THE ROLE OF SOFTWARE IN DETERMINING THE HARDNESS OF MATERIALS ACCORDING TO ISO STANDARD REQUIREMENTS BY THE BRINELL AND VICKERS METHOD

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Abstract. This article aims to reveal the role and importance of software in determining the hardness of construction materials according to ISO standard requirements.
Key words: ISO, standard, software, metrology, material hardness, Microsoft Excel, Visual basic.

Today, our life cannot be imagined without products and services created on the basis of standards. Behind any standard or specification is a demand for specified products and services. Requirements are in certain dimensions, units, sizes, that is, metrological characteristics, and each requirement is built on the basis of specific mathematical models.[5]

Visual Basic for Applications (VBA) is used to write programs for the Windows operating system. It works as an internal programming language in Microsoft Office (MS Office, Office) applications, including Access, Excel, PowerPoint, Publisher, Word and Visio.

VBA is part of Microsoft Corporation's (MSFT) legacy Visual Basic. It allows users to customize beyond what is normally available in MS Office host applications.

The mathematical model of the calculation process was used for the Rockwell hardness test, ISO 6508-1:2023 standard. This document specifies the Rockwell routine and Rockwell surface hardness tests for metallic materials on the A, B, C, D, E, F, G, H, K, 15N, 30N, 45N, 15T, 30T and 45T scales, stationary and co 'chma applies to hardness testing machines.[1]

For the Vickers hardness test, ISO 6507-1:2023 standard requirements were used.[2] This document specifies the Vickers hardness test method for three different ranges of test force for metallic materials, including hard metals and other cemented carbides, metallic coatings and other inorganic coatings. This document specifies the Vickers hardness test for diagonal lengths from 0.020 mm to 1.400 mm. Using this method to determine Vickers hardness from smaller indentations is beyond the scope of this paper, as the results are subject to large uncertainties due to optical measurement limitations and tip geometry imperfections.[3] The Vickers hardness specified in this document also applies to metallic and other inorganic coatings, including electrodeposited coatings, autocatalytic coatings, sprayed coatings, and anodic coatings on aluminum. This document applies to measurements normal to the coated surface and measurements in sections, if the characteristics of the coating (smoothness, thickness, etc.) allow accurate reading of the diagonal of the indentation.

It takes time and effort to perform measurements and keep records according to the requirements of the standard. In order to reduce these factors, software was created for these two methods using the Visual Basic program, which is a part of Microsoft Excel.[4]

The program starts first by clicking on the start button, in which a new window will open to us.

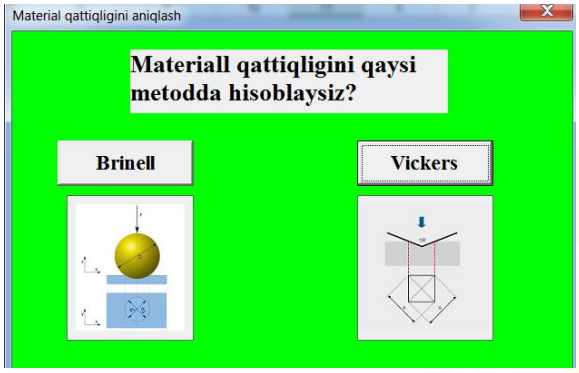


Figure 1. Choosing a method of calculating material hardness.

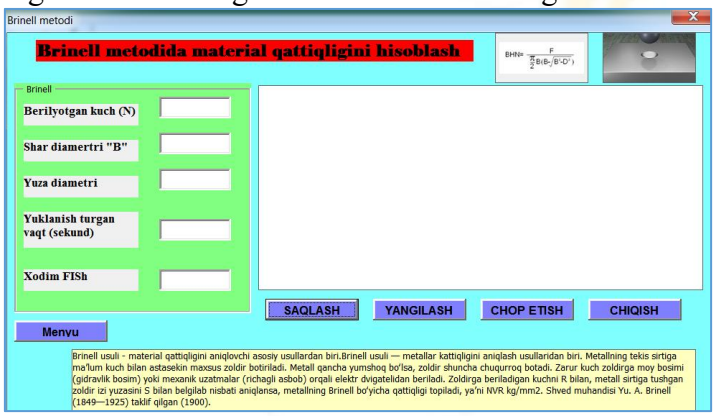


Fig. 2. Calculation of material hardness by the Brinel method.

$$BHN = \frac{F}{\frac{\pi}{2}B(B-\sqrt{B^2-D^2})}$$

This method is based on the formula, and variables are entered into the program window, the data of which indicates the output size based on the model based on the formula. An additional window has been created so that we can see the results continuously.

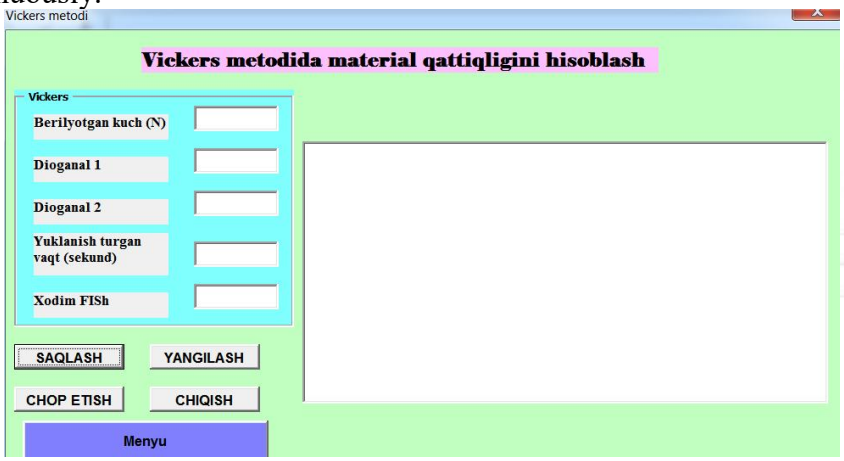


Figure 3. A window for calculating the hardness of materials by the Vickers method.

This method is based on the formula required by the ISO 6507-1:2023 standard, and variables are entered into the program window, the data of which shows the output size based on the model based on the formula. An additional window has been created so that we can see the results continuously.

It is possible to save the result of calculations in pdf format. When exiting the internal windows of the program and changing the program data, the program automatically asks the user to allow or deny the request.

Through this program, the time saving in the calculation work has reached about 35% efficiency. Also, mistakes made by the operator as a result of entering variables in the specified places in the program were prevented.

Literature:

1. ISO 6508-1:2023. Metallic materials — Rockwell hardness test. Part 1: Test method
2. ISO 6507-1:2023 Metallic materials — Vickers hardness test. Part 1: Test method
3. ISO 3738-1:1982.Hardmetals — Rockwell hardness test (scale A).Part 1: Test method
4. https://www.investopedia.com/terms/v/visual-basic-for-applications-vba.asp
5. "ANALYSIS OF THE LITERATURE ON THE SCOPUS DATABASE ON THE EVALUATION OF THE HARDNESS OF CONSTRUCTION MATERIALS BASED ON ISO STANDARDS". International Journal of Artificial Intelligence, vol. 4, no. 08, Oct. 2024, pp. 37-41, https://www.academicpublishers.org/journals/index.php/ijai/article/view/1373.

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