Claims

1. A heating, ventilation, air conditioning and refrigeration (HVACR) system including a single unit optimizing controller capable of operating the HVACR system, at least one cooling unit and at least one sensor for sensing a unique output of the HVACR system, the controller including:

a communications section for communicating with one or more remote controller terminals; and

a control section operatively associated with the HVACR system for selectively activating or deactivating the at least one cooling unit based on one or more settings received from the remote controller terminal via the communications section;

wherein the controller is responsive to the at least one sensor such that the selectively activating or deactivating the at least one cooling unit is influenced by the at least one sensor; and

characterised in that the at least one sensor includes a biofilm growth sensor for sensing biofilm growth in a water cooling tower and/or a water circuit of the HVACR system.

2. A HVACR system according to claim 1 wherein the at least one cooling unit includes a chilled water system having water circulation through a cooling coil and a fan for directing air across the cooling coil, wherein the control section selectively controls one or more of: the circulation flow rate; and the fan speed.

3. A HVACR system according to claim 2 wherein the biofilm growth sensor is connected to the control section.

4. A HVACR system according to claim 3, further including at least one further sensor for sensing an output of the HVACR system wherein the at least one further sensor includes one or more of: a current transformer for measuring system current and for control, measurement, and system functionality, and operation and alarming purposes; a temperature sensor for measuring the system temperature; a pressure sensor for measuring the pressure drop across a filter of the HVACR system and/or the cooling coil; a flow sensor for measuring a water flow rate through the chilled water system; and/or a humidity sensor for measuring the system humidity.

5. A HVACR system according to any one of the preceding claims wherein the HVACR system includes a plurality of additional sensors each for sensing a unique output of the

HVACR system, the controller responsive to the additional sensors such that the selectively activating or deactivating the at least one cooling unit is influenced by one or more of the plurality of additional sensors, wherein the plurality of additional sensors includes one or more of: a temperature sensor; a pressure sensor; and/or a flow sensor.

6. A HVACR system according to any one of the preceding claims wherein the communications section includes at least one communications port for enabling external connection to the one or more remote controller terminal, wherein the one or more remote controller terminal is preferably a computer capable of running control software configurable to operate the HVACR system to enable the desired functioning of the controller and systems.

7. A HVACR system according to any one of the preceding claims wherein the control section includes at least one I/O points, preferably up to 8 I/O points, more preferably up to 32 I/O points.

8. A HVACR system according to claim 6 or claim 7 wherein the HVACR system includes one or more of the group including: a single compressor; a multiple compressor; a chiller for an air conditioning system; a chiller for a refrigeration system; an inverter system, and a variable refrigerant flow (VRF) system, wherein the controller has a footprint of approximately 80mm by 80mm.

9. A HVACR system according to any one of the preceding claims wherein the HVACR system includes a plurality of cooling units and the controller is able to simultaneously control each of these cooling units, wherein at least one of the plurality of cooling units is preferably a different type of unit to at least one other of the cooling units.

10. A method for reducing the energy usage of an HVACR system including at least one cooling unit having at least one evaporator coil, the method including:

providing an optimizing controller for controlling the functioning of the HVACR system, the optimizing controller including a communications section for communicating with one or more remote controller terminals and a control section operatively associated with the HVACR system for selectively activating or deactivating the at least one cooling unit based on one or more settings received from the remote controller terminal via the communications section; and

providing a coil treatment to the at least one evaporator coil, such that the use of the controller in conjunction with the coil treatment reduces the energy usage of the HVACR system by over 15%, preferably over 18%, more preferably over 20%,

characterised in that the coil treatment includes:

i) a first enzymic cleaning step comprising contacting the coil with an enzymic cleaning solution to provide a cleaned coil; and

ii) a second step comprising coating the cleaned coil with a biostatic polymeric coating.

11. A method according to claim 10 wherein the enzymic cleaning solution comprises one or more of a protease, amylase, cellulase or lipase.

12. A method according to claim 10 wherein the enzymic cleaning solution comprises a protease and a biostatically effective phenoxyalcohol.

13. A method according to claim 10 wherein the enzymic cleaning solution comprises a protease, a water soluble glycol ether solvent and at least one anionic hydrotrope such as an alkali metal alkylarylsulfonate.

14. A method according to claim 10 wherein the enzymic cleaning solution comprises one or more enzymes (for instance a protease and an amylase), a biocidal quaternary ammonium biocide, and an anionic hydrotrope.

15. A method according to any one of the preceding claims 10 to 14 wherein the biostatic film comprises a phenolic biocide and polyvinylpyrrolidone or polyvinylpyrrolidone polymers or copolymers, such as acrylic copolymer based compositions, methacrylic copolymer based compositions, vinyl copolymer based compositions, epoxy resins, epoxy esters, and mixtures thereof.

16. A method according to any one of the preceding claims 10 to 14 wherein the biostatic film comprises a polyvinylpyrrolidone/polyvinylacetate copolymer complexed with triclosan.

17. A method according to any one of the preceding claims 10 to 14 wherein the biostatic film comprises a quaternary ammonium biocide and a compatible polymer, such as polyvinyl alcohol, or a half ester of maleic anhydride/alkylvinylether copolymer complexed with a quaternary ammonium biocide.