

Managing SF₆ Emissions at Argonne National Laboratory

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Uses of SF₆ at Argonne

- Electrical switch gear
- Electron Microscopes Sub-Angstrom Microscopy and Microanalysis (SAMM) facility
- Accelerators (Argonne Tandem Linac Accelerating System (ATLAS), Wakefield, Advance Photon Source)
- Van de Graaff Generators



SF₆ Reduction - 2010

- **Inspection of major SF₆ users facilities**
 - Purchased leak detection equipment with P2 funds
 - Performed leak detection of systems
 - Suggested options for reducing operating leaks
- **Better determination of SF₆ losses by mass balance**
 - Provides more accurate determination of losses
 - Pinpoints location of losses



SF₆ Emissions - FY 2010

- SF₆ purchased in 2008 was 7,800 lbs.
- Approximately 1400 lb SF₆ emitted
 - Argonne Wakefield Accelerator (AWA) (805 lb)
 - Materials Science Division (MSD) accelerator/electron microscopes (357 lb)
 - Facilities Maintenance (123 lb)
 - ATLAS accelerator (115 lb)
- MSD and ATLAS accelerators have recovery systems
- AWA operations required periodic shutdowns and opening of system resulting in SF₆ emissions (no recovery)

SF₆ Reduction Strategies - 2011

Argonne Wakefield Accelerator (AWA)

- AWA was largest SF₆ emitter at Argonne in FY 2010
 - Emitted 805 lb SF₆ in FY 2010
 - Equivalent to 8,727 metric tons CO₂
 - Emissions caused by need to open system on a periodic basis and leaks
 - All gas placed in the system is eventually lost
 - Future facility expansion (5X) made this system a priority for SF₆ emission control



AWA SF₆ Recovery

- **Dedicated recovery SF₆ system**
 - Automated system has compression ratio of 10,000:1
 - Recovery should be close to 100%
 - Cost of system (DILO) - \$77K
- **Loss of SF₆ expected to be minimal**
 - 805 lb (8,767 mt CO₂e) in FY 2010
 - Losses in future would be greater without recovery because system is being expanded

SF₆ Program - Additional Actions

- Use of scales (weighing) of full cylinders and cylinders to be returned
 - “Empty” SF₆ cylinders can have 0.6 – 1.0 lb in them (psi=0)
 - Improve mass balance calculation (take credit for heel weights returned to vendor in “empty” cylinders)
- Looking at portable SF₆ recovery system for smaller users (e.g., electron microscopes)
- Conducted a brief survey of users to keep the focus on reducing emissions and to keep the dialogue going.



SF₆ Users Information Survey

- 1. Name
- 2. SF₆ Facility
- 3. How many cylinders (including weight) have you bought to date in FY 2011?
- 4. How much SF₆ have you used (put into a system) to date in FY 2011?
- 5. Have you instituted any new leak detection and repair or other methods in FY 2011 to decrease SF₆ emissions?
- 6. Could you weigh SF₆ cylinders upon receipt and prior to returning to vendor (to calculate heel weights) if a scale were provided?
- 7. Could you recover SF₆ currently emitted if a recovery system (portable or dedicated) were available?
- 8. Do you anticipate your SF₆ usage in the future to increase, decrease, or remain the same?
- 9. What future changes in your facility could affect future usage of SF₆?
- 10. Any other comments or information

Survey Responses

- The leak detector helped identify input lines and valves to replace. Placed an order for a gas recovery system. Without the recovery system all of the SF₆ in place in the system will be lost.
- The leak detector helped us identify and seal most leaks. We identified equipment that needs to be modified or replaced. A pipefitting contractor is needed to address remaining leaks.
- MSD plans to fix leaks and add a second vacuum pump to the recovery system so that no gas is vented during recovery.

Questions?

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