Nevco Engineers Private Limited

Be a part of Solution

not Pollution

COVID VIRUS

The less said the better. This virus being a pandemic is claiming large number of lives and this made us do lots of work to find some solutions for benefit of mankind. Some very interesting observations are being put forward in this presentation for control of spread of this deadly virus.

INDOOR RISKS

Lots of studies have shown that very large number of this Corona virus transmission is indoors instead of outdoors. This is primarily in rooms or halls which are poorly ventilated and if the infection comes in , it starts effecting every persons present. A very urgent need is there to find some ways to reduce this spread because there are large number of banquet halls , gyms , malls , offices where this spread of virus can take place.

The issue becomes

How much are you inhaling of what others in room are exhaling?

How much is dilution of everyone's exhale ?

How much of everyone's exhale is being ventilated ?

GOVT. GUIDELINES
LIMITING NUMBER OF PERSONS PRESENT

Most state govt. guidelines have specified as of now to limit number of persons present in any banquet hall or offices. In most guidelines this has been specified as 50 or 100 numbers in a banquet hall.

There is a catch here. If a big hall is very well ventilated and small hall is poorly ventilated , where is more risk ?? For example – A 1000 sq feet of hall with 80 people present having very excellent ventilation and same 5000 sq ft hall having same 50 persons with very poor ventilation? Which hall should be in operation ?Answer is a hall which is well ventilated.

GOVERNMENT OF INDIA ADVISORY

Govt. of India last week came out with an advisorhttps://www.psa.gov.in/innerPage/psa-initiatives/stop-transmission-crush-pandemic/2956

Titled : Stop the Transmission, Crush the Pandemic.

The following is first paragraph of this advisory says :--

The advisory highlights the important role well-ventilated spaces play in diluting the viral load of infected air in poorly ventilated houses, offices etc. Ventilation can decrease the risk of transmission from one infected person to the other.

Just as smells can be diluted from the air through opening windows and doors and using exhaust systems, ventilating spaces with improved directional air flow decreases the accumulated viral land in the air, reducing the risk of transmission.

GOVERNMENT OF INDIA ADVISORY

With summers ON , rooms airconditioned with all windows / doors of any room or hall closed.

Question is --- How does one check on space being well ventilated ?

HOW TO CONTINUOUSLY CHECK IF THE HALL IS VERY WELL VENTILATED AND SPREAD OF COVID IN REDUCED ?

ANSWER

CO2 MEASUREMENTS

A human exhales CO2 while breathing. So if there are some people is a hall which has poor ventilation , levels of CO2 will increase and in well ventilated room , it will be reduced.

International standards on outdoor CO2 is 400 ppm and several studies have recommended indoor CO2 to be 800 ppm or less. Following slides gives recommendations of Center of Diseases Control – CDC of US.

UK GOVT. HEALTH AND SAFETY EXCUTIVE DEPT.

"The Health & Safety Executive (HSE) suggest the use of CO2 monitors to identify poorly ventilated areas to help reduce the risk of COVID aerosol transmission". Please see their web site https://www.hse.gov.uk/coronavirus/equipment-and-machinery/air-conditioning-and-ventilation/identifying-poorly-ventilated-areas.htm

On S.No.2 it is specified under heading Ventilation and air conditioning during the coronavirus (COVID-19) pandemic

You may wish to use carbon dioxide (CO2) monitors. Checking CO2 levels will help you decide if ventilation is poor

RECOMMENDATIONS OF CENTRE OF DISEASES CONTROL (CDC) OF US

Whole world follows what they recommend
https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html

See FAQ under question – Can carbon dioxide (CO2) monitors be used to indicate when there is good ventilation ?

The answer to this question is detailed but the following as written in answer is important:--
First line answer is -- Carbon dioxide (CO2) monitoring can provide information on ventilation in a given space, which can be used to enhance protection against COVID-19 transmission.

BENCHMARK ON CO2 INDOOR LIMITS AS SUGGESTED BY CDC

In the same question as written in previous slide , the following is written:

One potential target benchmark for good ventilation is CO2 readings below 800 parts per million (ppm). If the benchmark readings are above this level, revaluate the ability to increase outdoor air delivery. If unable to get below 800 ppm, increased reliance on enhanced air filtration (including portable HEPA air cleaners) will be necessary. Once the benchmark concentrations are established, take periodic measurements and compare them to the benchmarks. As long as the ventilation airflow is unchanged (outdoor air or total air) and the occupancy capacity is not increased, future portable CO2 concentrations that are 110% of the benchmarks indicate a potential problem that should be investigated. Under the pandemic response, a pragmatic application of portable CO2 measurement tools is a cost-effective approach to monitoring building ventilation.

THEREFORE, GOING BY CDC RECOMMENDATIONS , CO_2 IN ANY HALL/ROOM WITH ANY NUMBER OF PEOPLE SHOULD BE LESS THAN 800 PPM.

MAINTAINING THIS LIMIT CAN SAVE LIVES BY REDUCING SPREAD OF INFECTION.

STUDIES DONE BY Office for Novel Coronavirus Disease Control

Cabinet Secretariat, Government of Japan

Under study done on Monitoring carbon dioxide concentration in a room as an indicator of ventilation the following is specified :--

ISSUE:

There is no clear knowledge on how to ventilate air-borne particles to prevent from being infected with coronavirus although how to prevent from the virus for two transmission routes via close contact and surface fomite is relatively well-known.

SOLUTION:

Exhaled air includes carbon dioxide (CO2). So, by measuring the concentration of CO2 in a room, the quality of air and ventilation situation are known. Thus, using a CO2 sensor, people can manage ventilation so that CO2 level remains at a desired low level.

Studies done by University of Colorado at Boulder under

Carbon dioxide levels reflect COVID-19 risk

Research confirms value of measuring carbon dioxide to estimate infection risk -- https://www.sciencedaily.com/releases/2021/04/210407143809.htm

Tracking carbon dioxide levels indoors is an inexpensive and powerful way to monitor the risk of people getting COVID-19, according to new research from the Cooperative Institute for Research in Environmental Sciences (CIRES) and the University of Colorado Boulder. In any given indoor environment, when excess CO2 levels double, the risk of transmission also roughly doubles, two scientists reported this week in Environmental Science & Technology Letters.

"You're never safe indoors sharing air with others, but you can reduce the risk" said Jose-Luis Jimenez, co-author of the new assessment, a CIRES Fellow and professor of chemistry at the University of Colorado Boulder.

"And CO2 monitoring is really the only low-cost and practical option we have for monitoring" said Zhe Peng, a CIRES and chemistry researcher, and lead author of the new paper. "There is nothing else."

International limits of CO2 present indoors are as follows

250-400ppm	Normal background concentration in outdoor ambient air
400-1,000ppm	Concentrations typical of occupied indoor spaces with good air exchange
1,000-2,000ppm	Complaints of drowsiness and poor air.
2,000-5,000 ppm	Headaches, sleepiness and stagnant, stale, stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may also be present.
5,000	Workplace exposure limit (as 8-hour TWA) in most jurisdictions.
>40,000 ppm	Exposure may lead to serious oxygen deprivation resulting in permanent brain damage, coma, even death.

See international views at

https://www.youtube.com/watch?v=4EogrKJ6uTM

https://news.yahoo.com/co-2-monitors-can-help-prevent-the-spread-of-covid-19-experts-say-220455208.html

https://chicago.cbslocal.com/2020/10/29/are-restaurants-really-covid-19-super-spreaders-data-arent-specific-enough/

SOLUTIONS

The following CO2 instruments are available which are very affordable priced

1. CO2 indicator with alarms
2. CO2 Controller
3. CO2 Transmitter

CO2 indicator with alarms

This instrument is very affordable and costs around Rs.6,000. Ideal for use in residential house rooms having air conditioning.

A must for bedroom of children because prediction is of 3rd wave which will effect children and everything possible MUST be bone to prevent transmission. The moment alarm sounds , ventilation must be done by opening windows.

Besides Corona transmission , this if installed in children room will also increase their concentration in studies. Medical science says higher the CO2 , concentration gets reduced.

CO2 Controller

This is advanced version and besides measuring CO2 , Humidity and RH has also the ability to switch ON automatically exhaust fan when limit crosses 1000 ppm.

Priced at around Rs 18,000/ this is ideal for installation in places like banquet halls , gyms , saloons , malls , conference rooms , offices where multiple people sit in one room/hall.

CO2 Transmitter

This instrument has output as RS 485 and can be connected to modem for data transfer. Similar exercise is being done by state pollution control Boards for pollution parameters data transfer.

Limits of 1000 ppm can be put and sms alerts are provided above this.

Data is continuously sent to server.

Cost of this complete system with data transfer is around Rs 75,000

Actual Measurement of CO2 in Conference Hall

https://youtu.be/Ydp3tFoO5nQ

Actual Measurements of CO2 in Office Room

https://youtu.be/CRPsi6O8mfE