ISC Safety Lore

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Key lessons from incidents related to shift-handover

Introduction

Shift handover is a critical activity with a direct impact on production and safety. It is part of shift changeover, where outgoing and incoming personnel communicate to exchange task-relevant information; therefore, maintaining continuity between shifts is important. Poor shift handover is known to cause operation problems such as plant upsets, unplanned shutdowns and product reworks, which can result in considerable revenue loss.

Case 1 – Pesticide production

A runaway chemical reaction occurred inside a 4,500-gallon (20m^3) pressure vessel, causing the vessel to explode violently. Highly flammable solvent sprayed from the vessel and immediately ignited, causing an intense fire that burned for more than four hours. The incident occurred during the restart of the unit after an extended period of shutdown. Two company employees died in the explosion.

Key learning points

Due to a growing demand of pesticide, the operator was keen to restart the unit. The restart did not go smoothly; the new control system was used for the first time and the workers, who had already worked overtime and felt fatigue, faced several technical problems. Those issues diverted operators' attention, resulting in poor communication between board operators at shift change. The operating procedure specified that the waste tank vessel had to be prefilled to a level of 30% with "clean" solvent and heated before introducing residues coming from the solvent recovery flasher bottom. The operators forgot to prefill the tank on the day of the event. The status of the tank was not discussed during the shift change at 06:00. The night shifts staff did not inform the day shift crew that they had started to fill the tank. As such, the day shift operator activated the recirculation pump at 06:14 upon demand of his colleague in the control room.

For many years the unit operated with a first-line supervisor who directed the work of a team of operators. Four operating crews covered rotating shifts, and each team included a supervisor and a crew of operators. From 2004 to 2007, the management restructured the unit supervisory and technical oversight staffing. First-line supervisor positions in each operating unit were eliminated and self-directed. The investigation concluded, that "the multiple shortcomings in the technical support available to the operators made recognizing and addressing problems with the system more difficult". Normally operators maintained an electronic notepad (eLog) to identify ongoing activities for the incoming shift. In addition, they held verbal turnover meetings when shifts were changing. However, deficiencies experienced during the day of the incident were not entered in the eLog. Additionally, the day shift operator got distracted at the end of the shift with assisting another board operator and did not inform the incoming night shift operator about the high concentration of the product in the vessel.

Case 2 – Oil refinery

At approximately 13:20 on March 23, 2005, a series of explosions occurred at a refinery during the restarting of a hydrocarbon isomerization unit. Fifteen workers were killed, and 180 others were injured. Many of the victims were in or around work trailers located near an atmospheric vent stack. The explosions occurred when a distillation tower flooded with hydrocarbons and was over pressurized, causing a geyser-like release from the vent stack.

Key learning points

Shortly before 05:00 the Night Lead Operator left the refinery approximately an hour before his scheduled shift end time. He told his supervisor and the Night Board Operator that he was leaving, and briefly described the actions he had taken in the satellite control room. When the Day Board Operator changed shifts in the central control room with the Night Board Operator shortly after 06:00, he received very little information on the state of the unit. The Day Board and Night Board Operators spoke to each other, but because the Night Board Operator was not the one who filled the tower, he provided few details about the night shift's raffinate section startup activities other than what was written in the logbook. The Day Board Operator read the logbook and interpreted the entry to mean that liquid was added only to the tower; the Day Board Operator was unaware that the heat exchangers, the piping, and associated equipment had also been filled during the previous shift. The ISOM-experienced Day Supervisor, Supervisor A, arrived for his shift at approximately 07:15, more than an hour late, and did not conduct shift turnover with any night shift personnel.

The ISC believes that leadership across six key functional elements is vital to achieve good process safety outcomes. These elements are:

- systems & procedures
- engineering & design
- assurance
- knowledge & competence
- human factors
- culture

In the *What can I do* section below you can see how each of these elements plays a part.

Figure 1: The ISC Framework

What can I do?	
Management	
	• Make sure that the plant operating procedures include shift handover methods and clearly indicate roles and responsibilities.
	• Ineffective or miscommunication can have serious consequences; therefore, setting standards for effective communication is helpful to minimise such occurrences and helps to avoid complacency.
	• Different handover times for different groups (supervisors, maintenance, operators) can work well. The supervisor has time to talk to the outgoing operators in person before they do their handover, with the incoming operator and the maintenance crews. Consider this timing included in the operating procedures.
	• Build handover time into the shift pattern to minimise the chance of hourly paid workers performing handover "in the car park".
	• In order to reduce the impact of miscommunication, include communication skills in their selection criteria for shift-workers and have training programme in place to develop the communication skills of existing staff.
Process Engineer/Supervisor	
	• Make sure that at shift change, the handover arrangements between all involved in the work must include the status of continuing work, a re-appraisal of site conditions, and the appropriate control measures before work can restart.
	• Handover arrangements for continuing work, such as at shift change, must include all those who are involved with the work.
	• Make sure that information is repeated via more than one medium, such as verbal and one other method (written, electronic logbook, diagram etc) and all involved parties can give feedback.
	• Discuss problems at the start of the handover to make sure they are not forgotten or lost in the communication.
	• Make sure that issues recorded in the logbook are dealt with and followed-up in a timely manner to prevent carry over and them being lost in the system.
	• Part of the shift handover must be about people's welfare, not just technical issues.
	• Make sure that all issues are communicated clearly. Key information needs to be specified and presented, and irrelevant information excluded.
	• Pay attention to handovers which occur when staff return following a long absence from work; during plant maintenance; during deviations from normal working; and when handovers take place between experienced and inexperienced staff.
Operator	
	• Night shift is very demanding due to the disrupting sleeping pattern; day shift should pay extra attention when reading night shift logbook entries, avoiding criticism.
	• Make sure that all information you receive about shift handover issues are well communicated; if there are any issues that are not covered, clarify it with the supervisor before handing over the shift.
	• Ensure that shift handover is conducted face-to-face; both participants taking joint responsibility for ensuring accurate communication.
	• Check if you have received information using verbal and written means of communication and give as much time as necessary to complete the handover to ensure accurate communication.
	• Make sure you communicate clearly during shift handover; clarify with incoming staff and supervisor what are the main issues you have faced during your shift. For incoming staff, make sure you clarify all issues addressed by the outgoing shift.
	• Miscommunications do occur during shift handover; however, these occurrences can be kept low if all parties take responsibility for the handover.