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

***A. BELOUSOV, N. ZHURAVSKI***
***(Presented by A. Yagubkin, Ph.D. D. Shabanov)***

*An experimental setup for calibrating a depth sensor is described. Test results for a specimen equipped with the depth sensor are presented. The dependence of the load on the depth sensor readings is presented. The model obtained from the depth sensor allows predicting the specimen load 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%.

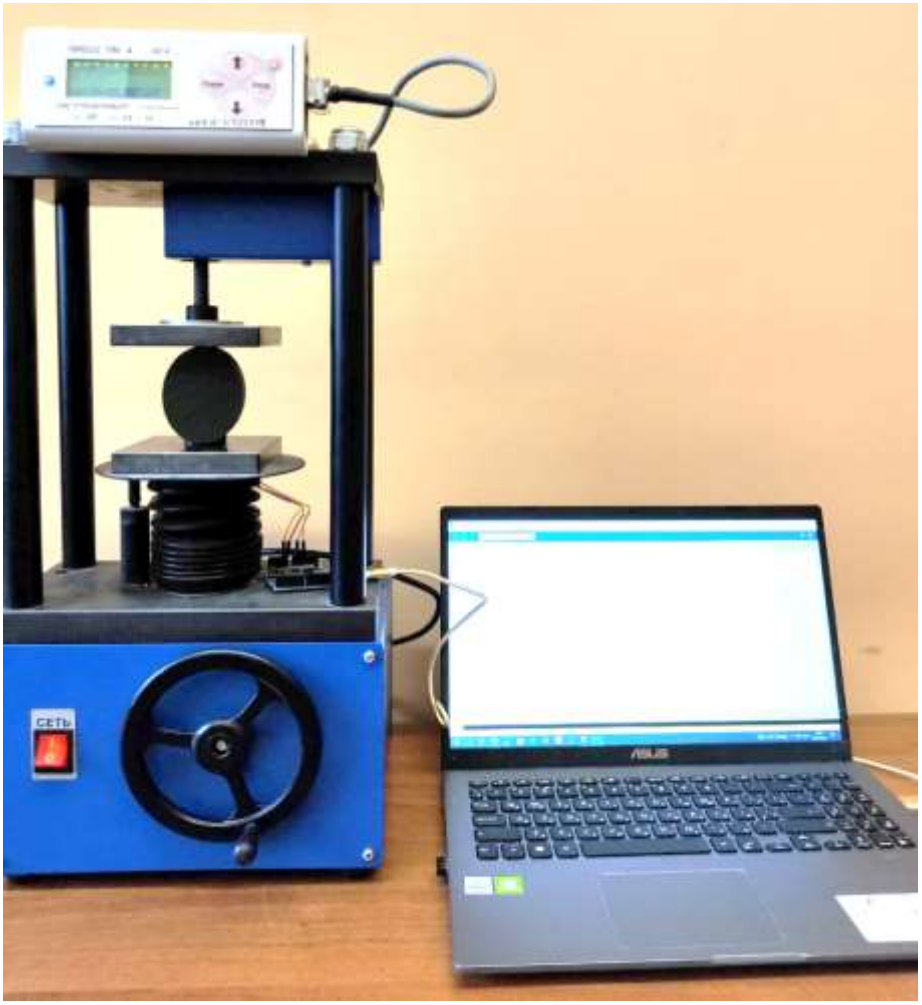


**Figure 1. – Installation for calibrating a depth sensor**

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.

As can be seen from Figures 2-3, the model obtained from the depth sensor allows predicting the sample load with 99% accuracy, and the remaining life (the last 10%) with 100% accuracy.

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

| Strain, kN | Sensor readings | Note |
|---|---|---|
| 0,00 | 167 | |
| 7,49 | 167 | |
| 33,51 | 167 | |
| 55,17 | 167 | |
| 77,53 | 167 | |
| 96,32 | 167 | Crackling in the sample |
| 122,26 | 167 | |
| 151,22 | 167 | |
| 173,35 | 167 | |
| 181,19 | 167 | |
| 207,91 | 305 | Sample destruction |
| 185,44 | 294 | Relieving the load |
| 174,78 | 294 | |
| 165,54 | 290 | |
| 130,55 | 165 | |
| 125,21 | 166 | |
| 98,39 | 167 | |

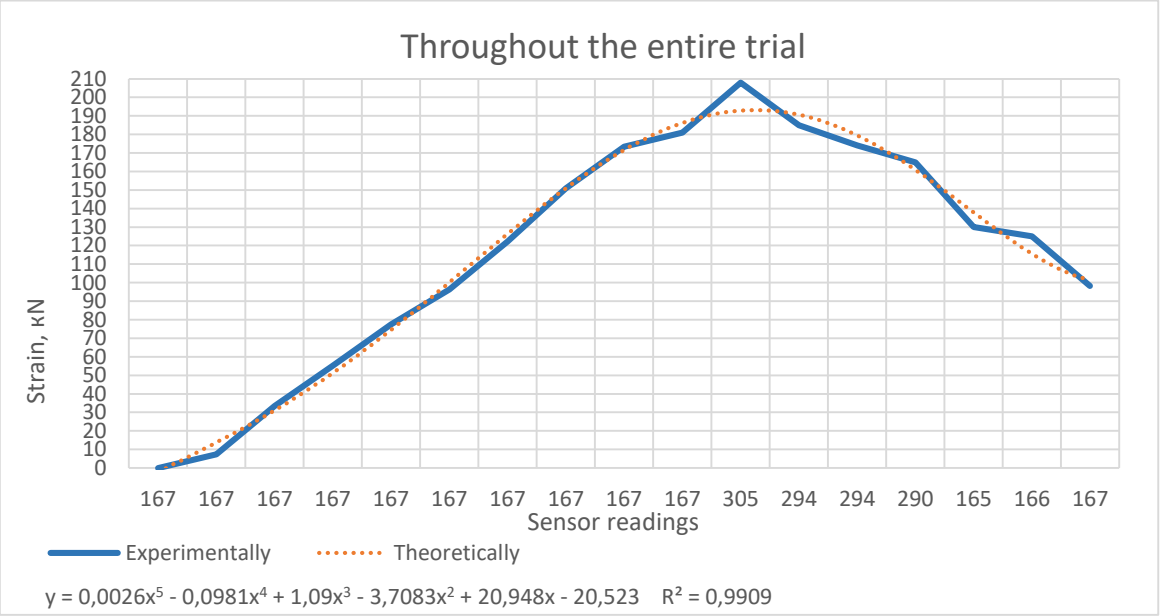


**Figure 2. – Dependence of load on depth sensor readings**

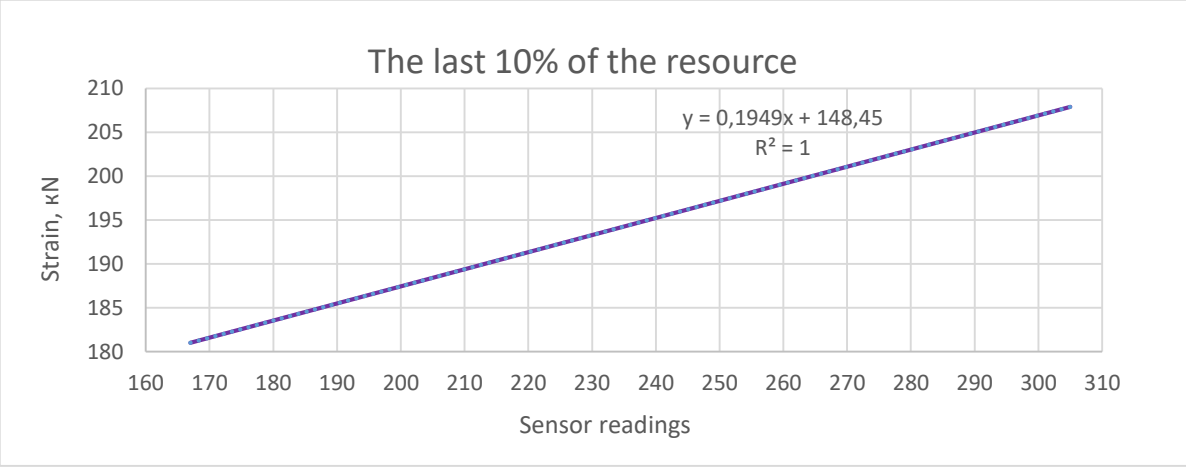


**Figure 3. – Dependence of the load (the last 10% of the sample resource) on the readings of the depth sensor**

LITERATURE

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