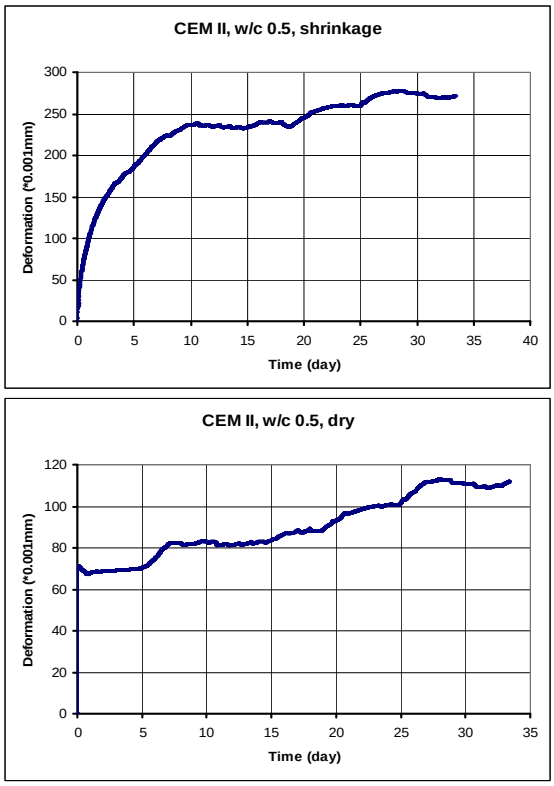

Fig. 17: Creep of specimens w/c 0.5 (CEM II).

6. Achieved results and their analysis

The goal of experimental work was in the getting dates from tests and its application in the simulation of the creep cement pastes and concrete. In the table 3 are summarized results from creep tests of the cement pastes specimens.

Specimen	1	2	3	4
w/c 0.3 Cem I	237	223	171	18.5
w/c 0.4 Cem I	190	47	142	32.6
w/c 0.5 Cem I	40	44	83	23
w/c 0.3 Cem II	100	100	26	84
w/c 0.4 Cem II	193	132	28	189
w/c 0,5 Cem II	386	335	30	223

Table 4. Values of creep and shrinkage after 25day.

Values in the table are deformation of cylindrical specimens (length 70mm) in μm (*0,001mm). Values in rows pertains to series 0.3; 0.4 and 0.5 of the CEM I and CEM II. Data in the first and second columns are deformations of water saturated specimens, third column is characterized by deformation of the water dried specimens. Data in the fourth column appertain to the shrinkage of cement paste. In the third column are strengths of dried. For the first series achieved creep after 25 day values between 223 and 237 μm. Deformation of the dried specimen is lower to deformation water saturated specimens. Shrinkage of cement paste specimen with w/c 0.3 is only 18.5μm.

In the second series (w/c 0.4) were result of measure "wet" creep (creep of the water saturated specimen) different. Values of the wet creep were from 47 to 190 μm. Value of the creep of the water dried specimen was 142 μm. Shrinkage of cement paste was little bit higher 32 μm.

Third series (w/c 0.5) is characterized by next results:

Deformation of the wet specimens was between 40 and 44 μm. Deformation of the dried specimen was 83 μm. Finally, shrinkage of specimen was 23 μm. The above described results pertain to the cement paste from CEM I. Following results are related with cement CEM II.

In this first series was achieved creep after 25 day values 100μm. Deformation of the dried specimen was lower to deformation water saturated specimens. Shrinkage of cement paste specimen with w/c 0.3 is 84μm. In the second series (w/c 0.4) were result of measure "wet" creep (creep of the water saturated specimen) little bit different. Values of the wet creep were from 132 to 193 μm. Value of the creep of the water dried specimen was 189 μm. Shrinkage of cement paste was 28μm. Third series (w/c 0.5) is characterized by next results: Deformation of the wet specimens was between 335 and 386 μm. Deformation of the dried specimen was 30 μm. Finally, shrinkage of specimen was 223 μm.

4 Conclusion

The paper compares results material properties from compression tests and from measuring of creep. In compression tests was the strongest 2nd series (CEM I). Third series CEM II was compression strength the lowest (50.82MPa). From achieved values result that optimal mixture is for w/c ratio 0.3 (for CEM I and CEM II near results). In the making cement paste with w/c ratio 0.5 is some content of water separated from cement gel. Whereas, in the making cement paste with w/c 0.3 is possible observe insufficient content of the water for treatment.

According with results of the compression tests are lowest (best) deformations from creep tests for w/c 0.3. If content of water in cement gel is increasing, deformation water saturated specimens in creep test is increased, too. The effect is reversed for CEM I. Shrinkage of the all kinds of cement paste was between 18.5 and 223 μm). Values of the creep of cement paste have increasing trend, too. The biggest difference is between drying creep and wet creep for specimens with w/c ratio 0.5 (CEMI).

For cement paste made by CEM II is possible observe decreasing trend for compression strength and Modulus of elasticity.

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References:

[1] B. Patzák, Z. Bittnar. Design of object oriented finite element code. *Advances in Engineering Software*, 32(10-11):759--767,

[2] P. Padevět, P. Bittnar, Measurment of Creep of the Cement Paste Specimen, *Acta Mechanica Slovaca 3/2009* pp. 133 – 136.

[3] Padevět P., Mechanical Properties of Cement Pastes, International Conference 70 years SvF STU, Bratislava, 2008.

[4] EN 197 – 1, Cement – part 1, Composition, specification and condition of the agreement of cement for universal use.

[5] B. A. Schrefler, F. Pesavento, A multiphase model for concrete: numerical solution and applications, *Proceedings of the 2nd WSEAS Int. Conference on Applied and Theoretical Mechanics*, Venice, Italy, November 20-22, 2006, pp. 108 – 116.

[6]Tsamatsoulis Dimitris, Application of the Exponential Kinetic Model in the Hydravion of Cement Produced According to EN 197-1, *12th WSEAS International Conference on SYSTEMS*, Heraklion, Greece, July 22-24, 2008, pp. 86 – 90.

[7] I. Krasniqi, Sh. Kelmendi, I. Zeqiri, Management of Lignite Combustion Waste from Kosova Power Plants – Fly Ash Use Posibilities, *Proceedings of the WSEAS Int. Conf. on Waste Management, Water Pollution, Air Pollution, Indoor Climate, Arcachon*, France, October 14-16, 2007, pp. 217 – 222.

[8] T. Plachy, M. Polak, Fatique Damage Identification on Concrete Structures Using Modal Analysis, *3rd WSEAS International Conference on APPLIED and THEORETICAL MECHANICS*, Spain, December 14-16, 2007, pp. 191 – 196.