
INCREASING THE DEFORMATION TOLERANCE OF CUTTING TOOLS IN THE MECHANICAL ENGINEERING INDUSTRY

E. V. Qoraboyev

Fergana State Technical University, Fergana, Uzbekistan

E-mail: koraboyeveldorbek@gmail.com

J. S. Xomidov

Fergana State Technical University, Fergana, Uzbekistan

Abstract

Measurement of bending areas on the front and back surfaces. This is the most common method. This method is quite simple and reliable. A magnifying glass and an instrumentation microscope are used for measurement. Bending areas are photographed on the ground of the camera. The depth of the pit on the front surface is measured with an indicator attached to the pole. This method makes it possible to compare the effect of cutting tool geometry and cutting speed on bending within a unit of time.

Keywords: cutting tool, bending, radioactive isotopes, deformation, erosion.

The mass of the cutting tool is reduced during wear, so the measure of wear can be mass. The cutting tool wear w measures the amount (mass) of the waste material m in relation to the work A :

$$w = \frac{\Delta m}{A}, \text{ кг} / \text{Дж} \quad (1)$$

This method of measuring intake is mostly accurate, but it has a number of significant drawbacks. The amount of chipped pieces compared to the total mass of the cutting tool is so small that it is difficult to measure. The following methods are used to determine the bending of cutting tools.

Measuring relative consumption: To compare the deflection of cutting tools operating at different cutting speeds, the ratio of the cutting edge to the length of the path gives the relative deflection U_0 : Often the deflection is

E- Global Congress

Hosted online from Dubai, U. A. E., E - Conference.

Date: 30th October 2025

Website: <https://eglobalcongress.com/index.php/egc>

ISSN (E): 2836-3612

expressed as corresponding to 1000 m of cutting path and is determined by the following formula.

$$U_0 = \frac{1000u}{l}, \quad \frac{M}{1000M} \left\{ \frac{MKM}{1000M} \right\} \quad (2)$$

where U is the bending of the cutter during operation m (μm), l is the cutting path, m.

$$l = \frac{\pi dL}{s} = M \quad (3)$$

d - the diameter of the processed part, m, L - the length of the processed part of the detail, m, s - push corresponding to 1 rotation of the detail, mm/rev.

Calculating the relative curvature only gives correct results in meomeric curvature environments. Dimensional reduction measurement from the point of view of machining accuracy, the curvature measured normal to the machined surface from the tip of the cutting edge and called dimensional curvature is of great importance.

Two superimposed lines are drawn at some distance from the cutting edge to determine the size of the dimensional deflection. Dimensional deflection is calculated as the difference in the distance from the peak of the shear to the line measured at the beginning of the experiment (d_i) and after the experiment (d_0). A single mounting base is selected to increase measurement accuracy.

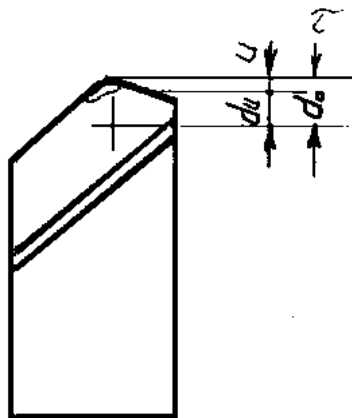


Figure 1. Scheme of measuring the dimensional erosion of the cutter

E- Global Congress

Hosted online from Dubai, U. A. E., E - Conference.

Date: 30th October 2025

Website: <https://eglobalcongress.com/index.php/egc>

ISSN (E): 2836-3612

Dimensional deflection is measured under an instrument microscope or projector. At the last moment, the contour of the cutting edge of the cutting tool is copied before the experiment, the amount of displacement of the cutting edge and also the dimensional bending are determined.

Sometimes dimensional deflection is determined by measuring the height of the deflection pad on the back surface and actually calculating the following formula:

$$U = h_{orq} \operatorname{tg} \alpha, \quad (4)$$

where α is the back angle

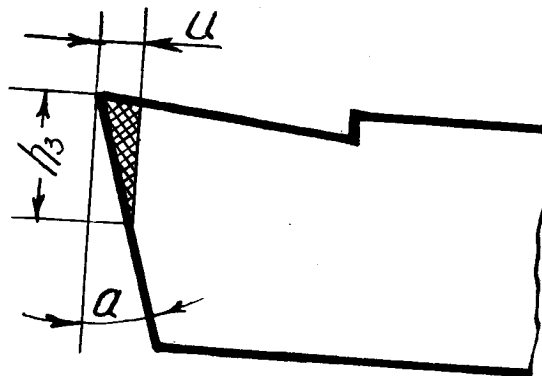
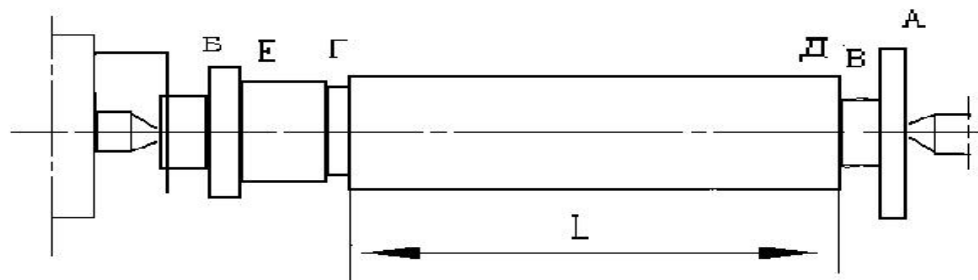


Figure 2. Correlation of dimensional bending and deformation on the back surface

However, this method is prone to errors.

Dimensional deflection can be determined by measuring the taper of the part. To study the effects of heating and elastic deformation of cutters, the system will look like this. Two surfaces A and B are oriented on the edges of the rough detail.



3rd Figure. The scheme for determining the dimensional bending of the detail by the conicity. System compression is equal to half of the difference of the surface diameters

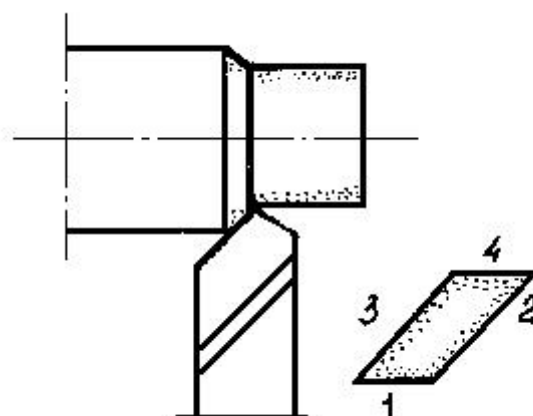
$$\frac{DB - DA}{2} \quad (5)$$

After that, a rough detail section between V and G ditches is routed in the given direction. In order to exclude the effect of deformation due to the influence of temperature, the push is stopped after the tool reaches the groove G, and the tool is left in the working state until it cools down. Then the push starts again and lane E is directed. The difference in diameters at points E and D is equal to the total error due to bending and compression. Dimensional bending of the cutting edge in length L is equal to:

$$U = \frac{(DE - DД) - (DB - DA)}{2}, \quad (6)$$

An uncomplicated device for measuring tool deflection using a minimeter is proposed.

The use of radioactive isotopes in corrosion testing. During the cutting process, the broken parts of the cutting tool are crushed, carried away with details, settle on the cutting tool and spread into the surrounding environment. A plate of hard alloy or other tooling material is irradiated with neutrons. As a result, radioactive isotopes of cobalt S_0^{60} , tungsten W^{185} , W^{187} , titanium Ti^{51} and others are formed in the cutting tool material.



4th Figure. Schematic of the location of the cutter reduction products

E- Global Congress

Hosted online from Dubai, U. A. E., E - Conference.

Date: 30th October 2025

Website: <https://eglobalcongress.com/index.php/egc>

ISSN (E): 2836-3612

After irradiation, the cutting tool is used for additional cutting to eliminate the initial corrosion effect. After that, the samples of the extract are separated (50-100 g portions) and their activity is measured. The radioactivity of the slag depends on the amount of crushed pieces of tooling materials. The amount of consumption is represented by the frequency of pulses and the mass of consumption products.

Conclusion

The method of radioactive isotopes has high sensitivity, accuracy, detailed results, and can dramatically reduce the time of the experiment and the consumption of materials, with the help of this method, it is possible to establish the change of Erosion within a unit of time, the elements of cutting tool geometry and the influence of cooling lubricants on Erosion, as well as the cutting characteristics of various tooling materials.

References

1. M.H Saidova. Kesuvchi asboblarni loyihalash va ishlab chiqarish. 2020 darslik.
2. Metallarni kesish nazariyasi asoslari, metall kesuvchi stanoklar va asboblari: O'quv qo'llanma/Jalilov H. I.—T.:“Talqin”, 2006-176 b.
3. Обработка металлов резанием: Справочник технолога / А.А. Панов, В.В. Аникин, Н.Г. Бойм и др.; иод общ. ред. А.А. Панова. М.: Машиностроение, 2004. 784 с.
4. O'rinov N.F., Norqulov A.A., Saidova M.X., «Materialshunoslik va konstruktsion materiallar texnologiyasi». Toshkent «Fan». 2003 y.