and assignment of tasks to small groups to produce recommended actions; c) Resultant tasks are assigned, tracked and completed; and d) Communications highlight that the work

accomplished was responsive to employee inputs, to reinforce the willingness to raise concerns, offer good ideas, and model behavior basic to a sound safety culture.

Change Process and Follow-Ups

Consistent with the overall conclusion that the plant Engineering safety culture was in reasonably good health, no specific changes to the organization or focused efforts to modify the safety culture were instituted. Following a series of communication efforts and discussions of the report, each organization was left to decide whether additional actions beyond reporting back were to be taken. We are not aware that any specific actions were initiated.

The specific personnel safety issues noted above (alcohol, speeding, icy walkways) have subsequently surfaced occasionally, indicating that while the issues have not been resolved to completely prevent recurrence, plant personnel still hold these conditions to be at variance with safety culture values.

A private result of the assessment was that specific feedback was provided to three of the plant senior managers, based on the input from the questionnaires and interviews. Strict confidentiality of sources was maintained. Personal observations indicate that at least two of the three managers have since made concerted and continuing efforts to modify behaviors that were perceived as aggressive or micro-managing.

In 1997, an Employee Concerns Program was initiated at the entire plant to provide another communication path for employees to raise concerns. The program is conducted on a low-key basis.

More recently, plant management is attending to the “human performance” area, an issue of concern throughout the industry. An industry-wide model provided by the

Institute of Nuclear Power Operations (INPO) is being used, which contains several important attributes of a healthy safety culture (INPO, 1997).

Overall Lessons and Discussion

My primary purpose in this paper is to emphasize the broader role of safety culture surveys in helping to shape and sustain a healthy safety culture. I assert that their use for assessing and measuring safety culture, although important in many contexts, is problematic without companion activities that connect questionnaire responses to the specific context of the setting, its history and particular challenges. More importantly, every survey is also an intervention that can reinforce undesirable or desirable aspects of culture, depending on how the survey is conducted and used. If the survey is a genuine effort to reach mutual understanding, to open dialogue among multiple levels of hierarchy and groups of employees, and to work together for effective change, then it can play an important role in creating and sustaining a healthy safety culture.

The situation described in this paper illustrates how managers get ambiguous cues and are tempted to take quick action. There were some indications that employees were intimidated by Engineering management, and that an employee concerns program was needed. The safety culture project that was initiated revealed some surprises that went far deeper into the safety culture and work culture of the plant. In this plant that was recovering from a crisis, in an atmosphere of mostly-positive improvements, there were some issues that needed management attention. The safety culture survey and group interviews found that safety was not understood consistently and comprehensively, communications up and down the hierarchy were not always effective, and supervisors were being placed in weak positions without the resources to carry out their expanding

roles.

Although reactions to the questionnaires and interviews were highly positive, and action was taken as a result of the safety culture project, the plant ultimately managed the safety culture self-assessment as a one-time "snapshot" of Engineering rather than a repeatable culture initiative. The VP and Plant Manager were reassured that existing communication mechanisms had given an early warning signal, and the team's investigation had revealed the overall health of the safety culture with some issues that could be dealt with by existing practices and revised routines. Thus, there has not been an institutionalization of the dialogues exemplified in the group interviews[1]. Management continues to employ existing communication processes such as routine stand down meetings, enhanced by heightened awareness of their significance to a healthy safety culture. Other companies in other circumstances might have decided to create new communication pathways and forums; the response in this case was to investigate and "stay the course." Although some opportunities may have been missed, they also avoided the risks of creating resource-intensive activities, raising expectations, and later disappointing employees.

[1] Corcoran (1998) distinguishes four types of self-assessments: routine, pre-emptive, reactive, and periodic. The culture survey project was a reactive self-assessment in response to a surprise. It was not institutionalized as a part of particular business activities, a requirement prior to making changes, or a scheduled activity.

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Table 1

Report to Management

Conclusions

1. The safety culture of the plant Engineering group is essentially healthy. While these issues should be addressed, they may be addressed through normal organizational channels, rather than on a plant wide – urgent basis.
2. There is a weak understanding of the safety culture. Direct threats are recognized. However, related conditions such as inappropriate schedule pressure are not always recognized as influencing our safety performance.
3. Decision processes and management behaviors are too hierarchical. Engineering workload is too often adjusted without regard to current loading. Supervisors are not always able to effectively balance the workload of their sections. Some management behaviors tend to inhibit the raising of concerns by engineers.
4. The 1995 Engineering reorganization exhibited weak change management performance. Productivity was reduced in some areas due to the perceived lack of pre-planning and communication that accompanied the change.
5. Too many Engineering employees are concerned about being blamed for their mistakes (need to achieve accountability without inappropriate consequences).
6. There is a lack of positive reinforcement of positive safe behaviors. This is a missed opportunity to encourage desired behavior.

Recommendations

1. Report back the results of this assessment to the engineers who provided the inputs, including expectations for addressing raised issues.

2. Employ stand down meetings before the refueling outage to report and begin to process the results as they specifically relate to Design and System Engineering.
3. Three issues in particular should be addressed by the separate departments. These issues should be discussed, with appropriate departmental actions adopted and implemented to address the issues: (a) Make the engineering supervisor the workload "gatekeeper"; (b) Enlarge the safety culture concept to include all work; and (c) Enhance accountability without inappropriate consequences.