Improve HVAC Performance and Reduce HVAC Replacement Costs

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Many buildings have major HVAC airflow problems due to dirty systems that waste energy, compromise comfort levels, and generate occupant complaints. Conventional HVAC cleaning does not effectively clean impacted coils and ductwork. Deep cleaning is essential to the proper functioning of variable air volume (VAV) boxes. Dirt buildup on coils can reduce their efficiency by 20% or more. Excessive supply air static pressure damages VAV boxes. Dirty coils and poorly functioning VAV boxes reduce heating and cooling efficiencies and area ventilation effectiveness. Clean coils increase system performance efficiency permitting lower compressor loads and lower fan speeds. Higher air side delta-T can save energy by allowing reduced system airflow. Increased delta-T on chilled water can result in pumping and chiller energy savings. It may even allow you to raise the chilled water setpoint to save energy.

At the 2018 annual NAESCO conference, I met an exhibitor, **Pure Air Control Services**, which has the best HVAC cleaning process (PURE-Steam Coil Cleaning) I have ever seen. Since the conference, I have been actively working with my public agency clients to adopt it as part of their energy projects. The 14 steps of their cleaning process are briefly explained below:

1. Perform before assessment of coil cleanliness condition to focus cleaning efforts to fix static pressure issues.
2. Perform before and after measurements of coil performance (e.g., delta P and cfm).
3. Introduce multi-enzyme cleaner a patented antimicrobial non-toxic, non-acid enzyme technology to breakdown biofilm and contaminates.
4.Environmentally clean AHU, cooling coils, blower assemblies, and drain pans utilizing PURE-Steam (no chemicals), the GREEN Steam Sterilization Cleaning Process (Green Clean Institute Certified Coil Cleaning Process). Steam temperature is 350 degrees Fahrenheit, and steam pressure is around 350 psi.
5. HEPA vacuum the interior of AHU cabinets using a combination of wet and dry HEPA vacuums.
6. Encapsulate any fiberglass insulation.
7. Disinfect interior with an antimicrobial solution.
8. Perform high volume/low-pressure coil flushing post PURE-Steam, if necessary.
9. Introduce compressed air (100-150 psi), if necessary.
10. Environmentally treat interior of AHU Cabinets with antimicrobial solution
11. Bioactive Coil Treatment - treat the coil surface area to provide a biostatic coating that lasts up to12 month residual protection
12. Perform before PURE-Steam process measurements with Coil Cleanliness Verification.
13. Perform before and after PURE-Steam process Measurement & Verification (M&V).
14. Provide photo log report, Clean Coil Verification report and M&V report before and after remediation.

This cleaning process is suitable for HVAC equipment which is 3-5 tons or larger. Based on average minimal coil fouling of 20%, many of their clients have recognized annual energy savings of $40-60 per ton. The savings from the steam cleaning process can be sustained by doing annual maintenance level steam cleaning which is about 20-25% of the cost of the initial 14 step cleaning process. The return on investment from this steam cleaning process is very attractive for many clients.

Besides energy savings this steam cleaning process provides many significant non energy benefits. Reduced HVAC work orders save building maintenance costs. Improved air flow helps building operators deliver a healthy and comfortable indoor environment. Improved air flow also creates better cooling and heating capacity for the HVAC system. Sanitizing the coils and blower assembly helps improve indoor air quality and extends equipment life. Comfortable and healthy indoor environments improve building occupant well-being and productivity. Existing studies suggest that improved building health and productivity benefits may be significantly larger than the energy and maintenance cost savings. Cleaner HVAC systems reduce owner exposure to the potential liability of occupational illness litigation. Reduced energy consumption reduces environmental emissions, which cause environmental damage. These non-energy benefits avoid potential costs, to the building owner, building occupants, and local community over the life of the building. Selecting a cheaper but ineffective method of HVAC cleaning will not deliver the many energy and non-energy benefits described above.

In addition to steam cleaning of HVAC systems, Pure Air Control Services also provides an HVAC New Life restoration service to extend the life of existing HVAC units as an alternative to immediate replacement with new HVAC equipment. Using its Pure Steam deep cleaning process as a first step, it then installs heavy-duty coatings on non-moving parts of the RTUs that extends the life of those components of the HVAC system. They provide a five-year warranty on the coatings they use. This allows them to significantly extend the life of the HVAC system as long as too many moving parts do not require immediate replacement (e.g., fans, motors, compressors). Based on their experience, Pure Air Control Services has found that 90-95% of HVAC equipment they have evaluated are good candidates for life extension using the New Life process. The minimum equipment size to be a candidate for this process is 15 to 25 tons. The cost of the New Life restoration process is 10-20% of the cost of replacement with new HVAC equipment. This provides major savings due to avoided capital cost expenditures in addition to all the benefits described above.

This approach also provides many non-energy sustainability benefits. It repurposes existing HVAC equipment and avoids disposal costs to send the old HVAC equipment to a landfill. Due to restoring the equipment in place, there is less disruption and downtime to the HVAC equipment. Due to the scope of the restoration process, the cost and delays of permits are avoided. There are no freight or shipping costs to deliver new HVAC equipment. There is no requirement to rent a crane for installation. By eliminating the energy costs for manufacturing and shipping the new HVAC equipment, environmental emissions are avoided. Restoration in place also provides a faster timeline than the procurement of new HVAC equipment which reduces transaction costs. Customers avoid the costs of renting temporary cooling equipment in some cases.

Pure Air Control Services has numerous detailed case studies of their projects for university and health care clients. For more information, please contact Tony Raszka, Marketing and Communications Director, Pure Air Control Services, Inc.,800-422-7873 ext. 403, PureAirControls.com,4911 Creekside Drive, Suite C, Clearwater, Florida,33760.

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Mr. Birr has 40 years of experience designing, managing, and monitoring energy efficiency projects in buildings. He is a nationally recognized expert on the energy performance contracting industry. Energy performancing contracting procurement, project management. measurement and verification of savings, maintenance and commissioning of equipment are technical topics he focuses on as an owner's representative. Due to his expertise in these topics he has served as the sole arbitrator or as an expert witness in contract disputes related to savings performance on energy performance contracts. He has worked on hundreds of energy performance projects for federal agencies, national labs, states, cities, counties, universities, hospitals, public housing authorities and schools. He has been the primary technical consultant for the state energy performance contracting programs in Illinois from 1987-2017 in Pennsylvania from 2001-2010, and in Hawaii from 2007-2019. He has worked on over a billion dollars in energy performance contracting projects. He has presented over a hundred technical energy efficiency and energy performance contracting presentations and training seminars. Many of his technical trainings are in depth multi day events. He has a B.S. in Industrial Engineering from Northwestern University (NU), but he also did extensive graduate level engineering course work at NU for 3 years in energy and environmental engineering. He serves as a voting member on the Accreditation Committee of the National Association of Energy Service Companies.