AIR QUALITY ENGINEERING

Tailored solutions from people who care

XJ-2 Isolation Room Air Cleaner

Air Quality Engineering

- Manufacturing air filtration systems since 1969
- Complete product line including residential, commercial, heavy industrial and medical
- Practical, cost effective designs to provide maximum value and functionality per dollar
- High Quality / Reliability
- Easy Installation
- User Friendly

XJ-2 Portable Negative Pressure Isolation Unit

Negative Pressure Applications*

- Mycobacterium Tuberculosis
- SARS
- Bird Flu
- Measles and Smallpox
- COVID-19**

*Can be used in Positive Pressure applications including Infusion Pharmacies, Acute Patient Care Areas and Laboratories

**COVID-19 is a new disease and we are still learning how it spreads. Check CDC for new information regarding environmental controls

What are the CDC Guidelines for Isolation Rooms?

- Air Filtration flow rates to attain 12 air changes per hour (ACH)
- Negative Pressure to be greater than .01 inches w.g.
- Monitoring to validate negative pressure
- Air Filtration efficiency to be 99.97% or higher as measured against 0.3 micron particle size (HEPA)
- All air from the isolation room shall be exhausted directly to the outdoors, except for isolation rooms that are retrofitted from standard patient room from which it is impractical to exhaust directly outdoors may be provided with recirculated air from the rooms exhaust on the condition that the air must first pass through a HEPA filter.
- Reference ASHRAE 170-2017

Attaining 12 Air Changes Per Hour

Formula for required airflow is:

Q = L x W x H x 12 ACH/ 60 Minutes

Q = cfm delivered by filtration unit

XJ-2 can yield 12 ACH for room size up to 5000 cubic feet

Example room size: 20’ x 25’ x 10’

Sizing for attaining 0.01” w.g. differential pressure

$A_e = .01138 * (DQ^{1.170}/DP^{0.602})$

A_e = leakage area of room in square inches

Since it’s not reasonable for anyone to know the leakage area in square inches, formula is not very practical

CDC example of a poorly sealed room is 300 square inches of leakage

Take comfort in knowing XJ-2 could handle up to 589 square inches of leakage or 4.09 square feet

Monitoring to Validate Negative Pressure

- Periodic or Continuous testing is acceptable
- Chemical aerosols (smoke tubes)
- Differential pressure sensing devices
- Physical indicators (flutter strips)

Frequency of Negative Pressure Monitoring

- Always check before patient occupancy
- When occupied by a patient, check daily
- When not in use, or in use by patients not suspected to be infectious, rooms should be checked monthly

Efficiency of Negative Pressure Filtration Equipment

- CDC guidelines call for HEPA efficiency
- HEPA efficiency to be ≥ 99.97% on 0.3 micron particles per military standard 282
- Filters used in XJ-2 are each individually tested and certified to be ≥ 99.97% on 0.3 micron
- XJ-2 was independently lab tested to validate its design as a whole is ≥ 99.999% on 0.3 micron particles

Importance of HEPA standard

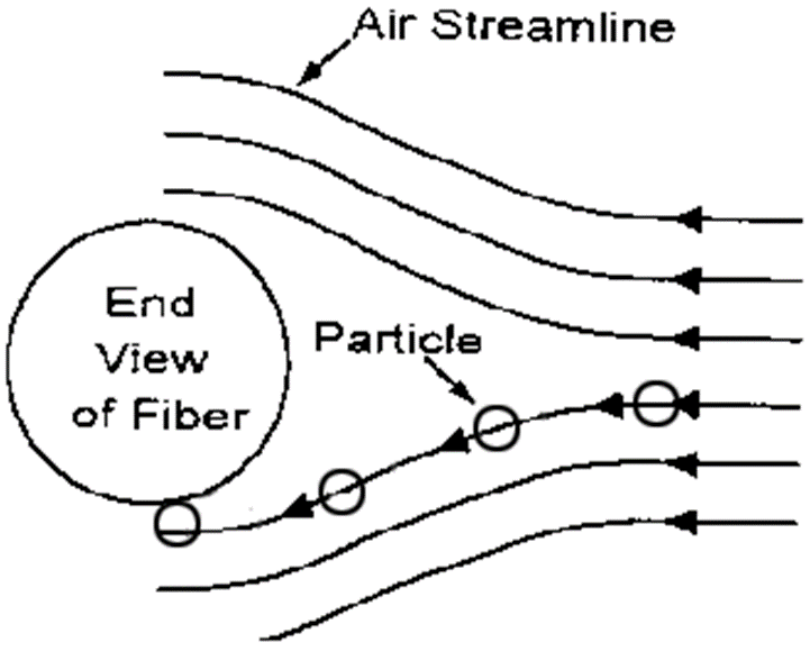
- Demonstrates efficiency on 0.3 micron particles
- 0.3 micron particles are representative of most difficult particle size to capture, even more difficult than particles smaller in size
- Roughly representative of minimum efficiency for virus, bacteria and other airborne particulate removal

Filtration Mechanisms:

- Interception
- Inertial Impaction
- Diffusion
- Straining / Sieving (most easily understood, yet least contributing factor)

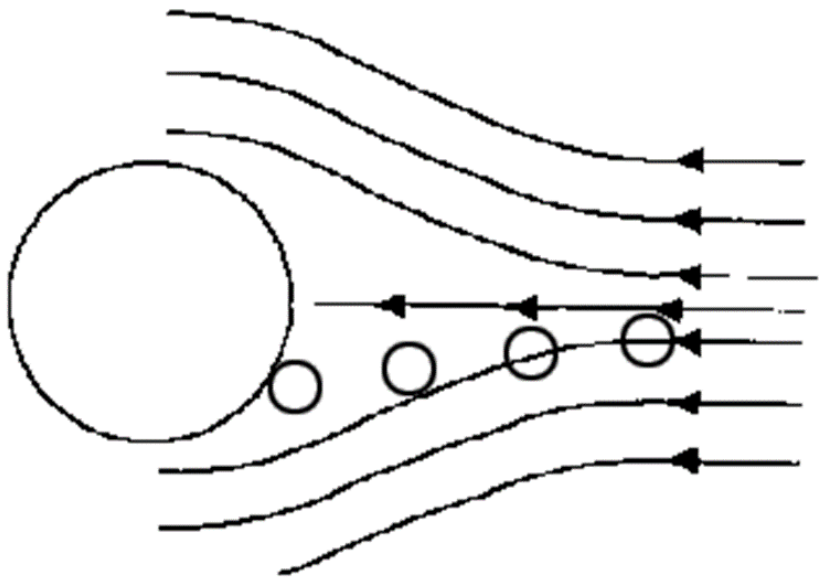
Interception

- Particle comes within one particle radius of a filter fiber
- Particles remain trapped or “filtered” by the filter media due to Van der Waals forces
- Larger particles are easier to capture by Interception



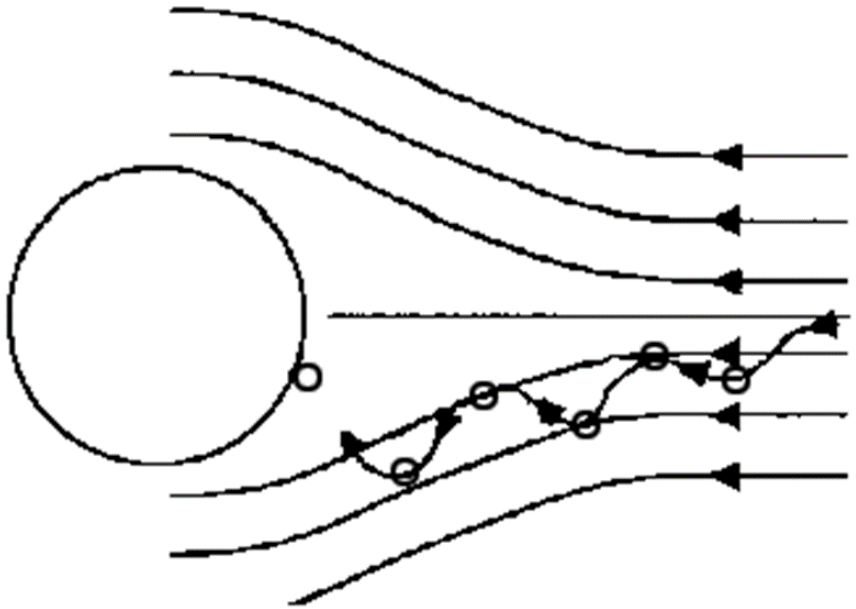
Inertial Impaction / Impingement :

- Heavier particles collide with filter fibers due to their inertia as air makes its way through the torturous path around the filter fibers
- Larger particles are easier to filter by inertial impaction / impingement

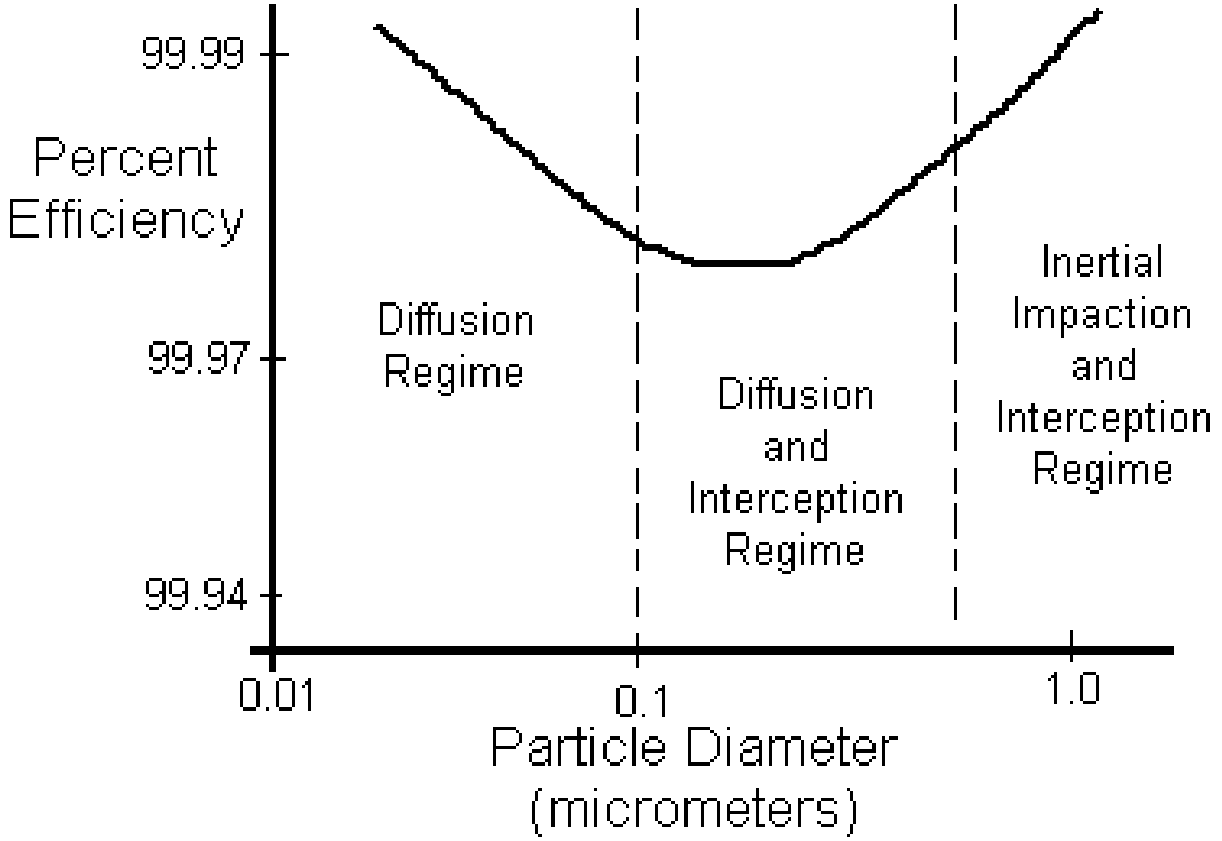


Diffusion

- Particles increase in random motion (due to Brownian Motion) as particle size decreases
- Greater random motion increases probability of particle to make contact with filter fiber
- Smaller particles are actually easier to capture due to Diffusion mechanism



Overall Filter Efficiency Versus Particle Size



Typical size of Viruses and Bacteria

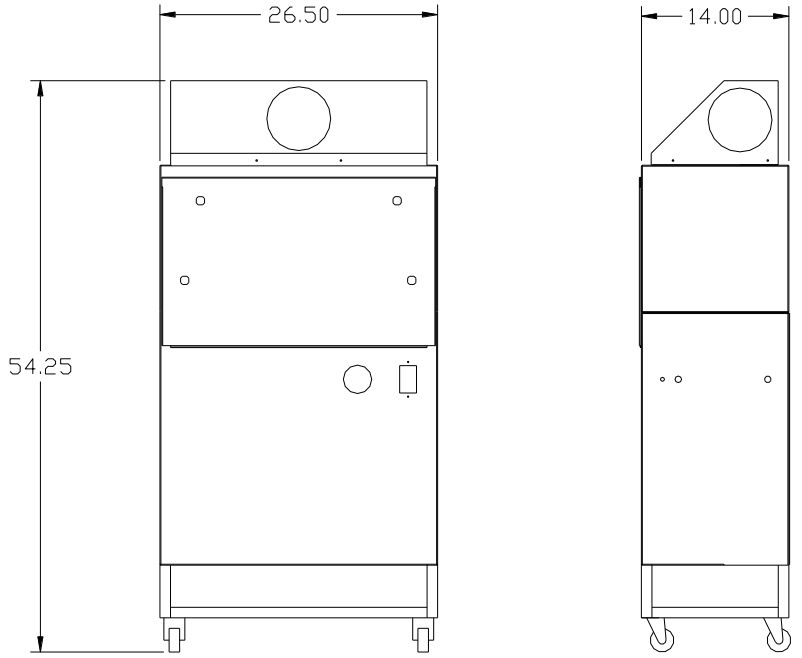
	Species	Size in Microns	Associated Diseases
VIRUS	Bacteriophage ØX174	0.025 to 0.027 diameter	Test virus used by Nelson Laboratories to test 2H Technology™ filtration efficiencies
	Hepatitis Virus (HBV)	0.042 to 0.047 diameter	Hepatitis B
	Adenovirus	0.07 to 0.09 diameter	Respiratory Infections
	HIV	0.08 to 0.11 diameter	Acquired Immunodeficiency Syndrome
	Filoviruses	0.08 diameter 0.79 to 0.97 length	Ebola Virus
	Bunyaviridae	0.08 to 0.12 diameter	Hanta Virus
	Orthomyxoviridae	0.08 to 0.12 diameter	Influenza A, B, and C
	Coronaviridae (SARS-CoV)	0.10 to 0.12 diameter	SARS
	Varicella-Zoster Virus	0.11 to 0.12 diameter	Herpes
	Cytomegalovirus	0.12 to 0.20 diameter	Pneumonia, Hepatitis, Retinitis, Encephalitis
	Variola Virus	0.14 to 0.26 diameter 0.22 to 0.45 length	Small Pox
BACTERIA	Serratia Marcescens	0.45 diameter	Extraintestinal Infections, Nosocomial Infections
	Pseudomonas Aeruginosa	0.50 to 1.0 diameter 1.5 to 4.0 length	Endocarditis, Pneumonia, Osteomyelitis, Nosocomial Infections, Meningitis, Septicemia
	Staphylococcus Aureus	1.0 diameter	Pneumonia, Osteomyelitis, Acute Endocartis Meningitis, Toxic Shock Syndrome, Myocarditis
	Mycobacteriumtuberculosis	1.0 to 5.0 diameter	Tuberculosis
	Bacillus Anthracis	1.0 to 1.5 diameter 3.0 to 5.0 length	Anthrax Infection

XJ-2 Portable Negative Pressure Isolation Unit

Cabinet:
Heavy gauge steel, welded cabinet with chemical resistant powder coat finish

Base:
Standard base includes four swivel casters

Motor:
Dynamically balanced, precision external rotor motor to insure quiet, energy efficient and reliable operation



55.0 x 26.5 x 15.0 140 lbs.

Specifications

Air Flow Capability:

- Infinitely adjustable from 115 CFM to 1000 CFM

Sound Levels:

- 35 dBA @ 115 CFM, 66 dBA @ 775 CFM at 4 feet from the unit

Power requirements:

- 120 Vac, 60 Hz, 4 Amps, 400 Watts OR
- 230 Vac, 50 Hz, 2 Amps, 400 Watts

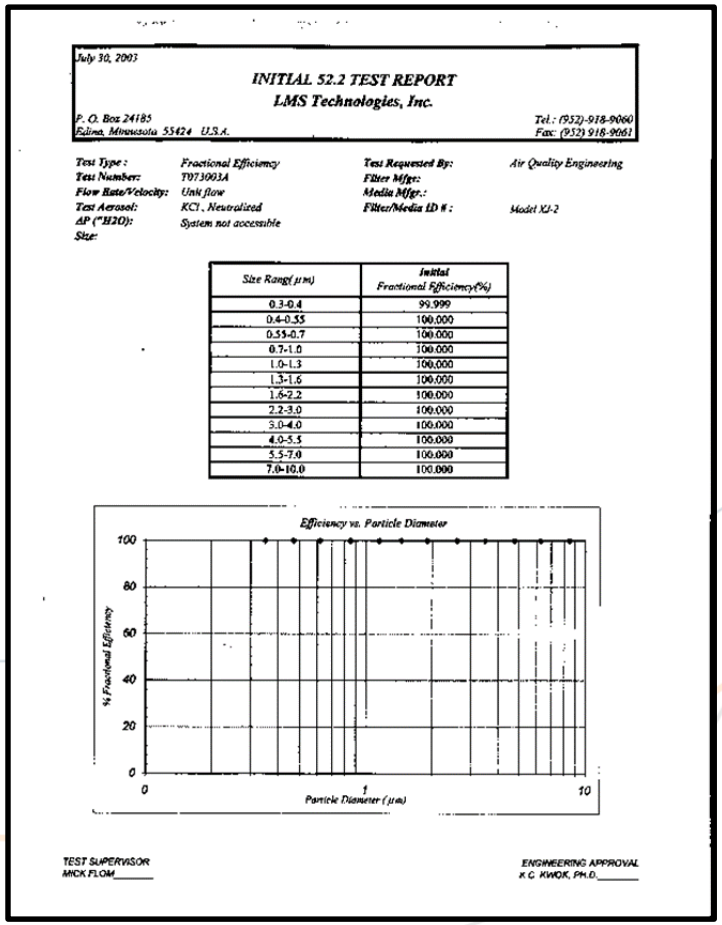
Specifications

Prefilter:

- (80-85% ASHRAE efficient)

Primary Filter:

- HEPA (≥ 99.97 DOP efficient on 0.3 microns)
- HEPA filter is oversized with 131 sq. ft. of media
- Oversized HEPA allows for minimum pressure drop
- Oversized HEPA allows for maximum filter life and minimum handling
- Each HEPA filter individually tested and certified



July 30, 2003

INITIAL 52.2 TEST REPORT
LMS Technologies, Inc.

P. O. Box 24185
Edina, Minnesota 55424 U.S.A.
Tel.: (952)-918-9060
Fax: (952) 918-9061

Test Type :	Fractional Efficiency	Test Requested By:	Air Quality Engineering
Test Number:	T073003A	Filter Mfgr:	
Flow Rate/Velocity:	Unit flow	Media Mfgr.:	
Test Aerosol:	KCl , Neutralized	Filter/Media ID # :	Model XJ-2
ΔP ("H2O):	System not accessible		
Size:			

Size Range(μm)	Initial Fractional Efficiency(%)
0.3-0.4	99.999
0.4-0.55	100.000
0.55-0.7	100.000
0.7-1.0	100.000
1.0-1.3	100.000
1.3-1.6	100.000
1.6-2.2	100.000
2.2-3.0	100.000
3.0-4.0	100.000
4.0-5.5	100.000
5.5-7.0	100.000
7.0-10.0	100.000

TEST SUPERVISOR
MICK FLOM

ENGINEERING APPROVAL
K.C. KWOK, PH.D.

Independently lab tested as a COMPLETE UNIT

Accessories

Standard Accessories Included with every XJ-2

- Individually tested HEPA
- Window Adapter Kit to exhaust filtered air
- 6” diameter flex hose for
- Dirty Filter Gage
- Variable speed control
- Portable Base
- Prewired with electrical cord and molded plug

Optional Accessoriess

- Security Cover
- Wall Mounting Kit
- Recirculation Plenum

Partial List of XJ-2 Customers

University of Michigan	MI	Larkin Community Hospital	FL
University of Maryland	MD	Swedish American Hospital	IL
Amarillo VA Medical Center	TX	Greene County Medical Center	IA
Pennsylvania State University	PA	Memorial Hosp. Los Banos	CA
Broughton Hospital	NC	Washington Medical Center	CA
Bartlett Regional Hospital	AK	Redding Medical	MD
County of NAPA	CA	Dewitt City Hospital	AR
Crowley Rehab Hospital	CA	Tehachapi Hospital	CA
Abbott Northwestern Hospital	MN	Inter-Community Med. Center	CA
North Texas Regional Hospital	TX	North Hawaii Community	HI
St. Elizabeth Ann's	NY	Queen of the Valley	CA
VA Medical Center	MD	West River Regional Med.	ND
Baltimore Research & Education	MD	North Shore Medical	FL
Queen of Angels-Hollywood	CA	McKinnley Health Center	IL
Lakewood Regional	CA		

XJ-2 Highlights

- Proven over years of manufacturing
- Independently tested in its entirety
- Infinitely adjustable with large maximum flow rate to insure compliance with both negative pressure & ACH
- Accessories for convenient use in the real world
- Flexible – easily switch between recirculation and positive/negative pressure
- Cost effective – money spent on the components that perform, nothing more