Ensuring TJC and Life Safety Code Compliance for Air Handler Refurbishment

HESNI Presentation – June 10, 2021

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AGENDA

1. Common Issues with Aging Air Handling Units
2. Drivers for AHU Refurbishment
3. Regulatory Standards for AHU Refurbishment
4. Common Refurbishment Methods Currently In Use
5. Overview of a Best-in-Class Refurbishment Solution
6. Financial Justification for Refurbishment
7. Refurbishment Case Studies
8. Questions & Answers
COMMON ISSUES

TYPICAL AIR HANDLER – CROSS SECTION

- Non-Compliant Coatings
- Impacted Fouled Coils
- Destructive Water Leaks
- Standing Water (No Pitch)
- Rust & Corrosion
- Microbial Growth

Biofilm
Customer Drivers for AHU Refurbishment

• Mechanical Failure
  • Address mechanical air handling units with severe structural corrosion and damaging water leaks

• Mechanical Life Extension
  • Proactively address mechanical air handling units with moderate rust & corrosion and standing water

• Energy & Environmental Initiatives
  • Proactively address mechanical air handling units for the purpose of energy savings
Customer Drivers

• Indoor Air Quality Concerns
• Capital Budget Constraints
• Downtime Concerns
• Operations & Maintenance Costs
• Regulatory Non-Compliance
• Improved Asset Valuation
REGULATORY DRIVERS

• Fire Codes
  • NFPA 90A, NFPA 101
  • Model Codes: IMC, UMC

• IAQ Standards
  • ASHRAE 62.1

• Healthcare Accreditation
  • TJC, DVN, HFAP

• OSHA

• EPA
FIRES IN AIR HANDLING UNITS

Hospital in New York State

Industrial Facility in South Carolina
NFPA 90A states that supplementary materials added to the interior of mechanical air handling units must meet the following requirements when tested at the actual applied thickness in accordance with NFPA 255 or ASTM E84:

NFPA 90A Requirements

- Maximum Flame Spread Index of 25
- No Continued Progressive Combustion
- Maximum Smoke Developed Index of 50

NFPA 90A requirement is far more stringent than the Class A fire rating as defined by NFPA
WHAT ARE BIOFILMS?

• Communities of microbes, including bacteria, viruses & fungi, that grow on surfaces and live for extended periods

• Protected by a strong tacky biopolymer called the Extracellular Polymeric Substances or EPS

• Biofilms are resilient and highly impervious to common cleaning chemicals and UV radiation

• Biofilms are largely responsible for the proliferation and spread of pathogenic agents such as Stachibotrys, Staph, Legionella and others
ASHRAE 62.1

- ASHRAE 62.1 sets specific requirements for the design and operation of HVAC drain pans to ensure acceptable indoor air quality. Those requirements are as follows:

**ASHRAE 62.1 Requirements**
- Drain Pan Slope Is At Least 0.125 In. Per Linear Foot
- Drain Outlet Is At The Lowest Point Of The Drain Pan
- P-Trap Or Other Seal For Negative Pressure Drains

![Diagram showing drain installation and minimum slope](image-url)
Proper Trap Design for Negative Pressure Drains

\[ A = B + C + \text{Pipe Diameter} \]

\[ B = \text{Max Static Pressure of Unit} + 1 \text{ inch} \]

\[ C = \frac{1}{2}B \]
Improper Trap Design for Negative Pressure Drains

ASHRAE 62.1

B = Max Static Pressure of Unit + 1 inch
C = \( \frac{1}{2} \times B \)
A = B + C + Pipe Diameter

Concrete Slab

Extended to Floor Drain

Threaded Plug (Typical)

Static Pressure (in. of H\(_2\)O)

Static Pressure (in. of H\(_2\)O)
• AQUIS is an integrated product development and service delivery company focused on providing sustainable, health-focused and code-compliant solutions for commercial and industrial mechanical air handling units

• In February of 2004, we developed the AQUIS System, a patented engineered coating system for the comprehensive rehabilitation of commercial and industrial mechanical air handling units

• To date, AQUIS has successfully completed over 2,500 installations of the AQUIS System nationwide for customers in the healthcare, higher education, manufacturing, government and commercial real estate business sectors
OVERVIEW

BEFORE

• No Pitch - Standing Water
• Fungal & Bacterial Growth
• Flammable Coatings
• Destructive Water Leaks
• Rust & Corrosion
• Structure Compromised
• Service Life Limited

AFTER

• Pan Pitched to ASHRAE 62.1
• Active Antimicrobial Surface
• Fully NFPA 90A Compliant
• Durable Watertight System
• Steel Sealed & Protected
• Structure Restored
• Life Extended by 10+ Years
Epoxy with Nanotechnology Provides Superior Bond Strength

Epoxy Halts Corrosion & Restores Structure to Surfaces

Advanced Fire Barrier Provides Fire Code Compliance (NFPA 90A)

Sloped Application Improves Drainage & Eliminates Standing Water Per ASHRAE 62.1 (CPR-1)

Smooth Hygienic Surface with Active Antimicrobial Abates Biological Growth

Durable Water-Proof Polymeric Topcoat Provides Extended-Life
• Installed only by AQUIS’s technically trained and highly experienced employees

• Typically completed in two 8-hour sessions with the ability to resume service immediately after each session

• Air handlers are isolated by sealing adjacent ductwork and utilization of negative air machines

• No volatile organic compounds (VOC’s) and no detectible odors either during or after the installation

• No need for removal of condensate pans, coils, motors or supply fans prior to installation
**INSTALLATION PROCESS**

**STEP 1:**
Dry out air handler and remove non-compliant foams & coatings, and other materials

**STEP 2:**
Remove corroded steel and debris, clean surface, and patch holes

**STEP 3:**
Map condensate pan for proper pitch with AQUIS LaserSlope System and install guides (when specified)
**INSTALLATION PROCESS**

**STEP 4:**
Trowel and smooth **Engineered Epoxy** to seal and protect surface (and create required pitch when specified)

**STEP 5:**
Brush or roller apply **Fire Barrier** for NFPA and fire code compliance

**STEP 6:**
Brush or roller apply **Antimicrobial Topcoat** for long-term waterproof performance
• **Extends the service life of air handlers** – Provides a 10+ year life extension of air handlers and delays the cost and disruption of air handler replacement

• **Halts damaging water leaks** – Avoids the costly consequences of water leaks such as water damage, mold contamination, and operational disruption

• **Eliminates standing water** – Stops the formation of biofilms containing pathogenic biological agents such as Stachibotrys (black mold), Staph and Legionella

• **Fully compliant with all regulatory requirements** – Offers peace of mind through compliance with fire codes, NFPA, ASHRAE, Joint Commission, EPA and others
CASE STUDY:

• A NYC area hospital had budgeted to replace four 20,000 CFM modular air handling units in Year 2 at a cost of $800,000

• AQUIS proposed to instead refurbishment the same 4 air handling units with it’s CPR-SL System in Year 1 at cost of $79,200

• The analysis considers the impact of both energy savings and maintenance savings for both the replacement and refurbishment scenarios
ASUMPTIONS:

- AHU replacement cost includes cost of equipment, installation and downtime
- AHU refurbished with AQUIS System on floors and anticorrosive coating on walls, ceilings, blowers and supports
- Maintenance savings based on reduced cost of parts & labor and increases by 10% annually
- Energy savings based on 10pp increase in efficiency of a 50 hp motor operating 8000 hours annually at 75% load
- Energy cost of $0.103 / kWh during year 1 increases by 3% annually
- ROI calculation based on discounted cash flow; Cost of Capital of 8% for NPV & ROI calculations
## AQUIS Financial Case Study

### SCENARIO A (Budgeted): Air Handler Replacement

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<th>Capital Cost</th>
<th>Operational Savings</th>
<th>Total</th>
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### SCENARIO B: AQUIS Installation

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### SCENARIO B VS. SCENARIO A: Savings for AQUIS Installation Vs. Air Handler Replacement

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<th>Year</th>
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### RESULTS

Net Present Value (NPV): $488,772

Return on Investment (ROI): 667%
SOLUTION CASE STUDY #1

BEFORE

AFTER
Air Handler Plan View

- Air Intake Chamber Floor (CPR-SL)
- Filter Rack
- Filter Chamber Floor (CPR-SL)
- Condensate Pan / Fan Chamber Floor (CPR-1)

Cooling Coil
Condensate Pan Cross Section View

Newly installed drain and trap to facilitate improved drainage

Aluminum angle affixed to floor to divide chamber into 2 separate pitched areas

CPR-1 installed with double pitch at ¼” per linear foot slope to drain
Condensate Pan Side View

- Cooling Coil
- CPR-1 Installation Installed in Condensate Pan
- Side Drain
- Coil Support Beam
• Fouled coils operate well below design performance conditions and are contaminated with pathogen-containing biofilms

• Typical coil cleaning fails to address biofilms deep within coils, providing only a marginal improvement in coil performance

• *AQUIS Coil Restoration* combines a high-performance sanitization process with a unique probiotic technology to clean coils at a microscopic level and unlock like-new system performance
MOISTURE ELIMINATORS

AQUIS Moisture Eliminator mounts directly to discharge of cooling coil.

*Also suitable for air intake applications.
Benefits

- Removes 99% of water droplets at 500 FPM with pressure drop less than 0.1”
- Eliminates carryover moisture that leads to standing water, corrosion, pathogenic growth and saturated filters
- Superior to 3-bend & 6-bend systems with lower cost, higher performance and less maintenance
- 304 stainless steel compact design installs easily and withstands the harshest environments
Contact us to setup an air handler assessment:

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Thank you for you time!