

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

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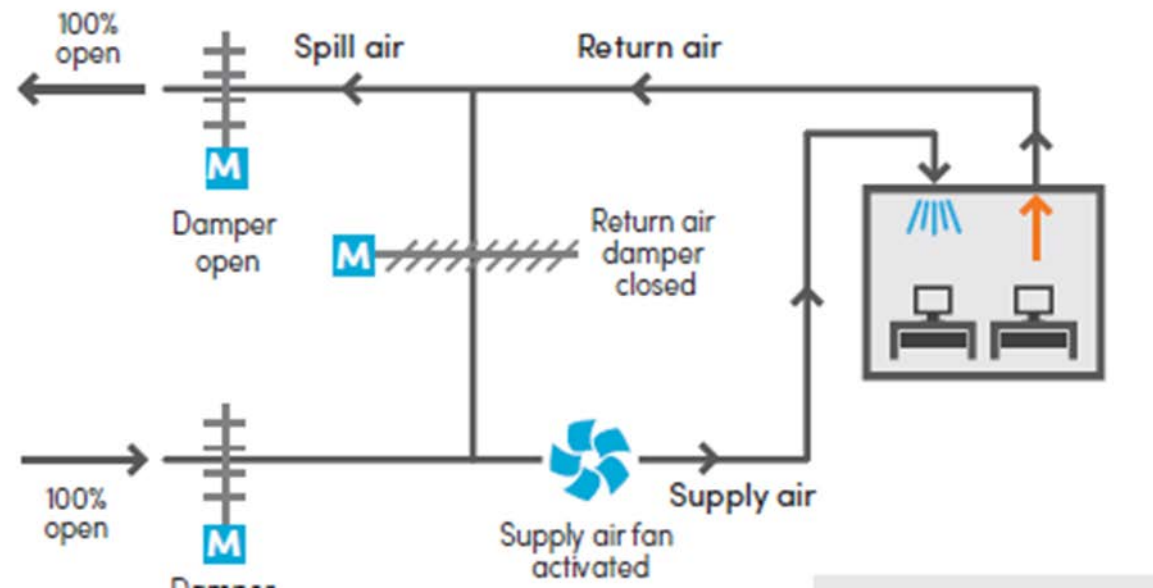


What is Economy Cycle?

- › 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)



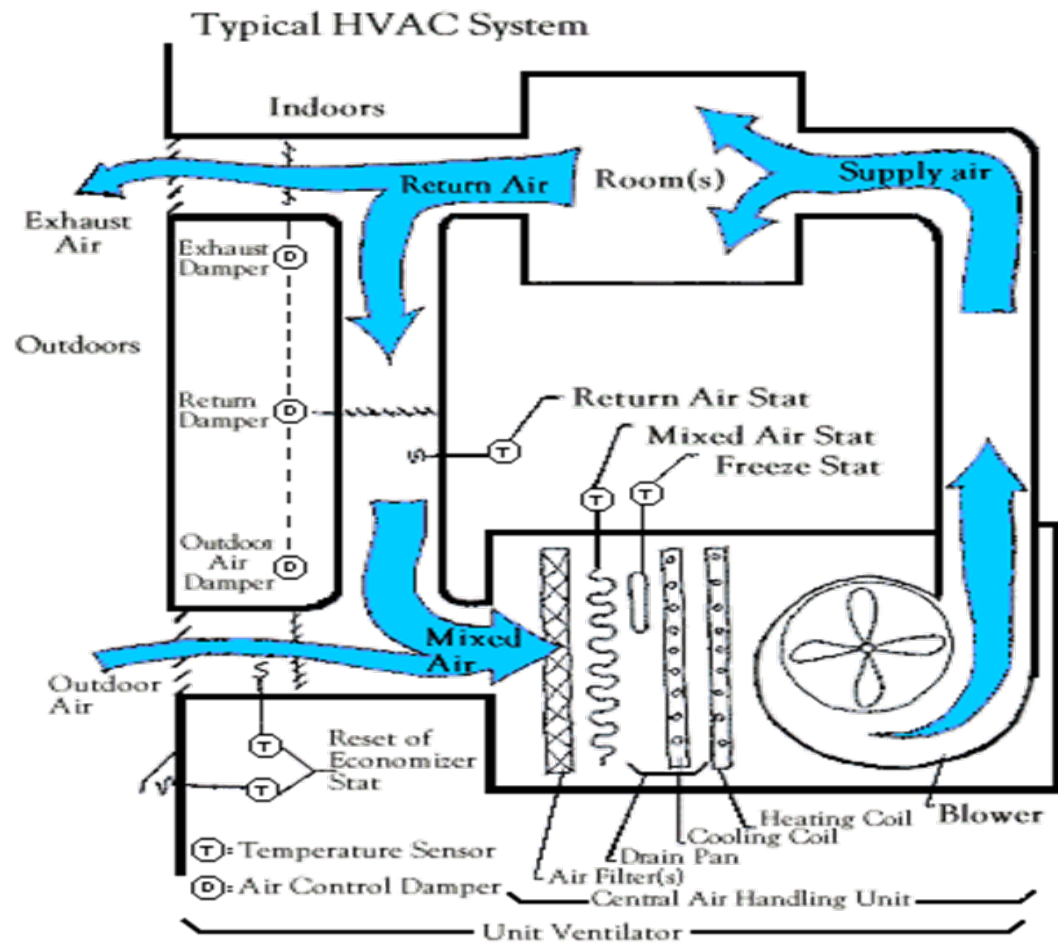
How does it operate?



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:

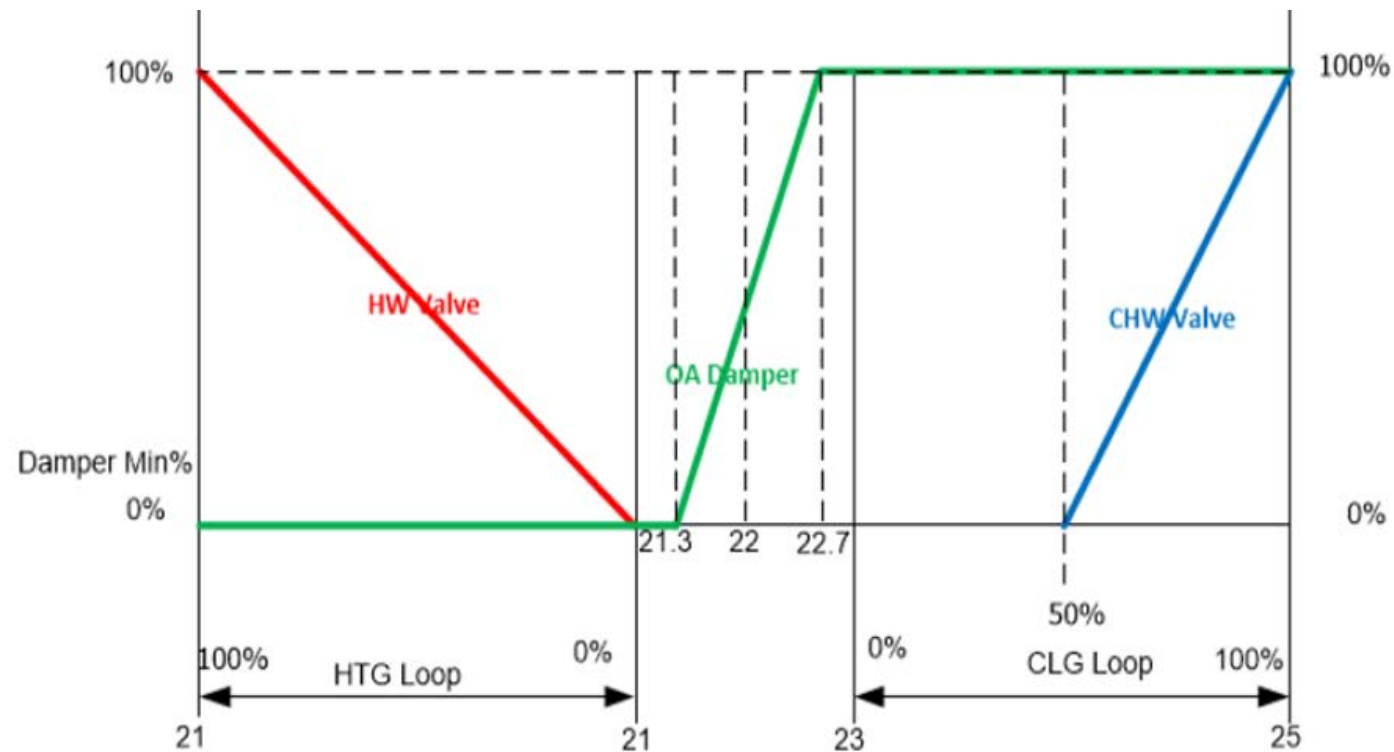
- pre-cooling,
- cooling and
- heating.

Control Economy Cycle based on:

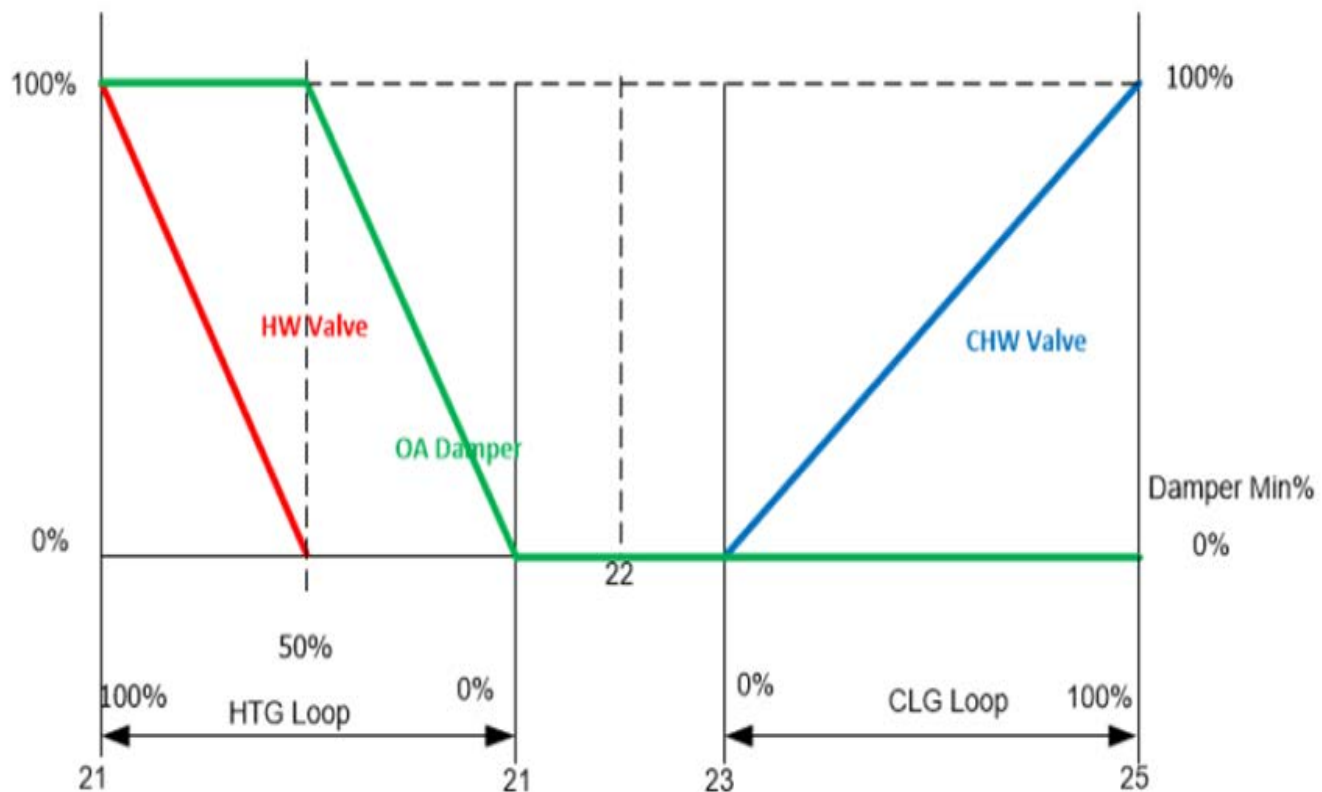
- enthalpy or temperature differential of O/A and R/A
- wide O/A temperature limits (5-30 deg C – adjustable)
- wide O/A High and Low absolute humidity limits (adjustable)
- wide space air temperature cooling, heating and dead band temperature bands
- time delays for engagement and disengagement (adjustable)



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

