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R E P O R T

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On the results of a research on the influence of water activated by the devices of the type U-S Air; ULTRA-SW and ULTRA-SMW on cement slurry density and concrete compressive strength

1. Devices used in the research

- U-S Air – hydrodynamic device for water activation through generation of mechanical oscillations in the sonic and ultrasonic fields, in addition performing aeration.
- ULTRA-SW – hydrodynamic device for water activation through generation of mechanical oscillations in the sonic and ultrasonic fields.
- ULTRA-SMW – hydrodynamic device for water activation through generation of mechanical oscillations in the sonic and ultrasonic fields, and simultaneous influence with magnetic field, variable in space.

2. Estimated parameters

- Standard density of cement slurry – the smallest amount of water, with which the standard density is reached (ml)
- Compressive strength (σ) of cement slurry samples (Mpa)
- Compressive strength of concrete mix

3. Cement slurry composition

Cement: 450 g. + Sand: 1350 g. + 30% Water

4. Concrete mix composition – for 1m³ concrete

- Cement: 42.5 R – 320 kg
- Sand: 0÷5 mm – 820 kg
- Gravel: 5-15 mm – 570 kg
- Gravel: 15-20 mm – 510 kg
- Water necessary for normal pressure:
 - Non-activated – 201.6 l
 - Activated with ULTRA-SMW – 196.4 l

RESULTS

The results for cement slurry standard density and the compressive strength of its samples are listed in Table 1 and Table 2 respectively.

On the basis of these results, for water activation of the concrete mix with composition described in item 4., is used ULTRA-SMW device only. The results for the compressive strength of this mix are listed in Table 3.

Cement Slurry Standard Density

Table 1

device	without	U-S Air	ULTRA-SW	ULTRA-SMW
water, ml	140	132	130	125

Compressive Strength – Cement Slurry Samples

Table 2

σ (Mpa)	without	U-S Air	ULTRA-SW	ULTRA-SMW
σ_1 (1st day)	1.9	2.3	2.3	2.4
σ_3	6.6	8.5	8.6	8.9
σ_7	10.9	13.0	13.8	16.1
σ_{14}	14.8	16.6	17.7	19.2
σ_{21}	16.2	17.3	18.2	22.4
σ_{28} (28th day)	18.2	19.9	21.1	25.1
σ_{90}				

Compressive Strength – Concrete Mix Samples

Table 3

σ (Mpa)	without	ULTRA-SMW
σ_1 (1st day)	5.6	6.5
σ_3	13.5	15
σ_7	20.6	24.5
σ_{14}	26.6	32.8
σ_{21}	30.5	35.5
σ_{28}	32.2	38.3
σ_{90}		

CONCLUSIONS

1. The use of ULTRA-SMW device for the activation of water for the preparation of concrete mix with composition described in item 4. allows compressive strength increase by 15-18%.
2. ULTRA-SMW device is more efficient than U-S Air and ULTRA-SW.

Research Performer:

Tests are carried out in the Silicate Department of the University of Chemical Technology and Metallurgy – Sofia, by Head Assistant DrEng Georgi Chernev.