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 .: +38 (062) 301 08 05; E-mail: [sydorova@gmail.com](mailto:sydorova@gmail.com)

### PVD-

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15 ATI Stellram 4E- CNMG542A 4E SP0819 CNMI60608E 4E  
 , PVD- 15

E. V. Sydorova

### PREDICTION OF TOOL LIFE OF THE CARBIDE CUTTING INSERT WITH PVD-COATING

*For a more effective processing control require accurate prediction of tool life of the cutting tool in any cutting conditions. Especially it is actual for automated production, in particular for CNC metal-cutting equipment. The proposed model allows predicting a tool life of the carbide cutting insert with PVD-coating by thermo-mechanical simulation, which significantly reduces an amount of required experimental research. In this model a tool life of the insert is dependent of the thermomechanical loading parameters, however, in distinction from classical tool life models, can be used for different work materials and the cutting conditions. The practical implementation of this method has been demonstrated by an example of the turning hardened steel 100Cr6 by cutting insert ATI Stellram with 4E-geometry CNMG542A-4E SP0819 CNMI60608E-4E for specific cutting conditions.*

**Keys words:** cutting, thermomechanical loading, tool life, cutting insert, cutting conditions, PVD-coating, 100Cr6

[1].

[2, 3].

[4].

[5],

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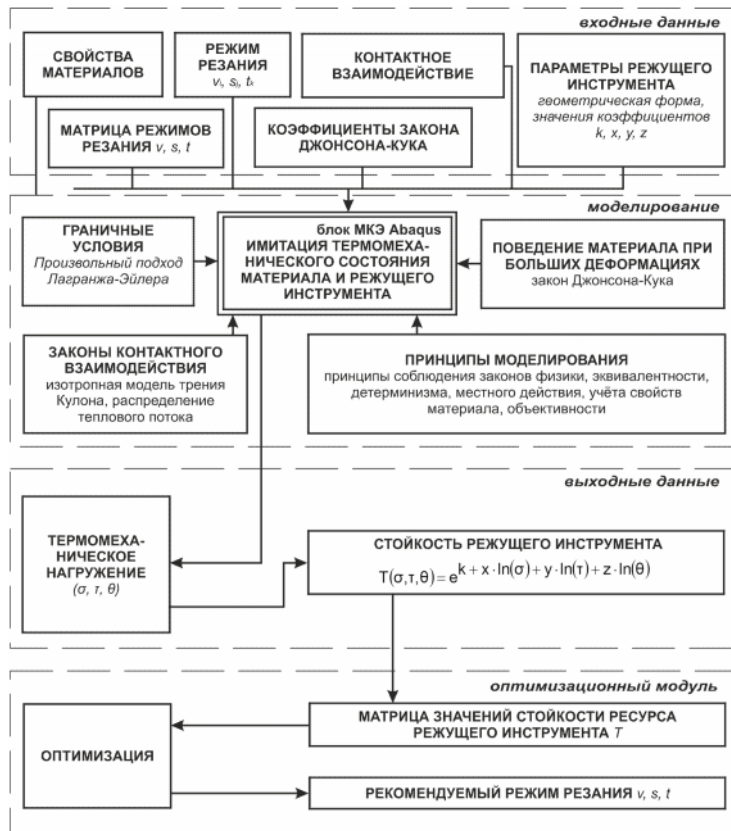
2.

( . 1).

ABAQUS Explicit,

MathCAD.

( v, s, t).



1.

[6].  
[7].

( $T$ ),

$$T(\sigma, \tau, \theta) = e^{k+x \cdot \ln(\sigma)+y \cdot \ln(\tau)+z \cdot \ln(\theta)}, \tag{1}$$

$k, x, y, z$  –

ISO 3685 «

» [8]

$VB_B = 0,3$  ,

3. TiAlN-

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ATI Stellram 4E- CNMG542A 4E SP0819

CNMI60608E 4E. SP0819 PVD- TiAlN,

16 1000° Sandvik Coromant DCLNR3232P-

= 50°, : = 9°; = 6°;

PVD- -5 i = 50°.

$v = 100-200$  /  $50$  / ,  $s = 0,05-0,15$  /  $0,05$  / ,

$t = 1-3$  /  $1$  .  $T$  -

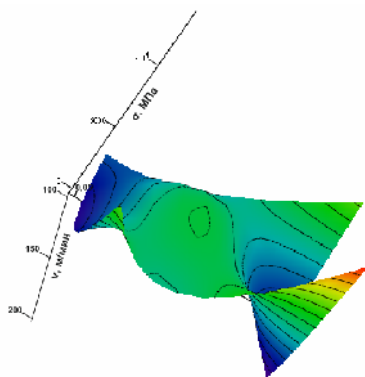
( ) , [7]

$$T(\sigma, \tau, \theta) = e^{25,06+0,01 \cdot \ln(\sigma)-0,79 \cdot \ln(\tau)-3 \cdot \ln(\theta)} \quad (2)$$

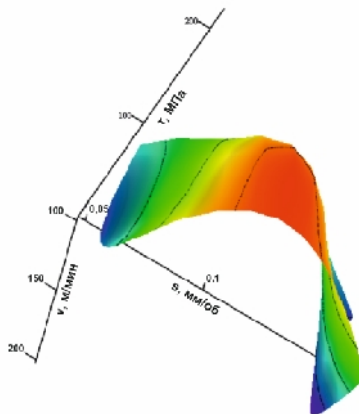
$k, x, y, z -$

15 ( 45 HRC), [9].

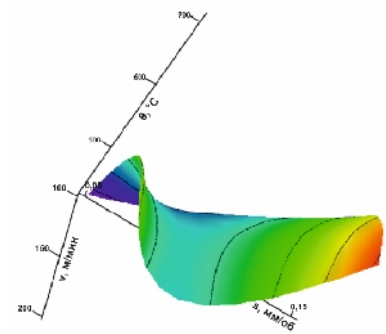
$t$   $v$   $s$   
15 ( . 2-10).



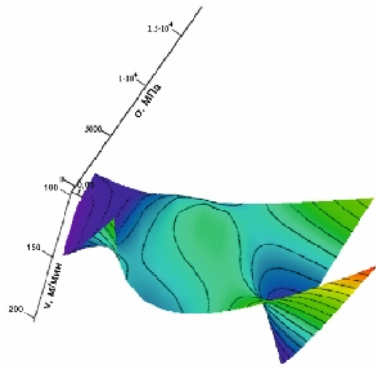
. 2.  $v$   $s$   
( $t = 1$  )



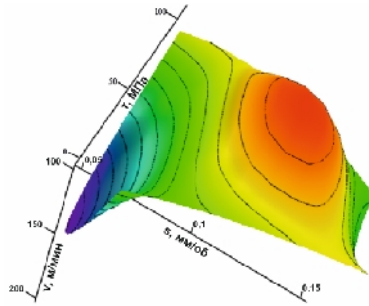
. 3.  $v$   $s$   
( $t = 1$  )



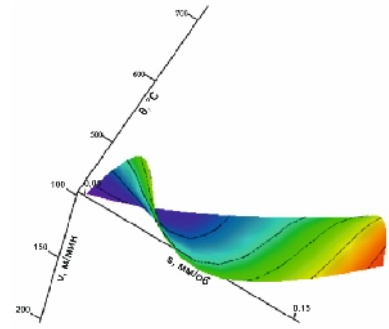
. 4.  $v$   $s$   
( $t = 1$  )



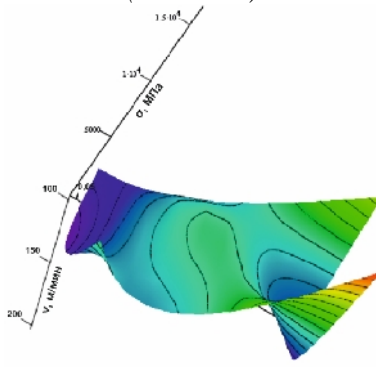
. 5.  $v$   $s$   
( $t = 2$ )



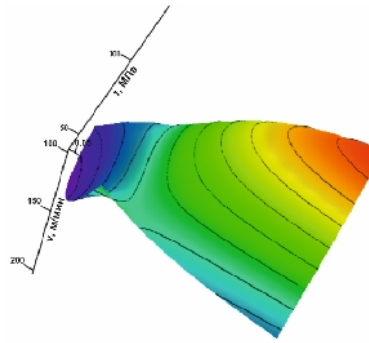
. 6.  $v$   $s$   
( $t = 2$ )



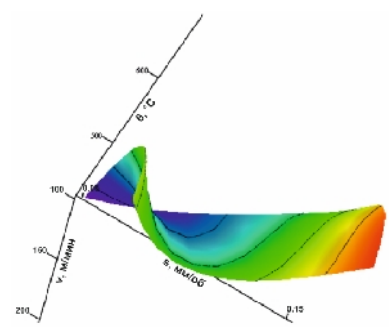
. 7.  $v$   $s$   
( $t = 2$ )



. 8.  $v$   $s$   
( $t = 3$ )

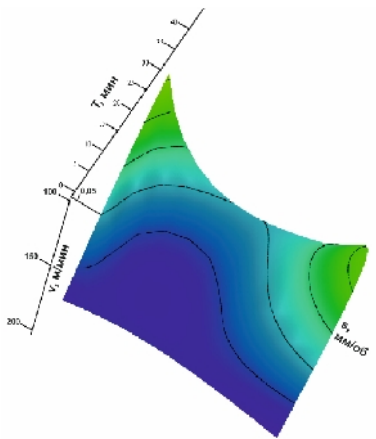


. 9.  $v$   $s$   
( $t = 3$ )

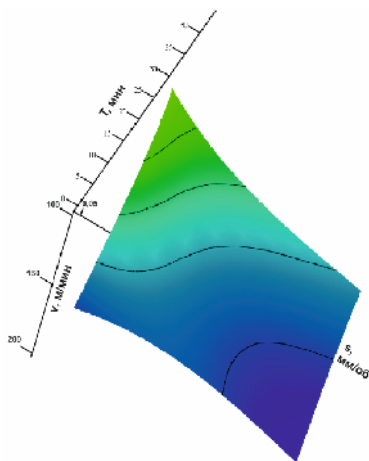


. 10.  $v$   $s$   
( $t = 3$ )

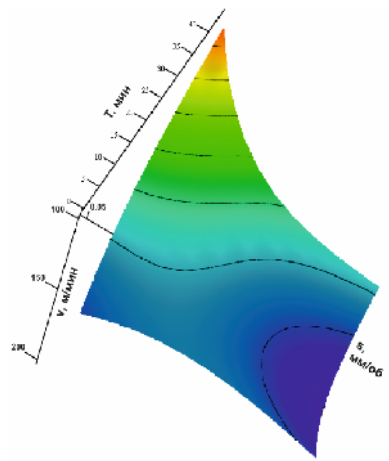
$s$   $v$   $s$   $t$   $T$   $v$   
 15 ( . 11-13).  $t$  15  $-$   
 $-$



. 11.  $v$   $s$   $T$   
( $t = 1$ )



. 12.  $v$   $s$   $T$   
( $t = 2$ )



. 13.  $v$   $s$   $T$   
( $t = 3$ )

## 4.

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15 ATI Stellram 4E- CNMG542A 4E SP0819  
CNMI60608E 4E

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20.06.2016 .