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Journal of Hazardous Materials 130 (2006) 321–325

Journal of Hazardous Materials

www.elsevier.com/locate/jhazmat

Interface management: Effective communication to improve process safety

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Available online 29 August 2005

Abstract

Failure to successfully communicate maintenance activities, abnormal conditions, emergency response procedures, process hazards, and hundreds of other items of critical information can lead to disaster, regardless of the thoroughness of the process safety management system. Therefore, a well-functioning process safety program depends on maintaining successful communication interfaces between each involved employee or stakeholder and the many other employees or stakeholders that person must interact with. The authors discuss a process to identify the critical "Interfaces" between the many participants in a process safety management system, and then to establish a protocol for each critical interface.

Keywords: Interface management; Process safety management; Communication; Crisis management; Media relations; Emergency response; Roles; Responsibilities; Critical information

1. Introduction

"Interface Management" (IFM) is a system for ensuring timely and effective communications in an operating plant. It includes all verbal and written communications between workers, contractors and the general public. It also involves communications between different levels in an organization. Interface management helps to establish who is in charge during normal operations as well as during upset and emergency situations. The concept of IFM has not been previously addressed in formal management systems or training nor is it reflected explicitly in process safety management regulations.

In fact, IFM was first identified as a key deficiency or contributor to several large-scale plant accidents only in the past decade. A holistic examination of several incidents from a large incident database enabled this single item to be pinpointed as a weakness and an opportunity [2,3]. From this examination, it is clear that given the significance of human involvement in most operations, it is important that interactions between people be managed and carefully coordinated to avoid incidents resulting from misunderstandings and lack of information. IFM is a key component of effective leadership in any organization.

The following noteworthy incidents from the past decade serve to illustrate where IFM contributed to an incident:

(A) An oil refinery had authorized contract maintenance workers to conduct weld repairs to a steel tank within a surrounding berm. A hot work permit was issued and the area was flagged off. Work commenced when conditions in the field were verified as safe. Soon afterwards, a process supervisor elsewhere in the refinery dispatched an operator to the tank farm to swing light product hydrocarbon rundown to a tank adjacent to the one being repaired. Valves were opened causing the level to slowly rise in the tank. Although the tank was covered with a cone roof and surrounded by a berm, vapors were emitted from a roof vent and blew into the adjacent tank lot. An ignition and flashback occurred causing the source tank to explode and killing two maintenance workers. Clearly,

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doi:10.1016/j.jhazmat.2005.07.009

the interface between maintenance and process activities was not coordinated and the hazards were not recognized or communicated to the workers.

(B) A loud thud was heard outside a chemical plant late at night. A news reporter called the plant switchboard to inquire about the cause and was placed in contact with a supervisor in the packaging plant. The supervisor explained that a pallet had fallen off the back of a loading ramp and that there was no danger to any workers or to the general public. He then took the opportunity to explain how safety was managed on his shift and how well he performed his job. Meanwhile, in another part of the operation, a relief valve had lifted on a reactor circuit causing highly toxic material to flow into a diversion ditch. This was likely the noise that had been heard from outside. As the emergency situation escalated, the diversion ditch overflowed into a main river. The area supervisor followed protocol and attempted to contact the media to issue a public warning. The media ignored the call because they had already been informed of the safe status of the operation.

Effective IFM could have prevented the above incidents. IFM starts with clear and concise job descriptions. It identifies what workers at all levels are expected to do and what they are not permitted to do. It clarifies the chain of command from top to bottom. Unfortunately, given the wide range of operating cultures and organization structures worldwide, it is impossible to prescribe an IM template that will work for every company. IFM should primarily focus on process safety issues. After all, this is what established criticality in most operations. However, the same approach could be used to designate those communication interfaces that might affect product quality or volume of production. Other operating efficiencies might be addressed as a lower level criterion.

There are a number of variables that affect the communications within an organization. The number of separate facilities under one management will determine the need for consistency and will establish the time required for any major communication to take place. The labor contract will determine how instructions are to be given and received. It may also dictate who may perform certain jobs. IFM extends beyond one-on-one communication. It must ensure that all workers are aware of key instructions and that they are kept abreast of each other's activities.

The IFM framework within a typical plant first establishes who is ultimately in charge. This is likely the plant manager or operations executive. However, from a practical point of view, a day superintendent will likely be empowered to make most decisions. His voice and signature will carry authority across the plant site for all matters pertaining to safety, operability, security and the environment. In a large operation, communications must be delegated to others. The senior control room operator is often empowered to make all key operating decisions and has open radio communication with field operators at all times. In some small to medium sized operations, the control room is the nerve center for the entire site.

Table 1
IFM planning questions

1.	What type of processes and hazards exist on the site? Do these have the potential to harm workers or the general public?
2.	Is the organization large and complex and do untrained or unfamiliar persons often enter the premises?
3.	Does the plant reside close to or adjacent to a residential community?
4.	Is the plant situated close to a public roadway?
5.	Is the plant situated adjacent to a major river or water reservoir?
6.	Does the plant draw water from this reservoir or discharge effluent to it?
7.	Is there a mutual aid agreement with other industries?
8.	Does the plant require medical, police or fire services from the community?
9.	Is the operation bound by local or federal regulations and is there a formal reporting responsibility?
10.	Does the plant utilize maintenance sub contractors from the community and is equipment periodically shipped out for repair?
11.	Does the plant require a continual shipment of chemicals and supplies from outside the local community?
12.	Does the plant draw utilities from a local power distribution network?
13.	Does the plant ship products to customers outside the community?

Despite what protocols are established and appear to work in a stable operating environment, there are situations that challenge all attempts to effectively communicate. During weekends, night shifts, start-ups or emergencies, key personnel may not be available in their normal positions. It is impossible to envisage every unusual situation that may arise in an operating plant. During a major incident, for example, the fire chief or emergency coordinator may preside over all activities across the site and he must be the focal point for all critical communications. To cover all such contingencies, the senior person on a plant site must be responsible for issuing a communication plan to all personnel.

2. Implementing IFM

The questions are intended serve as a planning basis for developing an IFM system for a plant site (Table 1).

If a positive response is obtained to one or more of these questions, there may be a need for formal IFM. How is this established and what are the general guidelines?

2.1. Identify and evaluate interfaces

The first step in setting up an IFM system is to conduct a screening level risk assessment of the operation. A "What If" analysis is an effective tool for identifying consequences of misdirected or untimely communications. This important first step will convince management of its vulnerability to communication problems and it will help to flag those areas that are the most critical. Identify the positions that have authority over the operation on a day-to-day basis.

Table 2
Interface matrix

	Information receivers				
	Receiver 1	Receiver 2	Receiver 3	···	Receiver *n*
Information sources					
Source 1					
Source 2					
Source 3					
⋮					
Source *n*					

How well established are the interfaces at your facility? Do they control risk to a manageable level? To find out, develop a matrix listing all the sources of information on the left side and all receivers of information across the page. The intersecting boxes on the matrix should be filled in if there is an interface requirement. Those interfaces that could result in significant consequences if not managed properly should be designated as critical and addressed with rigorous protocols. The form is intended only as an example (Table 2).

In each cell, identify whether that interface is a critical interface, indicating criticality according to the following key: P = process safety critical; Q = quality critical; E = environment critical; R = reputation critical. The completed table would look something like this.

An alternative method for mapping out the interface requirements in an operating organization is to graphically represent on a large page all the key positions that contribute to the success of the business. Draw lines between the circles or positions that communicate on a regular basis. Applying the results of the screening level risk assessment, increase the thickness of the lines to represent critical interfaces. If some scenarios from the risk assessment have been overlooked, add additional interfaces as required (Fig. 1).

Before moving to the next step it is important to examine all identified interfaces, at arm's length, to determine the relative number that are deemed critical. As a general rule, if more than 30% have been deemed critical, all interfaces will be managed alike and few will be managed properly.

2.2. Evaluate existing interfaces

Table 3 will help you to determine whether IFM practices are sufficiently defined and practiced at your facility. As in any checklist approach, it is important to review all questions to be sure they apply to your situation, and that you have not omitted any questions important to your company that are not included in table. Ensure that these questions are applied to all the critical interfaces.

	Information receivers				
	Receiver 1	Receiver 2	Receiver 3	···	Receiver *n*
Information sources					
Control room operator	Field operator 1 (P)	Panel operator for other unit (P)	Permit office (P)		
Emergency coordinator	Fire chief (P)	Environmental coordinator	Plant security officer		
Purchasing agent	Chemical company order desk				
Q					
⋮					
Source *n*					

Table 3
Evaluating interface management

	Question	Yes	No
1.	Is a single person designated in charge of your operation or facility on a round the clock basis?		
2.	Are roles and responsibilities regarding communications clearly defined for this individual?		
3.	Are external communication responsibilities included? e.g. police, fire, medical		
4.	Are formal records and documents passed on to management for their review?		
5.	Is a system in place that establishes the importance or criticality of communications in the field?		
6.	Are communication protocols established between key operating positions?		
7.	Are there any language barriers that might impede effective communications? Are persons identified on shift that can intervene in difficult communications?		
8.	Is a system in place to communicate the status of equipment between Maintenance and Operations?		
9.	Is a system established for procurement of emergency supplies, parts and chemicals during odd hours?		
10.	Is a system in place to ensure timely and accurate communications between complimentary positions at shift change?		
11.	Is a system in place to counteract or revoke standing orders and instructions made necessary by changing conditions?		
12.	Is a system in place to communicate emergency instructions to all personnel including contractors and subcontractors?		
13.	Is there a system that allows workers to challenge instructions that may be unclear or inappropriate?		

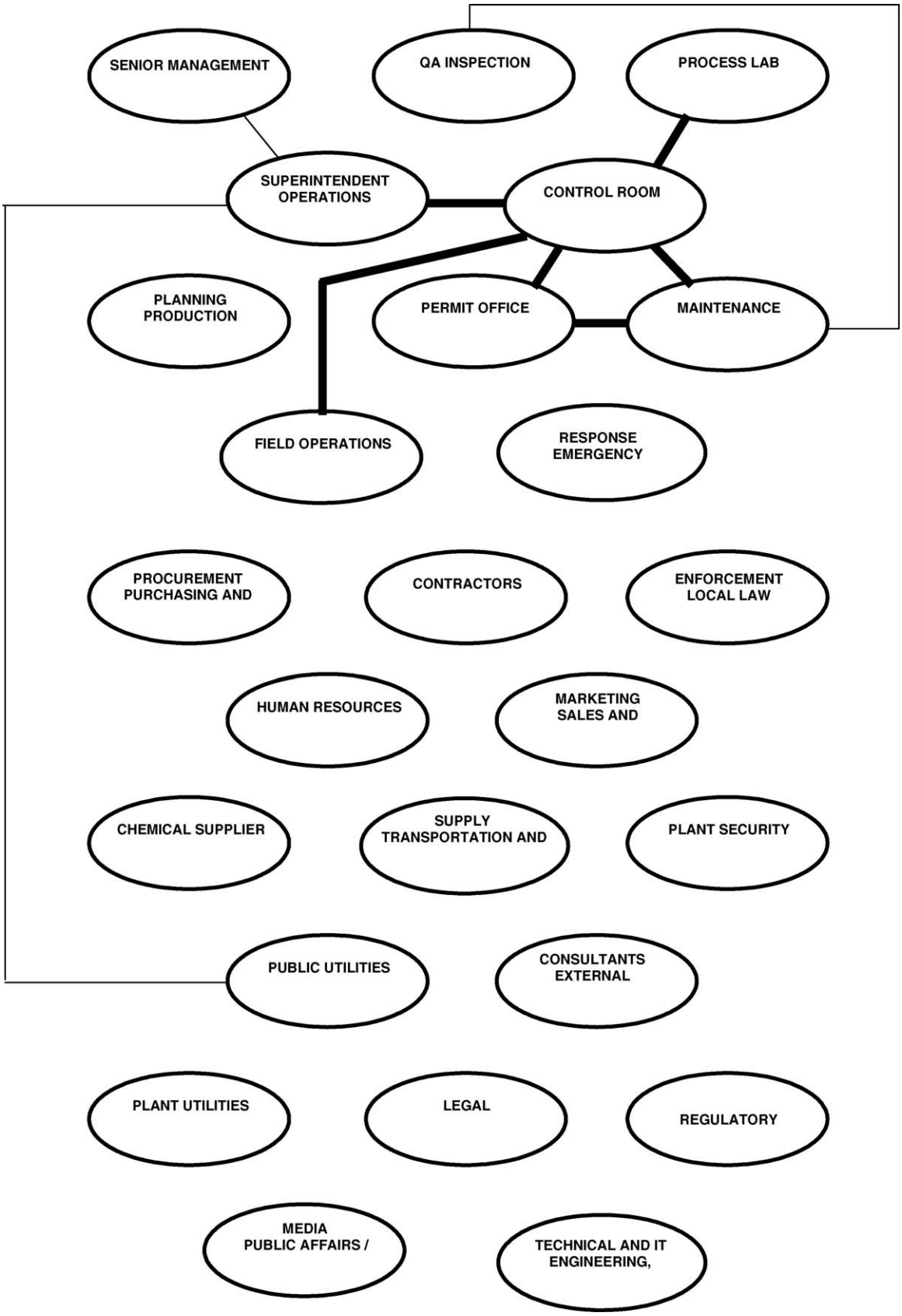

Fig. 1. Example of graphical representation of interfaces. *Note*: interface mapping not complete.

Table 4
Interface management considerations

1. What information is required? What is the critical content?
2. Why is this information important and how will it be used?
3. Who will use this information and who is authorized to provide it?
4. What is the mode and style of communication? One way or two way?
5. When is this communication required? Regularly scheduled or event triggered?
6. How is it documented? Is there a record of occurrence?

3. Develop system to establish interfaces

The last step in the process is to develop standard protocols for critical communications. A formal framework should be drawn up to address the gaps and deficiencies noted in Section 2. A "one size fits all" approach is neither reasonable nor practical. The approach must be risk-based and tailored considering the company and facility culture, history, and resources. It must meet the primary criteria of recognizing those situations or activities that might lead to a loss of containment incident with ensuing unwanted consequences. The questions can serve as a guideline to develop the standard (Table 4). It may be useful to include sample or mock up examples of verbal or written communications in the standard.

IFM takes on a different form during plant emergencies or upset conditions. When key personnel are diverted elsewhere it is important to designate a competent backup. The organization must be notified of this shift in responsibilities. Shift change also places high demands on IFM. A formal face-to-face turnover must take place between senior operating personnel to ensure continuity in the operation and to ensure that critical parameters have been flagged. A written shift log must be prepared utilizing a standard content and format. The shift log should be routinely audited.

IFM has not yet been included in formal process safety management frameworks. Effective communication within an organization has always been considered a prerequisite to all other business initiatives and programs. However, with the construction of larger plants and more complex process technology, IFM has taken on a whole new meaning. Computer interfaces, intended to improve communications and record keeping, have only compounded the problem. Large-scale incidents over the past decade have clearly demonstrated the need for effective face-to-face communication. Process safety professionals should be quick to recognize that IFM is a sub component of CCPS process safety element 1—leadership and accountability [1]. Leading firms will likely heed this warning and tighten up their IFM systems.

4. Conclusion

Interface management (IFM) is the systematic control of all communications that support a process operation. Given the significance of human involvement in most operations, it is important that interactions between people be managed and carefully coordinated to avoid incidents resulting from misunderstandings and lack of information. While such coordination is not formally defined as a process safety management (PSM) element, it is obviously needed and should be assumed to exist in each element. The basic steps laid out in this paper describe the basic steps to analyze critical interfaces and implement measures to manage them.

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Further reading

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