

UF6 Release Event at Honeywell Facility in Metropolis, Illinois
December 22, 2003
(Note: all times are central time)

On December 21, 2003, at the end of the 3:00 pm to 11:00 pm shift (A-shift), the A-train fluorinator system in the Feed Materials Building was placed in hot stand-by so that members of the following shift could reconfigure the fluorination system. Beginning on the 11 pm to 7 am shift (B-shift) on December 21, 2003, production and maintenance personnel were tasked with reconfiguring the fluorination system so that they could run two of the three fluorinators instead of just one. The plant had switched to the A-train fluorinator on December 6, 2003, when they had pipe line blockage problems with the C-train fluorinator. The C-train fluorinator had remained in a hot stand-by condition since December 6, 2003, and was going to be brought back on line with the A-train fluorinator after the system was reconfigured. This type of process reconfiguration (e.g., reconfigure from one train to two trains) was not a frequent operation.

While the fluorine lines are in hot stand-by, they are purged with fluidizing gas (nitrogen) at a pressure of 90 psi. Both the A and C-trains were under purge when an assistant fluorine operator (AFO) was assigned the task of preparing the A and C-train fluorinators so maintenance staff could reconfigure the pipe line blanks in the system to allow for dual operation. The AFO had worked the A-shift and was working overtime on the B-shift. To prepare the fluorinators for the maintenance staff, the AFO had to close the dust collector valves and open the system valves to maintain a negative pressure on the mist pots so that the flow of gas from this area would continue on through the piping system to the cold traps. This would isolate the required piping and allow the maintenance staff to remove some pipe blanks from the fluorinator piping system. The AFO accomplished this task at approximately midnight. Upon completion of the reconfiguration of the pipe blanks at the fluorinators, the AFO should have opened the dust collector valves and closed the valves on all three fluorinator trains prior to beginning the next job task. However, the AFO forgot to place these valves in these positions prior to beginning his next job task. This step in the process was not included in a written procedure or checklist, and there was no supervisory review or check to ensure it had been done.

The UF6 is moved through the piping system by negative pressure (vacuum) provided by a series of four Nash pumps. The Nash pumps also had to be reconfigured so that both the A and C-train fluorinators would each have two Nash pumps to provide the required negative pressure versus having four pumps support one fluorinator train. The AFO was also assigned the task of preparing the system down stream from the cold traps to the Nash pumps so that maintenance staff could reconfigure the piping system by removing a spool piece of pipe and inserting some pipe blanks. The AFO was provided a Special Work Permit which listed 21 lock-out/tag-out steps which must be accomplished prior to the start of the maintenance job. The first step on this list is closing and locking the tertiary cold trap outlet valve, which isolates the cold traps and the remaining upstream portion of the production line from the negative pressure provided by the Nash pumps.

With the dust collector valves closed, the system valves open, and the tertiary cold trap outlet valve closed, the system began to go from a negative pressure to a positive pressure due to the continued purging of the system with the fluidizing gas at 90 psi and the UF6 that comes from the hi and low boiler/distillation columns while in the "recycle" stand-by mode. While in the "recycle" mode, approximately 300 pounds per hour of UF6 is sent to the cold traps at approximately 70 psi. This UF6 could also enter the piping system upstream from the cold traps under certain pressure conditions. Minus pressure indicators on the system began to move toward positive pressure at approximately 12:50 am on December 22, 2003. There are

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no warning lights or alarms on the system to indicate that the negative pressure is being lost or that it has gone from negative to positive. Operators are required to periodically check the minus level on the system. Records of the change in pressure indicated that the change from a negative or minus level to a positive level occurred in a few minutes.

At approximately 2:15 am, while performing a verification of the lock-out/tag-out task performed by the AFO, the Flourine Foreman notices the smell of hydrofluoric acid and as he was approaching the fourth floor, he noticed a white cloud. The Foreman immediately went to the control room, looked at the video cameras that monitor each floor in the Feed Materials Building, and noticed that white clouds were present on both the fourth and fifth floors. The Foreman informed the control room staff of the leak, and the Lead Fluorinator Operator turned off the fluidizing gas (90 psi nitrogen) to the fluorinators.

At approximately 2:20 am, the Foreman activated the Radiological Contingency Plan and began discussing potential causes of the release. A census of the plant staff was completed, and the first pair of emergency responders was suited up in protective clothing to prepare for entry into the building. The first entry team entered the building at approximately 2:28 am and closed the system valves on all three fluorinator trains, opened the dust collector valves on all three trains, and opened the valves from the tertiary cold traps to the Nash pumps. This allowed the UF6 that was present in the piping system under pressure to flow to the dust collectors. The dust collectors were overcome with the volume and pressure of the UF6 in the system, and UF6 was discharged through the dust collector exhaust system. The horizontal exhaust stack exits the Feed Materials Building from the southwest side of the building, 86 feet above the ground. At the time of the release, the wind was out of the SSE direction and had an average velocity of approximately 6.2 mph.

At approximately 2:34 am, the Incident Commander requested that the Security Department dial 911 and notify the local authorities of the UF6 release. The Sheriff's Department was notified of the release and was told to evacuate everybody in the surrounding area. The Sheriff's Department dispatched officers to evacuate personnel from homes in the area surrounding the facility. The licensee did not have a procedure for determining what recommendations to make to local government officials regarding evacuation or sheltering in place of the public.

At approximately 0240, a second response team entered the area and tried to unlock and restart the Nash pumps to re-establish a negative pressure in the system. A smaller pump used in the start-up process failed and this system was not successfully started until approximately 3:15 am. At about this same time, the fifth team to enter the Feed Materials Building searched the area for leaks and found that the only visible leak was a wisp of white "smoke" coming from the C-fluorinator minus control valve on the fifth floor. They tightened down on the valve packing and the leak stopped. This valve was the primary source of the UF6 that leaked into the Feed Materials Building. This same valve had been identified as having an in-leakage problem on December 6, 2003 and was thought by some operators to be the cause of line blockages. The packing on this valve was tightened on December 6, and the in-leakage ceased. However, no maintenance report was made on the in-leaking condition and it was not entered into the licensee's database of equipment needing repair.

At approximately 3:30 am, the Incident Commander noted that there was no visible "smoke" leaving the Feed Materials Building, and at 3:30 am, management was informed that the leak had been contained. At approximately 4:05 am, the eighth response team to enter the building performed a walk-through of all floors and found no further evidence of any leaks. At approximately 4:15 am, the all clear was announced.