

Schematic layout of AHU room showing details of work carried out. (numbers connect to items in article)

Revamping Old AHUs to Provide a Clean & Healthy Environment

By R. Gopalakrishnan

Scientific Officer,
Indira Gandhi Centre for Atomic Research (Reprocessing Group)
Kalpakkam, Tamil Nadu

In order to provide a clean and healthy indoor environment for the building users, in the office area of our Reprocessing Development Laboratory, that was served by air handling units 1 & 5 which are about 20 years old, we decided to revamp these units by applying innovative thoughts and ideas, not only to increase the working life of the units, but also to follow the latest international standards applicable to indoor air quality.

The air handling units were of the central built up type, with all the vital internals of the AHU such as the blower, cooling coils, air filters, etc. placed inside a masonry enclosure. An entry door to the enclosure provides access to technicians to walk into the enclosure for maintenance purposes.

List of Works Carried Out Are:

1. Cost Effective Air Filtration.

Existing conventional sliding type filter frames were replaced with new high performance aluminium extruded Universal Holding Filter Frame (UHFF) as a retro fitment. See Figure 1 & 2.

About the Author

R. Gopalakrishnan has 23 years of experience in design, erection and revamping of HVAC systems in nuclear facilities. Specialised in innovative HVAC implementation in such facilities and IAQ management. Currently Chair, Student chapter of ISHRAE, Kalpakkam.

continued on page 108

continued from page 106



Figure 1: View of the Universal Holding Filter Frame (UHFF) – holding clamp in open position on left; UHF with filter and holding clamp in locked position on right.



Figure 2: View of retro fitted new high performance aluminium extruded Universal Holding Filter Frames (UHFF).

2. Cleaning of Cooling Coils. Cooling & dehumidification coils cleaned with environment-friendly bioactive enzymes instead of acid. See Figure 3 & 4.

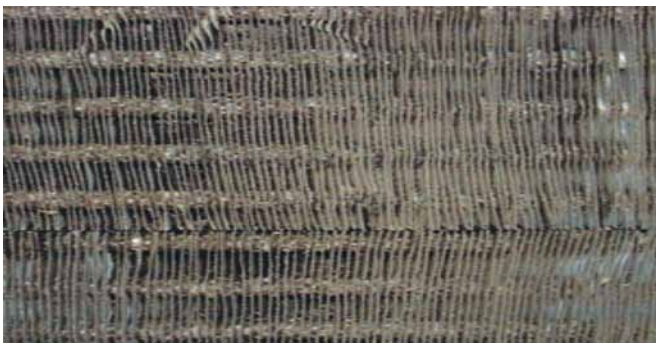


Figure 3: View of the AHU cooling coil before cleaning.



Figure 4: View of the AHU cooling coil after cleaning.

3. Treatment of Cooling Coils. Cooling coils treated with environment-friendly bioactive enzymes to retard the growth of mold again over the coil.

4. New UVC (Ultra Violet C band) Germicidal Lamps Fitted. Ultra Violet C band (UVC) lamps were introduced in order to improve industrial hygiene. Providing the UVC lamps, in AHUs of HVAC systems are a mandatory requirement in USA as per Facilities Standard 2003 (P100) of Public Building Service of GSA Section 5.9 "HVAC Systems". Ultra Violet C band germicidal lamps retard growth of bio aerosols. See Figure 5 & 6.



Figure 5: View of UVC (Ultra Violet C Band) germicidal lamp, fitted inside the AHU-5

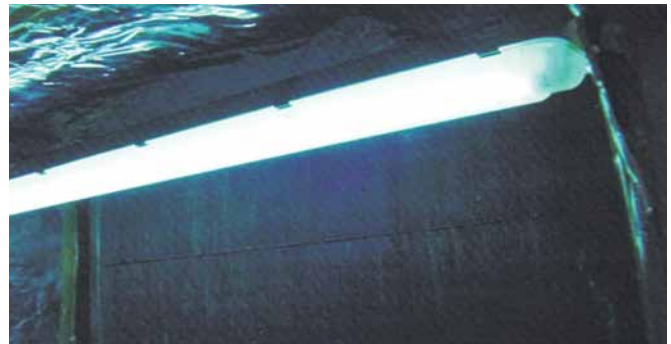


Figure 6: View of UVC (Ultra Violet C Band) germicidal lamp, fitted inside the AHU-5, while glowing.

5. Repairing Insulation. Damaged AHU internal thermal insulation was patched up to improve the AHU performance and reduce the energy loss.

6. Upgrading Insulation. After the patch up, entire AHU internal thermal insulation was covered with aluminium foil and upgraded to make it equivalent to the latest double skin AHUs in order to reduce the dust accumulation inside the AHU, as well as for improved hygiene and improved IAQ in a cost effective manner.

7. External Thermal Insulation Applied. AHU-5 plenums and main ducts in the AHU-5 room were thermally insulated externally with aluminium foil covering to avoid condensation and also to conserve energy as per the LEED concept. This resulted in increasing the cooling capacity and improved the system performance by minimizing energy loss.

8. AHU Internal Cleaning & Repainting. Painting of AHU internals (centrifugal fans, motor & pulley) and externals were carried out. About 10 kg. of dust, algae, debris was removed from

continued on page 110

continued from page 108

each AHU during thorough cleaning.

9. Fan Pulley & Flexible Connection Replaced. AHU-1 V-pulley was damaged, hence both the V-pulleys were replaced with taper bush pulley for easy maintainability. Discharge flexible connection was found damaged, and was replaced with new long life Polypropylene (PP) flexible connection.

10. Air Duct Cleaning as per National Air Duct Cleaners Association (NADCA) ACR 2006 Standard-Assessment, Cleaning and Restoration of HVAC Systems – Procedure and Specification. Entire air ductwork was cleaned in order to remove all the accumulated dust in the ducting by using remotely handled robotic camera and cleaning tools by source removal concept.

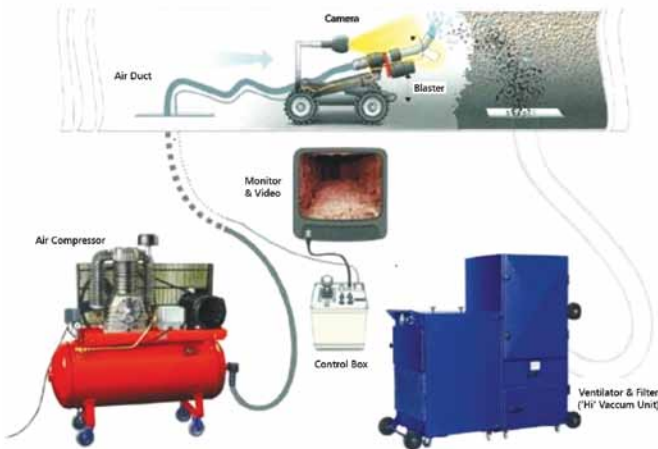


Figure 7: Illustration of duct cleaning method. Compressed air is supplied at positive pressure through duct cleaning tools to dislodge the accumulated dust in the ducting and at negative pressure, high vacuum, a HEPA filter unit is connected through suction flexible duct to collect and hold the dust.



Figure 8: Robotic camera image after duct cleaning process.

See Figures 7 & 8.

11. Strengthening Supports. Providing additional ceiling suspended supports for AHU-1 plenum and main branch at AHU room for structural stability and system integrity. Damaged anchor fastener and support was also re-fixed properly and structural integrity restored.

12. Repairing RA Boxing. Rectification of drawing office and staircase area return air boxing, including concrete drilling, refixing of aluminum grids and 'L' angles to ceiling and cemented gypsum board with beadings as it is in the existing condition.

13. Eliminating Air Leaks at Collars. Removal of existing M.S grills & diffusers from the false ceiling and ducting, rectification of grill collars and diffuser droppers, painting and refixing the same into its original place.

Education and communication are important parts of any industrial hygiene and IAQ management program. When everyone associated with the building – designers, architects, contractors, owners, managers, safety & occupational health professionals and occupants fully understand the issues and communicate with each other they can work more effectively together to prevent and solve problems.

Finally, it is the responsibility of the HVAC engineers and safety & occupational health professionals to provide healthy indoor environment, which promotes the comfort, health, and well being of our DAE personnel.

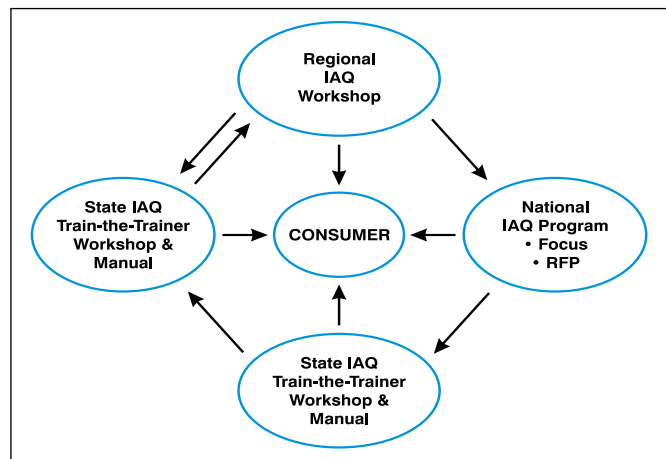


Figure 9: Healthy indoor air for America's homes - model developed in 1995.

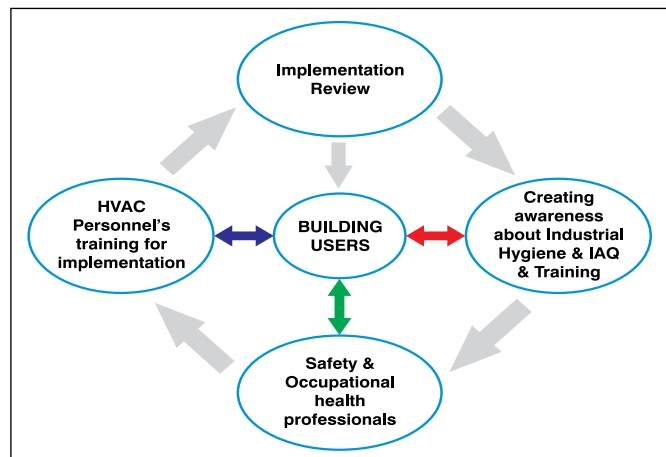


Figure 10: Proposed safety management model for healthy indoor air quality management for DAE Establishments.

Conclusion

The proposed safety management model of healthy indoor air quality (IAQ) for DAE Establishments through HVAC engineers and safety & occupational health professionals will provide healthy indoor environment and in turn a healthy Department.