02.04.02 TECHNICAL SPECIFICATION – IAQ, Penetrate & Treat

Office Indoor Air Odor, Microorganism & Chemical Pollutant Destruction System to Enhance Indoor Air Quality (IAQ) & Reduce Sick Building Syndrome (SBS)

1. Continuous movement of staff, visitors & guest coming from outside world, increases the microbiological contaminations in the indoor atmosphere & due to the same air being circulated in AHUs it can result in cross contaminations. At the same time chemicals from paint, glue, varnish, furniture, synthetic material, contributes to VOCs & Formaldehydes. Cleaning & pest control chemicals continuously add toxic fumes in indoor atmosphere. These pollutants cannot be treated or diluted by limited fresh air in conventional comfort air conditioning. Any other technology which is not effective on all three aspects of indoor air pollutant like UVGI or UVC are not permitted. **First requirement is to treat all three physical, chemical & microbiological pollutants with single system.**

2. An advance **"ECOBOI"** indoor air & surface treatment technology should be implemented to treat indoor circulating air, to safeguard all occupants from physical, chemical & microbiological pollutants. Where ECO stands for "Electro Chemical Oxidant" & BOI stands for "Bipolar Oxygen Ions". The technology should be such that entire occupied & non occupied atmosphere should continuously be present with ECO+BOI. This is to prevent any subsequent cross contaminations & generation of chemical pollutants anywhere in indoor space. Also to have effective disinfection CT value, contact time with oxidant should be in excess of 30 minutes. Any methodology having contact time less than 30 minute is not permitted. **The Second requirement is to have ECO & BOI present in indoor atmosphere & blend in entire atmosphere of the occupied space, AHUs, false ceiling, full ductwork & should remain 24 x 7.**

3. Source of chemical pollutant are not visible & physically accessible, since they are emitted in gaseous form from within building materials, furniture, paints, POP, glue, adhesive, etc. so chemical pollutants should be treated at the source of their origin. Use **"Penetrate & Treat"** treatment philosophy, where treatment ECOBOI, to be blended in ambient room air & reach every parts & furniture in the room & remain 24 x 7. Any treatment which is only happening near the limited distance, near place of installation & not happening in other places like occupied spaces & ductwork like UVGI is prohibited. **The third requirement is that, treatment should deep penetrate the source of pollutant origin & remove it.**

4. Microorganisms hide & multiply inside a protective Extracellular Polymeric Substance(EPS), called Biofilm. These biofilms time to time keep bursting & releasing pathogenic disease causing germs all over the occupied space. These biofilms grow under favourable conditions & are difficult to be wiped off with normal surface cleaning. Also, they grow inside electronic equipment, near light fittings, duct work, AHUs where they find hot & humid conditions. Most of the biofilms are on the ceiling, walls, within the space of the office furniture, POP, false ceiling etc. Since any type of filters or UVGI cannot be effective at source of contamination, are not permissible. **The fourth requirement is to effectively remove & further prevent formation of Biofilm at their source of formation.**

5. The return air carries the pollutant chemicals & airborne germs, so it has to be treated. AHU coils & filters are the breeding ground for germs, so AHU should also be filled with oxidant & supply air should carry the oxidant all over the occupied space so it should also be injected with oxidant. **The fifth requirement is of multipoint injection system for comprehensive performance, that is one in return air, second within AHU & third in supply air.**

6. Indoor spaces are filled with various sizes of organic & inorganic Suspended Particulate Matters (SPM) & bacteria & viruses use these SPMs as a medium to stay over them & travel all over the indoor spaces. These particles range from few microns to sub-micron(< 1.0micron) in size, to be trapped in air filters in AHU. These particles pass through the pores of air filter & along with them the bacteria & viruses. These submicron to nano particles are electrically charged to repel each other & can remain in indoor space in suspended conditions for extremely long period of time. The system should have capability of production of electrically positive & negative ions, which can polarise the surface charge of SPMs. **The sixth requirement is to neutralise the surface charge of SPMs & agglomerate such that either they become denser & settle to ground or gets trapped in AHU filters.**

7. The system should be with CE marked PLC based logic such that occasionally, occupied space can be treated with night time non occupancy programmable booster mode. During this mode of operation, a safe booster dose to be circulated for deep air & surface cleaning. **The seventh requirement is, system to have programmable booster mode for deep germs cleaning & chemical oxidation.**

8. In Air Handling Units (AHUs), return air & outside fresh air blends at the inlet & pass through series of air filters. These filters are the source of dust & breeding ground for bacteria. **The eight requirement is to have continuous presence with injection of concentrated disinfectant in the return air prior to air filters.**

9. In "Penetrate & Treat" technique, the penetrate plays significant role in treatment. The system should be designed on following critical criteria:
    a. Plan view with height of the occupied space with cabins, washrooms, lobbies, corridors, etc.
    b. Duct layout covering all areas of cabins, wash rooms, lobbies, corridors, AHU rooms, etc.
    c. Average occupancy of the staff & visitors.
    d. CFM of Supply Air.
    e. CFM of the exhaust air blower (if applicable).
    f. CFM of the fresh air (if applicable).
    g. Air changes per hour [ACPH].
    h. Present methods of air treatment.

10. The Concentration, dose & selection of appropriate model should strictly be as per ECOBOI projection software **"PROSOFT"** or as per selection chart provided by the authorised representative of the company.

11. The Oxidant & ions production & use should comply the permissible limits by OSHA, USEPA, NIOSH, WHO, ASHRAE, ACHIH & International Chemical Safety Card (ICSC).

12. Recommended to install 24 x 7 online ambient safety level monitoring & interlock with the ECOBOI reactor, which can sense & control operation automatically.

13. The ECO & BOI reactor should be sealed to prevent any dirt formation on the electrodes & frequency of ECO reactor cleaning should be once in 5,000 working hours. Open plate type electrodes or UV glass envelop are strictly prohibited, since they get covered with the dust & keep varying generation & need frequent cleaning.

14. The operation of the system should be 24 x 7, continuous industrial type. The system output can be adjustable type from 0 % to 100% using onboard PLC. Also system should have power booster mode for deep cleaning. The IAQ treatment system be protected from over heat burning protection with programmable PLC based precise operation resting time feature.

15. Replacement frequency of the ECOBOI reactor should be minimum 10,000 working hours, with continuous operation. Also, the life span should have monitored & indicated with operational time digital counter. Life span of the ECOBOI should be minimum 10 years.

16. Any part of the system should not hamper the flow of the air, by creating obstruction in a way. This means no part of the treatment should be installed within AHU or ductwork. Only diffuser fixture to be connected from outside duct to connect the ECOBOI carrying flexible tube.

17. The ECOBOI reactor, associated accessories & control panel can be floor, ceiling or wall mounted.

18. The MOC Of the ECOBOI reactor enclosure should be EC Marked/certified. And power supply should have EMI/RFI interference suppressor with surge & spike protection.

19. The system should be protected from any formation of moisture or water condensation. When the system is integrated along with AHU, it is strongly recommended to install moisture trap or back flow preventer in the outlet with visible indication of water.

20. Any part or component of the system should not contain mercury or any environmentally hazardous material.

21. The entire system should be energy efficient design having low power consumption of 15 W / 2,000 cfm.