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Experimental Study on A.D. Bio-Phyto-Dynamic Modulators Influence to Construction Materials

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Abstract. The present paper has as main objective the experimental results of the effect using energized water with A.D. devices (DEA), when producing several construction materials. At the Faculty of Civil Engineering and Building Services in Iasi an experimental program was developed, that meant creating Portland cement samples with normal water and with energized water. Similar to these cement samples, a new type of super-sulphatic cement named Kerysten, patented on the French market in 2009-2010 and which presents physical, chemical and mechanical properties far superior to the classical cement in the same mixing situations has been used. The experiment was according to the Methods of testing cement SR EN 196-1/1995. A number of three samples were made for each of the five mechanical characteristics determination periods (bending tensile strength and compression strength), at 24 hours, 48 hours, 72 hours, 7 days and 14 days. The strength evolution of the two types of tested materials was recorded and will be presented in the last part of this paper.

Keywords: energised water, DEA devices, construction materials, cement, experimental tests

INTRODUCTION

The appearance of the first mineral artificial binders is historically placed in the period of sedentarization of mankind. The use of fire for food preparation or for metals working, in limestone or gypsum boulder furnaces, presumed the release of carbon dioxide from the limestone and also a part of the constituent water from the gypsum, which resulted as the first lime powder, respectively plaster. Archaeological evidence on using lime and plaster comes from the Bronze Age in the area of the old civilizations: China, Egypt, Mesopotamia, Greece and Italy. In constructions the Egyptians were using plaster while the Greeks and the Romans were using lime. The first historical mortars („mortarium”) were made out of lime with sand, pounded bricks, fine crushed ceramics and water. In our country the first clues on using lime appear in IV-III B.C. at the construction of the Greek fortresses Histra, Tomis and Callatis. The Romans, by replacing the limestone with marl and lime marl in the lime obtaining furnaces and raising the burning temperature, have obtained a material which, fine crushed and mixed with volcanic ash, is considered the first cement in the history („caementum”). The mix was also named puzzolanic cement like the Pouzzolli city close to Vezuviu, from where the first volcanic ash was taken. The exceptional durability of the Roman binder is confirmed in the most difficult conditions, as in the case of the bridge of Appolodor from Damascus at Drobeta with a length of 1135m (102-105 A.C.). The foundation was made of 20 piles, 8 meters deep, but in 1906 the Danube Committee asks to demolish two of them. The Roman cement was capable to strengthen under water (navigable channel from Cazane, 100 A.C.), create a repellent layer (Drobeta – Porolissum stone road, 107-109 A.C.) or fix in a durable way the shaped stones of the city walls (Ulpia Traiana Sarmizegetusa, 110 A.C.). A „caementum” can be found at the mosaic pavement in Constanta (IV A.C.) as in its repairing works (V and VI A.C.). There are assumings that at the medieval city walls Oradea and Alba Iulia and at the fortresses Hunedoara, Targu Neamt and Targoviste (XIII – XIV) next to lime there is also Roman cement, otherwise their durability could be hardly explained. The „Roman cement", obtained through the calcination (burning) of the clay limestone natural nodules, by James Parker (XVIII century) and the patenting of the Portland cement in 1824 by the bricklayer Joseph Aspdin from Leeds, England are representative moments in its evolution. The first modern cement was made by Isaac Johnson in 1845 that burnt a clay and chalk mix until partial melting (clinkerization), or until the appearance of some compounds with important binding properties. The usage of cement as a binder has main results in obtaining concretes or mortars with applications in the execution of different construction elements, complete structures or finishing materials (www.heidelbergcement.ro).

Today in the area of the European Community, but also in other areas worldwide, new chemical mixtures for binders are studied that can partially or totally replace the Portland cements. The appearance of a binder, ecological super-sulphatic cement called Kerysten, patented in France, which can be obtained exclusively from industrial waste, mostly unrecoverable like phosphogypsum, lactogypsum or citrogypsum, opens new paths in obtaining construction materials with important qualities. Until now the French producer made some significant applications for the civil engineering area: precast elements for self compacting light concrete, self levelling flooring, finishing materials, roads for high traffic, repairing roads or some elements in contact with strongly aggressive chemical agents like sea water or animal manure.

EXPERIMENTAL PROGRAM

The testing equipment

For the tests to be exact and the results to have the same reference indicators the testing and mixing equipment, the mixing percentages and the testing process must be according to the specific standard SR EN 196-1/1995. In the testing laboratory of the Faculty of Civil Engineering and Building Services in Iasi there is all the standardized equipment needed for the experiments. From these it can be specified: digital electronic balance, mixer, shock table, the room for sample keeping, apparatus for testing prisms of 160x40x40mm.

The blender is an automatic model EL39-0031/01 produced by ELE International. This mainly has a 5 litres recipient, a paddle of stainless steel with the shape as presented in Fig. 1, engaged by an electrical engine with controlled speeds, in a rotational movement around its own axis accompanied by a planetary movement around the recipient axis. The rotational speeds of the blender are the ones indicated in Tab. 1. The mixing device is provided with an automatic sand dispenser as shown in Fig. 2.

Tab. 1

Speeds of the blenders paddle

Speed step	Rotation [min^{-1}]	Planetary movement [min^{-1}]
MICA	140±5	62±5
MARE	285±10	125±10

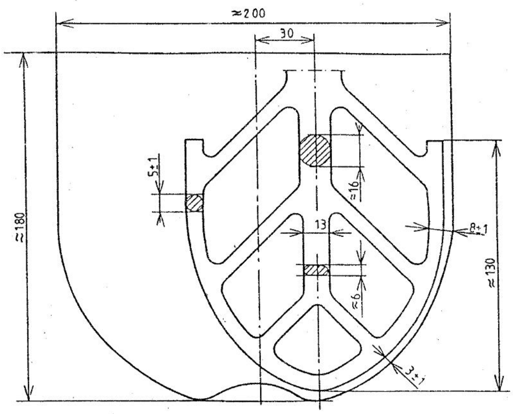


Fig. 1. Blenders cross-section

Fig. 2. Automatic standardized mixing device

The formworks in which the samples have been poured are provided with three horizontal compartments. This allowed the simultaneous pouring of three prismatic samples with a 40x40mm cross-section and 160mm length. A sketch is provided in Fig. 3.

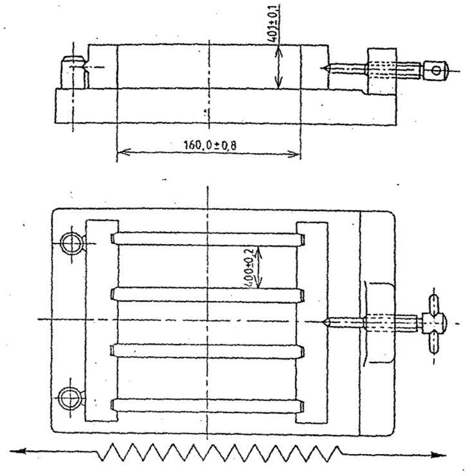


Fig. 3. Formwork sketch

Fig. 4. Formwork shape

The shock apparatus (Fig. 5) is made out of a rectangular rigid table, tied by two arms that are connected to a rotation axis that is deviated with 800mm from the mass centre. The mass is provided in the centre of its inferior face with a round faced hammer. The hammer rests on a small anvil with a superior plane surface.

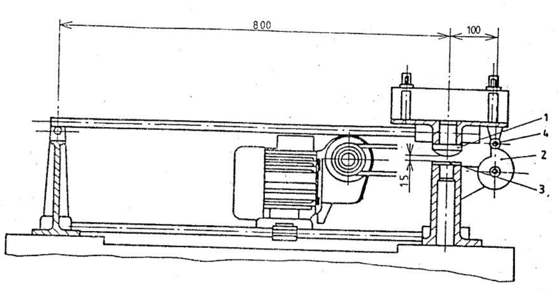


Fig. 5. Shock apparatus sketch: 1-hammer, 2-cam, 3-anvil, 4-cam follower

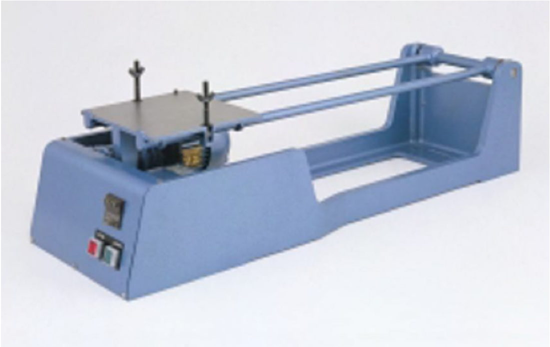


Fig. 6. Shock apparatus model EL 39-1150/01

The bending and compression strength testing machine is a semiautomatic model also produced by ELE. The model used at these experiments is the one presented in Fig. 8. In Fig. 7 is presented the working mechanism applied on the sample that must respect some conditions. The prism is positioned in the bending device with its lateral face on the sustaining roller and with its longitudinal axis perpendicular. The load is applied vertically, through a loading roller on the prisms opposite lateral face, and constantly increased with 50N/s until breaking. The fracture strength is calculated with the following formula:

$$R_t = \frac{1,5 \cdot F_t \cdot l}{b^3} \tag{1}$$

Where:

R_t – bending strength (N/mm^2);
b – side of the square cross-section of the prism (mm);
F_t – the ultimate load, applied in the middle of the prism (N);
l – distance between the sustaining rollers (mm).

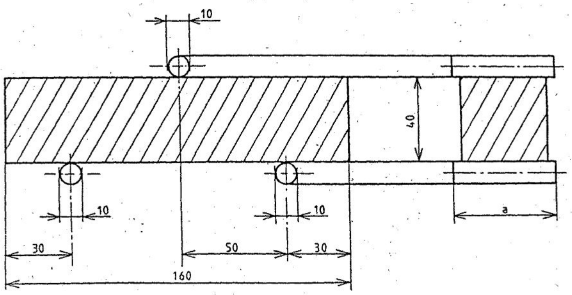


Fig. 7. Bending test on the prismatic sample

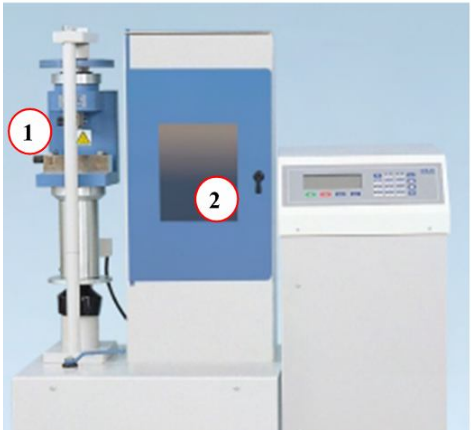


Fig. 8. Testing machine for 1-bending, 2-compression model ADR Auto 250/25

he determination of the compression strength is made by testing half prisms that resulted from the bending tests. Each half prism is centred with respect to the pans of the machine, with a ±0,5mm precision. A force of 2400N/s is applied, with no interruption, until breakage. The compression strength R_c (N/mm^2) is calculated using the next equation (SR EN 196-1/1995):

$$R_c = \frac{F_c}{1600} \qquad (2)$$

Where:
R_c – compression strength (N/mm^2);
F_c – maximum load (N);
1600 = 40mmx40mm – pans area (mm^2)

Materials and mixtures

In the first stage of the experimental program cement samples with normal water have been made. The used cement is a composite Portland cement, with high initial strength. The main constituents are: Portland clinker (K) (65-79%) and a mix of granulated blast-furnace slag (S) and limestone (L) in a percentage of 21-35%. The main application fields of cement are:

- reinforced concrete for foundations, columns, girders, slabs, load-bearing walls
- simple and reinforced concrete for precast elements
- simple concrete for foundations and levellings
- slab finishing
- monolithic elements and structures with thicknesses less than 1.5m

The mixtures preparation respects the standardized composition and is composed by one part cement, three parts sand, ½ part water. The water/cement ratio is 0.5. Each mixture for three samples follows these component quantities:

- 450 g cement
- 1350 g sand
- 225 g water

The mixing methodology consists in the following steps:

1. Put water in the recipient and add the cement
2. Start the blender at low speed and after 30 seconds add all the sand step by step in 30 seconds. We change the blender at a higher speed and keep mixing for another 30 seconds.
3. Stop the blender for 1 minute and 30 seconds. During the first 15 seconds the mortar clinged on the walls of the recipient is rabbled out using a rubber blade and reintroduced in the middle of the recipient.
4. Restart mixing with a high speed for 60 seconds.

For the second testing stage same cement mixtures have been made but using energised water with DEA devices. The third stage of testing has meant mixing normal water with the super-sulphatic cement, this being the mineral matrix that embeds the woven reinforcement glass fibres. In the last stage of testing the super-sulphatic cement mixture using energised water with DEA devices has been used. In the case of mixtures classical cement the water/cement ratio was of 0.5 and in the case of Kerysten super-sulphatic cement was of 0.2.

The samples have been made respecting the following procedure. After preparing the mortar in the binder, a layer is placed in each compartment of the formwork of approximately 300g, levelling it with a spatula. This first layer is subjected to 60 shocks. A second mortar layer is introduced, levelled and settled with 60 shocks. The formwork is taken from the shock table and levelled with a plane metallic ruler, with slow transversal moves, once on each side, after which the samples surface is relevelled with the same ruler. Every sample is labelled (date, time, type). After the 24 hours dismantling, the samples are kept in water until 15 minutes before the mechanical testing, except the samples that are tested at 24 hours. The scheduled dates for testing are the following:

- 24 hours ± 15 minutes
- 48 hours ± 30 minutes
- 72 hours ± 45 minutes
- 7 days ± 2 hours

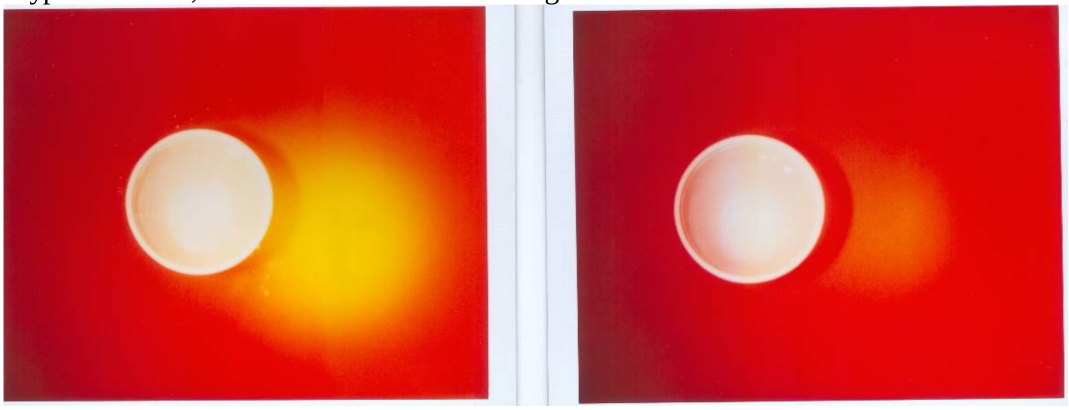
Normal water used for both type of materials is drinking water from the city system. The energised water is the same drinking water which was modified using DEA energising devices placed under the water vessel and kept there for 24 hours.

DNRN® and **ENERGIE®** products act on the basis of the informational energy of the plants that form the content of the devices. The efficiency of these products has been scientifically demonstrated using the existent equipment in the research laboratories and also the nonconventional appliance. Due to the different plant mix, these devices neutralize the harmful radiations from the environment or energise water, setting energo-informational integrity.

The water is a very special live substance which covers two thirds of the planets surface and constitutes 99% of the molecules that form the human body. Water can be charged and deposit several types of subtile energy. It's not by chance that water is the support for homeopathic remedies, where the drugs properties that have been created using plants are eliminated, leaving the subtile-energetic quantities that are absorbed by water to be predominant.

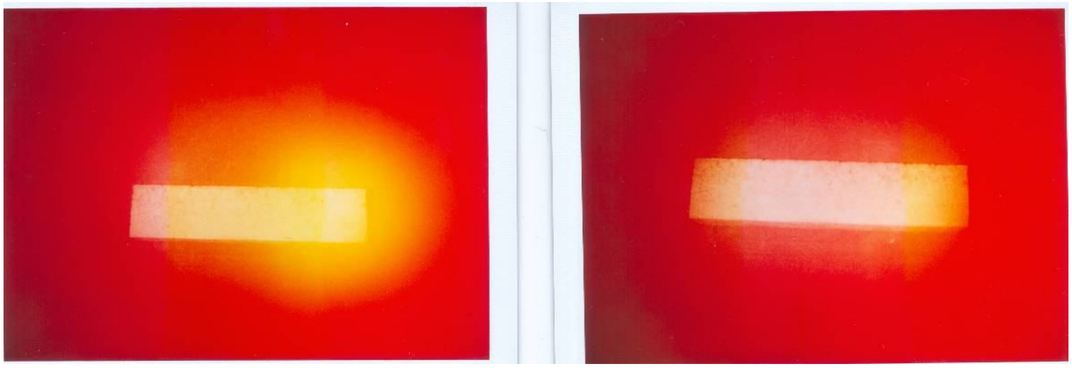
By applying **DEA®** under each water recipient a new quality is created with efficient properties for the human body. This type of treated water could be used and after longer time periods. Actually, this device restores the waters energo-informational balance. Among the researches in the last years it was detected instant elimination of the carbon dioxide, increase of the water pH, nitrites neutralization, elimination of residual chlorine and water molecule polarization through angle modification between the oxygen and hydrogen molecules (Dinca , 2009).

For the purpose of noticing the energised water properties with the help of the DEA devices, tests to obtain the mechanical resistances on the two types of construction materials presented before, normal Portland cement and super-sulphatic cement as a matrix component of composite materials reinforced with glass fibre. In the images from Fig. 9 and Fig. 10 are presented the water aspect in the recipients and the cement samples aspect performed with the two types of water, normal water and DEA energised water.



a b

Fig. 9. Water aspect: a-normal; b-energised



a b

Fig. 10. Cement samples aspect with water: a-normal; b-energised

Experimental results

The first samples have been the super-sulphatic cement with normal water. This stage was developed in the period 16.02 - 16.03.2010. The mechanical resistance determination periods have been in a shorter time compared with the normal cements. The final phase of the experimental program consisted testing the Portland cement samples with normal water. These have been carried out in the period 01 - 05.04.2010, and their storing has been at a distance of 15 meters from the place where the DEA energised water samples were prepared, so that there will be no influence on the samples with normal water. The second stage of cement samples preparation has been 06 - 10.04.2010 for which DEA energised water was used. All the results obtained in the four stages of the experimental program are presented in the following tables.

Tab. 2

Super-sulphatic cement (Kerysten) sample tests at 1 hour

Date: 16.02.2010, Age 1h						
Sample no.	E.W. - 25h		E.W. - 20h		N.W.	
	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)
1	2,383	8,12	2,401	9,848	2,088	8,254
		8,944		9,71		8,195
2	2,212	9,212	1,954	10,01	1,908	7,983
		9,088		9,326		8,111
3	2,157	9,351	2,17	9,365	1,855	8,084
		9,574		10,25		7,827
Average	2,25	9,05	2,18	9,75	1,95	8,08

Tab.3

Super-sulphatic cement (Kerysten) sample tests at 24 hours

Date: 17.02.2010, Age 24h						
Sample no.	E.W. - 25h		E.W. - 20h		N.W.	
	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)
1	4,162	22,9	4,335	26,69	3,772	20,04
		23,51		26,53		21,93
2	4,807	23,62	4,649	24,07	4,267	20,52
		22,89		24,8		20,33
3	3,411	23,51	4,197	26,72	3,971	19,54
		23,98		25,74		20,96
Average	4,13	23,40	4,39	25,76	4,00	20,55

Tab. 4

Super-sulphatic cement (Kerysten) sample tests at 7 days

Date: 23.02.2010, Age 7 days						
Sample nb.	E.W - 25h		E.W. - 20h		N.W.	
	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)
1	9.991	56.62	7.494	47.8	10.29	42.02
		49.74		48.57		48.57
2	10.62	48.62	7.399	41.16	9.699	44.36
		57.95		44.47		46.52
3	10.74	48.55	6.003	52.73	10.9	49.19
		49.57		48.13		46.11
Average	10.45	51.84	6.97	47.14	10.30	46.13

Tab .5

Super-sulphatic cement (Kerysten) sample tests at 21 days

Date: 09.03.2010, Age 21 days						
Sample no.	E.W. - 25h		E.W. - 20h		N.W.	
	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)
1	15.07	59.61	10.69	53.79	13.21	56.69
		43.46		57.27		53.77
2	15.32	66.61	12.05	54.48	11.5	51.51
		35.2		49.16		48.97
3	11.15	58.21	12.51	47.34	12.15	42.23
		59.31		51.59		53.03
Average	13.85	55.15	11.75	52.27	12.29	52.79

Tab. 6

Super-sulphatic cement (Kerysten) sample tests at 28 days

Date: 16.03.2010, Age 28 days						
Sample no.	E.W. - 25h		E.W. - 20h		N.W.	
	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)
1	9.814	52.48	12.91	47.29	14.25	52.9
		53.88		49.24		53.41
2	12.51	51.44	10.09	44.14	14.65	58.7
		48.65		48.62		55.74
3	13.94	59.21	14.81	44.35	15.11	57.16
		52.56		50.31		54.65
4	8.625	57.36	12.34	43.57	11.45	60.18
		65.46		47.02		60.38
5	7.562	62.61	12.46	46.24	5.231	59.85
		58.34		48.89		58.92
6	7.285	62.9	14.35	51.29	6.039	53.72
		67.01		49.08		62.34
Average	9.63	57.62	13.02	47.50	11.71	57.27

Tab. 7

Super-sulphatic cement (Kerysten) sample tests, average values

Average values						
Material	E.W. - 25h		E.W. - 20h		N.W.	
Strengths	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)	Rt (MPa)	Rc (MPa)
1h	2.25	9.05	2.175	9.75	1.95	8.08
24h	4.13	23.40	4.39	25.76	4.00	20.55
7 days	10.45	51.84	6.97	47.14	10.30	46.13
21 days	13.85	55.15	11.75	52.27	12.29	52.79
28 days	9.63	57.62	13.02	47.50	11.71	57.27

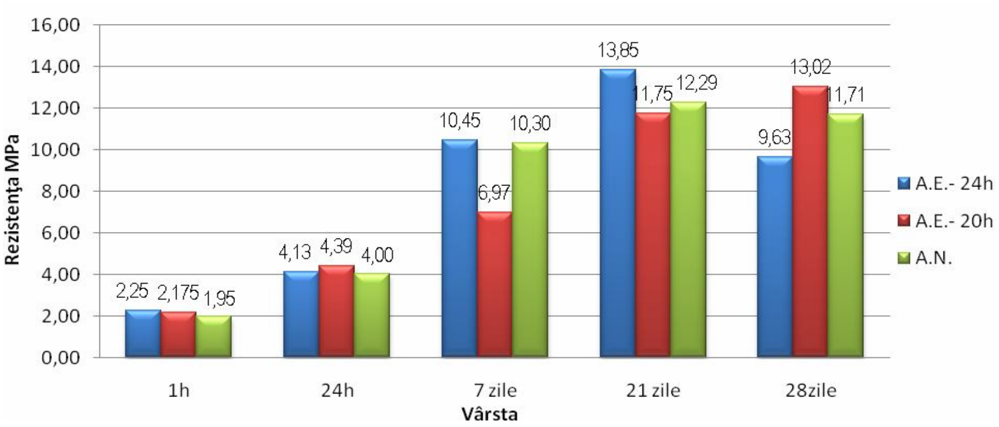


Fig. 11. Comparative results of tensile strengths obtained on the super-sulphatic cement samples

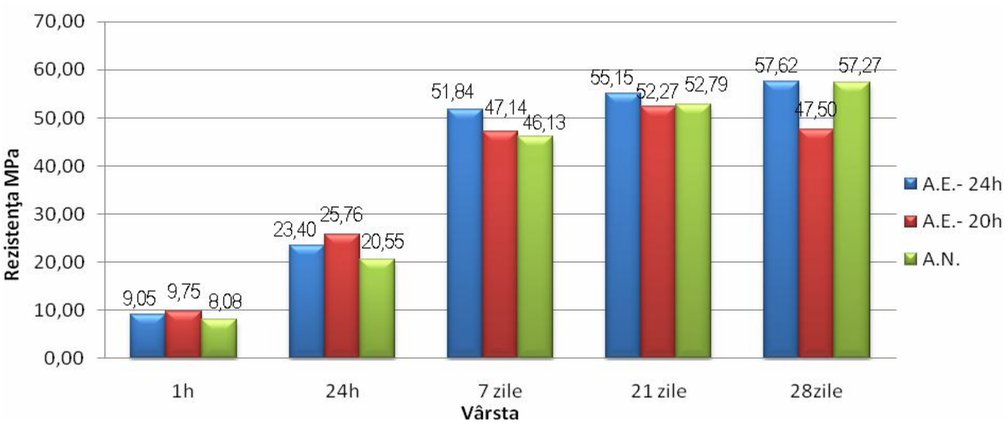


Fig. 12. Comparative results of compression strengths obtained on the super-sulphatic cement samples

Tab. 8

Test results for Portland cement with normal water samples

Age	Sample	R_t N/mm^2	R_{c1} N/mm^2	R_{c2} N/mm^2	R_{tmed} N/mm^2	R_{cmed} N/mm^2
24	1	0,83	3,01	2,8	0,83	3,069
	2	0,87	3,07	3,068		
	3	0,76	3,29	3,15		
48	1	1,88	7,51	7,12	1,98	7,23
	2	1,98	7,06	7,68		
	3	2,01	7,34	6,95		
72	1	2,061	8,105	8,44	2,073	8,335
	2	2,073	8,02	8,494		
	3	2,151	8,833	8,23		
168	1	3,06	12,24	12,45	3,06	12,26
	2	2,98	12,07	11,94		
	3	3,24	12,76	12,28		

Tab. 9

Test results for Portland cement with energised water samples

Age	Sample	R_t N/mm^2	R_{c1} N/mm^2	R_{c2} N/mm^2	R_{tmed} N/mm^2	R_{cmed} N/mm^2
24	1	0,85	3,08	3,16	0,92	3,1915
	2	0,92	3,386	3,242		
	3	0,94	3,223	3,076		
48	1	1,85	7,23	6,8	1,85	6,85
	2	1,71	6,62	6,9		
	3	1,92	6,62	7,28		
72	1	2,493	9,936	10,34	2,493	10,113
	2	2,44	9,388	10,44		
	3	2,553	9,854	10,29		
168	1	3,12	14,75	13,95	3,26	14,22
	2	3,45	14,54	13,94		
	3	3,26	14,16	14,28		

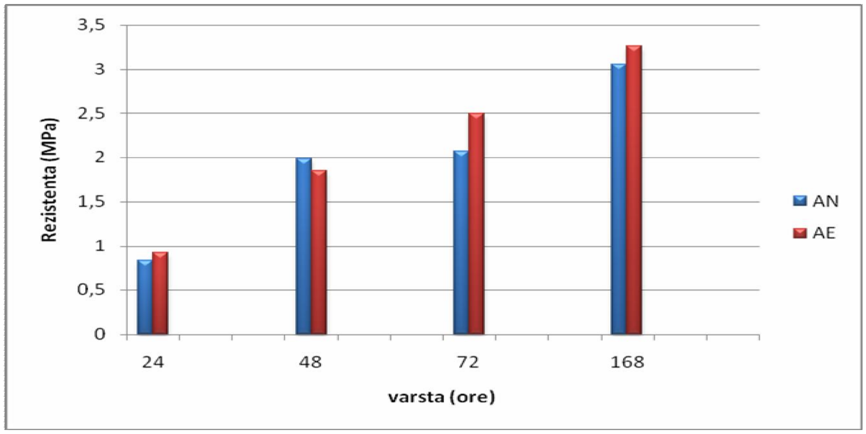


Fig. 13. Comparative results of tensile strengths obtained on the normal Portland samples

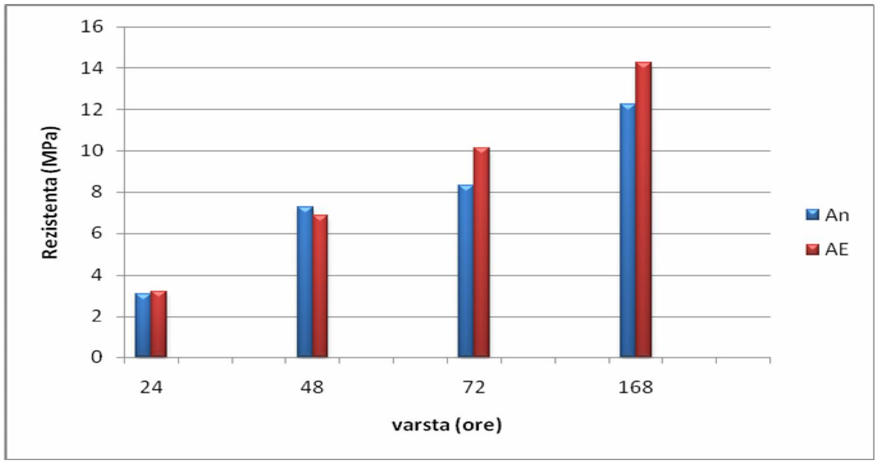


Fig. 14. Comparative results of compression strengths obtained on the normal Portland cement samples

CONCLUSIONS

The results of the experimental program have shown that in the case of the super-sulphatic cement, at 1 hour, the samples have similar strengths, then ones with 20 hours energised water presenting a slight increase. At the age of 24 hours the samples prepared with 20 hours energised water have the highest strength, with up to 30% more than the ones with normal water, and the ones with 24 hours energised water present a similar strength with the normal water samples. At the age of 7, 21 and 28 days respectively the samples that have been prepared with 24 hours energised water are the ones showing the highest strengths by approximately 5 - 7%.

In the case of samples prepared with normal Portland cement, except for the age of 48 hours where the ones with energised water had mechanical strengths with 5% smaller, at the other ages, 72 hours and 7 days respectively, the strengths have increased even up to 16%.

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