STUDY OF PLASIFICATORY PROPERTIES OF POLYMETYLEN NAPHTALINSULFONATE SOET FOR BITON MIXTURES

Kenjayev Akmal Qudratovich
National University of Uzbekistan named after Mirzo Ulugbek

At present, the construction industry in our country is developing very rapidly. Requirements for the rational and efficient use of raw materials and energy resources in the construction industry have also changed accordingly, strength of concrete mixes, assembly with high reliability and durability, requires extensive use of special chemical additives to effectively solve the problem of production of monolithic concrete and reinforced concrete structures.

Additives used to improve the operational properties of concrete mixtures are divided into three groups depending on the effect of the properties of concrete and lime mixtures:

- The first group includes additives that regulate the properties of ready-to-use concrete and mortar mixtures: plasticizers, stabilizers, porosity.
- The second group of modifiers of concrete and mortar mixtures: regulating the kinetics of product hardening (accelerating, delaying), increasing strength, reducing permeability, increasing the protective properties of steel reinforcement, etc.
- Additives to the third group, which give special properties to concrete and lime mixtures: are divided into types such as frost protection, hydrophobic, biocidal, cracking resistance [1].

According to experts, in the coming years the share of processed concrete with additives for concrete mixes in our country will exceed 50%. Currently, plasticizer additives are most widely used in the production of concrete and reinforced concrete. This increases their usability due to their high efficiency, lack of negative features as well as their relatively low cost[2].

Plasticizers are substances with surfactants that increase the mobility and performance of concrete mixes. Also, using the plasticizing effect of additives in the technology of reinforced concrete structures, it is possible to significantly simplify the shaping procedure of products or significantly reduce its water content, reduce or increase porosity while maintaining the constant mobility of the mixture. There are a large number of plasticizer additives on the world market today, which also differ radically in their composition and effect on concrete.

The use of plasticizers in the production technology of reinforced concrete structures allows to significantly facilitate the formation of concrete products while maintaining the same mobility of the mixture, reduce the time of products in the molds and thus increase production efficiency[3].

Plasticizers for concrete mixes began to be widely used in the late 40s and 50s of the last century. Today, they have undergone significant changes and have taken a large share of the market of chemical additives used in concrete technology. Surfactants are commonly used as plasticizer additives, which are often products derived from chemical industry wastes. Surfactants have high kinetic and chemical activity in dispersed systems, which is their characteristic feature.

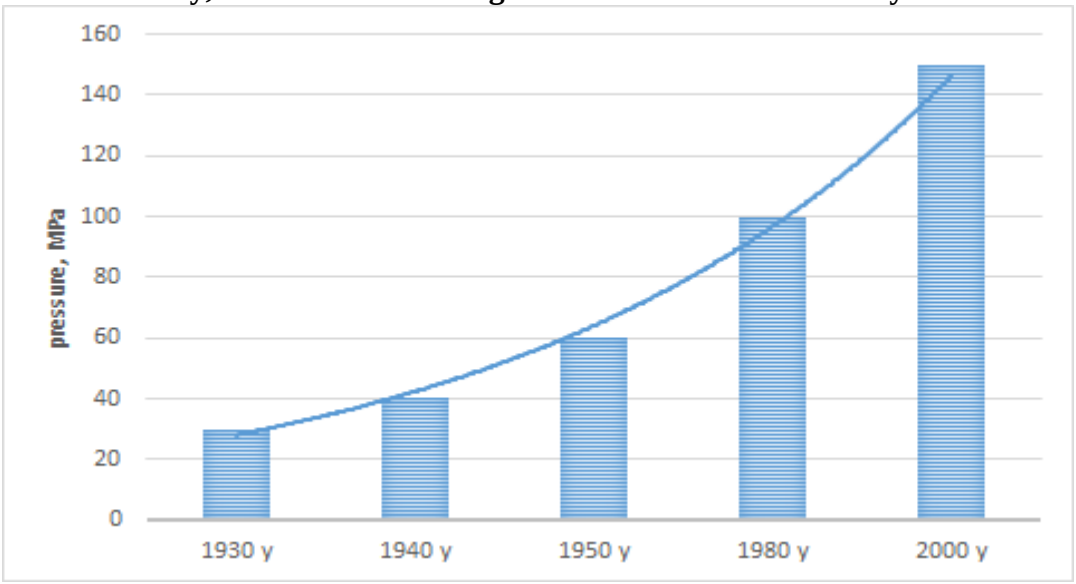
Surfactants are divided into two groups according to their properties:

- The first group - plasticizers of hydrophilic type, which contribute to the dispersion of the colloidal system of the cement mixture and improve its fluidity.

- The second group - waterproofing additives containing the smallest air bubbles in the concrete mix. Molecules of surfactant hydrophobic additives adsorbed in the air-water mixture reduce the surface tension of the water and stabilize the smallest air bubbles in the cement mixture. Group II additives, which are the main purpose of regulating the structure and increasing the resistance of concrete, have a significant plasticizing effect. [4].

The use of superplasticizers and complexes based on them allows to significantly increase the average and maximum strength of concrete, along with increasing the flexibility of concrete mixtures. The growth dynamics of the maximum capacity of heavy concrete is as follows (Figure 1).

Figure 1.
In the twentieth century, the maximum strength of concrete increased in dynamics over the years



Today, the use of optimal amounts of superplasticizers allows the production of bulk or highly mobile mixtures. According to their chemical composition, all superplasticizers can be conditionally divided into four groups:

- sulfonated melamine-formaldehyde to the first group;
- Polycondensation products of naphthalene sulfuric acid and formaldehyde to the second group;
- Products based on the third group of polycarboxylates and polyacrylates;
- The fourth group includes modified lignosulfonates.

A superplasticizer was synthesized on the basis of the secondary raw material of hydrocarbon pyrolysis of Ustyurt gas-chemical complex of Uz-KorGas Chemical LLC. The process consists of the following steps: sulfation of naphthalene and polycondensation of the resulting sulfomass with formalin[5].

The effect of this superplasticizer on the mobility of concrete mixes was carried out in accordance with the interstate standard GOST 10181-2014 [6].

Test 1. Determination of permeability of concrete mix without superplasticizer.

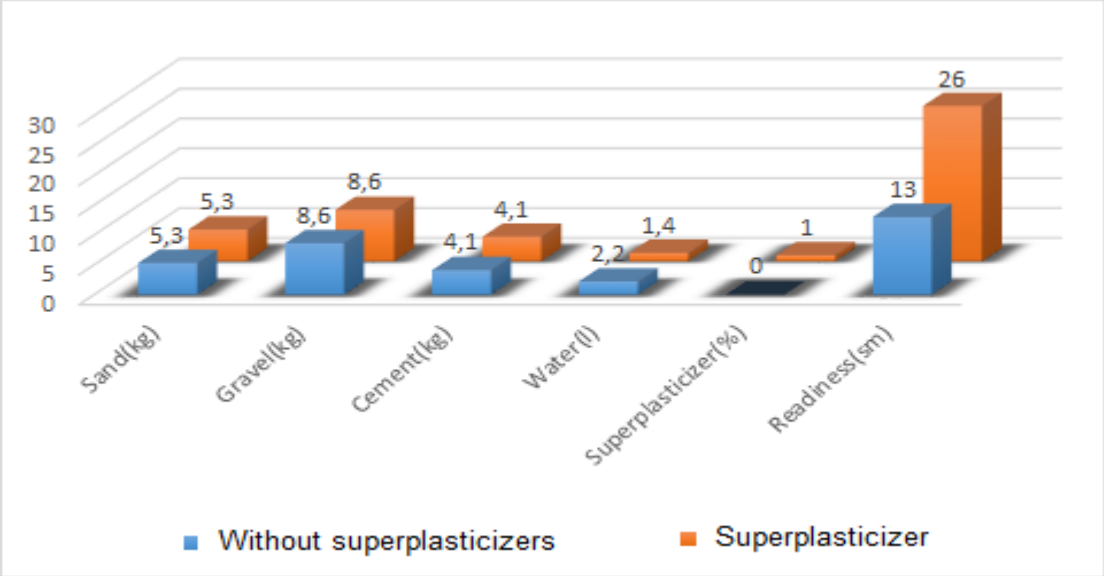
To study the fluidity of the concrete mixture without superplasticizer, 5.3 kg of sand, 8.6 kg of gravel, 4.1 kg of cement (M450) and 2.2 l of water were mixed in a container. The age aggregates in this concrete mix did not exceed 40 mm. The resulting concrete mixture was poured into a cone (d = 100 mm, D = 200 mm, H = 300 mm), pierced 25 times using a metal rod, and the excess was removed and the upper part was leveled. The cone was then slowly removed. When the concrete mix stopped moving, the cone was inverted and placed on a metal rod, and the rate of deceleration was measured using a ruler. The drop in concrete mix was 13 cm.

Test 2. To study the flexibility of a concrete mix using a synthetic superplasticizer

5.3 kg of sand, 8.6 kg of gravel, 4.1 kg of cement (M450), 1.4 l and 41 g of superplasticizer were placed in a container and mixed to study the permeability of the concrete mix in the presence of the superplasticizer. In this concrete mix, the size of the aggregates does not exceed 40 mm. The resulting concrete mixture was poured into a cone (d = 100 mm, D = 200 mm, H = 300 mm), pierced 25 times using a metal rod, and the excess was removed and the upper part was leveled. The cone was then slowly removed. When the concrete mix stopped moving, the cone was inverted and placed on a metal rod, and the rate of deceleration was measured using a ruler. The drop of concrete mix was 26 cm.

From the above test results, it can be seen that the flexibility of the concrete mix was higher when the plasticizer was used than the test results without the superplasticizer. Figure 2 shows the parameters at which the superplasticizer was used and when it was not.

Figure 2.
Superplasticizer used and unused time parameters



As can be seen from the graph above, the first 3 components were used in the same way. Water consumption is reduced by 36.4% due to the use of plasticizers. In the presence of a synthesized superplasticizer, the permeability of concrete mixes was found to be 2 times higher. This reduces energy consumption by 2 times during the use of concrete mixes.

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