HARDNESS TESTS

There are many types of hardness tests.

1. The most important are penetration tests. There are 3 types of these tests.

1.1 Rockwell test
We press a diamond cone into the material. The angle of this cone is 120°. Or we can use a steel ball instead of the cone. The level of hardness is the size of the plastic deformation. We do this test on a Rockwell hardness tester.

There are the following advantages:
- the test is quick to do
- the test is easy to do
- the test is suitable for checking large product series

There is one important disadvantage:
- it has lower accuracy

1.2 Brinell test
We press a hardened steel ball into the surface of the test material. We do it on a Brinell hardness meter.

There is one disadvantage to this test:
- the imprint is not clear to measure

In the following Picture 1 you can see the Brinell test for testing soft materials.

**Picture 1 - Brinell test - example**

1 … pressed ball
2 … test material
3 … sprint with diameters d1, d2
For calculating the **hardness** we use **diameters** $d_1$ and $d_2$ (see above).

### 1.3 Vickers test

We **press** a regular diamond pyramid into the surface of the test material. The pyramid has a top angle of 130°.

The advantages of this test are:

- it is very **accurate**
- we can use it for all materials

In the following Picture 2 you can see a diagram of the Vickers test.

*Picture 2 - Vickers hardness test*

For calculating the **hardness** we use **diagonals** $u_1$ and $u_2$ (see above).

---

**Material used:** M. Martinák – Kontrola a měření
VOCABULARY
accuracy  přesnost
accurate  přesný, správný
clear  jasný
cone  kužel
diagonal  úhlopříčka
diameter  průměr
hardened  ztvrdlý
hardness  tvrdost
imprint  vtisk
penetration  vnikání, penetrace
press  stlačit, stlačení
suitable for  vhodný pro

COMPREHENSION QUESTIONS
1. What are the most important hardness tests?
2. What types of penetration tests do you remember from the text?
3. What do we press into the material in the Rockwell test?
4. What are the advantages and disadvantage of the Rockwell test?
5. What do you know about the Brinell test?
6. What are the advantages of the Vickers test?
EXERCISES

1. Criss Cross Puzzle - 10 words were placed into the puzzle.

Across
3. úhel
4. průměr
5. přesný
8. tvrdost
9. úhlopříčka
10. stlačit

Down
1. nevýhoda
2. vnikání, penetrace
6. kužel
7. výhoda

2. Find grammatical and spelling mistakes in the sentences. Correct the sentences.

1) The importantest are penetration tests.
2) We can use a stell ball instead of the cone in Rockwell test.
3) The Rockwell test is qiuick and esy do do.
4) The Rockwell test is suitable in checking large product series.
5) In Brinell test we press a hardend steel ball into the surface of the test material.
6) The diamond pyramid have a top angle of 130°.
EXERCISES – KEY FOR TEACHERS

1. Criss Cross Puzzle

Across
3. úhel - angle
4. průměr - diameter
5. přesný - accurate
8. tvrdost - hardness
9. úhlopříčka - diagonal
10. stlačit - press

Down
1. nevýhoda - disadvantage
2. vnikání, penetrace - penetration
6. kužel - cone
7. výhoda - advantage

2.
1) The most important are penetration tests.
2) We can use a steel ball instead of the cone in Rockwell test.
3) The Rockwell test is quick and easy to do.
4) The Rockwell test is suitable for checking large product series.
5) In Brinell test we press a hardened steel ball into the surface of the test material.
6) The diamond pyramid has a top angle of 130°.