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Ai Group environmental solutions forum - energy efficiency

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# Energy efficient Heating, Ventilation and Air Conditioning (HVAC).

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# Agenda

- What is a HVAC System
- What does HVAC have to do with Energy
- Ideal World versus Real World
- The Silver Bullet
- The Myths
- The Facts
- Common problems
- The Solution

# What is a HVAC System?

- Heating – Boilers, Coils, Heat Recovery, Reverse Cycle
- Ventilation – Fans, Dampers, Building Design (Convection), Windows (automated)
- Air Conditioning (Cooling) – Chillers, Coils, Chilled Beams, AC units, Windows (automated)
- Generic Terms – AHU, FCU, Splits, Ducted Unit, Air Distribution
- It doesn’t really matter what it is made up of – HVAC just moves heat and air around and into / out of buildings

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# HVAC and Energy

- Federal Government ESD Operations Guide – up to 70% of energy consumed in a commercial office building is by HVAC (not lights or PCs)
- Chiller – largest single user of electricity (Commercial)
- Boiler – largest single user of natural gas (Commercial)
- Fans – responsible for around 60% of the HVAC energy used

- HVAC and Energy consumption in buildings are VERY closely linked

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# Ideal World

- 6 Star GreenStar and 5 Star NABERS
- Chilled Beams
- Zoning based on usage and loads
- Tri-generation Plant (Electricity / Heating / Cooling)
- Seasonal Fine Tuning
- Modifications to HVAC every time there’s a layout change
- 8 hour work week
- Free beer
- World Peace

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# Real World

- 1 - 2 Star NABERS Rating
- Old, inefficient Main Plant
- Split Systems
- Common Zones / incorrect Zoning
- No Fine Tuning for 15 years
- Too hot / Too cold
- Draughts
- Poorly positioned sensors
- HVAC layouts that haven’t kept up with office layouts
- Reduced equipment life

# The Silver Bullet!

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# The Silver Bullet!

Maintenance???

Yes – Maintenance

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# That’s good, I’m already getting maintenance!

A ‘maintained’ pump

Image courtesy of Laurie Reeves

- Increased electrical usage (misalignment)
- Increased repair frequency
- Accelerated capital outlay

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# That’s good, I’m already getting maintenance!

A ‘maintained’ filter set

Image courtesy of Laurie Reeves

- Increased electrical usage (dirt introduced to fans / duct / coils)
- Decreased comfort conditions
- Increased Health Risks

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# That’s good, I’m already getting maintenance!

A ‘maintained’ fan

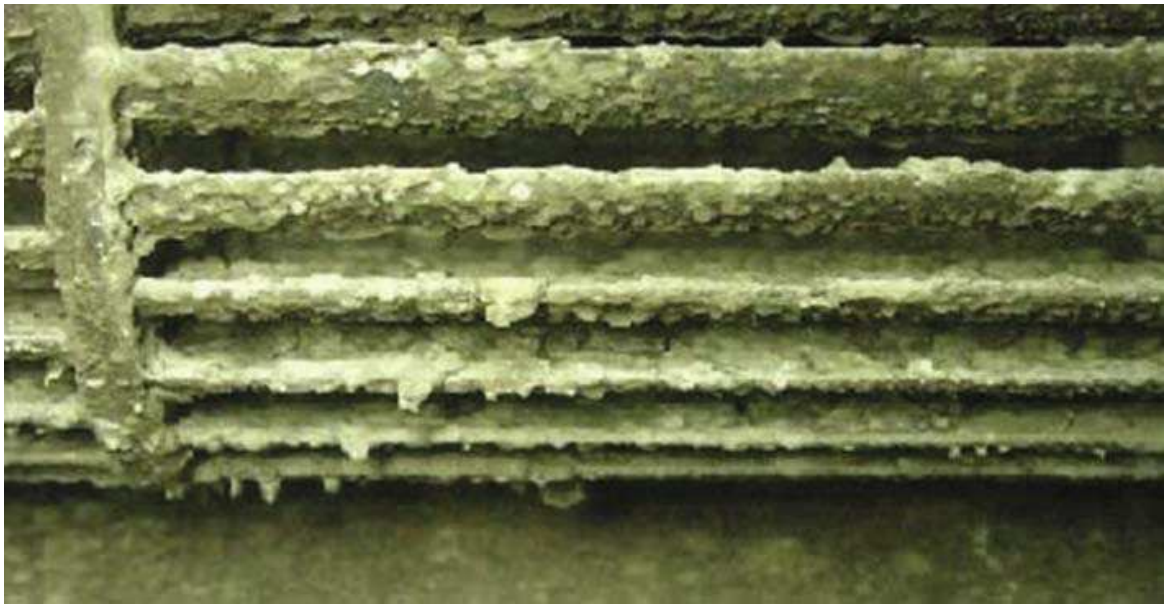

Image courtesy of Laurie Reeves

- Increased electrical usage
- Decreased comfort conditions
- Increased Health Risks

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# That’s good, I’m already getting maintenance!

‘Maintained’ coil

Before Clean

After Clean

Images courtesy of Enviroair

- Increased electrical usage
- Decreased comfort conditions
- Increased Health Risks

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# That’s good, I’m already getting maintenance!

A ‘maintained’ duct

Before Clean

After Clean

Images courtesy of Enviroair

- Increased electrical usage
- Decreased comfort conditions
- Increased Health Risks

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# The Myths

- Company cars run better when you drive them hard and hit gutters with no air in the tyres, no water in the radiator and no oil in the engine
- They washed my car, they've done a good service
- You don't need maintenance / maintenance is too expensive
- No dust on registers = good maintenance
- All maintenance is the same

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# The Facts

- Buildings are designed for 5 1/2 days of operation - does your building's plant operate longer?
- HVAC equipment runs for different time periods = different levels of maintenance
- Dirty Coils increase energy consumption by up to 40%
- Dirty Filters increase energy consumption by up to 30%
- Refrigerant leaks reduce equipment life and increase energy consumption
- Poorly maintained equipment uses more energy
- Maintenance needs to be tailored to the equipment – there's no such thing as an 'off the shelf' maintenance

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# Common ‘savings’ mistakes / Poor long term practices

- ‘Inspect & Test’ Maintenance
- Doing the ‘same’ maintenance on equipment with different usage profiles
- Not replacing filters (washing instead)
- Changing to a cheaper filter type

# The Solution –
# Proactive Preventative Maintenance

What is Proactive Preventative Maintenance?

- Proactive
  - Acting in advance to deal with an expected difficulty
- Preventative
  - Intended or used to prevent or hinder
  - Preventing or slowing the course of an illness or disease
- Maintenance
  - The work of keeping something in proper condition

It is doing the right actions at the right time to prevent increases in avoidable running, repair and replacement costs…

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# Total Cost of Ownership

- Maintenance Cost
- Running Cost (Energy)
- Repair Cost
- Replacement Cost (Embedded Energy)

- True Proactive Preventative Maintenance will most likely increase the first item, but will definitely decrease the final three items

- How much do you spend on repairs and replacement compared to maintenance?

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# Typical v Proactive Preventative Maintenance

Typical maintenance model ( reactive / adversarial);

- Get equipment list
- Submit standard maintenance proposal – win on cheap price
- Inspect equipment
- Test equipment
- Make list of faults
- Repair faults and charge customer
- Replace equipment and charge customer

- Low contract profit, high ‘extras’ profit (need more ‘extras’ to make contract worthwhile) = poor quality maintenance

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# Typical v Proactive Preventative Maintenance

Proactive Preventative Maintenance model (Forward Looking);

- Conduct full site audit and usage profile of equipment
- Construct specific maintenance procedure for equipment
- Prepare Maintenance Proposal – win on content not price
- Inspect equipment
- Test equipment
- Adjust, Lubricate, Tune, Clean, etc. equipment
- Report anticipated issues and suggested rectifications
- Work on long term OPEX and CAPEX plans with customer
- Execute, manage and evolve plan with customer

- Good contract profit, low ‘extras’ content (maintenance profit alone provides profit) = high quality maintenance

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# Advantages - Correctly Maintained Equipment

- Equipment runs to real capacity
  - Conditions are met sooner
  - Unit runs less
  - Less Energy consumed
  - Less ‘Wear & Tear’
- Comfort conditions are maintained
  - Staff happier
  - Increased productivity
  - Less work hours required for result
  - Less energy used
- Less Wear & Tear
  - Equipment replaced less often
  - Capital Amortized over longer periods
  - Less embedded energy

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# Summary

- If you have an existing building – have it recommissioned (based on current usage) and do Proactive Preventative Maintenance
- If you're going to redevelop or build new – hire a consultant, utilise GreenStar (HVAC associated credits) and do Proactive Preventative Maintenance

- **For both long and short term energy efficiency - Proactive Preventative Maintenance is the most cost effective solution!**

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