EFFECTS OF USING DEPTH WATER FROM A FRUIT FARM PLACEMENT ON THE BUILDING SITE

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Abstract

Water pollution may have most disastrous effects on environment, materials, vegetation, people and animals. Agriculture is one of the most hard polluters. After short term or long term treatments on lands and cultures, infiltration water, and then in time, depth water, become chemical charged. Using this type of water in building construction, without a previous special treatment, generates the carbonation phenomenon. This paper proves that it is recommended to avoid using drilling water to build, without chemical analyse and water treatment.

INTRODUCTION

The water and air pollutants have disastrous effects on environment, materials, vegetation, people and animals. One of the most serious environment problems today, in many world regions, is acid rain. This generic term refers to a large variety of phenomenon, see fig. 1. [1].

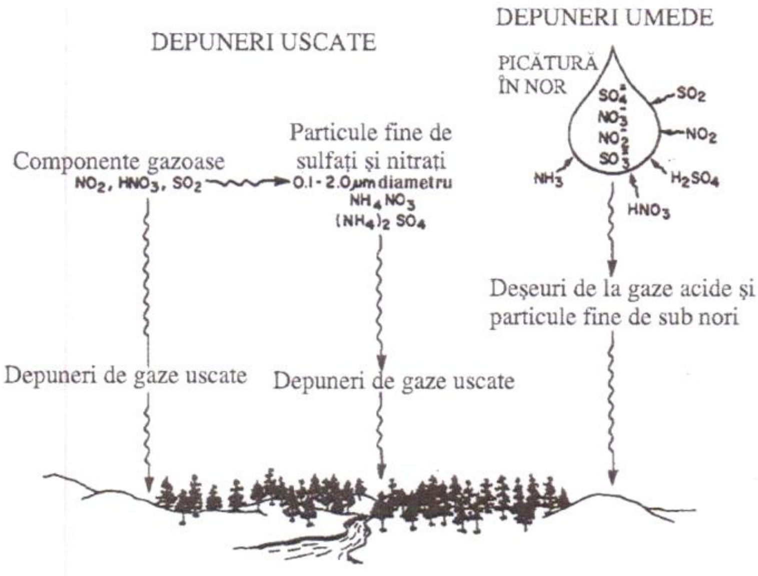

Fig.1 Atmospheric processes involved in acid filling.

When acid deposition going into the soil, the filtration processes affects the mass and the quality of the existing nutritive elements. The soil tolerance capacity of absorbing acid deposition depends in most way by its alkalinity. Major concern regarding air pollution is about soil and chalck degradation, wich is frequently used as construction material. Many old urban buildings were to smoke, SO_2 and CO_2 exposed, by decades .Due this, surfaces were petrified and become targets of chemical attack of the acid gases. By moisture , sulfur dioxide (SO_2) react with calcium carbonate ($CaCO_3$) resulting calcium sulfate ($CaSO_4$) and gypsum ($CaSO_4$ $2H_2O$). These two sulfates are completely soluble, and the cause of bricks and mortar degradation. CO_2 and moisture means carbonic acid, that transform chalck to bicarbonate, water soluble, so it can be washed by rain. [1].

The water problems from former fruit and culture farms placements it is the same. This paper studies the effects of chemical attack of the depth waters from a fruit farm site, on construction materials (mortar, concrete).

The causes of degradation appearance in aggressive mediums are [2]:

- dissolution of products of cement hydration (calcium hydroxide);
- formation of reaction products easily soluble;
- formation of compounds that cat destroy concrete and increase the volume by expansion;

Occurring chemical compounds in nature, water, gas or salt form acting in one way or another on the concrete bringing it to deteriorate.

The most important chemicals include [2]:

- seawater with the formation of magnesium hydroxide which decreases binding property;
- expansive products by forming ammonium crystal hydrates become the cause of internal stresses that product cracking of concrete (decrease of mechanical strength);
- sulfates leads to cracking and displacement in mass concrete;
- chloride ions corrode concrete fixtures and shrugs;
- alkaline salts compound crystallizes in concrete expands.

Carbonition: in concrete slow chemical process, a reaction between calcium hidroxide from cement and carbon dioxide from air resulting calcium carbonate. This proces generates an acid pH wich cause reinforcement destruction. [3].

$$Ca(OH)_2 + CO_2 \dashrightarrow CaCO_3 + H_2O$$

The chemical attack signs consist of decaying elements surfaces, increasing the crocks and gaps, overall displacement of masses of concrete, swelling. [2].

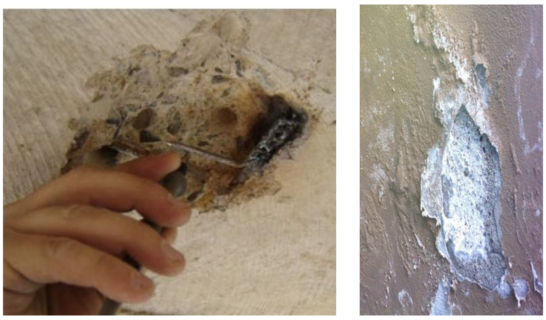

Fig.2 Carbonation phenomenon [3], [4]

MATERIAL AND METHOD

The targeted building in our study is located on Soarelui Street, City of Oradea, Bihor County, on former placement of Pomicola Research and Development Station, established from 1978.

Fig.3 The study building placement [5]

According to Pomicola Research and Development Station database, treatments to the soil and plants were applied every year, from 1978 . (table 1 and 2). The placement was dismantled in 1998 from the Research Station. From this year, chemical treatments were applied at 50 meters from the drilling that we taking about.

Scheduling phytosanitary treatments *Table 1*
in Pomicola Research and Development Station

Nr. crt.	Phenological stage and time application	Chemical treatment	Concentration %	Dose kg.,l./ha
1	fall leaves, month XI	Cooper sulphate Turdacupral	1,0 0,5	20 10
2	Winter treatments, month I -II	Oleocarbetox Cooper sulphate Carbetox	1,5 1 1	30 20 20
3	Treatments month III	Turdacupral Cooper sulphate	0,3 0,5	6,0 10
4	Repeat treatments, month IV	Carbedazin Bravo 500 Topsin Folpan 80 DG + Decis	0,1 0,15 0,007 0,2 0,05	1,5 3,0 1,3 4,0 1,0
5	Treatments month V	Folpan80 DG Topsin M70 Captadin 50 PU+ Karate Decis	0,2 0,1 0,2 0,02 0,05	4,0 2,0 4,0 0,4 1,0
6	Treatments months VI – VII	Sumilex 50 WP Topsin M 70 Ditane M45	0,1 0,1 0,2	2,0 2,0 4,0
7	Treatments months VIII - IX	Folpan 80 Captadin 50 Bavistin 50	0,2 0,2 0,1	4,0 4,0 2,0

Soil applied herbicides resort *table 2*
in Pomicola Research and Development Station

Nr. crt.	During application	Product	Dose kg., l., /ha
1.	months IV - V	Efosate	3,0
2.	month IV	Simadon	10,0 Kg.
3.	months IV- V	Randup	3,0 Kg.



Fig. 4 Carbonation phenomenon

Effects of using water from drilling on building achievement from this placement, were studied. These were revealed on the building façade, after 3 years of finishing construction. Images showing carbonating phenomenon both on building façade, and plywood joints of natural stone from façade, are relevant (fig. 4).

Also, carbonating phenomenon is visible sideways of the constructive elements, wich are into direct contact with soil from this placement (retaining wall) (fig.5).

Fig.5 Case study, carbonation phenomenon at the retaining walls

The water chemistry report, by Oradea Water Company Labs, are shown in the next table (table no. 2). The analysed water was from depth of 90 meters extracted.

Table 2

The results of physico-chemical water analysis laboratory

Nr. crt.	parameters	measurement unit	results	maximum value allowed by Law 311/04
1	pH (25^0C)	unit pH	7.73	6.5-9.5
2	NH_4	mg / l	0.57	0.5
3	NO_2	mg / l	0.42	0.5
4	NO_3	mg / l	2.12	50
5	PO_4	mg / l	0.024	-
6	conductivity	mS / cm	871	2500
7	fixed residue	mg / l	660	-
8	total alkalinity	mmo / l	6.9	-
9	bicarbonates HCO3	mg / l	421.0	-
10	chlorides Cl	mg / l	26.3	250
11	SO_4	mg / l	101.3	250
12	Ca	mg / l	46.4	-
13	Mg	mg / l	40.2	-
14	Na	mg / l	90.0	200
15	K	mg / l	1.3	-
16	Total Fe	mg / l	<0.06	0.2
17	Mn	mg / l	<0.025(0.009)	0.05
18	total hardness	^0G	15.8	minim 5

In table 3 comparative data regarding water chemical analyse of Crisul Repede were presented, before plant input, respectively for chlorinated water (Cl_5 - potable), at the minimum turbidity level (17.01.2011) and respectively maximum level (25.04.2001). [6].

Table 3

The results of physico-chemical water analysis laboratory

Nr. crt.	parameters	unit	water plant max	water plant min	water plant Cl_5 max	water plant Cl_5 min	Case study results	max. value L 311/04
1	pH	unit pH	8.0 (11^0C)	7.5 (5^0C)	7.0 (11^0C)	7.5 (5^0C)	7.73 (25^0C)	6.5-9.5
2	NH_4	mg / l	0.39	0.47	0	0	0.57	0.5
3	NO_2	mg / l	0.031	0.017	0	0	0.42	0.5
4	NO_3	mg / l	4.07	1.90	1.46	1.31	2.12	50
8	total alkalinity	mmo / l	1.6	1.6	0.8	1.6	6.9	-
10	chlorides Cl	mg / l	41.8	14.18	42.4	12.40	26.3	250
12	Ca	mg / l	28.8	25.6	30.4	28.8	46.4	-
13	Mg	mg / l	7.77	4.86	8.74	5.83	40.2	-
16	Total Fe	mg / l	1.15	0.18	0.16	0.102	<0.06	0.2
18	total hardness	^0G	5.82	4.70	6.27	5.37	15.8	minim 5

PROBLEM SOLUTION

In table 4 we present data according treated water analysis, at tanks output, analysed by Oradea Water Company laboratories [7],

Analyzed parameters and methods for control monitoring at the tanks output *Table 4*

Nr. crt.			Law 458 /2002 Law 311/2004	
	parameters	units	max. value	method of analysis
1	Streptococus fecalis	nr./100 cm3	0	SR EN ISO 7899-2/04
2	Residual total and free chlor	mg/l	0.25	SR ISO 7393-2/02
3	E. Coli	nr./100 cm3	0	SR EN ISO 9308 / 04
4	Coliform total	nr /100 cm3	0	SR EN ISO 9308-1/04
5	Bacteria at 37ºC	nr / cm2	20	SR EN ISO 6222/04
	Bacteria at 22ºC	nr / cm2	100	SR EN ISO 6222/04
6	Turbidity	NTU	≤5	SR EN ISO 7027/01

Using chemically treated water on façade mortars and plywood joints of natural stone achievement, appearance conforms to standards, and carbonation phenomenon is not visible (fig. 6).

Fig.6 No carbonation. Standard appearance.

CONCLUSION

Carbonating phenomenon is very common in construction. Given that using treated water on plasters, concrete and mortars achievement, appearance conforms to standards, environmental conditions beeing the same, it is recommended to avoid untreated water usage from drilling, on building construction. It is mentioned that water chemistry is the result of using chemical treatments on this placement, over 30 years. It is recommended also that construction elements not get into direct contact with water respectively with soil on this placement. This is applicable to retaining walls and building infrastructure.

REFERENCES

1. Lazaroiu, Effects of air pollutants. Pag_31_58_LAZAROIU.doc, accessed in 10.10.2012, http://www.spms.pub.ro/fisiere/depoluare/curs/cap02.pdf ;
2. Budan C., Stoica D. N., Cotescu A. M., Issues on reinforcement corrosion in concrete, Romanian Journal of Materials, 2010, 40(2), 132-140;
3. http://hidroizolatii.afacereamea.ro/glosar_termeni.php, accessed in 10.09.2012 ;
4. http://www.solmat.ro/450-pcc-mortar-pagel, accessed in 10.09.2012;
5. https://www.google.ro/search?q=harta+oradea, accessed in 10.09.2012;
6. http://www.greenagenda.org/eco-aqua/oradea.htm , acsesed in 10.10.2012;