

Characteristics of Companies with Great Process Safety Performance

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Process safety is important to our individual health, to our company's success, and to our region's business economy. Companies that handle toxic, flammable, and explosive materials understand the importance of process safety and risk management. So do regulators. So should the community and other stakeholders. Individually these stakeholders have been working for years to improve process safety performance. Accidents continue to occur. It's time to leverage our resources, knowledge and skills to all strive for a common goal of great process safety performance. CCPS's Vision 20/20 describes that vision. It calls for effort that goes well beyond any individual company, indeed beyond the industries.

The purpose of this paper is to share CCPS's Vision 20/20 with Hazards 24 and to begin the process of engaging the broader community in the vision and the steps to achieve it.

Keywords: process safety, vision, culture, competency, learning, standards

Introduction

In the quest to improve process safety performance, companies have typically centered their efforts on compliance with regulations such as in the US OSHA Process Safety Management, the UK COMAH (1), or North Sea Safety Case (2). The CCPS *Guidelines for Risk Based Process Safety* (3) (RBPS) describes many of the elements that are found in such regulations and company management systems as well as other key features needed to manage process safety.

Despite the attention paid by individuals, companies, industry, and government, accidents continue to occur. Yet there are many good ideas, approaches and insights to be shared - *if we just worked together toward the common vision of improved process safety performance.*

In 2011, the Center for Chemical Process Safety (CCPS) began an effort to approach the challenge differently in a project called Vision 20/20. In this project, participants worked hard to envision the process safety future and ask what will be the characteristics of companies with great process safety performance in the future? What will distinguish the companies with fewer process safety incidents from those with more process safety incidents? How can we work together in companies and with all our stakeholders to further process safety performance?

Envisioning the future, five tenets were identified that companies with great process safety performance will possess. As the tenets were developed, it was recognized that there are four societal themes that, if achieved, would also have a significant positive impact on process safety performance. The five company tenets and four societal themes were introduced at the Global Congress on Process Safety in 2013. Since their introduction, efforts have been directed towards communicating the tenets and themes and identifying and developing tools to support the concepts. The company tenets and societal themes are detailed in this paper. Although this paper is about a future vision, it is written in the present tense recognizing that many aspects of the vision currently exist - just not fully and globally.

This is now our call to action. It is time for individuals, companies, regulators, and academia to embrace the tenets and themes so we can leverage the collective process safety strength built over the last decades. It is time to deeply understand the company tenets and societal themes and evaluate introspectively and collectively what more we can do to further process safety performance.

Internal - From a Company Perspective

The five tenets identified for achieving great process safety are:

- Committed Culture,
- Vibrant Management Systems,
- Disciplined Adherence to Standards,
- Intentional Competency Development, and
- Enhanced Application and Sharing of Lessons Learned.

The core principle of fervor for process safety unites and supports adherence to these tenets. It is not sufficient that each company understand the tenet. Additionally, each company should be enthusiastic, focused, and energetic in their process safety efforts. Each tenet is defined and discussed below.

Vision 20/20

Five Industry Tenets and Four Societal Themes

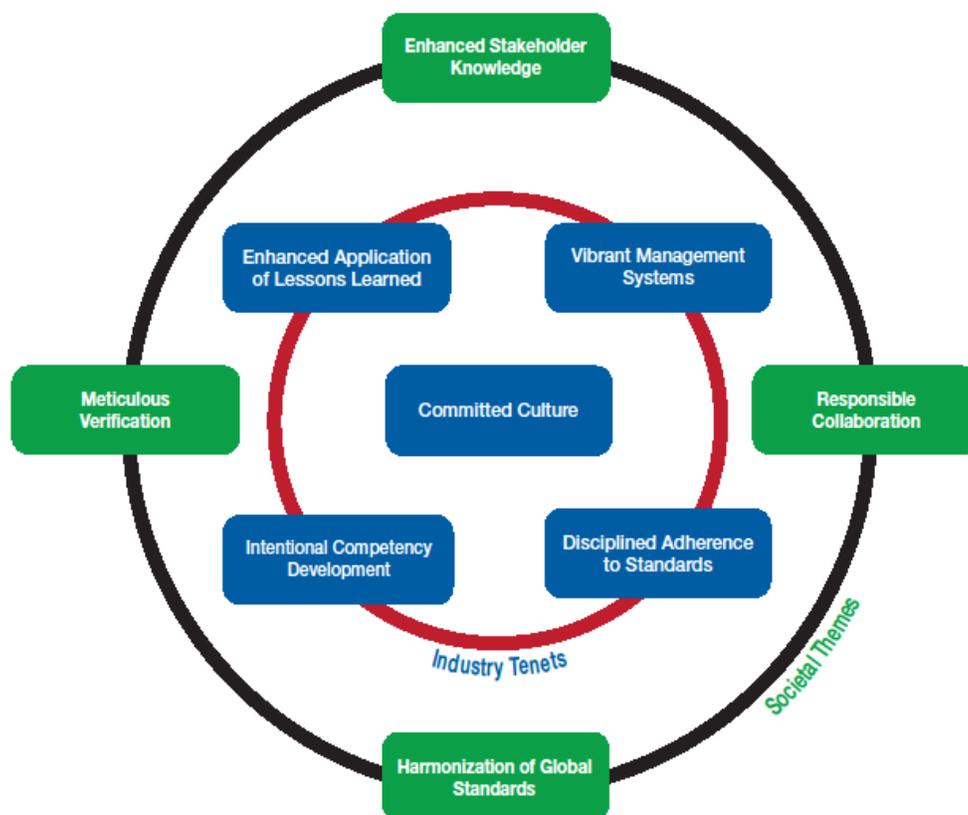


Figure 1. Five Industry Tenets and Four Societal Themes

Committed Culture

Three important aspects of committed process safety culture are emphasized in Vision 20/20. First is felt leadership from senior executives. Felt leadership means more than a periodic mention of process safety in speeches and town hall meetings. It means that the executives are personally involved in process safety activities. Employees know the executives care about process safety because of what they see executives doing in addition to what they hear executives saying. Executive leadership results in a tangible commitment and employee engagement at all layers of the organization. All layers of management and supervision stress the importance of process safety.

The second important aspect of process safety culture is operational discipline (4), the performance of all tasks correctly every time. Often operational discipline is considered to be an operator and mechanic issue, but in fact it is a leadership issue too. Sometimes leaders believe they do not have time to verify that work in the field is in conformance with practices and procedures. Sometimes leaders condone poor operational discipline by failing to take action when policies are not followed. In a committed

culture leaders know what is happening in the field and respond as needed to ensure that tasks are performed correctly every time. Operators and mechanics know what is expected of them and are doing their best to perform work correctly every time. Operational discipline also means that leaders adhere to policies that apply to them.

The third aspect of a committed process safety culture emphasized in Vision 20/20 is maintaining a sense of vulnerability. Because major process safety incidents occur infrequently, it is natural for employees at all levels to begin to believe unconsciously that their management systems and the implementation of the management systems are so strong that incidents do not happen to them. In a Vision 20/20 committed culture, employees at all levels are aware of the hazards of their processes, knowledgeable of the systems that protect against the hazards, and recognize that incidents can result if the systems are not well executed every time. They have an ever-present sense of vulnerability and respond to early warning signs.

Vibrant Management Systems

Vision 20/20 recognizes that all employees should have a clear understanding of the expectations of senior management and those expectations should be documented and shared. In a vibrant management system there is a structure that clearly defines and documents expectations for all systems that affect process safety. These systems are implemented with operational discipline throughout the organization. The management systems promote inherently safer design principles and the principles of RBPS. The word vibrant is used to describe the management system because the system needs to be flexible and adaptable to meet ever changing needs and it needs to work well with facilities of all sizes in the organization. Companies with great process safety performance do not impose the most complex systems on their facilities; instead, they require systems that are fit-for-purpose. RBPS provides many alternatives for implementation of process safety element management systems and is a useful tool when companies are developing or refining their fit-for-purpose systems.

Disciplined Adherence to Standards

Disciplined adherence to standards starts by having clear understanding of what standards apply to various equipment and processes. Most companies have standards for new equipment or hire contractors that have the necessary standards. Too often there is cost and schedule stress with the approach outlined in company standards and shortcuts may be taken. With disciplined adherence to standards, project managers either follow the endorsed standards or use a pre-existing management system to gain approval from executives to modify the standards for a specific application.

The necessity to follow standards affects several disciplines in addition to project engineering. Process design engineers, operations, maintenance, and purchasing also need to be aware of the requirements imposed by the standards. Mechanical, process, instrumentation, engineering, operation, and maintenance all work together as a system. Everyone should play their part in the system for the system to perform as desired. For example, purchasing agents always buy pre-approved valves from pre-approved vendors and do not substitute different valves even if they are more cost effective.

Application of standards to existing equipment is especially important for disciplined adherence to standards in Vision 20/20. Most companies apply standards to new equipment and may or may not apply fit-for-service approaches for existing equipment. There are examples where, after a furnace explodes, the company establishes minimum expectations for furnaces. After a compressor fails catastrophically, minimum expectations for compressors are established. Companies with great process safety performance establish minimum standards for existing equipment before incidents occur and have systems in place to ensure that the existing equipment meets those standards. This does not imply that existing equipment must be the same as new equipment, but decisions are documented in standards that define minimum expectations for existing equipment. To be clear, an existing furnace may not need to have instrumentation that is the same as a new furnace, but a company knows the minimum requirements for all furnaces and a system is in place to periodically ensure that existing furnaces meet those minimum expectations.

It is recognized that standards do not exist for all types of equipment and engineering practices. Risk decision-making is used when applicable standards do not exist.

Intentional Competency Development

Intentional competency development is ensuring that all employees that affect process safety are fully capable of meeting the technical and cultural requirements of their jobs. Intentional competency development is critical to great process safety performance because no matter how good the culture is, how good the management system is, or how well the company attempts to adhere to standards, highly competent employees are necessary to implement those systems. Competency development needs to be a corporate priority; it requires thought and organizational commitment. It is more than just a fill-in the box exercise during the annual appraisal cycle. The need for competency may even impact required job tenure. Individuals should not be rotated out of jobs before they can contribute effectively.

The need for competency is strong at all levels of the organization, not just new employees. Executives should have basic understanding of process safety and risk management. Corporations should consider how to improve even their strongest and most experienced employees including their technical experts. Companies with great process safety performance consider many forms of competency development including continuing education, seminars and symposia in their field, mentoring, job rotation, and participation on industry committees.

It is a given that companies provide sufficient numbers of personnel to perform the work that must be done.

Enhanced Application and Sharing of Lessons Learned

Enhanced application and sharing of lessons learned is being fully aware of near misses and incidents and responding in a manner that prevents those incidents from occurring again in the same equipment and in similar equipment throughout the company. There is a culture in which employees are driven to learn from many sources, including benchmarking, near misses and incidents, and jobs done well.

Sorting through near misses, incidents, and other sources of lessons and deciding which ones to emphasize is challenging. Companies with great process safety performance have systems in place to document and respond to these learning opportunities. They do not just share incidents, they respond to the incidents, take action, and learn from the incidents.

Summary of the Five Tenets

These five tenets, combined with fervor for process safety excellence, make a powerful framework for success. Process safety results will be dramatically improved if a company has:

- A committed culture in which the executives are personally involved, managers drive excellent execution every day, and all employees maintain a sense of vulnerability
- Vibrant management systems ingrained;
- Disciplined adherence to standards for new and existing equipment;
- Intentional competency development such that all of their employees have full technical and cultural capability to do their jobs well; and,
- Enhanced application and sharing of lessons learned including an expectation and thirst for learning from several different types of opportunities.

External - From an Industrial and Societal Perspective

As the CCPS Vision 20/20 committee developed the five tenets for industry, the committee recognized that issues beyond individual companies also strongly impact process safety results. Therefore, external factors must also be addressed to achieve great process safety performance. Four societal themes were identified that would help industry, and beyond, achieve the desired process safety performance. Successful fulfillment of this vision requires that industry, communities, labor, academia, and government embrace the four societal themes described below.

Enhanced Stakeholder Knowledge

In Vision 20/20 enhanced stakeholder knowledge includes two opportunities, public risk literacy and fundamental process safety education for chemical engineers.

Risk Literacy – The public, government, and industry decision makers have an enhanced understanding of the nature of risk and how it is managed. Middle or high schools introduce risk management concepts so that all of the population has a better understanding of risk. That early education also provides the background needed for more advanced concepts learned in university. Technical risk management becomes a specific area of university study in engineering and business.

Process Safety Fundamentals – Today many chemical engineering students learn about process safety after university when they are on the job. Some companies do an excellent job of educating their new engineers about process safety fundamentals, but many companies do not. In Vision 20/20, chemical engineers are required to take at least one process safety related course to receive a bachelor degree. All engineers receive education in system safety appropriate for their discipline.

Responsible Collaboration

There are significant opportunities for organizations that address industrial process safety to work together to have a positive impact on process safety results around the world. There are numerous opportunities where technical, government, labor, community, scientific, academic, and industrial organizations can work together locally, regionally, and internationally. Collaboration amongst these different groups can sometimes be challenging because the groups may have different objectives and approaches. If all the organizations could share Vision 20/20 and on this basis pull together, this will help align systems supporting process safety which would allow more time for managing process safety risk as opposed to managing systems.

Additionally, in Vision 20/20, industry, regulatory and investigatory authorities, labor organizations, communities, technical organizations, and universities work together to effectively remove barriers to reporting of incidents, develop reporting databases, and promote mutual understanding of risks and effective process safety systems.

Harmonization of Global Standards

Currently a number of organizations produce standards, guidelines, and practices for safe design, operation and maintenance of equipment. This cacophony of standards and practices is often confusing to people who are trying to design and maintain equipment to be in conformance with standards and practices, especially as they work in a global marketplace. Writing standards with the global marketplace in mind, would improve understanding, use, and efficiency in application of the resulting standards. In the future, organizations issuing accepted standards, guidelines, and practices work jointly to align and streamline practices, eliminate redundancy, and cooperatively address emerging issues.

Meticulous Verification

Companies use various verification, assessment, and auditing techniques to assure that their process safety management systems are working as intended. Generally, these verifications, audits, and assessments are made by individuals internal to the companies being assessed. There is a need for commonly available and competent third-party assessment to aid companies in identifying any shortcomings that may not be recognized by internal assessors. In Vision 20/20, third parties, including public or Non-Governmental Organizations (NGOs), are available to evaluate implementation of company process safety programs to help companies ensure that their process safety systems are robust and functioning as intended.

Tools Being Developed

The CCPS Vision 20/20 tenets and themes have been created. Now the challenge is to bring them to life starting with publicity and communication, to prompt people to change behaviors, and to all support a common vision for great process safety performance. A number of tools are being developed to promote the Vision 20/20 concepts. Some of the tools are intended to help companies better understand the intent of the Vision. Others will help companies identify opportunities for improvement and help them find constructive resources.

One-Page Documents

A description of each of the tenets and themes is being developed in one-page documents, which will be published on the CCPS website and worldwide to over a million readers through CCPS's distribution networks. Each document has a brief description of the tenet or theme followed by sections that further explain them.

- What does it mean? - This section contains a description of activities that will take place when the tenet or theme is in place. This further illustrates the tenet or theme.
- What is the value? This section addresses the importance of the tenet or theme and how it impacts performance.
- What can I do? This section personalizes the tenet or theme by suggesting activities for individuals to promote the tenet or theme.
- Illustration – Each tenet or theme has a specific illustration that visually explains the concepts in the tenet or theme.

The one-page document for the tenet Committed Culture is in Appendix I.

A day in the life

To help illustrate the changes that will occur if Vision 2020 tenets are achieved, “A day in the life of” examples have been written. These paint the picture of the difference in behavior between the current state and the envisioned state. “A day in the life of” a unit manager is attached in Appendix II.

Assessment tool

Companies that embrace the tenets in Vision 20/20 may see benefit in a tool to assess their position relative to the vision. The assessment tool should differentiate mediocre performance from great performance for each of the tenets so that companies can recognize and prioritize their biggest opportunities for improvement (5). At the same time, if the tool is to be valuable, it cannot be unnecessarily burdensome. Developing a tool that differentiates performance yet is not burdensome will be challenging.

Resources to support the tenets

Where a company assessment identifies improvement opportunities, then the next step might be identifying potential resources available to help them improve. The Vision 20/20 project is compiling a list of previously published resources (e.g. documented references, training materials) that address identified gaps. There are many resources that address the five tenets. The list will include resources from bodies supporting process safety from around the world.

A call to action

After an incident occurs, even if a perfect incident investigation is completed, perfect root cause analyses are identified, and perfect action items are developed to ensure the incident does not happen again, no risk reduction occurs until the action items are completed. The same is true for Vision 20/20. No risk reduction occurs until broad industrial and societal change in behavior is accomplished.

CCPS has taken the first step; the next step is yours. It is time to get personally involved. It is time to take on board and communicate the five industry tenets and four societal themes. It is time for companies to evaluate their performance relative to the tenets and themes and take action to improve where needed. It is time for organizations that impact process safety to understand the societal themes and evaluate their contribution to process safety performance, seek collaboration, and take appropriate action.

We look forward to working together with you to achieve Vision 20/20.

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COMMITTEE MEMBERS

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Appendix I - One-Page Document for Committed Culture

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Center for Chemical Process Safety

Committed Culture

A **Committed Culture** is one where the executives are personally involved, managers and supervisors drive excellent execution every day, and all employees maintain a sense of vigilance and vulnerability.

What does it mean?

All employees and contractors commit to "do it right", but have a plan for when it goes wrong.

- Executives personally and visibly lead process safety.
- Operators and mechanics diligently follow procedures and speak up when they suspect a problem or see an opportunity for improvement.
- Supervisors and managers verify work is done properly, intervene to correct situations, and freely communicate bad news up.



What is the value?

Doing "the right thing, the right way" shift after shift, day in and day out, prevents incidents.

A **Committed Culture** supports both safe AND reliable operations.

What can I do?

- Perform all tasks, correctly, every time.
- Support your leadership to demonstrate a commitment to process safety.
- Recognize that "it could happen here..."

More information is available at <http://www.aiche.org/ccps/about/vision-2020>

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Appendix II - “A day in the life of”

Written by Todd Aukerman, LanXess

<p style="text-align: center;">The Unit Manager 2012</p>	<p style="text-align: center;">The Unit Manager 2020</p>
<p>Arriving shortly before the overnight shift concludes, Andrew brings up the latest production numbers from the night shift on his monitor. He sees that for once everything seems to be operating smoothly. Small upsets have caused production numbers to be below target so he's happy to see a shift with no problems. Looks like he won't have to visit the control room.</p> <p>He observes, however, that he still needs to act on the incident that occurred at the end of yesterday's day shift. With a few clicks of his mouse, he deftly assigns it to his engineer Cameron. He allows a small sigh of relief...at least that's done.</p> <p>He begins the 0900 unit meeting with the usual review of production and quality numbers. Following this, he asks Cameron if he saw that he'd been assigned the investigation lead. He follows with: "Good, address it quickly." Then going around the table, he asks each of his team if they have any issues; when it's Cameron's turn, he begins to ask those present about potential safety and environmental impacts from the MOCs he has to coordinate. As some of the team members begin to respond, Andrew interjects "Folks, this isn't a safety review meeting. Schedule a separate meeting."</p> <p>At a site management lunch with the CEO, the plant manager and the plant safety manager approach Andrew and ask about yesterday's incident. He observes the CEO eavesdropping on the conversation and makes it clear that it's being investigated and that there were no safety or environmental impacts.</p> <p>That afternoon, he smiles inwardly as the CEO compliments his unit on their worker injury numbers. Andrew's has made sure that his employees always wear PPE and take their time doing maintenance tasks and similar physical activities. Although he stresses over meeting production goals, he does emphasize worker safety.</p>	<p>Zach arrives at his unit at 0630 every morning. His first stop is always the control room to chat with the night shift. Looking at the shift log and chatting with his operators gives him a much better feel for what's really going on; it's also allowed his operators to talk openly with him about any issues. He's glad to hear that everything was smooth last night; his production numbers have been below target; any shift without an upset is an improvement. He also asks the shift supervisor for any insight on yesterday's overpressure incident.</p> <p>Arriving in his office, his first order of business is to assign his unit engineer James as the investigation lead for yesterday's incident. Zach observes that this is just one of several similar incidents; he decides he's going to keep close tabs on this investigation through the on-line incident system.</p> <p>He starts the 0900 unit meeting with a safety moment about using a ladder at his home. After getting his team in the right frame of mind, his first topic is the incident. He's pleased that James already has scheduled the first investigation meeting and he passes along the input from the night shift. Later, he's pleased that James wants to address the MOCs right now in the meeting. Zach knows it won't take too much more time but these changes should smooth out some of the upsets; Zach readily supports the review at that time.</p> <p>During lunch with the CEO, Zach is a bit surprised to hear the CEO dive directly into a discussion on his unit's incidents. Nevertheless, he calmly contributes that he's similarly concerned about the repeat nature of the events, has received some insight from his night shift, and is personally monitoring this investigation.</p> <p>As the CEO tours his unit, Zach stays in the background as she chats with his operators. He's impressed with her knowledge of process safety and her effort to emphasize it, especially to the supervisors. He's sure her efforts will help improve process safety and production.</p>