

CCPS's Vision 2020: Characteristics of Companies with Great Process Safety Performance

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CCPS's Vision 2020 describes the characteristics of companies with great process safety performance in the future. This work is extremely important to the process industries and other industries that handle toxic, flammable, and explosive materials because it establishes targets to which companies will aspire for years to come. In developing the vision, it was also recognized that there are issues beyond the scope of individual companies that need to be addressed to enable improved process safety performance. Therefore, in Vision 2020 there are activities that go well beyond any individual company, indeed beyond the industries. The purpose of this paper is to share CCPS's Vision 2020 with the Global Congress, begin the process of engaging the broader community in the vision and the steps to achieve it, and provide an opportunity for companies to begin comparing their current characteristics to the vision.

1. Introduction

CCPS's vision is to protect people, property, and the environment by bringing the best process safety knowledge and practices to industry, academia, the government, and the public around the world through collective wisdom, tools, training, and expertise in order to eliminate process safety incidents in all industries (CCPS 2013). To this end, CCPS and its member companies maintain a robust program incorporating development of technical interaction, guidelines, tools, training, and conferences. Periodically, CCPS also evaluates the state of practice of process safety to look for opportunities to take global industry performance to the next level. This is necessary because process safety efforts typically reach a plateau that can be difficult to move beyond without taking a new approach. The previous such effort, begun in 2004, led to publication of Guidelines for Risk Based Process Safety (CCPS 2007), which since its publication has served as the roadmap for upgrading process safety in thousands of chemical plants and refineries globally.

To maintain progress through this decade, in 2011 CCPS initiated work to develop a new roadmap for improvement to achieve great process safety performance. This effort was titled Process Safety Vision 2020. Previous efforts aimed to codify and consolidate a wide range of best practices used in parts by diverse companies into a common best practice. By contrast, the current effort challenged CCPS member companies to envision the characteristics that companies should demonstrate, organizations and government should support, and the public should understand related to process safety in the year 2020, even if a specific path forward to achieve these characteristics is not completely clear today.

CCPS' resulting Vision 2020 differs from previous efforts in that it recognizes that individual companies cannot accomplish alone all that is needed to truly produce great performance in the not-too-distant future. Accordingly, CCPS Vision 2020 is presented from two points of view; the internal corporate perspective and the external perspective going beyond any individual company, in fact extending beyond the processing industries. The Vision incorporates a core principle, five basic tenets, and four societal themes needed to integrate actions of the process industries, academia, governmental agencies, and the public.

2. Internal - From a Company Perspective

The five tenets identified for creating and sustaining great process safety include (a) Committed Culture, (b) Vibrant Management Systems, (c) Disciplined Adherence to Standards, (d) Intentional Competency Development, and (e) Enhanced Application of Lessons Learned

Adherence to these tenets is united by the core principle of Passion for Process Safety Excellence as shown in Figure 1. Each tenet is defined and discussed below.

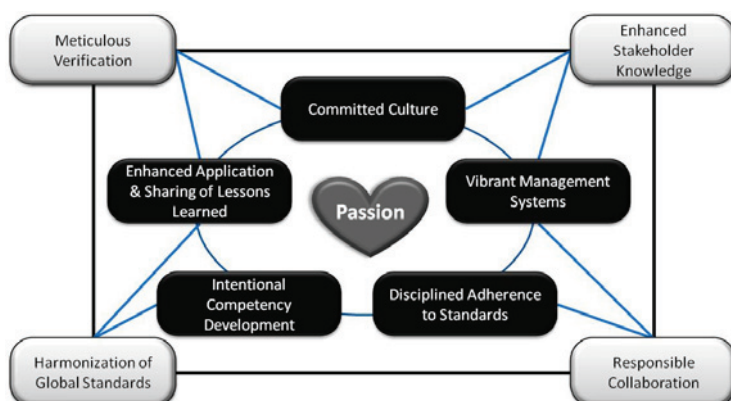


Figure 1: CCPS Vision 2020 and Interrelationship of its elements

2.1 Committed Culture

Leadership instills disciplined adherence to the management system and procedures at all organizational levels. Leadership is felt from senior executives through plant personnel via personal involvement, tangible commitment, and workforce engagement. A desire to improve is ever-present due to a strong sense of vulnerability.

There must be a strong and committed culture for excellence in process safety performance and the key to that strong culture is the leadership from senior executives, who must be personally committed to process safety excellence and demonstrate that commitment through their personal involvement. The commitment needs to extend from the senior executives all the way through line management such that all employees are compelled to adhere to the management system and procedures. This atmosphere will be sustained by an ever-present sense of vulnerability.

2.2 Vibrant Management Systems

There is a structure that clearly defines and documents expectations for all systems, including those that affect process safety. These systems are implemented throughout the organization. The management systems promote inherently safer design principles and the principles of Risk Based Process Safety (ibid) including fit-for-purpose policies and procedures.

All employees need to have a clear understanding of the expectations of senior management and those expectations need to be documented and shared. Companies with great process safety performance will not impose the most complex systems on their facilities; instead, they will require systems that are fit-for-purpose. Guidelines for Risk Based Process Safety (ibid) provides many alternatives for implementation of process safety element management systems and is a useful for companies are developing their fit-for-purpose systems.

2.3 Disciplined Adherence to Standards

Company and/or industry standards are rigorously followed to standardize equipment installations and design methodologies to minimize opportunities for error in design, operation, and maintenance. Systems are in place to ensure that existing equipment meets the original design intent and clearly defined company minimum expectations.

Often when considering adherence to standards, new construction is the primary focus. In fact, in most companies there is much more existing equipment than there is newly constructed equipment. Therefore, though adherence to standards for newly constructed equipment is important, possibly even more important is ensuring that existing equipment meets company expectations, with standards applying to old equipment as well as new. While it may be difficult for old equipment to meet standards established or revised after the equipment was installed, in such cases systems are needed to ensure that the old equipment delivers the same process safety performance requirements. Companies should have minimum

requirements for all equipment and a management system in place that ensures the equipment meets the established minimum requirements.

2.4 Intentional Competency Development

A robust employee competency program is developed and managed to ensure employees who impact process safety results are fully capable of meeting the technical and cultural requirements of their jobs. It is a given that companies provide sufficient numbers of personnel to perform the work that must be done.

All companies provide some type of training for employees. Operators and mechanics receive training as new employees as well as periodic refresher training. Engineers are hired with a degree, so their initial training is often less specific than operators and mechanics, but engineers do receive on-going training throughout their career. Sometimes the training for engineers simply includes a course with relatively little thought about the real needs of the employee. Intentional competency development requires much more thought and organizational commitment to ensure competent employees. Intentional competency development is critical to great process safety performance because no matter how good the culture or management system is, or how well the company attempts to adhere to standards, highly competent employees are needed to implement those systems.

2.5 Enhanced Application and Sharing of Lessons Learned

To reduce incidents, employers and employees must enthusiastically support a culture that is driven to learn from many sources, including benchmarking, near misses and incidents, and jobs done well. Changes are implemented based on lessons learned within the company, industry, and across industries.

To achieve great process safety results, companies must have a learning culture. There must be a thirst for learning at every opportunity, including major incidents, significant near misses, benchmarking, and work done well, with an obsession with learning at every opportunity. With each learning moment, action must be taken to turn the learning into procedural or mechanical changes to apply the lessons learned.

These five tenets, combined with a passion 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 engrained;
- 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 of lessons learned including an expectation and thirst for learning from several different types of opportunities.

3. External - From an Industrial and Societal Perspective

Successful fulfilment of this vision will be greatly aided if overall industry, the public, labor, and government embrace four societal themes described below.

3.1 Enhanced Stakeholder Knowledge

Risk Literacy: The public, industry decision makers, and government authorities have an enhanced understanding of risk and how it is managed. Risk management concepts are introduced in secondary school; and, technical risk management becomes a specific topic in business school (e.g., MBA).

Process Safety Fundamentals: Chemical engineers take at least a 1-semester course on process safety to receive a BS degree. Other engineers receive education in process safety appropriate to their discipline. Executives not otherwise trained receive an overview of process safety and risk management concepts.

Two opportunities exist from a stakeholder knowledge perspective. The general public, including industry decision makers and government authorities, need a strong understanding of risk. Ideally teaching the concepts of risk should begin in secondary school so that all of the population has a better understanding of risk concepts and so that individuals who need to learn more about risk have the background to absorb concepts that are more advanced in business and engineering schools.

In addition to general risk literacy, there is a need to improve the knowledge of process safety fundamentals of graduating chemical engineering students. Today to a large degree, chemical engineering students learn about process safety after they are on the job. Some companies do an excellent job of educating their new engineers about process safety fundamentals, but there are also many companies that do not perform that education well.

3.2 Responsible Collaboration

Regulatory and investigatory authorities, organized labor, communities, research institutions and universities, and industry work together to effectively remove legal barriers to incident reporting, develop reporting databases, and promote mutual understanding of risks and effective process safety systems.

There are significant opportunities for organizations that affect industrial process safety to work together and have a positive impact on process safety results throughout the world. There is currently no obvious opportunity for government authorities, labor organizations, communities, research institutions, and industries to pull together to help industry achieve improved results. Collaboration amongst these different groups will be challenging because the groups sometimes have conflicting objectives and approaches, but if all of the organizations work together, there will be improvements in systems that affect process safety.

3.3 Harmonization of Global Standards

Organizations issuing accepted standards, guidelines, and practices work jointly to align and streamline practices, eliminate redundancy, and cooperatively address emerging issues.

Today, a number of organizations produce standards and guidelines for safe design, operation and maintenance of equipment. This cacophony of standards and practices is often confusing to people who are trying design and maintain equipment in conformance with standards and practices. If the standard writing organizations collaborated with their customers in mind, there could be much improved understanding and use of the resulting standards. Work is ongoing between CCPS and other global and national organizations to harmonize process safety metrics (CCPS 2009) and (CCPS 2011).

3.4 Meticulous Verification

To help companies ensure that their process safety systems are robust and functioning as intended, third parties, including public or Non-Governmental Organizations (NGOs), are available to evaluate implementation of company process safety programs. Companies use various assessment and auditing techniques to assure that their process safety management systems are working as intended. Generally, those audits and assessments are made by individuals internal to the companies being assessed. There is a need for commonly available and accepted third party assessment so that companies are fully aware of shortcomings so that they may use that experience to enhance their own assessments.

4. 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 and two are included below. The examples demonstrate several types of improvements suggested by Vision 2020.

4.1 The CEO-2012

On the ride in to the office in the back of her town car, the CEO reads through background information on the nearby production site she'll be visiting later in the day. She makes a point of reviewing the production numbers and profitability, as well as the worker injury rate. While the business numbers are below expectations, the site worker injury rate is better than the goal.

In the office that morning, she asks the CFO for further analysis on the site financials. She also calls the regional Head of Health, Safety, and Environment to see if there's been any change in the worker injury rate. He replies that those numbers are still good but the site has had a few process incidents lately.

Around noon she arrives at the site. While gathering with the site leadership team for lunch, she overhears some of the managers discussing a process upset incident that occurred overnight. Initially concerned, she relaxes when she hears that, although there was a release of material, there were no injuries and the release was not reportable to public agencies. She commends the team on their good worker injury numbers and then delves into a discussion on production. During a tour of the units, she

once again commends the control room workers for their worker injury rate and then casually chats with them about their ideas on production and operability improvements.

4.2 The CEO-2020

The CEO sits back in her town car as it pulls away from her house on the way to the office. Like every morning, the CEO begins her work day by checking the “daily KPIs” on her tablet. Among the variety of metrics, she notes that the nearby production site that she’ll be visiting later that day has business numbers that are below expectations but the worker injury rate is doing well. What draws her attention though is the steady increase in process upset incidents. Drilling down through the metrics, she sees that the site had yet another overpressure incident the previous day.

In the office that morning, she asks the CFO for further analysis on the site financials. She also calls the regional Head of Process Safety to discuss the disturbing trend in process upset incidents at the site. He replies that he’s seen the trend as well as gives her some points to discuss during her visit. Arriving at the site and gathering with the site leadership team for lunch, she intentionally launches into a discussion on the previous day’s incident and the trend of process upsets.

During a subsequent tour of the units, she commends the operators on their worker injury rate but also asks for thoughts about the process safety incidents. She makes a point to seek out some of the front-line supervisors to chat personally about the importance of proper conduct of operations and to gain their buy-in for improving the process safety performance.

4.3 The Unit Engineer-2012

Terry sips his first cup of coffee and rereads the email assigning him as investigation lead for the upset and pressure relief incident yesterday. He’s already thinking “Great, one more thing on the list. How am I going to fit an investigation into my schedule?”

Diverting himself momentarily from the incident email, he turns to the two high-priority Management of Change (MOC) forms he’s responsible for coordinating. Both changes are relatively simple and nearly identical changes have been made multiple times previously but he still needs to make sure that the extensive checklists are completed. He wonders if he can just complete them ahead of time...“Do we really need to discuss and answer all of those questions?”

In addition, he’s the technical “expert” on a new by-pass system that is being designed. He needs to approve the design today; he feels the design is sound but has begun to wonder if it meets “codes.” The company has internal standards but they are rather dated and don’t apply to all situations. He hasn’t kept up on relevant external recognized codes and the company has never pushed for him or others to learn those codes. He thinks there’s an old copy of one of the codes in his filing cabinet. He decides he’ll worry about that in the afternoon; he has to find time for those MOCs.

He has a unit meeting coming up at 9:00 a.m. and sighs, “Great, more time wasted.” Thinking back to the incident, he knows that this is just one of several similar incidents...the cause and findings should be the same...that should make the investigation simple and get it out of the way...maybe he’ll just quickly meet with the operations supervisor sometime tomorrow.

4.4 The Unit Engineer-2020

James starts into his first cup of coffee and rereads the email assigning him as investigation lead for an upset and pressure relief incident yesterday. He quickly pulls up the incident “screening” methodology in the incident tracking system; the results show that because this incident was a repeat incident and had the potential to be “really bad” it requires a comprehensive, systematic root cause analysis instead of a streamlined method. James thinks, “Ugh, as if I don’t have enough to do. This is going to be more involved than I thought.” Nevertheless, he knows it has to be done right and begins re-planning his day.

He turns to the two high-priority Management of Change (MOC) forms he’s responsible for coordinating. He notes that the submitter attached an existing site procedure created specifically for these types of process changes. The site created this procedure because the changes are relatively simple and are performed a few times per year. The site still manages the changes under MOC because there can be minor difference for each change. The site MOC “system”, however, has generated streamlined yet applicable safety and environmental review forms. He breathes a sigh of relief—the forms combined with

the specific procedure will minimize the review time involved while still forcing the MOC team to answer the right questions. He should be able to address both of these during the 9:00 a.m. unit meeting.

In addition, he's the technical "expert" on a new by-pass system that is being designed. He needs to confirm today that the design meets the recognized industry codes. Having been to refresher training on the relevant codes earlier in the year, he feels he can complete that task after the unit meeting.

Although James still has a lot of other tasks to do, he realizes he can now devote the afternoon to the incident investigation. He begins identifying investigation team members and drafting an email instructing them to make their afternoon available—the investigation needs to be their priority.

5. Conclusions

Achieving great process safety is both a journey and a destination. It takes constant vigilance on the part of the companies, industry, academia, governmental agencies and the public, all working together to eliminate incidents and manage and understand the risk associated with exploration, Research and Development (R&D), manufacturing, and distribution of materials.

Some readers of this paper may conclude that their companies already do these things. CCPS believes that many concepts described herein may have been conceived by some companies which demonstrate leadership in process safety, and some companies have plans and may even be making good progress in one or more areas. This belief gives CCPS confidence that although difficult, Vision 2020 should be achievable. Nonetheless, when CCPS speaks frankly to companies considered the leaders in process safety, it is clear that every company will have important steps to take to reach Vision 2020.

CCPS recommends that companies review the Vision 2020 tenets and critically assess their current status, recognize improvement opportunities, and address needs, including working with organizations and the public to address extra-company gaps.

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