

Safety Culture Management in High Reliability Organizations

July, 2007

david.collins@dom.com 1-800-269-9994 x3710

APPLICATIONS

Aviation	Biological	Business
Chemical	Ethical	Environment
Exploration	Finance	Hazardous
Insurance	Medical	Military
Nuclear	Security	Societal

DEFINITIONS

High Reliability Organization (HRO)

An organization that manages a process with potential impact to human life or the environment.

DEFINITIONS

SOE

Significant Operating Event. An unexpected and undesired operating event with minor to major consequences.

DEFINITIONS

Ethical Attitude

Concern for the impact of one's behavior on the welfare of others.

DEFINITIONS

Safety Culture (OSHA / VPP)

An ethical attitude which ensures activities are performed without injuring the people performing them.

DEFINITIONS

HRO Safety Culture

The ethical attitude throughout a High Reliability Organization which ensures a hazardous process is managed without harm to people or the environment.

DEFINITIONS

HRO Safety Culture Management

The management activities in a High Reliability Organization that maintain an ethical attitude throughout the organization.

DEFINITIONS

Individual HRO Safety Culture

The ethical attitude of an individual working in a High Reliability Organization that ensures a hazardous process does not harm people or the environment.

DEFINITIONS

Safety Culture Quality Management
Managing the component of SOE risk contributed by human performance. A quality safety culture maintains the human performance element of risk ALARA: *As Low As Reasonably Achievable*.

DEFINITIONS

Human Performance Safety Culture

A human performance based safety system that requires maintenance, monitoring, and quality management like any safety system.

DEFINITIONS

Healthy Organization Culture

An organization culture where observed behavior aligns closely with stated values.

TOPIC

Culture Fundamentals	Industry Objective	Plant Objective
Role of Leadership	Damaging Culture	Restoring Culture
Effective Assessments	Managing Culture	Conclusion

Culture Fundamentals



ENRON Value Statements:

Respect

We treat others as we would like to be treated ourselves. Ruthlessness, callousness, and arrogance don't belong here.

Integrity

We work with customers and prospects openly, honestly and sincerely. When we say we will do something, we will do it.

Culture Fundamentals

Organization Behavior

does not always align with stated (espoused) values.



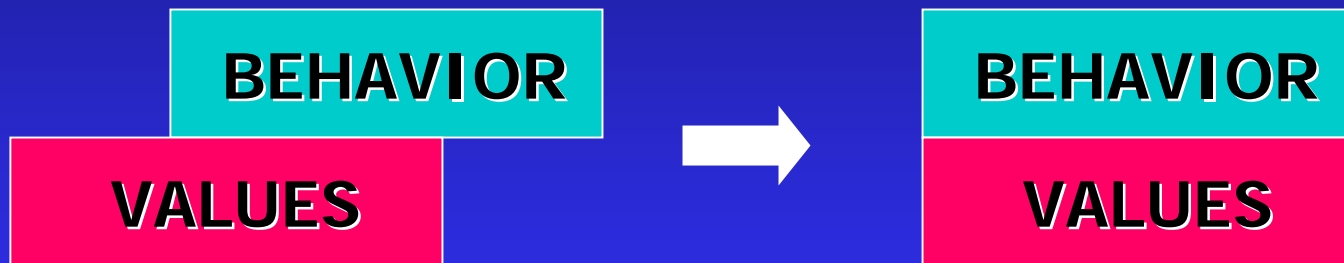
A Weak, or Low Quality Culture

is the condition where an organization's behavior does not align with its stated, espoused values.

Culture Fundamentals

Culture Management

assures that organization behavior remains aligned with organization values.



Culture Fundamentals

What is Safety Culture Management?

Does not involve maintaining the performance of protective boundaries or equipment

- Fuel cladding
- RCS
- Containment



Culture Fundamentals

Safety Culture Management

Involves maintaining protective safety attitudes

- Worker
- Manager
- Internal Oversight
- External Oversight



Culture Fundamentals

How does Safety Culture differ from Organizational Culture?

Culture Fundamentals



Culture Fundamentals

Organization Culture

Safety, Management, Operations,
Engineering, Outage Planning, HR, Training

Safety Culture

HRO, Hardhat/OSHA, Electrical,
Fire, Security, Medical

HRO (Nuclear) Safety Culture

SCWE , Questioning Attitude, Appreciation of
Risk, Conservative Decision-making, Appendix
B Compliance, Procedural Compliance,
Engineering Reviews, Human Performance,
Training, Learning Organization

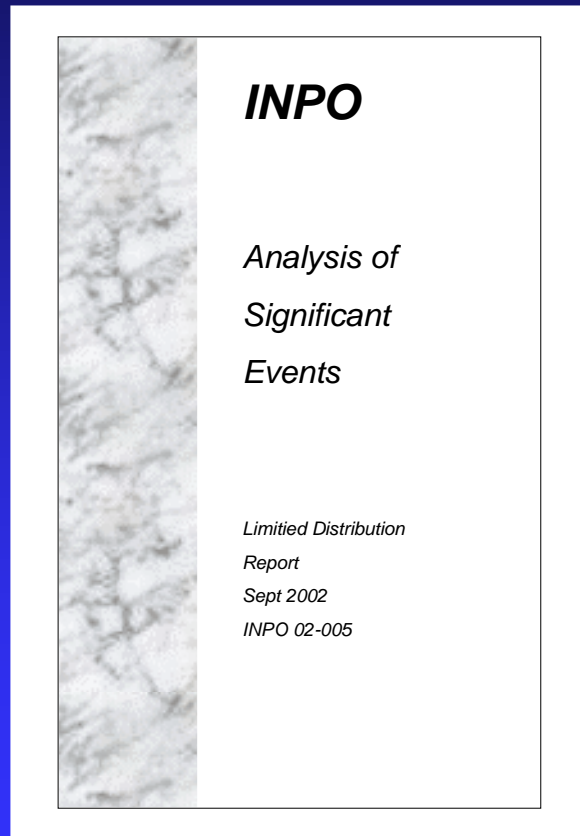
SCWE Understanding impact of
actions on others, Communication
Skills, "Crucial Conversations"

TOPIC

Culture Fundamentals	Industry Objective	Plant Objective
Role of Leadership	Damaging Culture	Restoring Culture
Effective Assessments	Managing Culture	Conclusion

Industry Objective

Safety Culture as a Causal Factor



**According to a 2002
INPO Study of SOEs:**

**No SOE *causal factor* is
more frequent than a
weak Safety Culture**

Industry Objective

Better Culture Management needed as industry becomes More Competitive:

INPO:

Before 2001 there were never more than two US fuel failure events in any one year, in 2001 there were eight. In 2002 there were twelve. In 2003 there were 1262 SOEs, the most ever in one year.

Due to economic pressure to continually reduce outage durations, SOEs during refuelings are anticipated to increase in frequency and severity.

Industry Objective

INPO:

“Pressure to continue operating was not observed to be a SOE causal factor prior to deregulation, but since 1993 has been identified in all but one of the most serious SOEs...

...therefore, given today’s competitive environment, pressure to continue operating may be a notable contributor to future significant events.”

“This analysis demonstrates that organization influences on individual behavior often negatively impact the severity of events...

...the majority of these events causes and contributors were largely a result of human behaviors that were instilled in the individuals by the organizational culture.”

Industry Objective

INPO identifies Safety Culture as a Causal Factor in 70% of the most Serious SOEs

Lack **of**:

- appreciation of risks
- questioning attitude
- conservative approach

Industry Objective

Suggested for an Industry GOAL

The Industry should set a goal of reducing safety culture as a SOE causal factor by 50% over the next 10 years.

This means in 10 years we would see safety culture halved as a causal factor in future SOEs

Industry Objective

How do we reduce Safety Culture as an SOE Causal Factor?

The **first step** is to make safety culture management a normal part of business risk management by adding safety culture to the QA Topical Report for all licensees.

Industry Objective

QUALITY ASSURANCE PROGRAM (QAP) TOPICAL REPORT – NUCLEAR POWER STATION

Policy Statement: this Quality Assurance Program (QAP) Topical Report has been developed to achieve quality assurance in all activities affecting safe operations.

QAP 1.0	Organization	QAP 11.0	Testing
QAP 2.0	Program	QAP 12.0	Test Equipment
QAP 3.0	Design Control	QAP 13.0	Handling Shipping
QAP 4.0	Procurement	QAP 14.0	Inspection Testing
QAP 5.0	Procedures	QAP 15.0	Non Conf Materials
QAP 6.0	Documents	QAP 16.0	Corrective Actions
QAP 7.0	Materials and Services	QAP 17.0	QA Records
QAP 8.0	Parts and Components	QAP 18.0	Audits
QAP 9.0	Special Processes	QAP 19.0	Safety Culture
QAP 10.0	Inspection		

Industry Objective

The **next step** is for the Industry to provide guidance on how to:

- *define* SC crisply and clearly
- *identify* measurable attributes
- *establish* acceptance criteria
- *maintain* culture above minimal levels.

Industry Objective

Excerpt from a December 2002 Plain Dealer article

The term nuclear safety culture was introduced after the Chernobyl disaster in 1986. Pinning down exactly what it means has proved elusive.

“I think if you were to talk with five different people about what safety culture is, you’d probably get five different answers,” NRC Chairman Meserve said in a recent interview with The Plain Dealer.

George Apostolakis, a respected Massachusetts Institute of Technology nuclear engineering professor who chairs the NRC’s safety advisory panel, goes further.

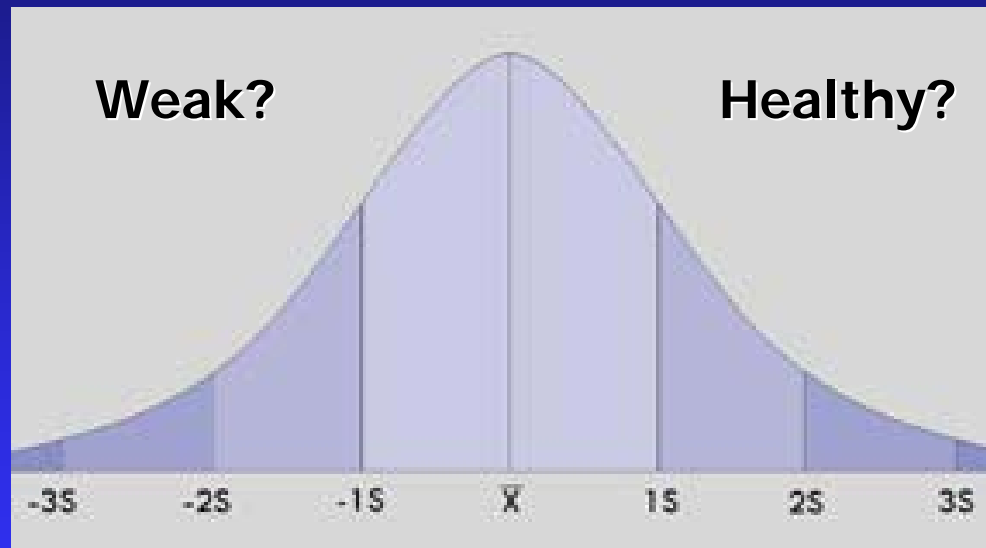
“We really don’t understand what an adequate safety culture is and how to measure it,” Apostolakis said. “Some of my colleagues with long experience at nuclear plants tell me they walk into a facility, and 10 minutes later they know whether they have a good safety culture. But they can’t tell me why.”

TOPIC

Culture Fundamentals	Industry Objective	Culture Health
Role of Leadership	Damaging Culture	Restoring Culture
Effective Assessments	Managing Culture	Conclusion

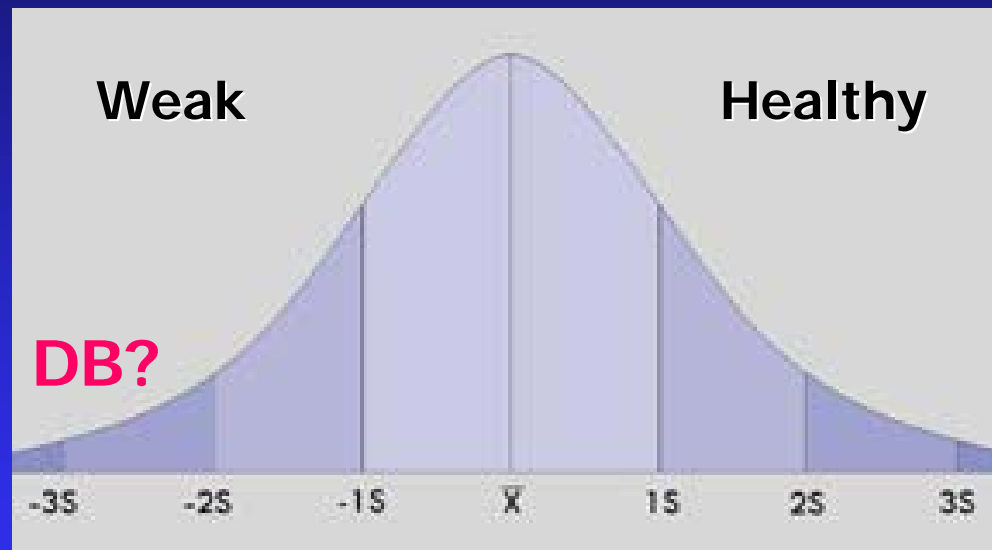
Culture Health

How healthy are the safety cultures at US nuclear plants?



Culture Health

Was The Pre-Event Davis Besse Safety Culture Truly One Of The Very Weakest In The Industry, Or Closer To The Average?



Culture Health

“Pre-event” Davis Besse Culture Metrics:

- **An NRC inspection indicated the DB safety culture was "green" or "good"**
- **NRC says long production runs tend to correlate to safe plants, and DB was having long runs**
- **INPO assessments picked up on a few leadership culture issues, but didn't flag any major ones**
- **DB had one of the best materiel conditions of any FENOC plant, 5 million hours without a lost-time accident, and one of the lowest operator error rate in the industry**
- **The safety metrics of American Nuclear Insurers put DB in the top 20% qualifying it for a discount**

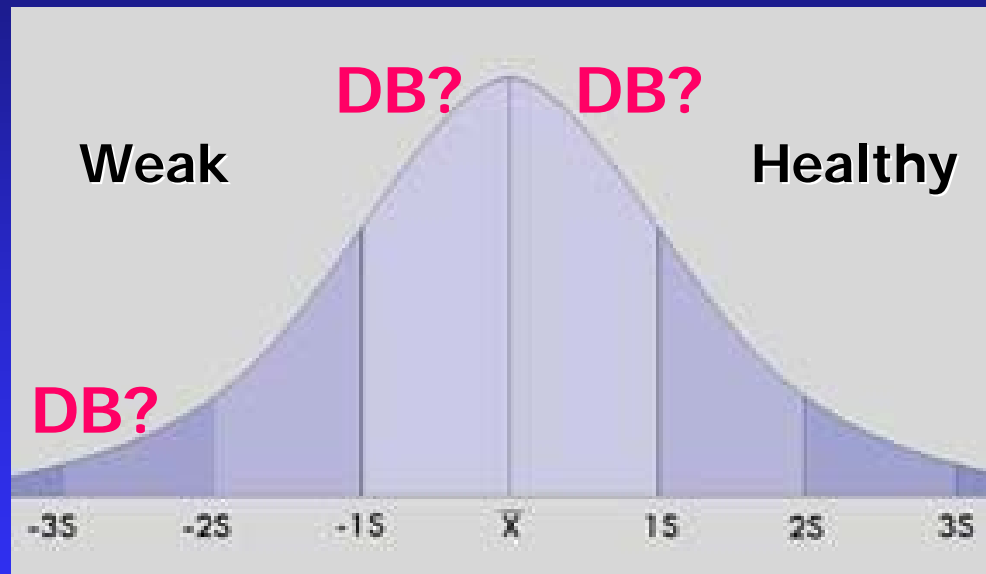
Culture Health

FENOC CEO Peter Burg at 2002 INPO
CEO Conference:

“Indications were that DB was a strong performing plant...capacity factor of 99.7% in 2001...500 day run...5.5 million hours no lost-time accident...that didn’t raise any red flags with us, would it with you?”

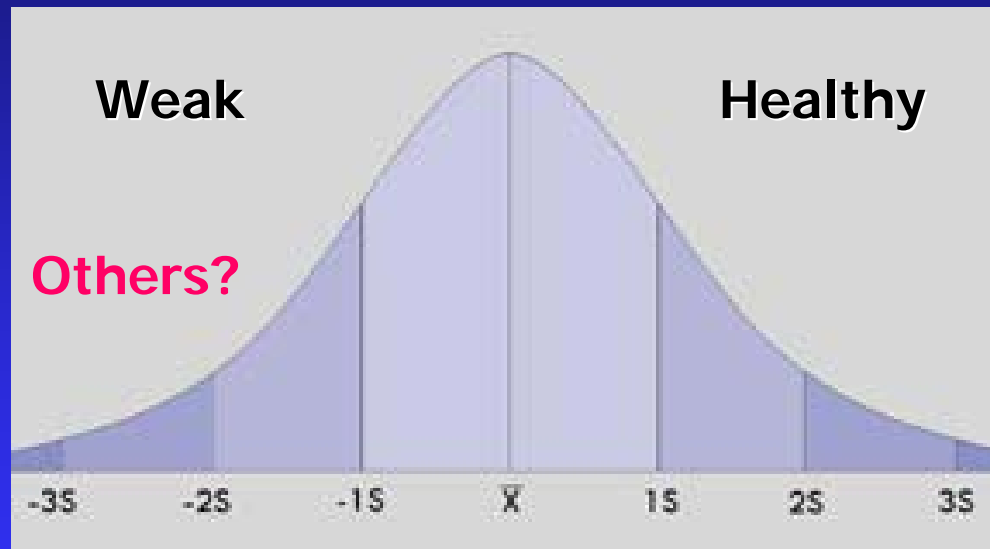
Culture Health

Traditional culture metrics indicated that the Davis Besse culture was not weak, many metrics placed it above average.



Culture Health

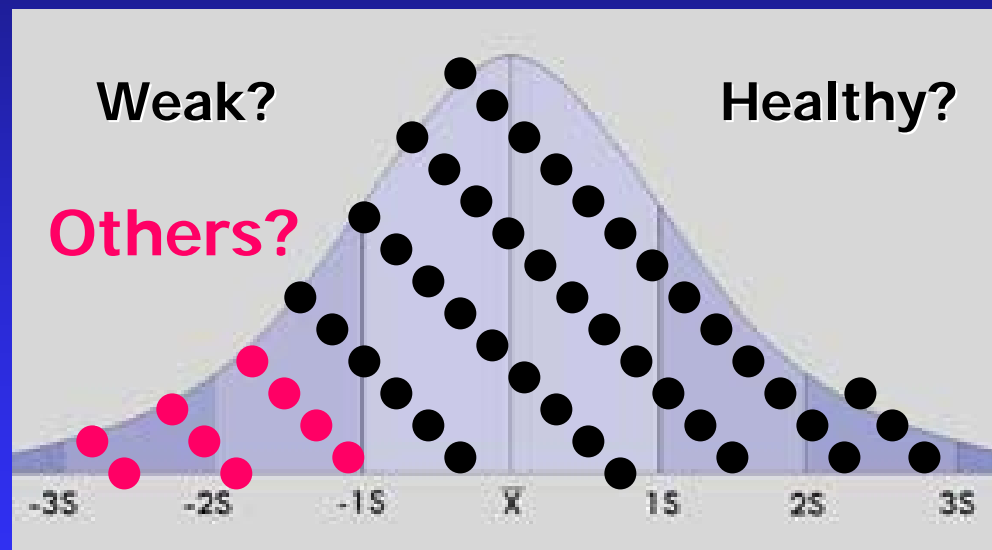
This begs the following question:
“How many other plants might have safety cultures insufficient to prevent a major SOE risk from developing?”



Culture Health

What are the real “red flags” of safety culture?

Traditional culture metrics indicated a healthy culture at DB. We now know these culture metrics do not reliably indicate culture health. The industry continues to work to develop metrics that are truly reliable, and culture management methods that are truly effective.



Culture Health

What should plants be doing right now?

Plants should be looking for ways to implement effective culture management. This starts with training on fundamentals such as:

- What is Organizational Culture?
- What is Safety Culture?
- What is an HRO?
- What is HRO Safety Culture?
- What affects culture health?
- What is the role of the manager?

TOPIC

Culture Fundamentals	Industry Objective	Culture Health
Role of Leadership	Damaging Culture	Restoring Culture
Effective Assessments	Managing Culture	Conclusion

Role of Leadership



Dr. Edgar Schein of MIT:

"Leaders create culture"

Role of Leadership

Dr. Edgar Schein on Culture:

- Culture is a phenomenon that surrounds us at all times and it is being enacted and created by our interactions with others.
- Culture can be a tool used by managers to better understand the dynamics of change in the organization.
- If leaders want to start evolutionary change they must first understand the dynamics of culture.

Role of Leadership

Dr. Edgar Schein on Culture:

- Cultural understanding is critical for leadership, and is the determining factor in the choice of leaders within a group or organization.
- Leaders embed and transmit culture both formally and informally within an organization.
- The process of culture creation and management are the essence of leadership.

Role of Leadership

NASA O-Ring Engineer Roger Boisjoly on “Point Leadership”:



“Managers, ask for what you need to hear, not for what you want to hear. Subordinates, tell your boss what they need to hear, not what you think they want to hear.”

Roger Boisjoly Morton-Thiokol Chief Engineer Space Shuttle Challenger

Role of Leadership

**“Safety culture is the
central role of leadership”**

**- INPO Human Performance
Fundamentals Training**

Role of Leadership

**“Safety culture flows down
from the actions of
senior management.”**

- INSAG

Role of Leadership

Cornerstone concept:



Leaders Create Culture

TOPIC

Culture Fundamentals	Industry Objective	Culture Health
Role of Leadership	Damaging Culture	Restoring Culture
Effective Assessments	Managing Culture	Conclusion

Damaging Culture



Millstone 1990's shutdown event:

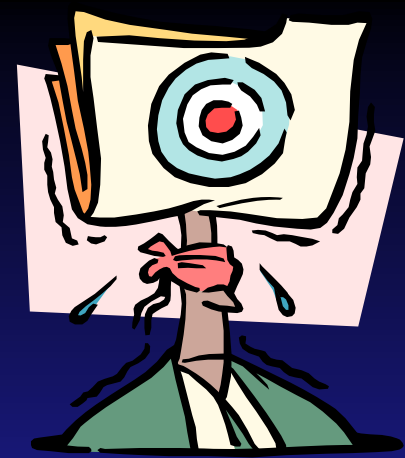
What damaged the Safety Culture
prior to the event?

Damaging Culture

Numerous reports indicated a “shoot the messenger” culture existed, managers had unwittingly created a culture of fear.

To a member, the new Millstone senior management team said the most difficult part of recovery by far was:

**“Restoring the manager / worker
trust relationship”**

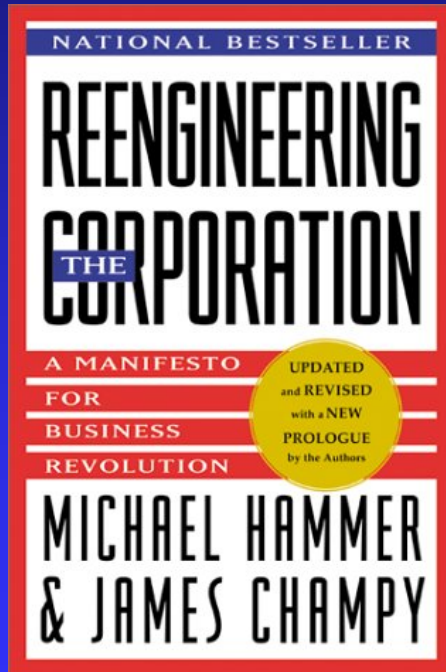


Damaging Culture

Where did the culture of fear
come from?

Damaging Culture

Reengineering: "Hottest Management Trend of the 1990's"



MIT Computer Science Professor
Dr. Michael Hammer

Method says extreme cost cutting is essential to survive modern competitive environments

Damaging Culture

Millstone Senior Leadership Philosophy of Extreme Cost Cutting



"We can no longer afford to be a Cadillac"

**"If something is not necessary to do,
it is necessary not to do"**

**"If you don't like how we must now operate,
there are 100 people willing to take your place"**

**"Don't expect loyalty from the company, if you want
loyalty get a dog"**

Damaging Culture

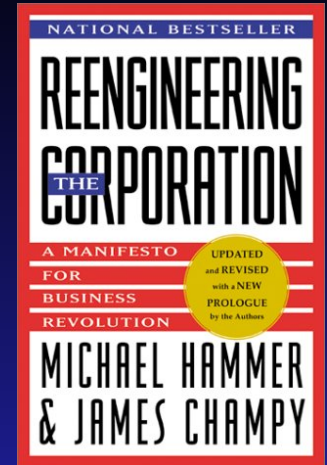
**Millstone Senior Leadership
Philosophy of
Extreme Cost Cutting**



**Improvement suggestions ignored
Numerous examples of "shoot the messenger"
Workers afraid to raise concerns
Record # of complaints to NRC (> 50 / yr)
Loss of trust that the plant is operating safely**

Damaging Culture

Since the 1990's failure rate of businesses who implemented reengineering > 70%



Dr. Michael Hammer today on
“reengineering”:

“I forgot about people, I have
learned that people are essential”

Damaging Culture

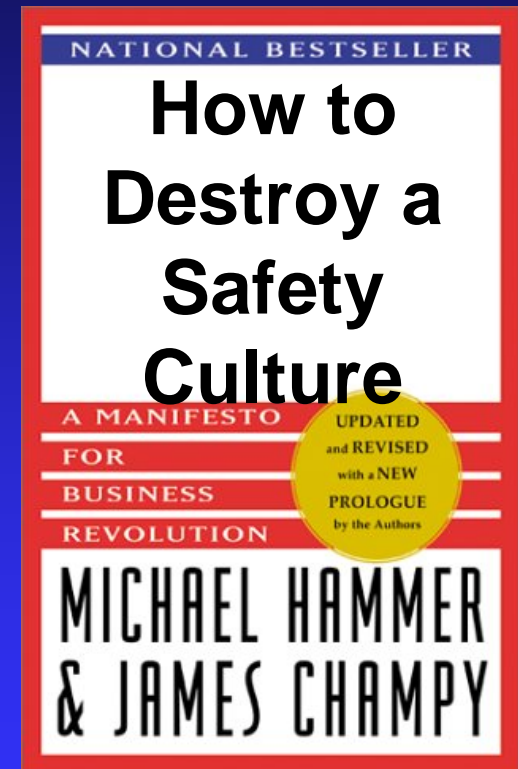
How to Destroy a Safety Culture

Proven method for destroying a safety culture:

“Forget About People”

The book might as well have been titled:

“How to Destroy a Safety Culture”



Damaging Culture

John Beck's Final Memo to Millstone Leadership:

“Never forget that previous management failed so miserably, not because they were not intelligent, not because they did not understand clearly what successful economics looked like in a competitive environment...

...they failed because they were arrogant, dismissive, and refused to listen to the issues and concerns of the people who make this place run.

TOPIC

Culture Fundamentals	Industry Objective	Culture Health
Role of Leadership	Damaging Culture	Restoring Culture
Effective Assessments	Managing Culture	Conclusion

Restoring Culture

The Big Question:

How do you **change**
a Safety Culture from one of
the worst in the industry
to **one of the best**?



Restoring Culture

**Lee Olivier,
Manager of Millstone Recovery**



“During Millstone recovery, the most difficult task was restoring the worker / manager trust relationship”

Restoring Culture

Formula for Culture Excellence:

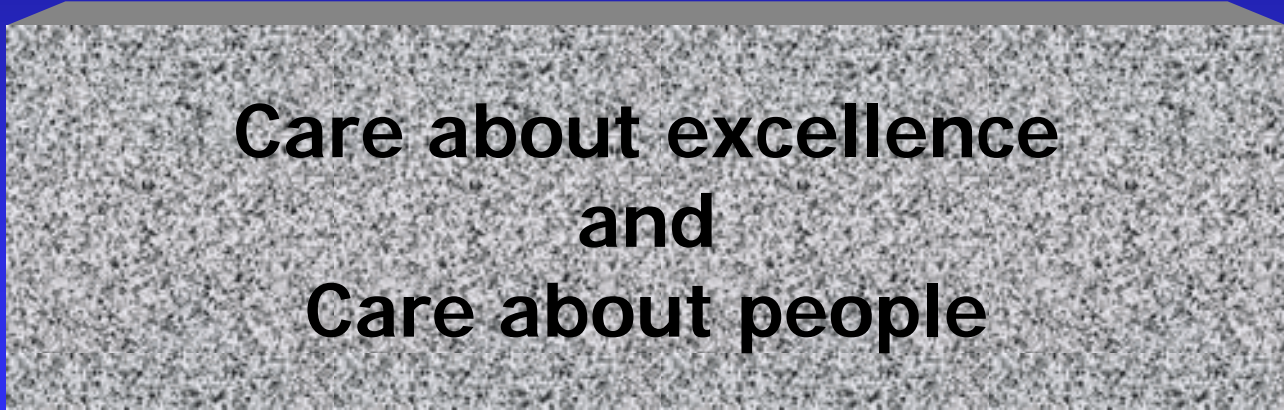
“Show people that you care about excellence and that you care about them...

...when you do these things you build trust coupled with higher expectations”

Restoring Culture

Cornerstone Concept:

Maintaining a strong organizational safety (and quality, and adaptive) culture requires that all members of the management team consistently show that they:



**Care about excellence
and
Care about people**

TOPIC

Culture Fundamentals	Industry Objective	Plant Objective
Role of Leadership	Damaging Culture	Restoring Culture
Effective Assessments	Managing Culture	Conclusion

Effective Assessments

Organizational Culture Expert

MIT Professor Edgar Schein on culture assessment:



Observe the artifacts of the culture: what do you see, hear and feel?

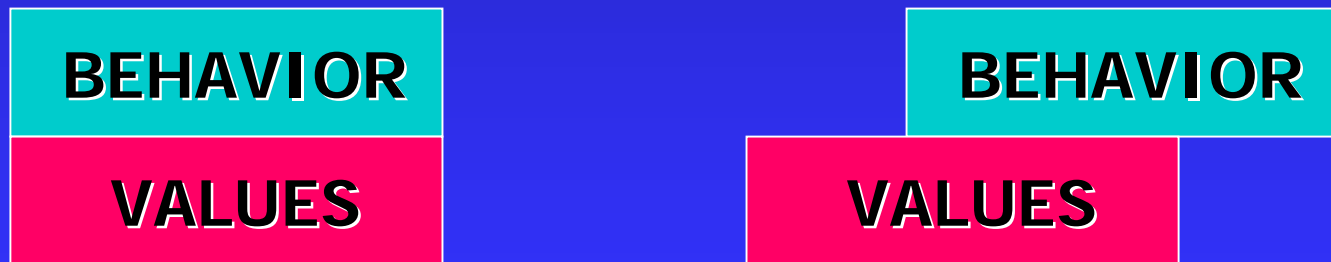
Do the shared tacit assumptions (the real culture) align with the espoused values (the stated culture)?

Effective Assessments

Does the walk match the talk?

Culture is assessed by reviewing the observed behavior (artifacts) and evaluating whether the observed behavior aligns with the stated (espoused) values, or if there are other beliefs for how people should behave in the organization (shared tacit assumptions – the actual culture).

Do the artifacts (the evidence) indicate alignment of behavior and values:



Effective Assessments

Schein on Culture Surveys:

Surveys alone don't work.

Surveys can indicate only in a general way whether espoused values are being met

Focus groups are needed to identify the true culture, the "shared tacit assumptions".

The survey data is almost irrelevant, it's the conversations around the survey, and the actions based on those conversations that are important.

Effective Assessments

Conclusions:

In a large organization (such as a nuclear plant) it is not practical to regularly hold culture focus groups with all workers, so culture **surveys are necessary**.

Surveys should not attempt to answer every conceivable culture question, because 1) there are hundreds of possible questions and 2) it is not possible to discern the true culture in this manner.

The survey should ask only a **few general questions** that flag general areas where the culture is suspect. The actual culture (the shared tacit assumptions) are then determined from a **focus group discussion**.

Effective Assessments

Survey / Focus Method

- The method was field tested at Millstone in the fall of 2000
- Simple surveys with general questions were filled out by staff
- Simple feedback methods were used: answers were binned as "good", "neutral", or "needs more focus"
- Culture reports were given to managers
- Acceptance criteria: if more than one third of the staff reported problems, the need for a focus group was indicated

Effective Assessments

John Sorenson

NRC ACRS Safety Culture Expert, author of Methodology Study "Safety Culture a Survey of the State of the Art" comments on this method:

The idea of using leadership culture as a surrogate for safety culture is a good one. The conceptual framework looks relatively complete

The importance of suitable metrics shouldn't be underestimated. There is a reasonable chance that management could accept this kind of measurement.

A very promising approach, one that has a good chance of advancing the "state-of-the-art."

TOPIC

Culture Fundamentals	Industry Objective	Culture Health
Role of Leadership	Damaging Culture	Restoring Culture
Effective Assessments	Managing Culture	Conclusion

Managing Culture

Do Diet Plans work?

National Institutes of Health on dieting:

Within five years 95-98% of people who lose weight gain it back, and 90% gain back more weight than they lost.

Only 2-5% succeed. The failure of weight loss programs is so great that a leading researcher has said:

"Dieting is the leading cause of obesity in the US."



Managing Culture

Diet management plans.

The authors and many people claim they work.

The evidence indicates more often than not, they do not work



ATKINS
DIET
PLAN



SOUTH
BEACH
DIET



GRAPE
FRUIT
DIET



FIRM
DIET
PLAN

Managing Culture

Safety culture management plans.

The authors and many people claim they work.

The evidence indicates more often than not, they do not work

INPO
HU
FUNDA
MENTALS

DAVIS
BESSE
SOER

INPO
New 8
PRINC
IPLES!

INSAG
15
How
to...

Managing Culture

INPO's New "Principles for a Strong Safety Culture"

- 1. Everyone is responsible for nuclear safety.
- 2. Leaders demonstrate commitment to safety.
- 3. Trust permeates the organization.
- 4. Decision-making reflects safety first.
- 5. Nuclear technology is recognized as unique.
- 6. A questioning attitude is cultivated.
- 7. Organizational learning is embraced.
- 8. Nuclear safety undergoes constant examination.

How do we make this happen?

Managing Culture

Rickover's "Principles for Doing a Job"

Ownership

"A person doing a job - any job - must feel that he owns it and that he will remain on that job indefinitely. Lack of commitment to the present job will be perceived by those who work for him, and they will also tend not to care. If he feels he owns his job and acts accordingly, he need not worry about his next job."

Responsibility

"Along with Ownership comes the need for full acceptance of full responsibility for the work. Shared responsibility means that no one is responsible. Unless one person who is truly responsible can be identified when something goes wrong, then no one has really been responsible."

Managing Culture

Rickover's "Principles for Doing a Job"

Attention to Detail

"A tendency among managers, particularly as they move to higher positions, is to think they no longer need to be concerned with details. If the boss is not concerned about details, his subordinates also will not consider them important."

Priorities

"If you are to manage your job, you must set priorities. Too many people let the job set the priorities. You must apply self-discipline to ensure your energy is applied where it is most needed."

Managing Culture

Rickover's "Principles for Doing a Job"

Know What is Going On

"You must establish simple and direct means to find out what is going on in detail in the area of your responsibility. I require regular periodic reports directly to me from personnel throughout my program."

Hard Work

"For this, there is no substitute. A manager who does not work hard or devote extra effort cannot expect his people to do so. You must set the example. Hard work compensates for many short-comings. You may not be the smartest or most knowledgeable person, but if you dedicate yourself to the job and put in the required effort, your people will follow your lead."

Managing Culture

Rickover's "Principles for Doing a Job"

Checking Up

"An essential element of carrying out my work is the need to have it checked by an independent source. Even the most dedicated individual makes mistakes."

Facing the Facts

"Another principle for managing a successful program is to resist the natural human inclination to hope things will work out, despite evidence or doubt to the contrary. It is not easy to admit that what you thought was correct did not turn out that way. If conditions require it, one must face the facts and brutally make needed changes despite considerable costs and schedule delays. The man in charge must personally set the example in this area."

TOPIC

Culture Fundamentals	Industry Objective	Plant Objective
Role of Leadership	Damaging Culture	Restoring Culture
Effective Assessments	Managing Culture	Conclusion

Conclusion

Is Culture Management Working?

Ownership

Someone needs to own safety culture. The owner should be the organization CNO – the Chief Nuclear Officer.

Responsibility

INPO's "Principles for a Strong Safety Culture" states that everyone is responsible for nuclear safety. The document should also have said that the management team is responsible for maintaining an acceptable safety culture throughout the organization. As Rickover pointed out "shared responsibility means that no one is responsible". Managers need to understand they are responsible for the quality of the culture and need to view safety culture as an important (as INPO says "central") responsibility.

Conclusion

Is Culture Management Working?

Attention to Detail

We need to look at the elements of culture in greater detail, and help managers understand and address the details that are adverse to quality.

Priorities

Effective quality management for culture requires senior management commitment, adequate resources, manager / worker training and training to develop culture subject experts (culture coaches) similar to the Six Sigma program and the Six Sigma “black belts”.

Conclusion

Is Culture Management Working?

Know What is Going On

Managers are sometimes the last to know when manager / worker trust relationships have been significantly weakened or damaged.

Hard Work

Safety Culture is a human performance safety system requiring maintenance, monitoring, and quality management like any other safety system. Safety Culture does not presently receive the level of maintenance provided almost any other safety system. Promoting understanding in this area is a major goal of this presentation.

Conclusion

Is Culture Management Working?

Checking Up

Rickover: "An essential element of carrying out my work is the need to have it checked by an independent source." We let managers guess at the healthy of the culture within their areas of responsibility. We need to create better assessment tools for managers. Promoting understanding in this area is a major goal of this presentation.

Conclusion

Is Culture Management Working?

Facing the Facts

Rickover: “If conditions require it, one must face the facts and brutally make needed changes despite considerable costs and schedule delays. The man in charge must personally set the example in this area.”

There are always a few managers who (in the words of Lee Olivier) “just don’t get it” and are unable to effectively manage culture. An unfortunate but essential part of effective culture management at the senior leadership level is to make management replacements when and where necessary. In an HRO, it is a liability to have managers in safety sensitive areas who are effective at production management but ineffective at safety culture management. Lee Olivier would say this is the most important single fact in safety culture management that senior managers often will not face.

Conclusion

To Improve, Culture Management in the Nuclear Power Industry will require:

- An improved definition of safety culture
- Development of reliable assessment methods
- Development of quality assessment criteria
- Addition of SC to the QA Topical Reports (NRC)
- Culture training for managers, workers and SMEs
- Regular SC assessments, maintenance and QA
- Development of more effective NRC regulations
- Improved guidance from INPO
- Improved understanding throughout the industry