

TECHNICAL BULLETIN - 1

STERILYFT – SYSTEM COMPARISONS

In today’s business world and today’s current climate of pandemic fighting and prevention, we have come across several types of systems to help “clean” or “sterilize” the elevator cab interiors and make the ride safer and healthier for the riding public. Following, we will compare Sterilyft to each “type” of system currently being offered.

SHAFT AIR INDUCTION:

DESIGN: This system utilizes filtered and/or UV-C to treat shaftway air which is then forced into the elevator cab enclosure. The base premise is the introduction of cleaned and sanitized air into the cab, and puching the air in the cab out, returning to shaft via existing cab base vent slots.

EFFICACY: Being that there is no treatment to the exhaled or expelled air from the interior passengers, the efficacy is NONE. Any pathogens, droplets, virus, bacteria, etc will not be filtered or treated. This poses an increased risk as the system does not address how to “kill” any infectious particles introduced in to the cab enclosure.

PROS: Being that there is shaft air being used, the installation is less tedious. Only an opening in the cab canopy is needed to input the shaft air in to the cab. Ducting to the base or elsewhere on the cab is not needed. Of course, with less install time, less cost to the customer.

CONS: Shaft air is volatile. Allergens, bacteria, dust, molds, mildews, fungus are all possible. VOCs may be emitted by shaftway / elevator lubricants, grease, lubrications and (in some cases) hydraulic fluids. Further, in a some condition in building that fills shaft, smoke would be forced in to the passenger cabin of the elevator. As mentioned above, no treatment is performed on the air within the cab. System as well only forces air in to the car and is not balanced by return flow. Circulation will be poor to non-existent.

SIDE BY SIDE:

	<u>SHAFT AIR INDUCTION</u>	<u>STERILYFT</u>
1 – Circulation	Forced Intake Only	Full Semi Closed Loop System
2 – Efficacy	NONE on enclosure air	MERV 13 filtration and UV-C Irradiation
3 - Power Req	Most 220Volt	110VAC
4 – Install Time	Minimal with one hole	Canopy hole and base register install
5 – Maintenance	Frequent for shaft contaminants	Minimal 6 month, 1 year frequency
6 – Air Quality	Poor - Filtered shaftway air	Optimal - In cab recirculated
7 – Cost	Lower cost (less labor)	Moderate System and Install

COMPARISON:

If cheaper and easier install is the way to go, then shaft air induction is the route. For sterilization, risk mitigation, air quality and overall performance, Sterilyft is more expensive and more difficult to install but, specifically designed with health and safety as the paramount consideration.

LIMITED LOOP CIRCULATION:

DESIGN: This category will encompass multiple systems seen that are designed to create a loop only using the car canopy as duct access. Some systems utilize filtration only, others incorporate UV-C, PECO (Photo Electrochemical Oxidation) or Plasmacluster (Ion) technologies. Each will be broken down below the Limited Closed Loop comparison

LIMITED CLOSED LOOP vs SEMI CLOSED LOOP

EFFICACY: Germicidal efficacy will be broken per technology below this comparison however, efficacy of the circulation can be noted here. With limited closed loop (ducts at canopy only), there is little or no draft or flow of air below the car’s very top interior, or above a drop / suspended ceiling. Without the introduction of forced air at the base with semi-closed loop, any contaminants or pathogens from floor up to ceiling would have very little chance of being drawn into the treatment device of system.

PROS: Again, cost and install time. Being that the systems seen are far less powerful (some at less than 200 FPM compared to 710 FMP of Sterilyft), smaller units (smaller filters) and some even with thermoplastic or composite enclosures (decreasing cost of manufacturing), unit costs are reduced. Two holes are required however, with lack of integration of base ventilation, install is simpler at top of car only.

CONS: Individual germicidal technologies again, will be compared below. Con here however, just in design of circulation flow of system, has a huge disadvantage to semi-closed loop as the lower 3/4 of the cab is left untreated or treated very little. This effectively delivers false results to a perceived system that cleans, purifies or sterilizes the car interior air as it is only partially effective at best.

SIDE BY SIDE:

	<u>SHAFT AIR INDUCTION</u>	<u>STERILYFT</u>
1 – Circulation	Limited Loop	Full Semi Closed Loop System
2 – Efficacy	Minimal below ceiling	Full address with semi-closed loop
3 - Power Req	Some 220, some 110	110VAC
4 – Install Time	Decreased, only top of car	Canopy hole and base register install
5 – Maintenance	Speculatively comparable	Minimal 6 month, 1 year frequency
6 – Air Quality	Poor – Minimal circulation	Optimal - Full cab recirculated
7 – Cost	Lower cost (less labor)	Moderate System and Install

COMPARISON:

A step up from shaft air induction on quality of system and again, a cheaper option with easier install. However, the overall performance, quality of in cab air, sterilization benefits and efficacy again proves to conform to “you get what you pay for”. Some modifications to the system (ducting the exhaust lower on car) may increase the “loop” or encompassing flow of air however, most systems appear to have far less powerful (CFMs) than Sterilyft. This widening of air circulation would slightly increase efficacy however, the weaker flow may effect the efficiency of the system’s full effects.

FILTRATION ONLY (Air Purifier)

EFFICACY: Germicidal efficacy does not really “apply” here to an extent. Filters are intended to remove particles from an air flow, not kill them. An understanding to filter only systems (even HEPA, or High

Efficiency Particulate Air, filters) can be made by the below chart. As limitation of the efficacy is directly related to filter efficiency (MERV, or Minimum Efficiency Reporting Value) rating, some consideration needs to be considered as some bacteria, pathogens and virus are less than .1 microns (Corona being .125 microns).

MERV RATING CHART

Standard 52.5 Minimum Efficiency Reporting Value	Dust Spot Efficiency	Arrestance	Typical Controlled Contaminant	Typical Applications and Limitations	Typical Air Filter/Cleaner Type
20	n/a	n/a	< 0.30 pm particle size	Cleanrooms	>99.999% eff. On .10-.20 pm Particles
19	n/a	n/a	Virus (unattached)	Radioactive Materials	Particles
18	n/a	n/a	Carbon Dust	Pharmaceutical Man.	Particulates
17	n/a	n/a	All Combustion smoke	Carcinogenic Materials	>99.97% eff. On .30 pm Particles
16	n/a	n/a	.30-1.0 pm Particle Size	General Surgery	Bag Filter- Nonsupported
15	>95%	n/a	All Bacteria	Hospital Inpatient Care	microfine fiberglass or synthetic media, 12-36 in. deep, 6-12 pockets
14	90-95%	>98%	Most Tobacco Smoke	Smoking Lounges	Box Filter- Rigid Style Cartridge Filters 6 to 12" deep may use lofted or paper media.
13	89-90%	>98%	Proplet Nuceli (Sneeze)	Superior Commercial Buildings	
12	70-75%	>95%	1.0-3.0 pm Particle Size Legionella	Superior Residential	Bag Filter- Nonsupported
11	60-65%	>95%	Humidifier Dust Lead Dust	Better Commercial Buildings	microfine fiberglass or synthetic media, 12-36 in. deep, 6-12 pockets
10	50-55%	>95%	Milled Flour Auto Emissions	Hospital Laboratories	Box Filter- Rigid Style Cartridge Filters 6 to 12" deep may use lofted or paper media.
9	40-45%	>90%	Welding Fumes		
8	30-35%	>90%	3.0-10.0 pm Particle Size	Commercial Buildings	Pleated Filters- Disposable, extended surface area, thick with cotton-polyester blend media, cardboard frame
7	25-30%	>90%	Mold Spores Hair Spray	Better Residential	Cartridge Filters- Graded density viscous coated cube or pocket filters, synthetic media
6	<20%	85-90%	Fabric Protector Dusting Aids	Industrial Workplace	Throwaway- Disposable synthetic panel filter.
5	<20%	80-85%	Cement Dust Pudding Mix	Paint Booth Inlet	
4	<20%	75-80%	>10.0 pm Particle Size Pollen	Minimal Filtration	Throwaway- Disposable fiberglass or synthetic panel filter.
3	<20%	70-75%	Dust Mites Sanding Dust	Residential	Washable- Aluminum Mesh
2	<20%	65-70%	Spray Paint Dust		
1	<20%	<65%	Textile Fibers Carpet Fibers	Window A/C Units	Electrostatic- Self charging woven panel filter.

PROS: Primarily, cost. Systems lacking germicidal treatment should ultimately be less to produce. Installation may be easier if system design is limited closed loop.

CONS: No treatment of air. A filter based only system serves only to “trap” or stop particles (to specific size restrictions).

SIDE BY SIDE:

FILTRATION ONLY

STERILYFT

• **TAKING ELEVATORS TO NEW HEIGHTS** •

1 – Circulation	If Limited Loop	Full Semi Closed Loop System
2 – Efficacy	Based on MERV rating	MERV 13 filtration and UV-C Irradiation
3 - Power Req	Some 220, some 110	110VAC
4 – Install Time	Decreased, if only top of car	Canopy hole and base register install
5 – Maintenance	Speculatively comparable	Minimal 6 month, 1 year frequency
6 – Air Quality	Comparable if fully circulated	Optimal - Full cab recirculated
7 – Cost	Lower cost (less labor)	Moderate System and Install

COMPARISON:

More of a comparison to Sterilyft, systems by filtration only will decrease cost and install time (if a limited loop design). The lack would be directly comparable to the MERV rating of filters. Sterilyft uses twin MERV 13 (soon MERV 13 and MERV 16) which will filter to .3 microns (soon .1 microns). Unless a filtration system is MERV 16 or higher, some viruses (specifically Corona virus) would be permitted back into the car. This being the case, a filtration only system would fail as no germicidal treatment is being effected to the air (as in UV-C treatment by Sterilyft).

Ionization Systems

EFFICACY: Ionization means that small needles with negative charges within the system releases negatively charged ions into the air (some systems produce both negative and positive charged ions). Science behind this technology states that the negative ions will be attracted to positive charges of air contaminants and will bond with those particles making the particle larger and heavier. The intent of this process is that the particles can then be either trapped by a filter (as the particle is now larger) or, will drop to the floor due to the increased weight. This process does not effectively “kill” pathogens but, could possibly help trap them or have them fall to the floor. Efficacy would then be related directly to the position of the filter, efficiency rating of the filter, size of the newly formed particle or effectiveness of having contaminants on the floor. Being that this technology is more for air quality (purification) and not germicidal effects, the efficacy would be in question as compared to other germicidal means. In addition, any positive ions have been said to have adverse effects to the respiratory system so any positive ion forming devices should be avoided.

PROS: Cheap. Less install (ions only need be introduced into the car).

CONS: Possible adverse respiratory effects. No true “germicidal” property. Without proper filtration, particles would be reintroduced or not removed from air. Particles (that still may be active) could be left in the car at floor level.

SIDE BY SIDE:

	<u>INOIZATION SYSTEM</u>	<u>STERILYFT</u>
1 – Circulation	Not Compared	Not Compared
2 – Efficacy	Poor	MERV 13 filtration and UV-C Irradiation
3 - Power Req	Some 220, some 110	110VAC
4 – Install Time	Less if no loop required	Canopy hole and base register install
5 – Maintenance	Not Compared	Not Compared
6 – Air Quality	Similar but, Pathogen remains	Filtered air and includes UV-C
7 – Cost	Lower	Higher

COMPARISON:

Cost will be lower as system is less expensive and more widely available. Lack of true germicidal property questions the use and would be predicated on the ultimate result desired. If removing particles only, an ion system with proper filtration could achieve however, if germicidal process is needed, an alternate system would be required. The additional contemplation of respiratory effects would need to be considered as there are some studies and reports on negative respiratory effects from the inhalation of ion saturated air.

PECO (Photo Electrochemical Oxidation) Systems

EFFICACY: Germicidal effect of PECO arguably will be similar to PCO (Photocatalytic Oxidation) systems such as UV-C treatment. Both utilize a light source to enact oxidation (molecular destruction) however, PECO is a newer technology effectively adding negative ion charges to particles to more effectively “attach” to particles. This means that it is the same germicidal effect but, actively seeks out to destroy after the light source is passed by traveling with the air flow for further oxidation of airborne particles. Efficacy is improved. However, the free floating negatively charged particles may effect other electronics. In addition, PECO has little research so far as to the true added effects as the technology is newer than UV-C which has been used for decades.

PROS: Pending further research, efficacy of PECO may be improved over PCO (UV-C).

CONS: Lack of research advancements do not yet prove increased efficacy other than theory and initial testing. As a newer technology, cost may be increased over traditional UV-C treatment.

SIDE BY SIDE:

	<u>FILTRATION ONLY</u>	<u>STERILYFT</u>
1 – Circulation	Not Compared	Full Semi Closed Loop System
2 – Efficacy	Pending Confirmation	Proven Effect
3 - Power Req	Some 220, some 110	110VAC
4 – Install Time	Not Compared	Not Compared
5 – Maintenance	Not Compared	Not Compared
6 – Air Quality	Pending Confirmation	Proven Effect
7 – Cost	May be higher	May be lower

COMPARISON:

As a discussion in comparison, the PECO technology may effectively prove more effective in time and research over standard UV-C technology of Sterilyft. Given there is less research (being a newer technology), the true benefit can not be realized. As research continues, Sterilyft plans to review all results as compared to current germicidal treatment process and may adopt at future time, pending research proves to be more effective.

Plasmacluster Systems

EFFICACY: Plasmacluster technology consists of negatively and positively charged ions (H₂O⁺) that are released in to the air. These particles seek out particles, bonding with the surface. Upon bonding the particles are transformed to OH radicals that enact an oxidization process on the particle, removing hydrogen from their molecular bond, inactivating the molecule, the bi-product being water. Efficacy is dependent on the environmental conditions specific to the system. This means that the efficiency of the ions to inactivate particles is based on the delivery method and the conditions (or environment) they are being delivered into. We assume this means that this should be a static, uncirculated system would be preferable as circulated air may effect the ion’s abilities to attach to air particles.

PROS: Proven process of inactivation, similar to that of UV-C. Little or no risk to respiratory system as plasma is water based. Less install if only releasing in to car.

CONS: Circulation may impede efficacy, so circulation in car would not be provided. Water based process may be of concern to electrical components.

SIDE BY SIDE:

	<u>FILTRATION ONLY</u>	<u>STERILYFT</u>
1 – Circulation	None or minimal	Not Compared
2 – Efficacy	Comparable with best conditions	Conditions controlled by system
3 - Power Req	Some 220, some 110	110VAC
4 – Install Time	Not Compared	Not Compared
5 – Maintenance	Not Compared	Not Compared
6 – Air Quality	Cleaned and disinfected	Cleaned and disinfected
7 – Cost	Comparable	Comparable

COMPARISON:

Very comparable to Sterilyft in sterilization process however, circulation of air could more than likely not be increased or added to the elevator. With the lack or decreased movement of air, there would be a tendency for air particles to linger and settle on surfaces. Even though there is sterilization process going on, the pathogens would remain in public area awaiting inactivation. Further, the water based process may build up moisture on sensitive electronic equipment in time. Sterilyft has been designed to be as effective as plasmacluster for germicidal properties but, also increase circulation, remove pathogens away from the public while awaiting sterilization and to provide all benefits without the issues mentioned.