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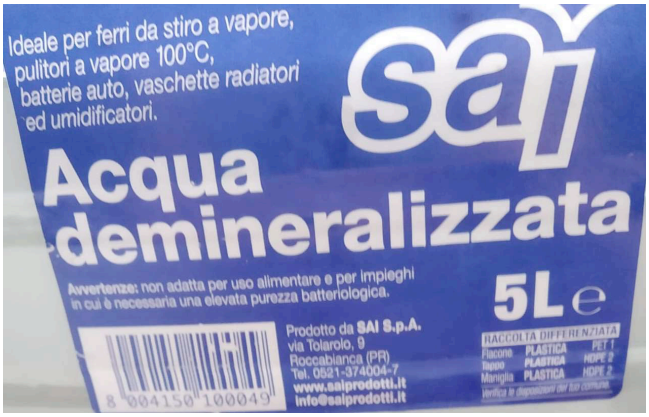
Second Analytical Report concerning Scientific Investigations Performed to Validate the HYLA EST DEFENDER System.

This report follows a first report related to other scientific investigations for the validation of the Hyla Est Defender system. In this second cycle of investigations, we focused primarily on the chemical substances aspirated and therefore retained by the aqueous component of the system.

1. Set-up and use of the suction equipment in indoor household environment

Device: HYLA EST DEFENDER (air and room cleaning system, indicated as HYLA in this report).

The (new) HYLA system was assembled and prepared for suction, connecting the flexible hose, the two inflexible pipes and then the convertible multi-purpose floor brush to the engine block. The water tank has been filled up to the level indicated by the manufacturer („water to this level“) with approximately 4 liters of water.



The system was switched on and used continuously for 25 minutes in a household environment of 90m2, consisting of 2 two bedrooms (parquet), living room (ceramic floor + 1 carpet), 2 bathrooms (ceramic floor) and kitchen, inhabited by a family of two adults and one child, in order to simulate a typical indoor home environment.

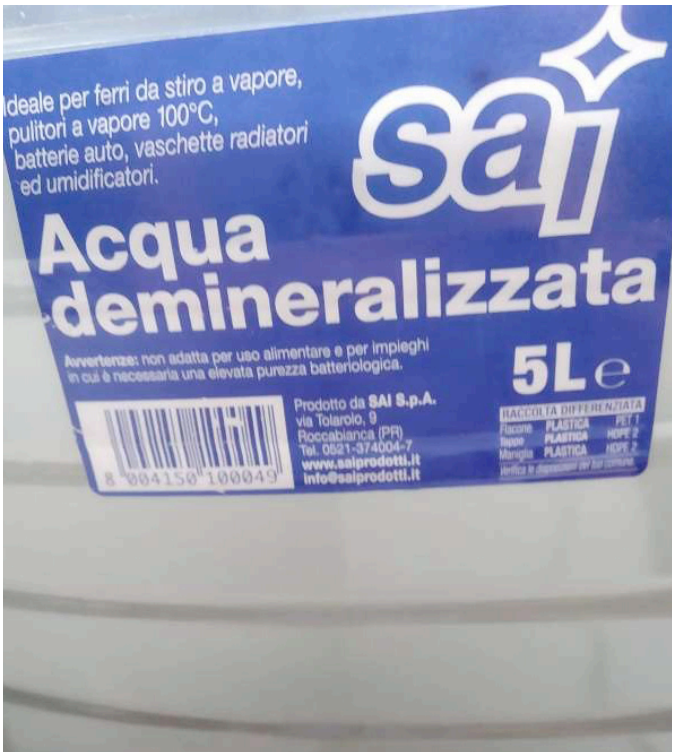
After the aspiration phase, the content of the tank was poured into a clean container for subsequent analyses. Before pouring the content of the tank, the larger solid residues were collected and discarded.

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2. Tank Water Filtration

The water in the tank was left to settle for a few hours, to let coarse residues accumulate at the bottom of the container.

The supernatant was then filtered on quartz filters (47 mm, QMA) by using the filtering equipment shown in the figure. To allow efficient filtration, vacuum is made in the collection container by using a mechanical pump.









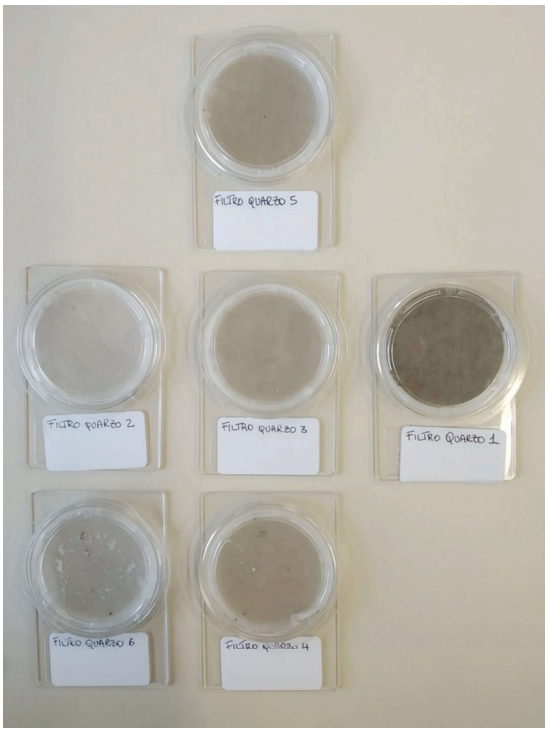
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The filtration procedure has been performed according to the following time schedule and filtration volumes:

		WEIGHT of the FILTER / mg		
N° FILTER	**Volume of filtered water / mL**	**PRE-filtration**	**POST-filtration**	**WEIGHT filtered / mg**
1	250	157.64	171.34	13.70
2	50	162.22	< pre	n.d.
3	100	156.69	160.62	3.93
4	100	154.55	159.40	4.85
5	100	155.53	160.05	4.51
6	50	156.24	156.65	0.42

To be noted that in the case of the 250 mL filter, it was not possible to complete the filtration, as the residues still present in the water clogged the filter until the holes were completely blocked.
In the case of filter N. 2, a decrease in the mass of the filter was observed post filtration. Probably, in this case there was a loss of filter material during the filtration process. However, the weight of the filtrate reflects the values of filtered water.

The collected filters are shown in the figure.
Both the residual filtrate (quartz filters) and the filtered water were analyzed to evaluate their content.



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3. Chemical-physical analysis of the water in the post-filtration tank

The chemical-physical analysis of the water has been carried out on quartz filters, both on a sample of the same water provided for the suction phase (see point 1) but not used for it, and on the water present in the tank after suction and post filtration.
The table summarizes the results of the analyses:

Parameters	Clean Water	Dirty Water	U.M.	Limits set by D.lgs 31/2001 concerning water for human consumption
pH	6.9	6.8	unità pH	6.5 -9.5 unità di pH
Turbidity	1	35	NTU	1 NTU
Colour	4.45	>50	Pt Co Unit - Hazen	
Conductivity	29.6	**267**	uS/cm	2500 uS/cm
Calcium carbonates	0	0	mg/L	No limits
Hydroxides	0	0	mg/L	No limits
Partial alkalinity	0	0	mg/L	No limits
Total alkalinity	14.3	45.5	mg/L	No limits
Bicarbonates	14.3	45.5	mg/L	No limits
Fixed residue	21.2	**191.1**	mg/L	No limits
Hardness	0	9	°F	No limits

Parameters		Clean Water	Dirty Water	Difference consump-tion	U.M.	Limits set by D.lgs 31/2001 concerning water for human
Metals	Boron	0.05	0.08	0.03	mg/L	1mg/L
	Sodiium	7.19	51.13	**43.94**	mg/L	200 mg/L
	Magnesium	0.48	4.85	4.37	mg/L	No limits
	Silver	0.27	0.14	-0.13	ug/L	10ug/L
	Aluminium	1.98	58.83	**56.85**	ug/L	200ug/L
	Potassiium	0.45	17.10	**16.65**	mg/L	No limits
	Calcium	1.09	26.98	**25.89**	mg/L	No limits
	Vanadium	0.01	0.76	0.75	ug/L	50 ug/L
	Chromium tot	0.20	18.22	**18.02**	ug/L	50 ug/L
	Manganese	0.65	23.05	**22.4**	ug/L	50 ug/L
	Iron	8.42	42.16	**33.74**	ug/L	200 ug/L
	Nichel	1.01	13.09	**12.08**	ug/L	20 ug/L
	Copper	0.00	0.06	0.06	mg/L	1mg/L
	Zinco	6.56	153.45	**146.89**	ug/L	No limits

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Metals	Arsenic	0.02	1.14	1.12	ug/L	10 ug/L
	Selenium	0.03	0.24	0.21	ug/L	10 ug/L
	Strontium	3.14	50.44	**47.3**	ug/L	No limits
	Cadmium	0.06	0.08	0.02	ug/L	5 ug/L
	Antimony	0.12	2.19	2.07	ug/L	5 ug/L
	Mercury	0.00	0.06	0.06	ug/L	1 ug/L
	Barium	0.67	14.34	**13.67**	ug/L	No limits
	Titanium	0.39	0.49	0.1	ug/L	No limits
	Molybdnenum	0.02	1.17	1.15	ug/L	No limits
	Thallium	0.00	0.02	0.02	ug/L	No limits
	Tellurium	0.00	0.01	0.01	ug/L	No limits
	Gadolinium	0.00	0.01	0.01	ug/L	No limits
	Lithium 7	0.20	1.30	1.1	ug/L	No limits
	Gallium	0.00	0.02	0.02	ug/L	No limits
	Rubidium	0.27	11.86	**11.59**	ug/L	No limits
	Cobalt	0.01	0.38	0.37	ug/L	No limits
	Zirconium	0.03	0.14	0.11	ug/L	No limits
	Tungsten	0.10	35.74	**35.64**	ug/L	No limits
	Bismuth	0.00	0.03	0.03	ug/L	No limits
	Lead	0.57	5.24	**4.67**	ug/L	10 ug/L
	beryllium	0.00	0.01	0.01	ug/L	No limits
	Uranium	0.01	0.02	0.01	ug/L	No limits
Anions and Ammonium	Ammonium	0.058	1.698	1.64	mg/L	0.5 mg/L
	Chlorites	0.017	0.000	-0.017	mg/L	0.700 mg/L
	Chlorides	3.097	40.684	**37.587**	mg/L	250 mg/L
	Nitrates	0.99	5.727	**4.737**	mg/L	50 mg/L
	Nitrites	0.000	0.291	0.291	mg/L	0.5 mg/L
	Sulphates	1.27	10.169	**8.899**	mg/L	250 mg/L
	Phosphates	0.000	0.127	0.127	mg/L	No limits
	Fluorides	0.255	0.133	-0.122	mg/L	1.5 mg/L

It was not possible to carry out the analyses on pesticides as the sample, despite the filtration, was too turbid and led to a clogging of the pre-column of the instrument used for the analysis.
It has been impossible to perform the analyses on VOCs as the sample presented too high concentrations in surfactants, which caused the formation of foams and bubbles that did not allow us to perform the analysis.

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Analysis of the quartz filters containing the filtrate

The determination of the concentration of carbonaceous fraction using the TOT (Thermal Optical Transmittance) technique was performed on the quartz filters obtained after water filtration (samples named from 1 to 6). This method allows to determine the concentration of organic carbon (OC, Organic Carbon) and elemental carbon (EC, Elemental Carbon) within samples of atmospheric particulate matter homogeneously dispersed on quartz filters.
However, due to the inhomogeneity of the filters it was not possible to quantify the two fractions separately, since the analytical determination is based on the transmittance value of the filter and it was not homogeneous in the case of the examined filters. It was therefore possible to produce only an estimation of the total carbon concentration TC (Total Carbon), which represents 30-40% of the mass of the particulate collected on the filter. Given the nature of the particles sucked in by the system, it is reasonable to obtain this kind of data. The remaining part of particulate was most likely made up mainly of silicate particles (i.e. “dust”).

4. Conclusions

The Hyla system is able to remove - from the „aspirated“ environment - various inorganic (as evidenced by the significant increase in conductivity and fixed residue) and organic materials. The „water filter“ is capable of retaining numerous metal species (including some important heavy metals that are dangerous for human health such as chromium, manganese and lead), as well as chlorides, nitrates and sulphates.

Concerning the ability of the Hyla system to remove carbonaceous substances, it has been shown that - on the filtered particulate - there are particles of a carbonaceous nature whose mass concentration is similar to that found in atmospheric particulate. Although it was not possible to carry out a dimensional characterization of the particles, it is already known that the particles of carbonaceous nature are mainly found in the fine fraction of particulate matter, that has been removed by the Hyla system.

The Researchers Responsible for the Analyses



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