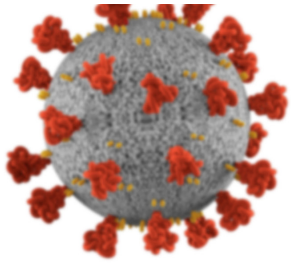
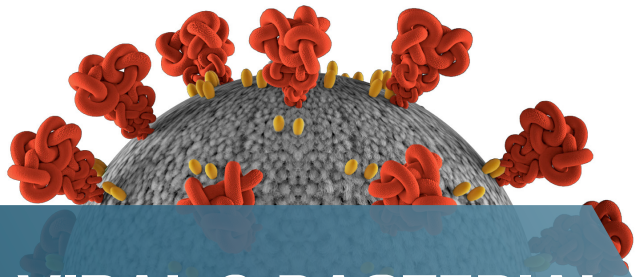
VIRAL & BACTERIAL

ENERGY RECOVERY

FläktGroup SEMCO





VIRAL & BACTERIAL CONTAMINANT CARRY-OVER FAQS

QUESTIONS

"What about carry-over of bacteria, COVID-19 and other viruses within a FläktGroup SEMCO energy recovery wheel?"

"Can't particulate stick to the entering edge of the media and then be blown back into the fresh air stream?"

ANSWER

Invest in several scientific research studies, which address the levels of viral and bacteriological contaminant carry-over exhibited by FläktGroup SEMCO's total energy recovery wheels and systems.

THE CONCLUSION OF THESE STUDIES:

When the FläktGroup SEMCO True 3Å™ energy recovery wheel, utilizes a purge section, the degree of carry-over bacteria, viruses (including COVID-19) and other particulate is well below 0.045% of the exhaust air concentration. This makes the FläktGroup SEMCO True 3Å™ the best energy recovery wheel on the market in terms of particulate carry-over, highest energy recovery efficiency ratio as well as reliable operation and life expectancy.

GEORGIA TECH RESEARCH INSTITUTE STUDY

An independent investigation completed by the Georgia Tech Research Institute (GTRI) confirms the ability of the FläktGroup SEMCO True 3Å™ energy recovery wheel to limit the transfer of gaseous contaminants below .045% of the exhaust air concentration. (as shown in **FIGURE 1**)

It is logical to conclude that if carry-over of gaseous compounds (extremely small airborne particles) can be avoided, so will larger particulates.

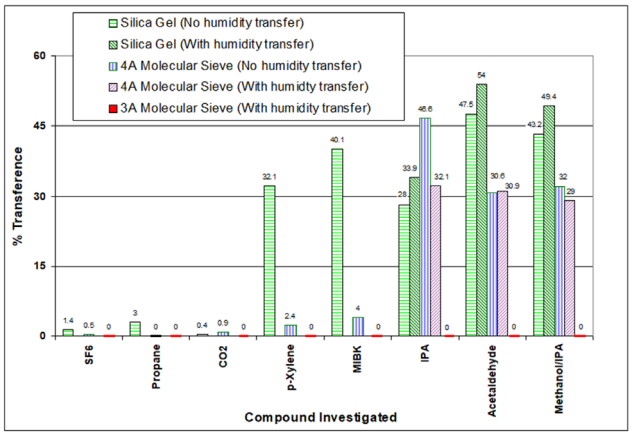
The smallest viruses are approximately 0.1 microns, with COVID-19 falling in the 0.05 - 0.2 microns range. The smallest bacteria being quite a bit larger in size.

Gaseous contaminants are measured in Ångstroms. One Ångstrom is 0.0001 microns. FläktGroup SEMCO's True 3Å™ wheel has 3 Ångstrom molecular sieve coating.

CONCLUSION OF THE GEORGIA TECH RESEARCH INSTITUTE STUDY:

Even the smallest virus will not fit into the 3 Ångstrom pores of the FläktGroup SEMCO 3 Ångstrom coating.

Figure1: Gaseous Chemical Carry-over Data for FläktGroup SEMCO True 3Å wheel vs. Recovery Wheels Using Other Desiccant Coatings



The full Georgia Institute of Technology report entitled "Results of Cross Contamination Testing on Desiccants" is available upon request.

NATIONAL CANCER INSTITUTE STUDY

An investigation sponsored by the National Cancer Institute and conducted in the field at the Frederick Cancer Research Center quantified the degree of bacteriological that existed in an actual installation of a fluted asbestos paper total energy wheel. (These original asbestos wheels have since been retrofitted with FläktGroup SEMCO 3Å™ wheels).

The study challenged energy recovery wheels with e-coli bacteria concentrations more than 10 times greater than those found in typical animal research environments.

The results concluded that the measures carry-over was less than 0.005% — an extremely low percentage. Seeing that the older asbestos wheels were made of paper, we would anticipate that the thinner entering edge and non-fibrous flow channel provided by a FläktGroup SEMCO True 3Å™ wheel with coated aluminum media would result in even less carry-over.

CONCLUSION OF THE NATIONAL CANCER INSTITUTE STUDY:

This conclusion has since been replicated in several successful field experiences where numerous sulfur hexafluoride tracer gas and full spectrum GC/mass spectrum analyses have been completed at medical research facilities like Johns Hopkins.

Figure 2: National Cancer Institute Investigation of E Coli Bacterial Carry-Over (Summary of Final data - **.005%**)

NUMBER AND PERCENT OF PHAGE PARTICLES PASSING ACROSS THE ENERGY RECOVERY WHEEL IN BUILDING 522

Station	Test 1	Test 2	Average
	Numbers of Phage Particles per Cubic Foot of Air		
A- 1/	6.8×10^6	14.1×10^6	10.4×10^6
B- 2/	3.0×10^6	6.4×10^6	4.7×10^6
C- 3/	488	370	429
Percent Crossover From A to C	0.007	0.003	0.005
Culture used as Challenge Phage/ml	25.3×10^9	17.6×10^9	14.3×10^9

1 Station A - Located in exhaust duct building side of wheel.
2 Station B - Located in exhaust duct outer side of wheel.
3 Station C - Located in intake duct building side of wheel.

The full National Cancer Institute report entitled "E Coli Challenge of Energy Recovery Wheel" is available upon request.

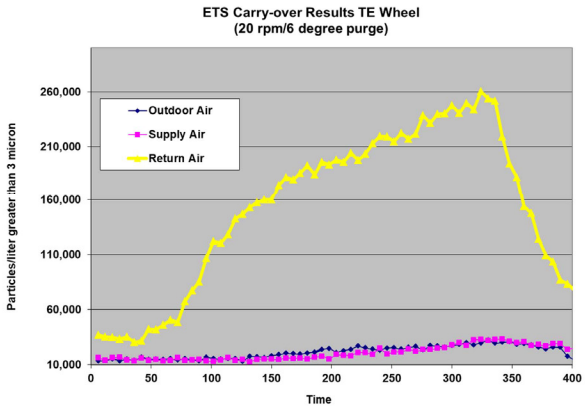
GEORGIA TECH RESEARCH INSTITUTE STUDY #2

In another study, Georgia Tech Research Institute tested FläktGroup SEMCO's True 3Å™ wheel's performance in regards environmental tobacco smoke and sub-micron particulate carry-over.

Georgia Tech's data on this subject was conclusive with the National Cancer Research study's findings, that the particulate carry-over is essential at 0.

Even when the wheel is challenged with more than 260,000 particles /liter (ranging in size from 0.01 microns to 3 microns — all smaller than the 0.05-0.2 microns size of COVID-19) the supply air particulate concentration leaving the FläktGroup Semco wheel is essentially the same as the outdoor particle levels. (See FIGURE 3)

Figure 3: Laboratory Carry-over Testing Using Sub Micron Tobacco Smoke (Same Results as SF6 Tracer Gas and Bacteria Method)



No submicron carry-over measured with ETS (supply and outdoor concentrations the same)

PARTICULATE CARRY-OVER IN CONTEXT

- To put the FläktGroup SEMCO particulate carry-over limit into context, this equates to 99.95% efficient in limiting carry-over.
- Precisely the same level offered by the best HEPA filters when perfectly installed and maintained.
- If the supply air leaving the FläktGroup Semco wheel is followed by a filter (commonly done) this equates to a 0.00045% carry-over — essentially 0%.
- FIGURE 4 summarizes sulfur hexafluoride carry-over testing completed at various hospital and laboratory facilities with designs using high-plume injection fans to provide maximum separation between the exhaust air and the fresh air inlet.
- As you can see from the diagram, the average measured carry-over associated with the FläktGroup Semco energy recovery wheel was almost one order of magnitude less than the short circuiting of air from the exhaust air outlet into the outdoor intake damper.

Figure 4: Results from Field Testing of Total Energy Recovery Wheel Systems Comparing Re-entrainment with Wheel Carry-over

Project Type	Exhaust Re-entrainment	Wheel Carry-over	Injection Fume Exhaust Used?
	Percentage of Exhaust Air SF6 Concentration		
Pharmaceutical Laboratory	0.09%	0.02%	Yes
	0.12%	0.01%	Yes
Wet Chemical Laboratory	0.07%	0.02%	Yes
	0.07%	0.02%	Yes
Hospital	0.03%	0.04%	Yes
	0.03%	0.04%	Yes
Government Research Lab	0.11%	0.02%	No
	0.12%	0.02%	No
Medical Research Laboratory	0.16%	0.01%	No
	0.16%	0.01%	No
	0.11%	0.06%	No
University Laboratory	0.03%	0.02%	Yes
	0.03%	0.01%	Yes
Medical Research Laboratory	0.28%	0.02%	No
	0.41%	0.02%	No
University Laboratory	0.04%	0.03%	Yes
Average Values	0.12%	0.02%	

Sample SF6 reports for numerous laboratories are available upon request. Source GTRI