From pandemic to business-as-usual in 60 days, best practices from China

Louie Cheng

PURELIVING
Indoor Environmental Solutions

Introduction

Louie Cheng

President PureLiving Indoor Environmental Solutions

Louie is President and founder of PureLiving, an indoor environmental health and safety consulting firm and the director of the China chapter of the Indoor Air Quality Association. With offices in Shanghai, Beijing, Chengdu, Hong Kong, and New Delhi, PureLiving provides a total range of solutions including pollutant testing, design and installation of cutting-edge filtration systems, monitoring, and odor and chemical reduction.

Louie has over 22 years of experience in the scientific and consulting fields in the US, Europe, and Asia. In his role, he manages all aspects of the business, including strategy, marketing, finance, HR, sales, and business development. He has personally conducted or supervised over 2000 successful indoor environmental consulting projects in China, and over one-third of the largest 100 companies in China are among their clients.

Previously, Louie was the Asia-Pacific Director of Strategy and Business Development for Thomson Reuters' Healthcare and Science business. Before that he was a Managing Consultant with IBM’s Strategy & Change practice.

He began his professional life in the US Army as an enlisted soldier and is a Lieutenant Colonel in the Army Reserves. His roles have included: tank platoon leader, mortar platoon leader, chemical officer, combat engineer, and operations officer.

PURELIVING
Indoor Environmental Solutions

- China's first indoor environmental quality consulting and engineering company
- Turnkey approach: Assess, Design, and Implement Solutions and Monitoring
- Over 8000 Projects completed in China
- Advisor to over 35% Fortune 100 companies in China
- IAQA China Chapter Founder; BOMA Official Trainer, IFMA Member
- WELL/ASHRAE/LEED APs

* Services cover by SHANGHAI office

IAQA MA U.S. GREEN BUILDING COUNCIL LEED USGBC ASHRAE CIE IFMA International Facility Management Association BOMA International

Engineering CLEAN Environments

PureLiving's Roots are in Nuclear, Biological, and Chemical Defense

The new normal

Observations Three Months Later

- COVID-19 response has been reactive and focused on point solutions instead of holistic program implementation due to lack of awareness about transmission routes
- Because of this, building owners and companies cannot easily measure defense effectiveness and face high risk if “second wave” of reinfection hits
- Public and staff are hesitant to re-enter public spaces which is a pre-requisite to business recovery
- Commercial facilities have seen a noticeable downturn
- High risk transmission facilities such as healthcare particularly hard hit
- Emerging opportunities to market health and safety – look to air quality as the precedent

Any COVID Defence Program Must Consider Transmission Methods

Direct

Indirect

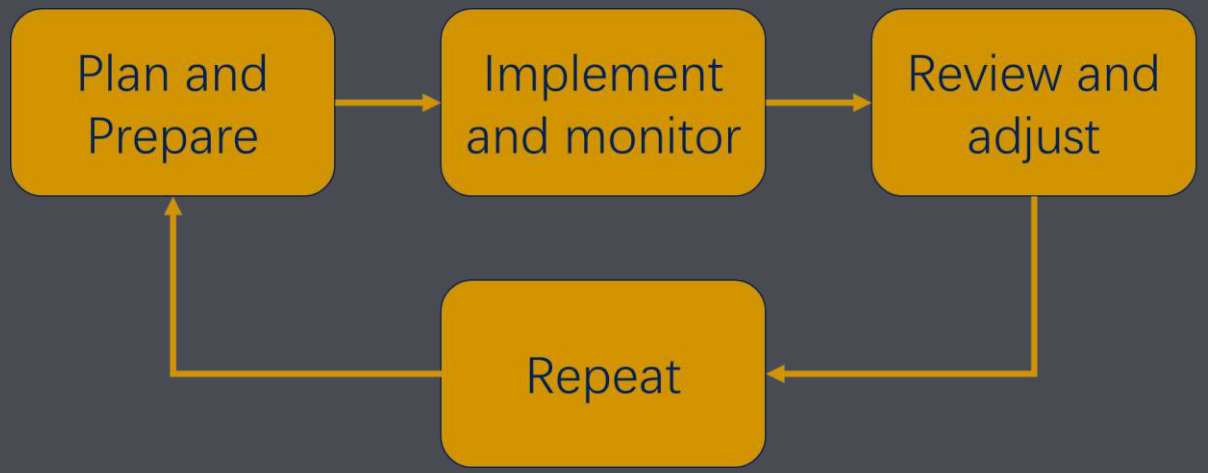
(Fomite transmission)

Bio-Aerosol

What can your facility do to prepare?

Gap Analysis Assessment

1. Protection for individuals
2. Building Infrastructure
3. Performance Auditing and long term management



Coronavirus Risk Assessment			
Protection level	**Are you providing individuals…**	**Does your Company Policy Consider…**	**Are your Building Systems….**
Excellent	• N95 or higher masks have been issued to staff • Hand sanitizer for each staff member • Timely information released with latest updates from official sources	• Mandatory hand washing/sanitizing at entry points with controls to check • Disinfectant foot bath at entry points with controls to check • Cleaning conducted throughout the day using virucidal disinfect ant • Recirculating filtration systems in place • CO2 & PM levels monitored with system control over ventilation and filtration • ATP testing to check quality of hygiene • HR policies to identify at-risk individuals and preventing them from entering space	• Public areas such as elevators are regularly sanitized throughout the day • HVAC systems are installed with HEPA and/or BPI / Electronic media • Ventilation is maximized • Temp and RH is >24°C and RH is 50-65% • Positive pressure is established • Systems have been regularly maintained
Good	• Surgical or dust masks have been issued to staff • Hand sanitizer in office area but not for individuals	• Hand washing/sanitization stations but no mandatory requirements to wash • Cleaning conducted with non-virucidal solutions	• HVAC systems have F7 (MERV 12) or higher filtration installed • Ventilation rate is 30m3/hr per person • Temp and RH is maintained as per AHSRAE 62.1 • Systems have been periodically maintained
Need to Improve	• No masks provided to staff • No hand sanitization	• Staff are advised to wash hands but no control measure in place to validate • Cleaning is being conducted but schedule or methodology is not known	• HVAC systems have some level of filtration, but grade is not known • It is not known when systems were last maintained

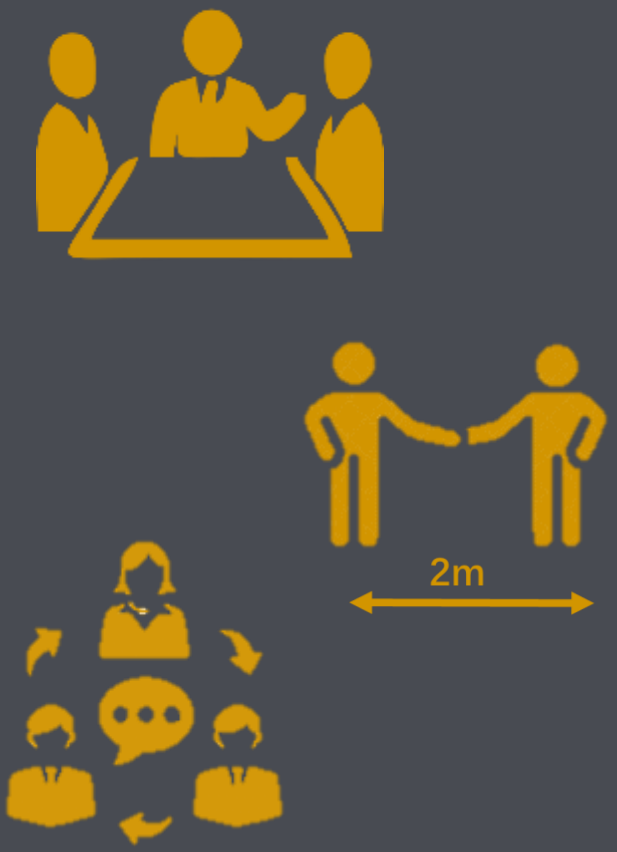
Facility Defences

PPE

- Masks
- Hand Sanitizer
- Information logging

Entry Controls

- Limit entry points
- Mandatory hand sanitizing
- Personnel screening



Personnel

- Reduced occupancy
- Rotating shifts
- Communication plan

Facility Defences

Facility Operation

- Regular disinfection
- Adjust system operation

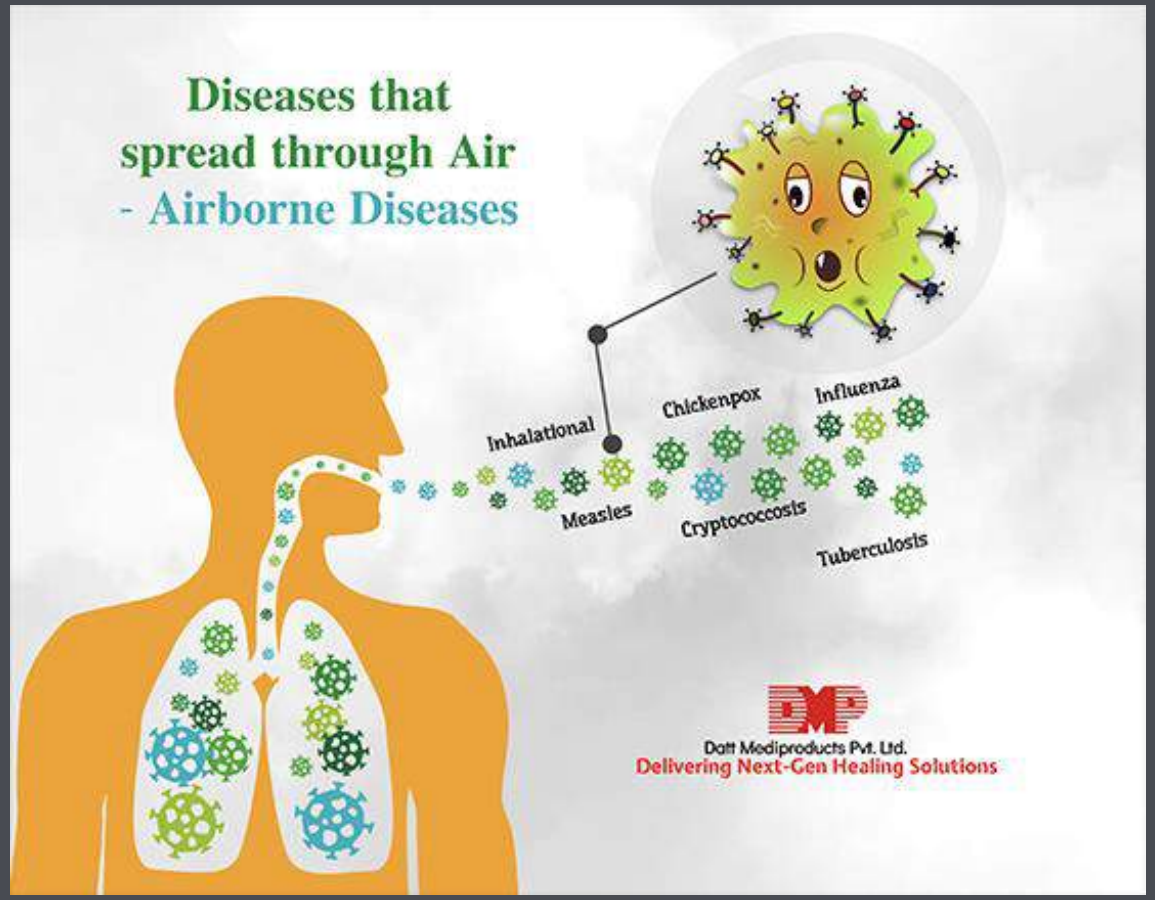
HVAC Optimization

- Maximise ventilation and restrict multi-zone recirculating systems
- Humidity between 50-65%

Validation & Verification

- Real time monitoring
- Communication plan

Increasing evidence of airborne transmission



REUTERS

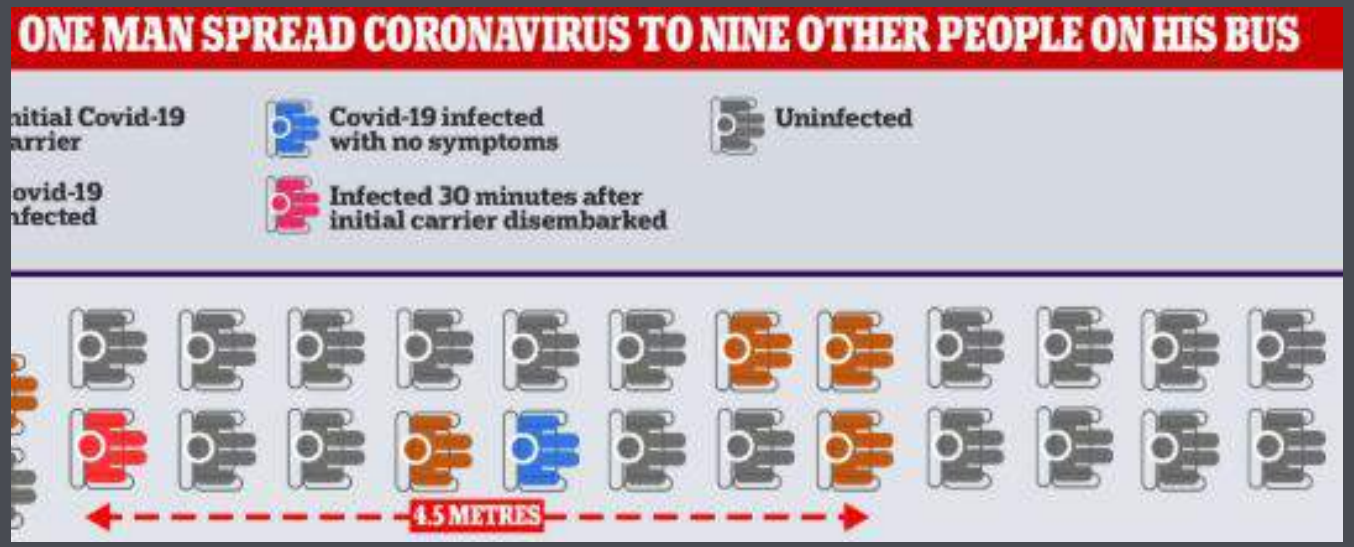
RCH 11, 2020 / 9:25 AM / 9 DAYS AGO

South Korea reports jump in coronavirus cases after call centre outbreak

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Evidence of Airborne Transmission of the Severe Acute Respiratory Syndrome Virus



Air Conditioning

- General Air Conditioning, maximise ventilation

- Target 30m3/hr per person CO2 <1000ppm (NL: 60 m3/h; 800 ppm)

- Restrict systems which recirculate air between different zones

- Open windows if required

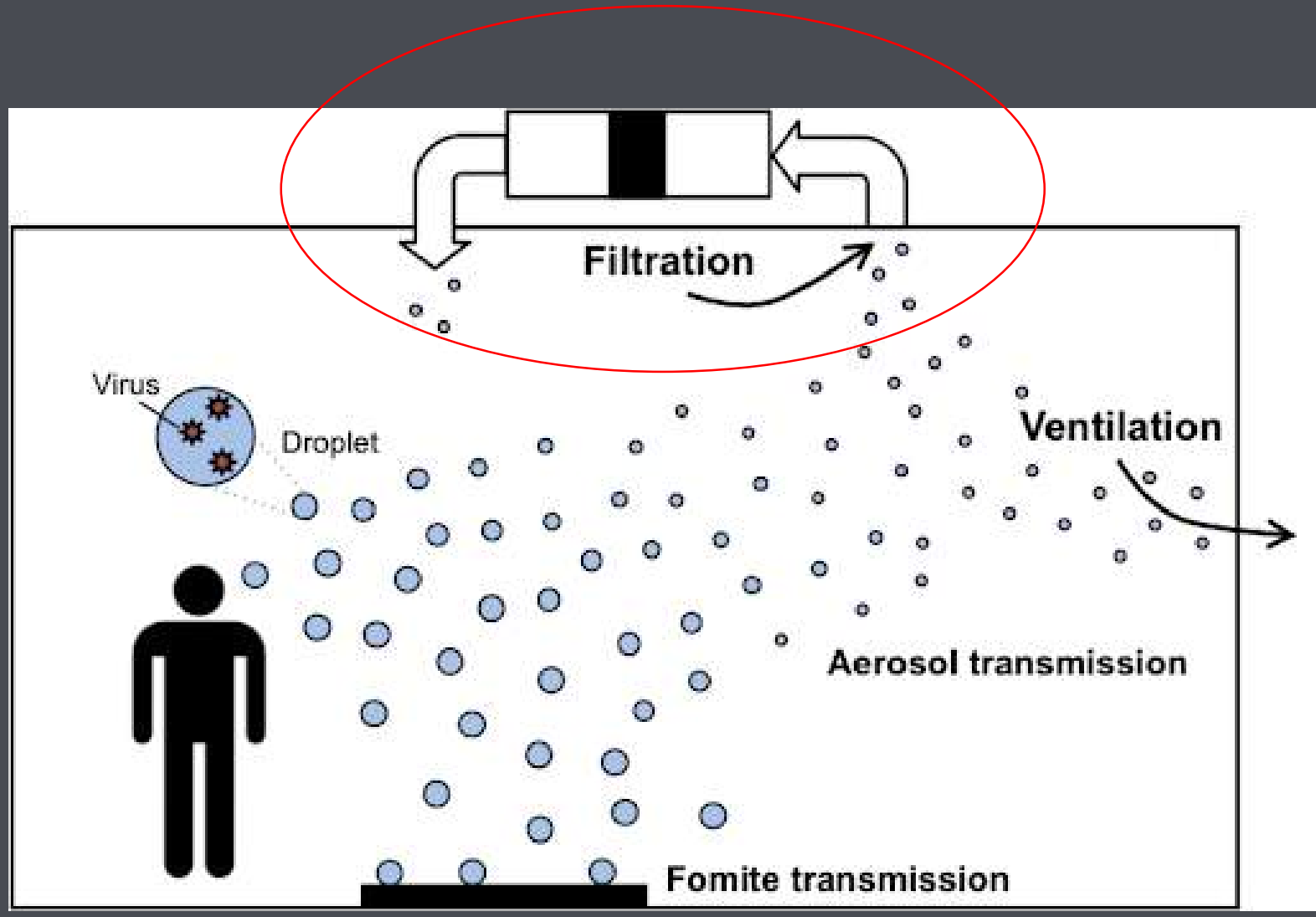
Some standard mistakes (not good for health)

- All systems off =
  - **High CO2 and low comfort**

- 100% ventilation with no pre-heating/cooling =
  - **Low thermal comfort**

- 100% ventilation with pre-heating/cooling =
  - **Higher energy costs**

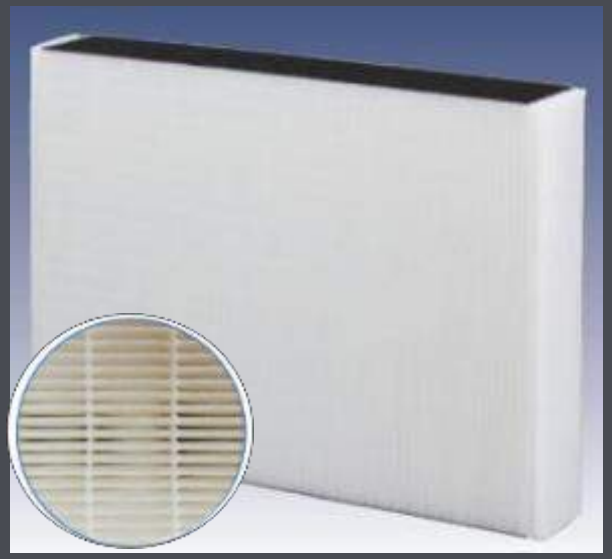
On filtration and air cleaning

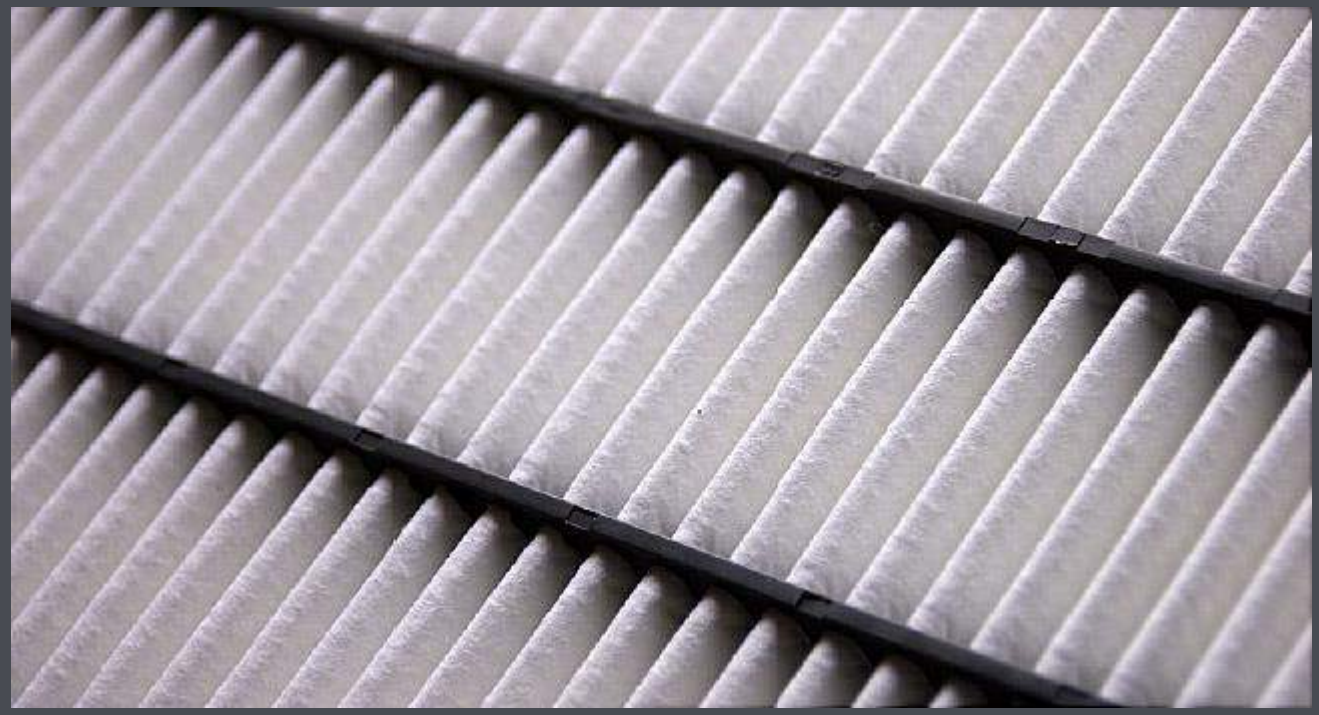


HVAC Filtration

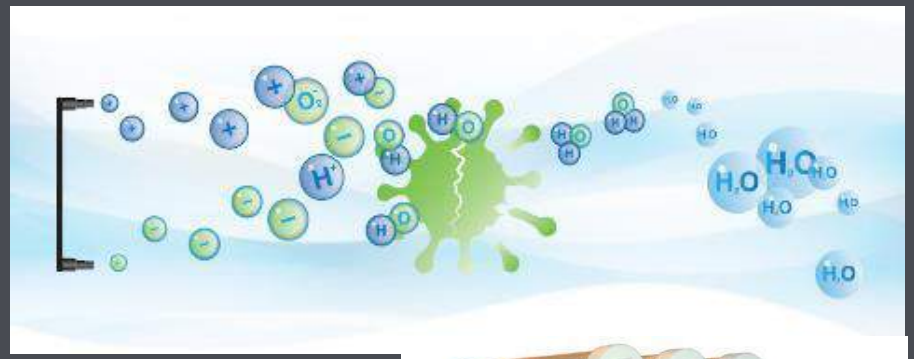
Recirculating filtration systems

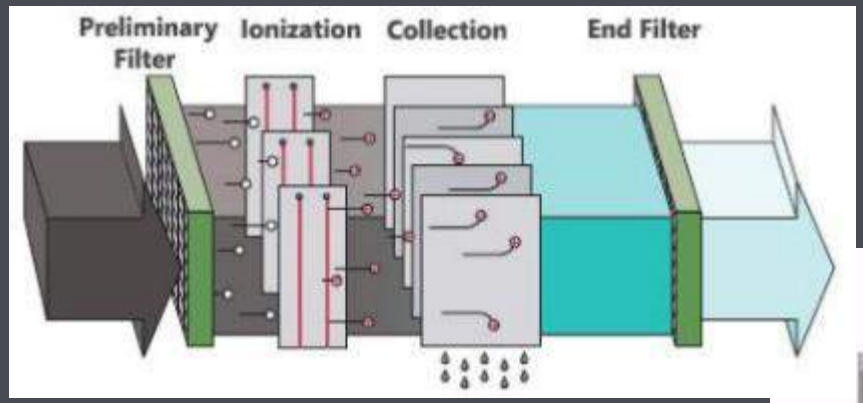
- Media filters minimum efficiency F7 (MERV13) for HVAC systems
- Portable and recirculating systems should have true HEPA H13
- Particles carrying the virus can become trapped
- Best to be paired with other technologies such as UV-C to kill virus trapped on filter





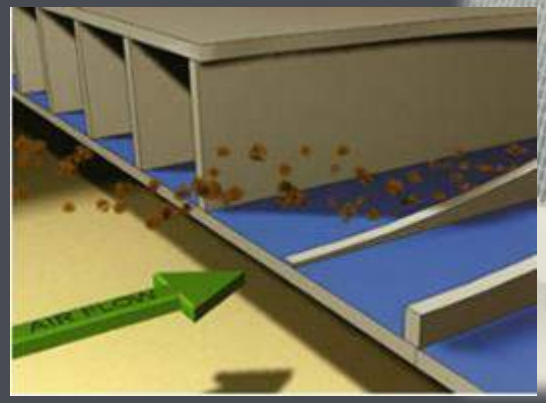
BPI (Bi-polar Ionization)





ESP (Electrostatic precipitator)

IFD (intense field dialectic)



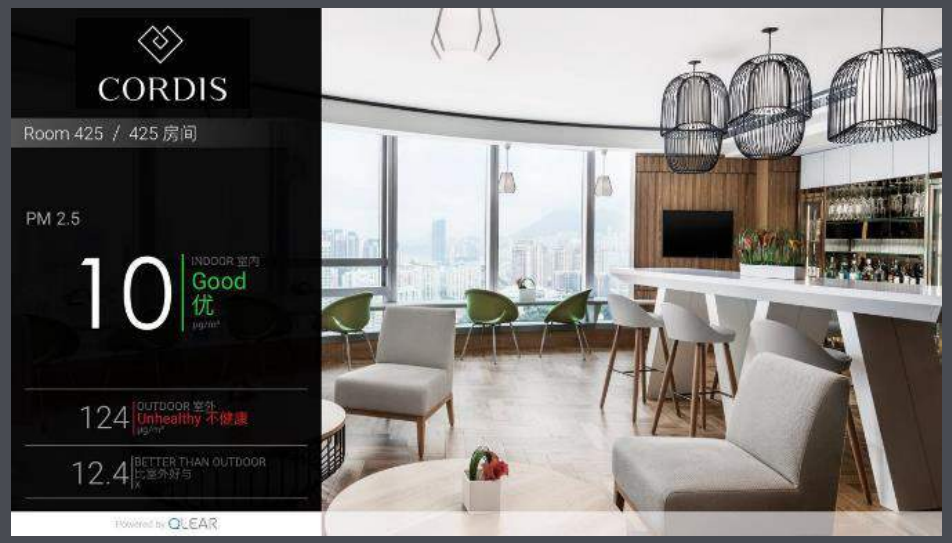
UVGI

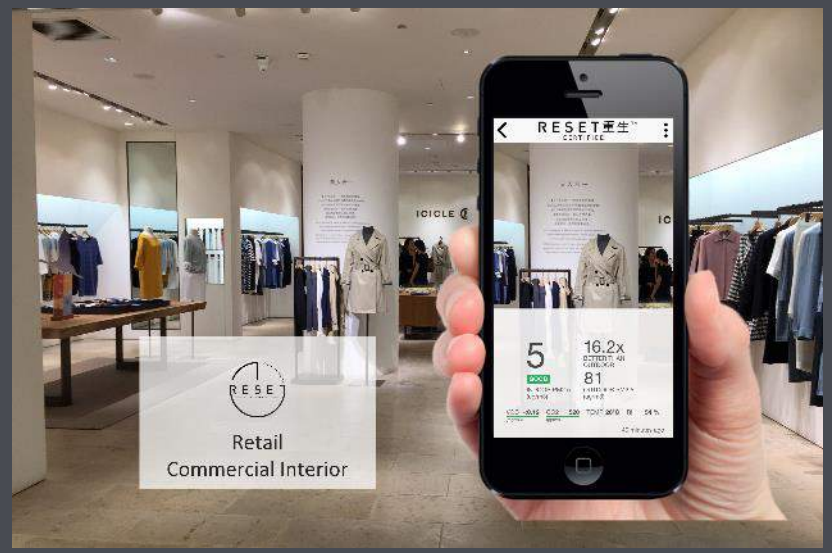
- Widely used in healthcare to sterilize
- Needs to be UV-C (200-280nm wavelength)
- Air Speed and contact time dictates performance
- Needs to be shone direct onto surfaces (won't sterilize bacteria or viruses in fast moving air)
- Install across filter banks in AHU's or recirculating filtration systems to kill virus trapped in filters

“YOU CAN'T MANAGE WHAT YOU CAN'T MEASURE”

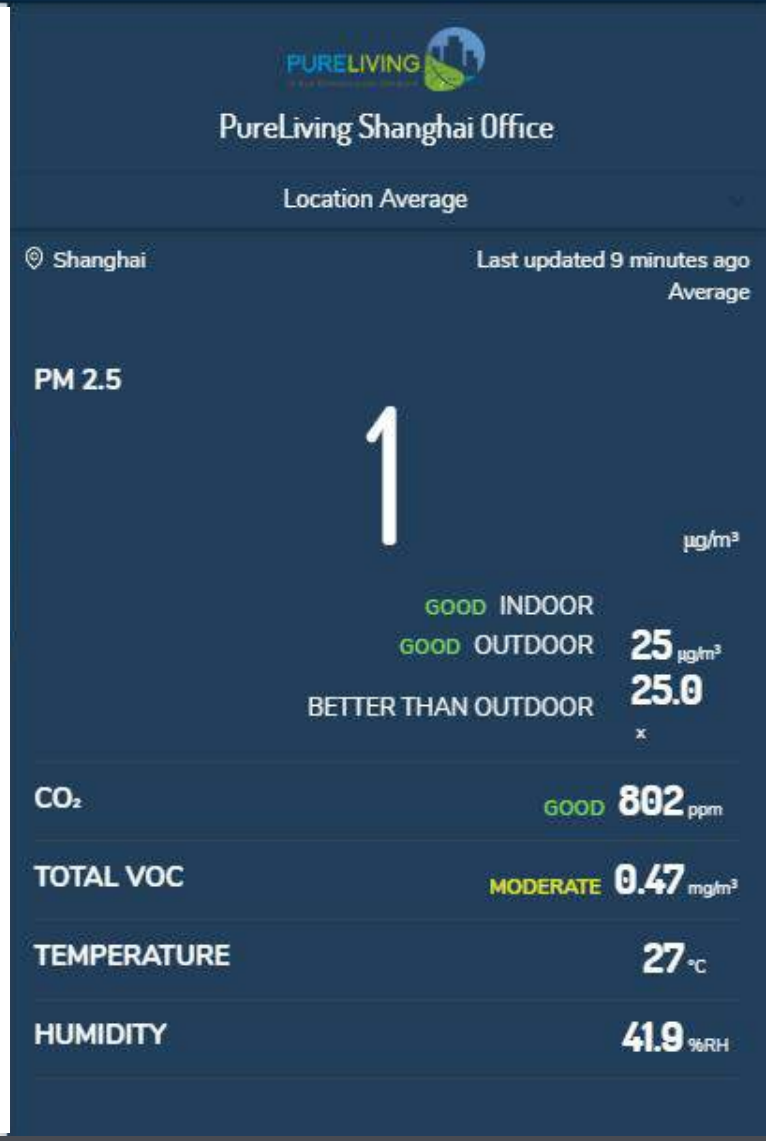
– Peter Drucker

Real time Environmental Monitoring



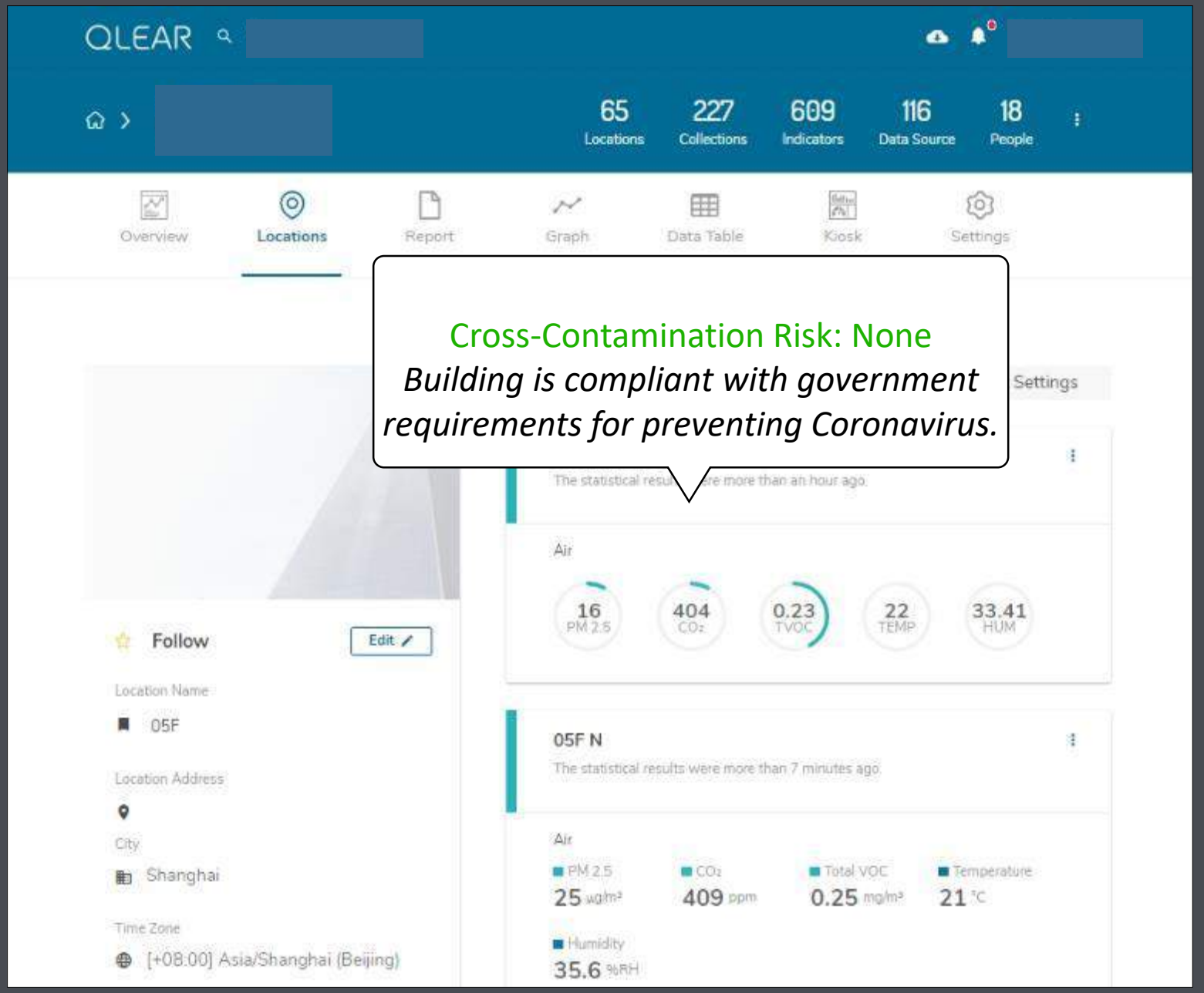


IAQ Parameter	Indicative of Activity	Target Levels (daily average)
Relative humidity	Creative of environment hostile to virus; supportive of human immune systems	50-65%
Temperature	Creative of environment hostile to virus; comfortable for occupants	24-27C
Carbon dioxide (CO2)	Ventilation sufficiency to dilute viruses and other indoor pollutants	<1000PPM
Particulate Matter (PM2.5)	Effectiveness of filtration	<15ug/m3 (or >85% reduction of outdoor levels



Central Mechanical System

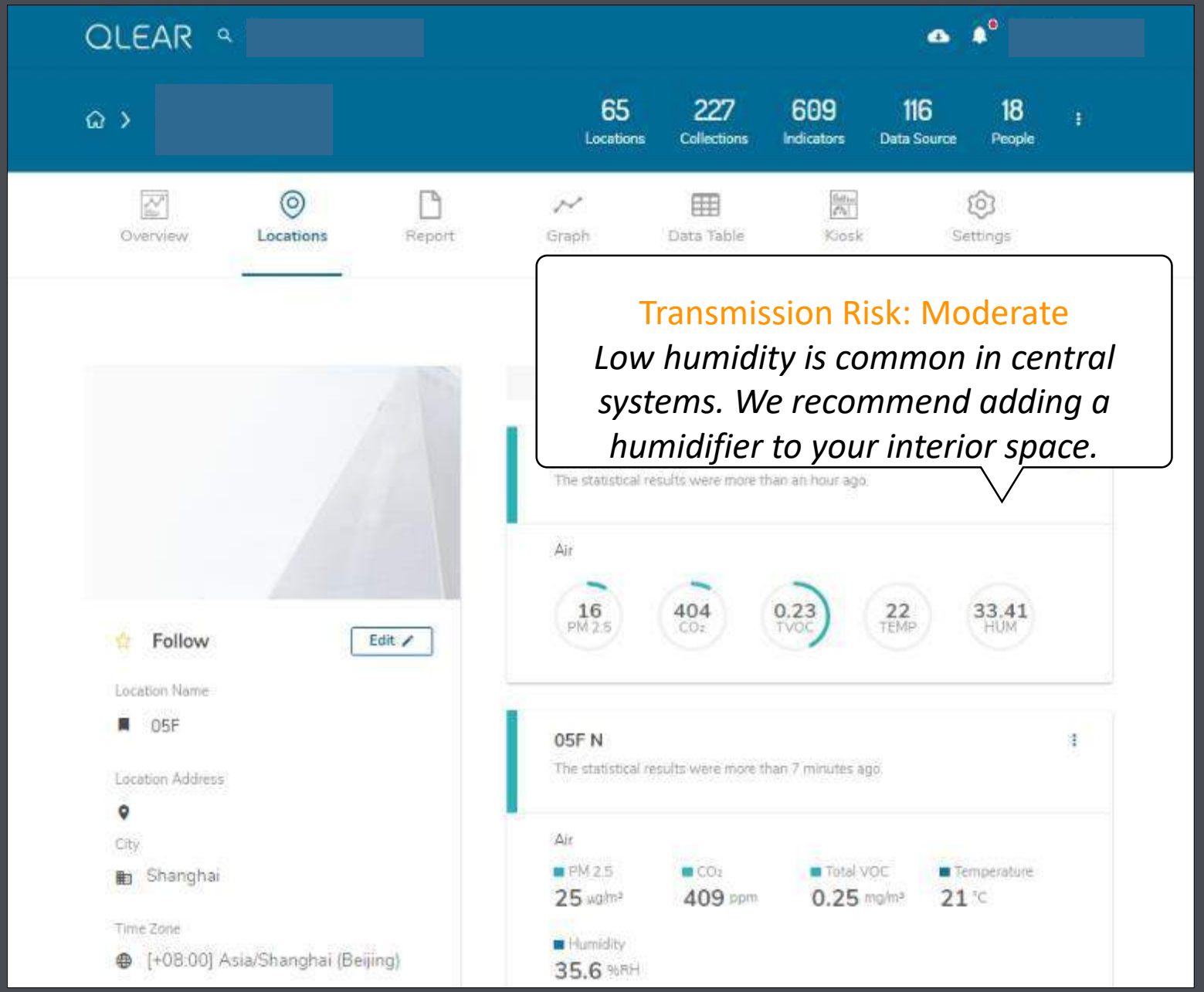
Measured in the main air supply duct of the central ventilation system (post mixing room), these low levels of CO_2 show that 100% of the air being delivered to tenants is coming directly from outdoors, as per government requirement for preventing the spread of Coronavirus.



Interiors:

Humidity levels are generally low within central ventilation systems.

As a result, the addition of humidifiers in offices is recommended.



ATP Testing – Cleaning Performance Auditing

Communications

- ✓ Senior management huddle to align actions and priorities
- ✓ Daily senior audit in first week of COVID defense items to validate execution
- ✓ Policy decisions sent out to all staff
- ✓ Good to have a single knowledgeable “COVID Defense Champion” for questions
- ✓ Recommend status report and results are regularly released
- ✓ Environmental monitoring data publicly displayed

Summary Actions

Identify and isolate ill individuals

Correctly wash and sanitize hands and establish entry sterilization policy

Conduct regular cleaning using best practices

Limit use of central AC which shares zones and maximise ventilation

Target 30m3/hr per person ventilation and CO2 <1000ppm

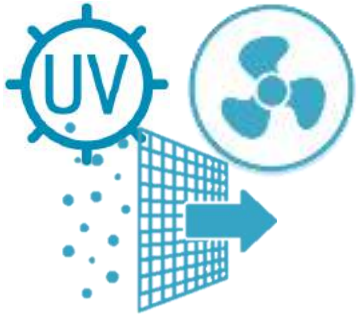
RH 50-65% and temperature >24°C

Use filtration, either portable, fixed or in HVAC

Monitor efforts by checking humidity, temperature, CO2, PM2.5, and measure ATP levels

CASE STUDY: COVID DEFENSE PACKAGE

All-in-one easy to implement solution that combines environmental monitoring, risk algorithm scoring, third party credibility, scientific rigor, and automated solutions to **reduce transmission risk** and **make environments safer** and **easier to maintain**

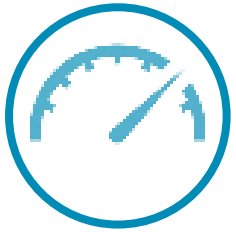


Control Systems

Filtration, ventilation, exhaust air, and in air sterilizing (UV-C, Ionization, Activated Carbon)

Space sterilization

Active sterilization to decontaminate areas



Monitoring

Measure environmental parameters that impact transmission in real time

Automation

Automate air systems to run intelligently based on real time need or schedule

Results Tracking

Report results benchmarked against scientific rigour and int'l standards

CASE STUDY:
INTEGRATED HEALTHCARE COVID DEFENSE SOLUTION

Medical grade HEPA filtration unit creates negative pressure, deactivates pathogens with UV

Source capture to remove contaminants as soon as created

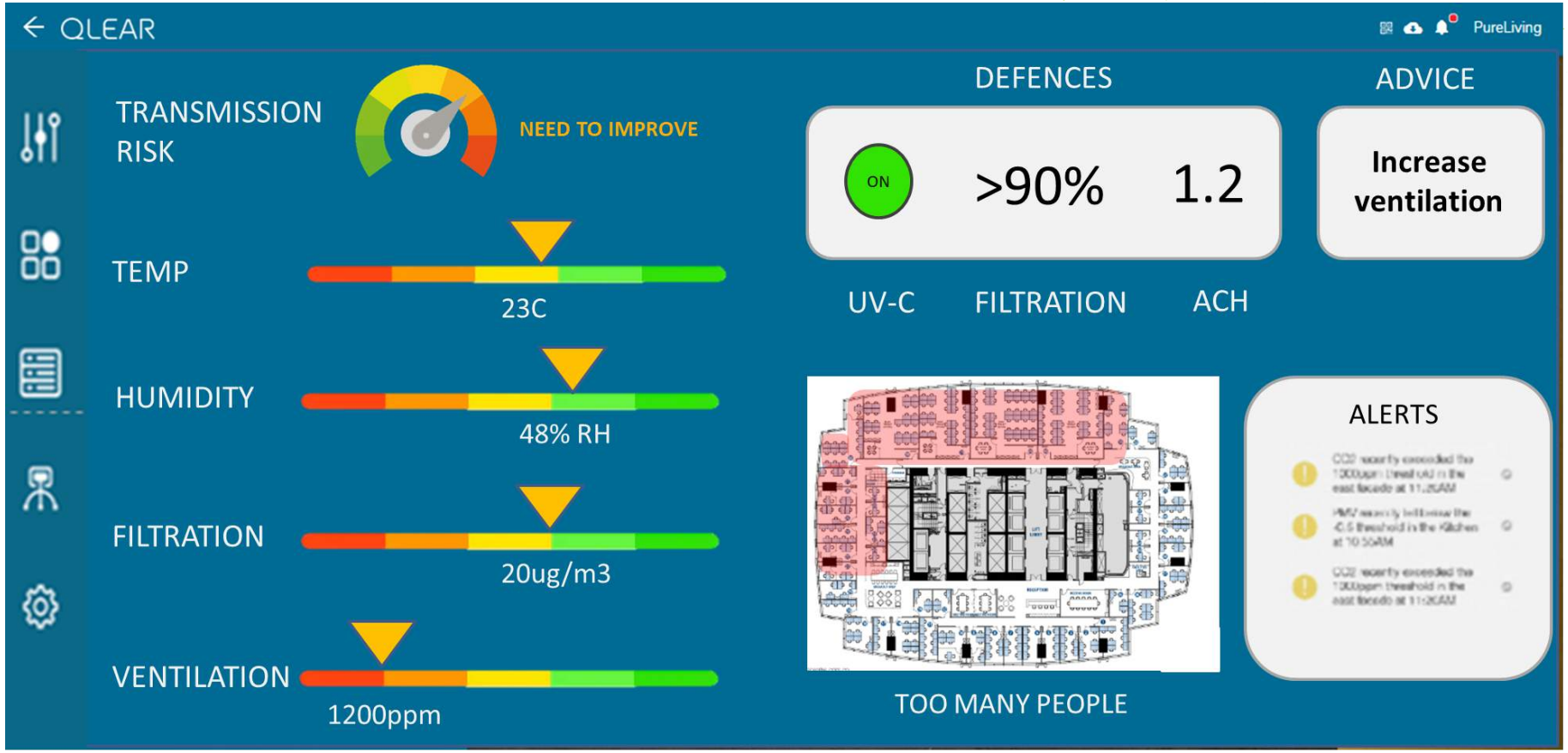
Sensors measure real time conditions and operate equipment automatically based on need

Dashboard enables benchmarking and communications

In-room chlorine dioxide sterilization in between treatments

YOU CAN'T IMPROVE WHAT YOU DON'T MEASURE
MEASURING AND COMMUNICATING RESULTS

COVID TRANSMISSION RISK DASHBOARD



Although sensors cannot currently detect COVID, the conditions impacting the spread can be measured and controlled

REAL WORLD EXPERIENCE ACHIEVING ROI

Internal:

What was done:

- Building upgrades (ventilation and filtration)
- Implementation of bipolar ionization
- Enhanced real-time monitoring and reporting
- Internal town hall and communications plan for employees

Business results:

- In Feb, no staff wanted to return.
- By April, post implementation and with internal communications campaign, office was fully staffed to target levels
- Monitoring used to manage building environment

External:

What was done:

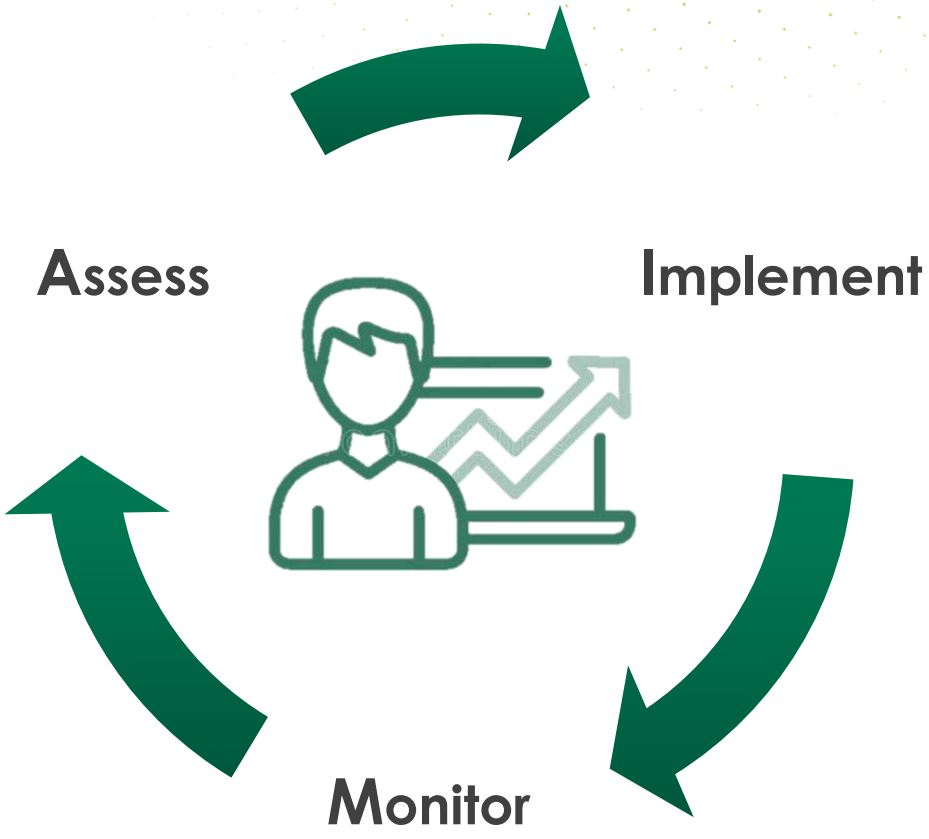
- Conducted technical risk assessment
- Implemented: improved access control, enhanced building filtration, real-time monitoring
- Highlighted COVID defense in proposals as differentiator
- Social media campaigns & in space signage

Business results:

- Brought largest number of new customer signings, 20% of new customers reported positive influence.
- Won a key client: Huawei (cited Covid-safety measures as factor)

HOW CAN THIS BE EXTENDED TO OFFICES AND BUILDINGS? AIM FOR IMPROVEMENT

1. Start with baseline assessment
2. Address all modes of transmission: direct, indirect, airborne
3. Automate operations to reduce human error
4. Measure to manage performance
5. Communicate performance to generate ROI



Looking for more help or to be involved?

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