Claims

1. A method of operating a building environment management system (BEMS) comprising:

a) obtaining zone environmental sensor data and zone set-points for each of two or more zones in a building;
b) computing, for each zone, a request for a minimum cooling/heating air supply rate to meet the zone set-points;
c) communicating the request for each zone to a scheduler;
d) receiving, at the scheduler, the request for each zone and energy efficiency data on one or more components of the BEMS;
e) balancing the requests against energy consumption of the one or more components of the BEMS for a subsequent time period;
f) calculating an air supply strategy based on the balancing of step e), the air supply strategy comprising a cooling/heating air supply allocation for each zone in the subsequent time period to minimise the energy consumption of the one or more components, while aiming to satisfy all zone set-point requirements; and
g) controlling the BEMS to deliver the allocation of step f) to each zone.

2. The method according to claim 1, wherein the one or more components of the BEMS comprises an air handling unit.

3. The method according to claim 2, wherein the one or more components of the BEMS further comprises a fan and/or damper associated with the air handling unit.

4. The method according to any preceding claim, wherein the one or more components of the BEMS comprises a chiller or heater.

5. The method according to any preceding claim, further comprising repeating steps a) to g) at pre-defined time-intervals.

6. The method according to any preceding claim, further comprising repeating steps a) to g) when zone environmental sensor data reaches a pre-defined value.

7. The method according to any preceding claim, wherein each request conveys an amount of cooling/heating required and an urgency of the request.

8. The method according to any preceding claim, wherein the requests are determined for multiple time periods.

9. The method according to claim 8, wherein the multiple time periods of the requests have a common start time and different end times.

10. The method according to claim 4, further comprising accounting for a coefficient of performance of the chiller/heater when minimising the energy consumption.

11. The method according to any preceding claim, further comprising accounting for air duct design constraints when minimising the energy consumption.

12. The method according to any preceding claim, wherein the zone set-points are determined by thermostat settings.

13. A building environment management system (BEMS) comprising:

a) two or more zone modules configured to:

i. obtain zone environmental sensor data and zone set-points for each respective zone;

ii. compute a request for a minimum cooling/heating air supply rate to meet the zone set-points within each respective zone; and

iii. communicate the request for each respective zone to a scheduler;

and

b) a scheduler configured to:

i. receive the requests for each zone and energy efficiency data on one or more components of the BEMS;

ii. balance the requests against energy consumption of the one or more components of the BEMS for a subsequent time period;

iii. calculate an air supply strategy based on the balance of step b) ii, the air supply strategy comprising a cooling/heating air supply allocation for each zone in the subsequent time period to minimise the energy consumption of the one or more components, while satisfying all zone set-point requirements; and

iv. control the BEMS to deliver the allocation of part iii) to each zone.

14. The system according to claim 13, further comprising zone sensors for obtaining the zone environmental sensor data which comprises one or more of temperature, air pressure, carbon dioxide (CO_2) concentration, humidity, occupancy, status of windows, and status of doors.

15. The system according to claim 13 or 14, further comprising a communication network infrastructure for communication between each zone module and the scheduler.

16. The system according to any one of claims 13 to 15, wherein the BEMS is configured to adjust damper or fan settings to regulate a flow of cool/hot air to the zones.

17. The system according to any one of claims 13 to 16, wherein each zone module comprises one or more mathematical models configured for predicting environmental conditions within the zone.

18. The system according to claim 17, wherein the models comprise forecasts of one or more of weather, cooling/heating load, zone set-points, and occupancy.