BMS - Potential for enhanced use of Economy Cycle in temperate climate conditions

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What is Economy Cycle?

› Energy Saving mode of operations of HVAC Systems (Air Handling Units)
› Use of outside air for air conditioning
› It reduces energy consumptions, energy cost and GHG emissions of HVAC Systems
› It improves IAQ (Indoor Air Quality)
› Most frequently controlled by BMS (Building Management system)
How does it operate?

Typical operations of AHUs at HVAC Systems
How does it operate?
Typical Applications?

› Central Chilled Water Plants – AHUs or FCUs

› Larger DX Packaged Units
Economy Cycle - Current Control Strategies

a) Outside Air (O/A) temperature is lower than the air temperature set point for the Economy Cycle (16°C) – cooler air than space air temperatures is used to reduce load of AC compressors – disadvantage of this method is that it overlooks that warmer air can also be utilised if it has less energy than return air.

b) O/A temperature is similar to Supply Air (S/A) temperature (12-13°C) – this strategy severely disadvantages use of Economy Cycle (minimises its operating hours) as it only operates when outside air temperature is close to the Off-Coil S/A temperature.

c) RH of O/A is lower than 60% or if Economy Cycle is within a given operational temperature limits. This approach overlooks that sometimes even higher RH of O/A (say 70%) does not compromise engagement of Economy Cycle, if outside air temperature is in the lower or mid range – 70%RH and 17 deg C.

d) Total energy (enthalpy) of O/A is less than total energy (enthalpy) of R/A – this is the most efficient control strategy (cooling mode).
Economy Cycle – Opportunities for optimisations

Use Economy Cycle for:

- pre-cooling,
- cooling and
- heating.

Control Economy Cycle based on:

- enthalpy or temperature differential of O/A and R/A
- wide O/A temperature limits (5-30 deg C – adjustable)
- wide O/A High and Low absolute humidity limits (adjustable)
- wide space air temperature cooling, heating and dead band temperature bands
- time delays for engagement and disengagement (adjustable)
Economy Cycle – Opportunities for optimisations - Precooling and Cooling modes of operations of Economy Cycle
Economy Cycle – Opportunities for optimisations - Heating mode of operations of Economy Cycle
Economy Cycle – DOs and DON’Ts

DOs:

› Use enthalpy differential control strategy

› Use Economy Cycle for Pre-cooling, cooling and heating

› Provide wide space temperature cooling, heating and dead band ranges, adjusted for various applications

› Provide wide absolute humidity limits of O/A, adjusted for various applications

› Use it as part of Optimum Start BMS Function

› Check regularly calibrations of relevant field sensors

› Check stroking/modulation of O/A and R/A dampers

› Check control sequencing
Economy Cycle – DOs and DON’Ts

DON’Ts:

› O/A based-only strategy
› RH limits of O/A
› Positions of O/A and R/A dampers checked only at BMS
› Small range of O/A temperature limits
› Rarely checked stroking of O/A and R/A dampers
› Rarely checked control sequencing
› Rarely checked torque of the dampers
› Long time delays for engagements and disengagement of Economy Cycle
Q & A