ioMosaic®

Minimizing risk. Maximizing potential.®

April 15, 2019 / QPSS 2019

Process Safety Competency

Rajeev Kumar

Process Safety and Risk Management Consultant

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

TÜV NORD TUV USA Inc. ISO 9001

“Competency
is
the combination of knowledge, skill, expertise, and training needed to deem an individual well-qualified and capable in a subject area”

Source: CCPS, “Guidelines For Defining Process Safety Competency Requirements”

Process safety competency (PSC) includes but is not limited to:

Process Safety Competency
Understanding the importance of process safety
Process Safety Management
A familiarity with major safety related regulations
The ability to characterize hazards associated with chemicals
Chemical reactivity hazards and material properties
Runaway reactions
Applying concepts of inherently safer design
Understanding how to mitigate hazards
An understanding of impacts of chemical plant incidents due to releases and exposures
Pressure relief and venting
Explosion hazards
Process hazard identification and risk analysis
Process safety culture

There is no single formula or method for accomplishing PSC, but the most important factor is commitment by the senior management

- CCPS Guidelines for Risk Based Process Safety – Chapter 5: Process Safety Competency
  - There is no simple answer for “How to achieve Process Safety Competency?”
- CCPS Guidelines for Implementing Process Safety Management – Chapters 4 & 5
  - PSC deals with ‘soft’ , people related areas
  - Most important factor is a strong commitment by senior management
  - Commitment results in knowledge transfer, learning, and companywide collaboration

Proactive implementation of PSC is a way to barricade against catastrophic incidents

- Lack of competence may mean failure at performing a task
- Absence or deficiency in PSC can result in incidents or accidents
- On the contrary, proactively PSC can minimize or mitigate incidents. According to EPSC:
  - Competent individuals are less likely to initiate situations leading to incidents
  - Competent individuals may detect early signs of an incident and possibly prevent it
  - Competent individuals can mitigate the impact of an event reducing potential for harm

Competent organizations support individual competency

- Organizational competency ensures providing an environment conducive to developing competent individuals
- This includes all staff levels starting with upper management through entry level individuals
- Management support is key in encouraging a strong process safety culture
  - Understanding of hazards and communicating them to the organization
  - Establishing – and enforcing – a process safety management system
  - Achieving and sustaining competency

A well developed process safety management competency system achieves the following:

- Defines the necessary knowledge, experience, and skills for specific operations and job roles for individuals and teams
- Links PSC to risk assessments, job descriptions, MOC (organizational); to ensure that new PS knowledge and experience are properly integrated
- Ensures training achieves the transfer of knowledge and required skills needed
- Confirms continued use and suitability of PSC
- Maximizes effectiveness by providing a structure and process linked to operations

How do we develop and maintain competencies organizations?

- What competencies are necessary for defined organizational roles?
- What level of proficiency is required for each competency? How do we define and measure proficiency levels?
- How do we develop, sustain, update, assure, and certify competencies?
- What types of trainings are needed, (a) public courses, (b) e-learning and webinars, (c) LMS, (d) etc.
- What are the most effective means for delivering training and reinforcing competencies over time?

Managing PSC – Industry reality check

- Most companies rely on conventional methods for managing PSC
- Basic training programs are used to train without proper mapping of PSC
- Trainings are provided with limited resources / employees on a per need basis
- In most cases, training departments do not understand the importance of PSC; trainings tend to be generic in nature

IChemE identifies six key elements for process safety competencies

Elements	Topic
Culture	Safety leadership commitment, responsibility and workplace culture
Knowledge & competence	Process safety concepts
	Hazard identification and risk assessment
	Hazard awareness specific to the operation
Engineering & design	Safety in design
	Asset integrity
	Codes and standards
	Management of change
Human factors	Human factors
Systems & procedures	Systems, manuals and drawings
	Process and operational status monitoring and handover
	Contractor and supplier selection and management
	Safe systems of work
	Project delivery
	Management of major emergencies and emergency preparedness
	Incident reporting and investigation
Assurance	Legislation and regulations
	Audit, assurance, management review and intervention

Source: "ISC Process Safety Competency Guidance" Edition 2, 2018

Process safety competency matrix are used to define and measure levels

1. Awareness	Has knowledge of the theory and displays conceptual understanding. Actively participates in discussions regarding the skill. Performs routine tasks with significant supervision. Learns how to do things.
2. Basic application	Performs fundamental and routine tasks. Requires occasional supervision. Increased functional expertise and ability. Works with others.
3. Skilled application/ proficient	Independent contributor. Integrates work with other disciplines. Frequently mentors or coaches others. Assesses and compares alternatives and opportunities. Builds networks with others skilled in application or mastery.
4. Mastery/expert	Advanced experience in the particular skill. Applies creative solutions to complex problems. Defines and drives critical business opportunities and needs. Represents the organisation internally and externally on critical issues. Sets standards within the organisation. Recognised as a subject matter expert.
Not applicable	No role requirement.

	Front line			Engineering				Support functions										Management		Executives				
Competency element	Operator	Maintainer	Supervisor	Integrity/reliability	Technical authority	Project	Information technology	Process safety advisor	Process safety lead/Manager	HSE site	HSE corporate	Quality control	Corporate assurance	Human resources	Finance	Procurement	Operational authority	Manager / Superintendent	GM/Site manager	Leaders/ MD/CEO	General board member	Board chair	Safety committee chair	Process safety specialist board member
Safety leadership commitment, responsibility and workplace culture	2	2	3	2	2	2	N/A	3	4 T	3	4 M	2	N/A	2	N/A	N/A	N/A	3	4 M	4 M	4 M	4 M	4 M	4
Process safety concepts	2	2	3	2	3	2	2	3	4	2	3	2	1	1	1	1	3	3	3	3	2	2	3	3
Hazard identification and risk assessment	2	2	2	2	4	2	2	3	3	2	2	1	1	1	1	1	2	2	2	1	1	1	2	2
Hazard awareness specific to the operation	2	2	3	3	4	3	3	3	4	2	3	2	2	1	1	1	3	3	3	2	1	1	2	2

Source: “ISC Process Safety Competency Guidance” Edition 2, 2018

Management of Change competency process identified

Element	Competency required	Competency level 1 – Awareness	Competency level 2 – Basic application	Competency level 3 – Skilled application/proficient	Competency level 4 – Mastery/expert
Engineering & design	Management of change	• Aware of the need to manage change. • Aware of what is covered by management of change procedure: policies, procedures, work methods, personnel, etc. • Able to recognise what a change is and initiate the process.	• Understands own role in change management. • Contributes to implementation of change management. • Able to initiate change management process. • Prepares management of change (MOC) documents. • Understands the change and is able to update information systems eg drawings, manual, procedures, etc.	• Recognises theory of implementing change and how changes will affect risk. • Communicates changes as required. • Actively implements change management procedures. • Authorises change in their area/competency or is a reviewer on the change.	• Subject matter expert across relevant cross-functional areas including hazard identification and risk control, human factors, systems, etc. • Develops change management process. • Actively involved in organisational changes and how they are managed.

Source: "ISC Process Safety Competency Guidance" Edition 2, 2018

E-Learning / training systems can also define and measure proficiency level requirements for specific process safety competency

Level	Knowledge	Points	Description
L1	Awareness	≥ 100	General knowledge of the subject and its implications
L2	Basic	≥ 200	General working knowledge of the subject. Participant
L3	Practical	≥ 300	Can practice or lead work. PSM Engineer, HSE manager
L4	Expert	≥ 400	SME, Subject Matter Expert
L5	Leader	≥ 500	Has (200 pts in L2, L3, or L4) and Management (300 pts)

- Example: PSL has a proprietary algorithm for assigning points to subject matter competency levels
  - PSL based training
  - PSL equivalence
  - Experience based equivalence

We all struggle with cost effectiveness associated with ongoing training

- Instructor based training may not be practical for training a large number of employees
- It may be less practical if refresher training is needed at 2 or 3 year intervals
- It can be costly and require employees / instructor be sequestered for specific periods of time
- Records management is a nightmare for most companies
- Sustaining the learnings is challenging

How does ioMosaic build or manage competencies internally?

- We use PStv® and Process Safety Learning® (PSL)
- PStv® provides an environment to support process safety culture
- PSL provides a platform for training and managing staff competencies efficiently and cost effectively
  - Easy to access the platform from anywhere
  - Tracks learner progress and KPIs
  - Latest updates and training materials

Key notes to take from our session

- Management must support a PSC that encourages competency throughout the organization
- Proactive learning, knowledge, and experience will help maintain competency
- PSC management systems can help provide a sustainable, process safety competency work environment eliminating incidents and lower costs in long term

The following guidelines are recommended reading resources

- *Guidelines For Defining Process Safety Competency Requirements*, Center for Chemical Process Safety, 1st Edition, 2015
- *Process Safety Competency – a Model,* IChemE Safety Centre Guidance, 2015
- *Introduction to Process Safety for Undergraduates and Engineers*, Center for Chemical Process Safety, 1st Edition, 2016
- *ISC Process Safety Competency Guidance*, Edition 2, 2018

About ioMosaic Corporation

Through innovation and dedication to continual improvement, ioMosaic has become a leading provider of integrated process safety and risk management solutions. ioMosaic has expertise in a wide variety of areas, including pressure relief systems design, process safety management, expert litigation support, laboratory services, training, and software development.

ioMosaic offers integrated process safety and risk management services to help you manage and reduce episodic risk. Because when safety, efficiency, and compliance are improved, you can sleep better at night. Our extensive expertise allows us the flexibility, resources, and capabilities to determine what you need to reduce and manage episodic risk, maintain compliance, and prevent injuries and catastrophic incidents.

Our mission is to help you protect your people, plant, stakeholder value, and our planet.

For more information on ioMosaic, please visit: **www.ioMosaic.com**