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Villafranca Padovana, 12-01-2009

Object: Analytical check on your filters of urban air treatment - technical explanations
(References of acceptance n. 57080/57199)

Referring to your enquiries we send our clarifying on the analytical technical reports here attached.

We remain at your disposition for every need and present our best regards.



technical document follows

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Sede Legale Milano Via G. Gozzi, 1/A - Capitale sociale Euro 2.500.000 i.v.
C.F./N. Iscritt. Reg. Imprese di Milano 04112680378 - P. IVA n. 11370620154 - Cod. Mecc. n. M1223813



In the context of the urban air treatment, which is operated by the filtering station designed and manufactured by from the company *systemlife* of Camposampiero (Padua), two batteries of filters (constituting the first stage of dust reduction - PM, Particulate Matter) have been delivered to our laboratories of Villafranca Padovana in order to quantify the total PM which have been filtered and to verify the dust load.

The filtering unit under test, which operated continuously for 2300 hours (*) (corresponding to approximately 95 days), has filtered relatively to the first battery 748 grams of PM from the air in the city installation zone; while the second unit has withheld 217 grams of this rough powder.

The nominal flow of the station is of 10'000 m³/h (*); for the previously computed time interval the filtering station has aspired and cleaned 23 million m³ with a powder load of 45 µg/m³.

(*) Data supplied from *systemlife*.

For comparing the data with a reference limit value one has to refer to the Ministry Decree n. 60, April 2nd 2002, which is based on the EU Directive 1999/30/CE assigning a limit value of 50 µg/m³ for PM 10 in 24 hours. Clearly this treatment section withholds the coarse powder and it doesn't filter the thin PM part which is reduced by following stages (from the second to the fourth): the total amount of particulate collected by the station will be higher: in fact one must perform the sum of the PM collected in the first stage (object of this analysis) with the powder withhold in the filters in woven F7, the part electrically collected by the electrodes of the electrostatic filters, the one which is deposited inside the station and that airborne deposited during the ordinary maintenance operations.

The limit value defined by the regulations is mentioned in order to supply an objective reference to make comparison for the data verified in laboratory.

Subsequently to the quantification of the yield of the first filtering stage (45 µg/m³), we provided the determination of the organic and inorganic components present in polluted dust; the distribution of the components is reported here after, referred to the rough PM tenor withhold by the primary battery of city air treatment. The data are reported as polluting, expressed in mg per PM kg which is singularly withhold from the two filtering units; on the right side the risk comments are associated to the compounds under examination.

Polycyclic aromatic hydrocarbons	First treatment battery	Second treatment battery	risk comments
	1° Batteria di trattamento Rif. N. 57080 (mg/kg)	2° Batteria di trattamento Rif. N. 57199 (mg/kg)	Frases di pericolo
Acenaftene	< 0,05	< 0,05	Xi; R36-37-38
Acenaftilene	< 0,05	< 0,05	
Antracene	< 0,05	0,09	
Benzo(a)antracene	0,31	3	Carc. Cat. 2, R45
Benzo(a)pirene	0,26	0,32	Carc. Cat. 2, R45 Repr. Cat. 2, R60-61 Muta. Cat. 2, R46
Benzo(b+k+j)fluorantene	0,63	0,71	Carc. Cat. 2, R45
Benzo(g,h,i)perilene	0,29	0,26	
Crisene	0,54	0,44	Carc. Cat. 2, R45-68
Dibenzo(a,h)antracene	< 0,05	< 0,05	Carc. Cat. 2, R45
Fenantrene	0,26	0,47	Carc. Cat. 2, R45
Fluorantene	0,54	< 0,05	
Fluorene	< 0,05	0,44	
Indeno(1,2,3-c,d)	0,16	< 0,05	
Naftalene	0,13	0,14	Carc. Cat. 3; R40
Pirene	0,59	0,52	

Metalli	1° Batteria di trattamento	2° Batteria di trattamento	Frases di pericolo
	(mg/kg) Rif. N. 57080	(mg/kg) Rif. N. 57199	
Alluminio	7000	13000	Carc. Cat. 2; R45
Antimonio	45	78	Carc. Cat. 3; R40
Argento	< 1	< 1	C; R34
Arsenico	8	8	T; R23/25
Bario	380	580	Xn; R20/22
Berillio	0.4	1.7	Carc. Cat. 2; R49
Cadmio	2.9	0.8	Xn; R20/21/22
Cobalto	5.4	5.9	Xn; R42/43
Cromo totale	90	130	Carc. Cat. 2; R49R43
Ferro	23000	24000	
Manganese	410	410	Xn; R20/22
Mercurio	0.3	0.3	T; R23, R33
Molibdeno	56	65	Xn; R48/20/22
Nichel	46	42	Carc. Cat. 3; R40, R43
Piombo	100	110	Repr. Cat. 1; R61
Rame	910	970	Xn; R22
Selenio	2	< 1	T; R23/25R33
Stagno	130	100	T+; R26/27/28
Tallio	1.2	1.7	T+; R26/28
Titanio	120	380	C; R14, R34
Vanadio	29	39	Muta. Cat. 3; R40 Repr. Cat. 3; R63
Zinco	3800	5700	Xi; R36/38



Note: The allocation of risk phrases to the inquired substances is adhered to indicated how much from the Communitarian Directive in matter of Standardization of the dangerous substances introduced on the market (67/548/CEE - 1999/45/CE and s.m.i.); for inorganic compounds it analyzes you to the elementary state, has been associated the relative phrase of risk to the analogous one composed bringing back the condition of higher dangerousness and estimating of eventual the possible presence in the urban air particulate conveyed.

We have reported the risk and danger indications of the substances which are exclusively present in the directory of the cited Communitarian Directive.

Risk characteristics: Legend

T : toxic

T+ : very toxic

C : corrosive

Xn : injurious

XI : annoying

Carc. Cat. 1/2/3: cancerogenous, category 1/2/3

Repr. Cat. 1/2/3: toxic for the reproductive cycle, category 1/2/3

1/2/3. Cat. 1/2/3: mutagen, category 1/2/3

Text of Risk Phrases: Legend

R 1: Explosive if dry.

R 2: Risk of explosion for bump, friction, presence of fire or other sources of fire.

R 3: Great risk of explosion for bump, attrition, in presence of fire or other sources of inflammation.

R 4: Form of metallic mixtures very sensitive to the explosive.

R 5: Risk of explosion in presence of heat.

R 6: Risk of explosion to contact or not with the air.

R 7: it can provoke fire.

R 8: provokes inflammation of combustible

R 9: it can explode composing itself with combustible substances.

R 10: Inflammable

R 11: Very inflammable.

R 12: Extremely inflammable.

R 13: Extremely inflammable liquefied gas.

R 14: It reacts violently in contact with water.

R 15: In contact with water it develops very inflammable gas.

R 16: it can explode by composing itself with combustive substances.



- R 17: spontaneously inflammable in presence of air.
- R 18: With the use, possible formation of mixture inflammable/explosive vapor/air.
- R 19: it can form explosive peroxides.
- R 20: Harmful for inhalation.
- R 21: Harmful to contact with the skin.
- R 22: Harmful.
- R 23: Toxic for inhalation.
- R 24: Toxic to contact with the skin.
- R 25: Toxic.
- R 26: Very toxic for inhalation.,
- R 27: Very toxic to contact with the skin.
- R 28: Very toxic if swallowed.
- R 29: To contact with the water it develops toxic gas.
- R 30: it can become very inflammable in exercise.
- R 31: To contact with an acid it develops toxic gas.
- R 32: To contact with an acid it develops very toxic gas.
- R 33: Danger of accumulated effects.
- R 34: It provokes burns.
- R 35: It provokes serious burns.
- R 36: Irritating for the eyes.
- R 37: Irritating for the respiratory streets.
- R 38: Irritating for the skin.
- R 39: Danger of very serious irreversible effects.
- R 40: Possibility of carcinogenic effects - insufficient Tests.
- R 41: Risk of serious ocular lesions.
- R 42: it can cause sensitization for inhalation.
- R 43: it can cause sensitization to contact with the skin.
- R 44: Risk of explosion if heated in closed environment.
- R 45: it can provoke the crab.
- R 46: it can provoke hereditary genetic alterations.
- R 47: it can get congenital malformations.
- R 48: Risk of serious effects for the health in case of prolonged exposure.
- R 49: it can provoke the crab for inhalation.



- R 50: Highly toxic for the aquatic organisms.
- R 51: Toxic for the aquatic organisms.
- R 52: Harmful for the aquatic organisms.
- R 53: it can provoke for a long time term negative effects.
- R 54: Toxic for the flora.
- R 55: Toxic for the fauna.
- R 56: Toxic for the organisms of the ground.
- R 57: Toxic for the bees.
- R 58: it can provoke for a long time term negative effects for the environment.
- R 59: Dangerous for the layer of ozone.
- R 60: it can reduce the fertility.
- R 61: it can damage children not yet been born.
- R 62: Possible risk of redoubt fertility.
- R 63: Possible risk of damages to children not yet been born.
- R 64: Possible risk for children nursed to the breast.
- R 65: Harmful: it can cause damages to the bellows in case of inhalation.
- R 66: The exposure to the vapors can provoke dryness and cracks to the skin.
- R 67: The inhalation of the vapors can provoke drowsiness and dizziness.
- R 68: Possibility of irreversible effects.

Combinations sentences of danger:

- R 14/15 React violently with the water freeing inflammable gas.
- R 15/29 To contact with the water free toxic gas and easily inflammable.
- R 20/21 Harmful for inhalation and contact with the skin.
- R 21/22 Harmful to contact with the skin and for ingestion.
- R 20/22 Harmful for inhalation and ingestion.
- R 20/21/22 Harmful for inhalation, ingestion and contact with the skin.
- R 23/24 Toxic for inhalation and contact with the skin.
- R 24/25 Toxic to contact with the skin and for ingestion.
- R 23/25 Toxic for inhalation and ingestion.



R 23/24/25 Toxic for inhalation, ingestion and contact with the skin.

R 26/27 Highly toxic for inhalation and contact with the skin.

R 26/28 Very toxic for inhalation and for ingestion.

R 27/28 Highly toxic to contact with the skin and for ingestion.

R 26/27/28 Highly toxic for ingestion, inhalation and contact with the skin.

R 36/37 Irritating for the eyes and the respiratory streets.

R 37/38 Irritating pearls respiratory streets and the skin.

R 36/38 Irritating for the eyes and the skin.

R 36/37/38 Irritating for the eyes, the respiratory streets and the skin.

R 39/23 Toxic: danger of very serious irreversible effects for inhalation.

R 39/24 Toxic: danger of very serious irreversible effects to contact with the skin.

R 39/25 Toxic: danger of very serious irreversible effects

R 39/23/24 Toxic: danger of very serious irreversible effects for inhalation and to contact with the skin.

R 39/23/25 Toxic: danger of very serious irreversible effects for inhalation and ingestion.

R 39/24/25 Toxic: danger of very serious irreversible effects to contact with the skin and for ingestion.

R 39/23/24/25 Toxic: danger of very serious irreversible effects for inhalation.

R 39/26 Very toxic: danger of very serious irreversible effects for inhalation.

R 39/27 Very toxic: danger of very serious irreversible effects to contact with the skin.

R 39/28 Very toxic: danger of very serious irreversible effects for ingestion.

R 39/26/27 Very toxic: danger of very serious irreversible effects for inhalation and to contact with the skin.

R 39/26/28 Very toxic: danger of irreversible effects very for inhalation and for ingestion.

R 39/26/27/28 Very toxic: danger of very serious irreversible effects for inhalation, to contact with the skin and for ingestion.

R 42/43 can provoke sensitization for inhalation and to contact with the skin.



R 48/20 Harmful: danger of serious damages for the health in case of exposure prolonged for inhalation.

R 48/21 Harmful: danger of serious damages to the health in case of exposure prolonged to contact with the skin.

R 48/22 Harmful: danger of serious damages to the health in case of exposure prolonged for ingestion.

R 48/20/21 Harmful: danger of serious damages to the health in case of exposure prolonged for inhalation and to contact with the skin.

R 48/20/22 Harmful: danger of serious damages to the health in case of exposure prolonged for inhalation and ingestion.

R 48/21/22 Harmful: danger of serious damages to the health in case of exposure prolonged to contact with the skin and for ingestion.

R 48/20/21/22 Harmful: danger of serious damages to the health in case of exposure prolonged for inhalation, to contact with the skin and for ingestion.

R 48/23 Toxic: danger of serious damages to the health in case of exposure prolonged for inhalation.

R 48/24 Toxic: danger of serious damages to the health in case of exposure prolonged to contact with the skin.

R 48/25 Toxic: danger of serious damages to the health in case of exposure prolonged for ingestion.

R 48/23/24 Toxic: danger of serious damages to the health in case of exposure prolonged for inhalation and to contact with the skin.

R 48/23/25 Toxic: danger of serious damages to the health in case of exposure prolonged for inhalation and for ingestion.

R 48/24/25 Toxic: danger of serious damages to the health in case of exposure prolonged to contact with the skin and for ingestion.

R 48/23/24/25 Toxic: danger of serious damages to the health in case of exposure prolonged for inhalation, to contact with the skin and for ingestion.

R 50/53 Highly toxic for the aquatic organisms, it can provoke for a long time term negative effects for the aquatic environment.

R 51/53 Toxic for the aquatic organisms, it can provoke for a long time term negative effects for the aquatic environment.

R 52/53 Harmful for the aquatic organisms, it can provoke for a long time term negative effects for the aquatic environment.



R 68/20 Harmful: possibility of irreversible effects for inhalation.

R 68/21 Harmful: possibility of irreversible effects to contact with the skin.

R 68/22 Harmful: possibility of irreversible effects for ingestion.

R 68/20/21 Harmful: possibility of irreversible effects for inhalation and to contact with the skin.

R 68/20/22 Harmful: possibility of irreversible effects for inhalation and ingestion.

R 68/21/22 Harmful: possibility of irreversible effects to contact with the skin and for ingestion.

R 68/20/21/22 Harmful: possibility of irreversible effects for inhalation, to contact with the skin and for ingestion.