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DEFORMATION DETERMINATION BY A DEVELOPED MONITORING SYSTEM WITH A DEPTH SENSOR FOR MONITORING THE STRESS-STRAIN STATE OF BUILDING STRUCTURES

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An experimental setup for calibrating a depth gauge is described. Test results for a specimen equipped with the depth gauge are presented. The dependence of deformation on depth gauge readings is presented. The model obtained from the depth gauge allows for the prediction of specimen deformation with 99% accuracy and the remaining service life (the last 10%) with 100% accuracy.

A Wheatstone half-bridge was used to obtain data. This was used to measure the relative change in resistance in the strain gauge [1-5].

In the first stage, a depth gauge in a cylindrical housing was calibrated using a PM-2MG4 press (Figure 1). Load and strain values obtained from the gauge corresponded to press readings with an accuracy of ±1%.

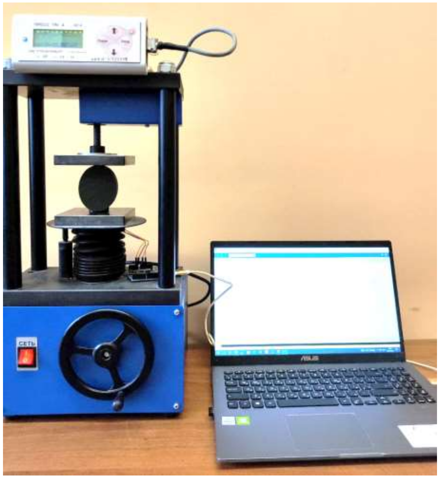

Figure 1 – Installation for calibrating a depth sensor

In the second stage, the depth sensor was immersed in a concrete sample (a cube with a 100 mm side dimension). After 28 days, the sample was compressed using a PGM-500MG4A press. The load and deformation values for the cube sample with the depth sensor are shown in Table 1 and Figures 2-3.

Table 1. – Test results of a sample with a depth sensor

Deformation, mm	Sensor readings	Note
0,00	167	
0,21	167	
0,32	167	
0,43	167	
0,52	167	
0,62	167	Crackling in the sample
0,72	167	
0,92	167	
1,11	167	
1,22	167	
1,71	305	Sample destruction
1,71	294	Relieving the load
1,71	294	
1,71	290	
1,71	165	
1,71	166	
1,71	167	

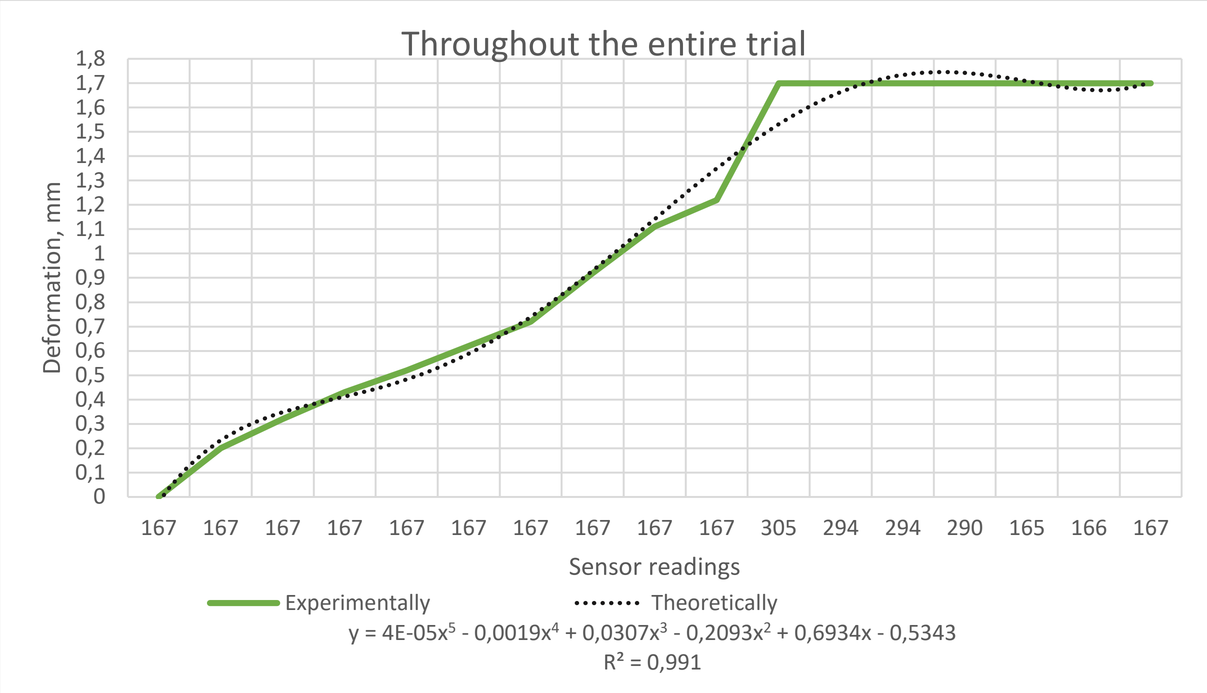

Figure 2. – Dependence of deformation on depth sensor readings

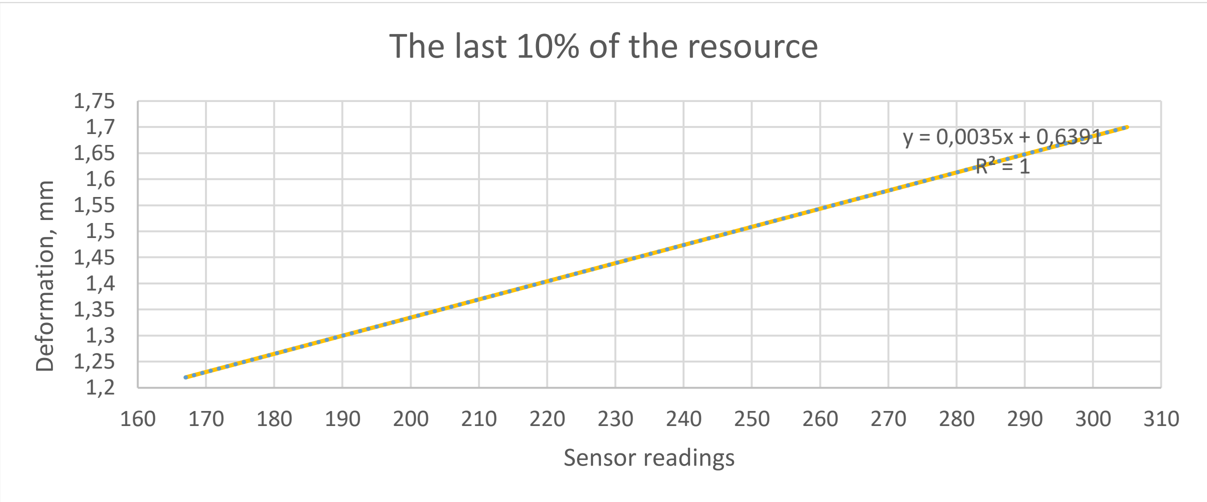

Figure 3. – Dependence of deformation (the last 10% of the sample resource) on the readings of the depth sensor

As can be seen from Figures 2-3, the model obtained from the depth sensor allows us to predict the deformation of the sample with an accuracy of 99%, and the remaining resource (the last 10%) with an accuracy of 100%.

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