

* * *

2008/1/23:

2008/6/5:

(5) (\)

(100)

" "

.1 :

.3 . .2 .

"

)

(7) : (300

(5) :

(7) :

(Ra =1.2) :

:

Abstract :

The term deep hole originally referred to hole depth over (5* diameter) Deep hole drilling is a collective name for method for machining both short and deep holes. In deep hole drilling cutting fluid supply and chip transport play an important role in machining of hole depths of more than (100*diameter). The cutting tip geometry has a significant effect on a drills performance and on the quality of the machined holes by effecting on chips shape and

thickness, distribution of the cutting forces, and on the flow of the cutting fluid at the cutting edge. The gun drill is normally divided in three parts: 1. Drill tip 2. Shank. 3. Driver.

Depending on the application, the most common tool tip material is C2 carbide, which is one of the harder grades. This paper deals with experimental effect of gundrill tip geometry on the following properties of the hole: Hole straightness, Error shape in roundness, Dimension tolerance and Surface roughness. According to improvements of gun drill tip geometry in this work, the deep drilled holes properties are significantly improved with the following results: Hole straightness (7 μm), Error shape in roundness (5 μm), Dimension tolerance (7 μm) and Surface roughness (Ra 1.2 μm).

/ *

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[6],[5],[4]

:

" " ([1] (Deep Drilling) [2]

[2] "

- .1
- .2
- .3

: Gun Drill

") ([3] "

: [7] (2)

[12] [11]

: [13]

(V)

(115 °- 110°)



(180 °, 90 °)

. [8]

.1
.2
.3
.4

. [8]

, °(0.039 - 0.023)

. [10]

(ψ 1)

, (ψ 2)

, [14]

(3)

. [15]

. [10]

(IOTA)

(Taylor-Hobson)

(Ra)

(C.L.A.)

(4)
°(40 ,35 ,30 ,25)

°(20)

(φ 14 , φ 11 , φ 8)

, (300)

(φ 8)
(25)

, [17],[9],[5]

(9)

.1

(26 ,20 ,12)

)

:

)

(40 ,35 ,30

°(40,35,30,25

(φ 14) (φ 11)

.2

°(30,25,20,15)

.3

(5)

°(40 ,35 ,30 ,25)

, °(25,15) °(20,10) °(15,5)

°(20)

(φ 14 , φ 11 , φ 8)

.4

(φ 8)
(25)

°(+ 5, + 2.5, 0)

$\phi 8$)
 (25) ((11)
 (25 ,18 ,12)
 (Ra=1.1) °(40 ,35 ,30)
 (2.4 ,1.8 ,1.4)
) ($\phi 14$) ($\phi 11$)
 °(40 ,35 ,30)
 ($\phi 14$) ($\phi 11$) °(30 ,25)
 (25)

" (6)
 °(40 ,35 ,30 ,25)
 °(20)
 ($\phi 14$, $\phi 11$, $\phi 8$)
 °(30 ,25) ($\phi 8$)
 (25)
 °(30 ,25 ,20 ,15) (14)
 °(30) (27 ,20 ,15)
 ($\phi 14$, $\phi 11$, $\phi 8$) °(40 ,35 ,30)
 °(20) ($\phi 14$) ($\phi 11$)
 °(30 ,25)
 (9)

°(25 ,15)
 ($\phi 14$, $\phi 11$, $\phi 8$) (300)
 (12) (7)
 (5) °(35,40 ,30 ,25)
 (11) °(20)
 (Ra = 1.2) ($\phi 14$, $\phi 11$, $\phi 8$)
 ,+ 2.5 , 0) °(+ 5

(5) :

(7) :

(Ra =1.2) :

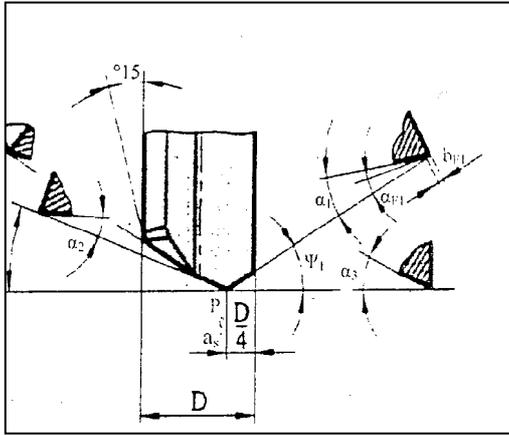
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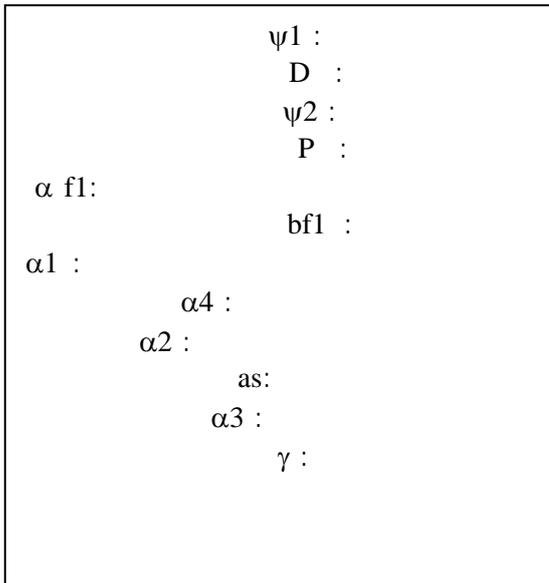
1. Mikell P. Grover, "Fundamentals of Modern Manufacturing", New York, 2000. (7)
2. Sandvik Coromat, "Deep-Hole Drilling", Chart, Mech. Eng., Vol, 24, No. 5, May, 1977. (5)
(7)
3. Juneja B. L., Sekhon G.S., "Fundamentals of Metal Cutting and Machine Tools", 1987. Ra =) (1.2
4. Katsuki Akio, "Influence of tool geometry on axial hole deviation in deep drilling", JSME Int. J. Vol. 30, No. 265, Jul. 1987. ° (25)
5. Sakuma Keizo, "Deviation in deep drilling – the influence of the shape of the cutting edge", C. Hen, Vol. , 54 , No. 502, Jun, 1988. °(20)
φ 14 , φ 11 , φ 8) (.2
6. Astakhov V.P., "On the experimental optimization of tool geometry for uniform pressure distribution in single edge gun drilling", J. of Engineering for industry, Vol. 116, Nov., 1994. (10) .3
7. Arther d. Roberts, Samuel c. Lapidge, "Manufacturing Process-Cutting Tool for Drill Process", 1977. " .4
8. John A. Schey, "Introduction to Manufacturing Processes", 2000. .5
9. Guhring Co., "Modern Cutting Tools Technology-Gun Drills", 1984.
10. Swinhard H. J., "Gun Drilling Trepanning and Deep Hole Machining", 1976.

: (300)
(7) :

(7) (2)



(8) (3)



11. Hinchcliffe J. F., "Precision Hole Drilling", Chart, Mech. Eng., Vol.24, No.5, May, 1977.
12. Botek co., "Gun Drilling and Counter Boring Tools", 2001.
13. D. Wizard, "Gun Drilling Solution", in web site:<http://www.gundrillingsolutions.com>, 2002.
14. Jain R. K. "Engineering Metrology", 1989.
15. Sandvik Coromat, "Modern Metal Cutting", 1994.
16. Brian P., Rob B., "Failure Analysis Investigation : Drill Failure in the Body Section of Gun Drills", in web site:<http://www.gundrillingsolutions.com>, 1999.

" , .17

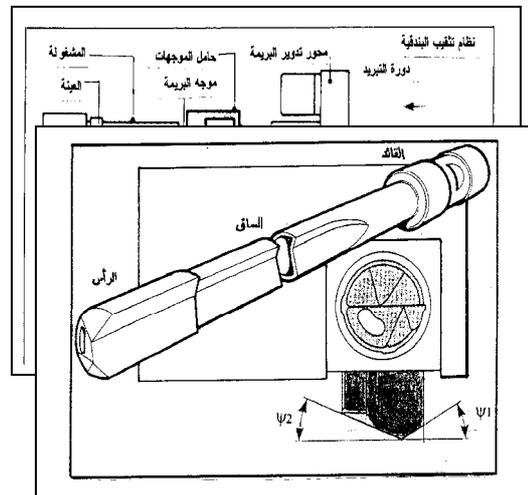
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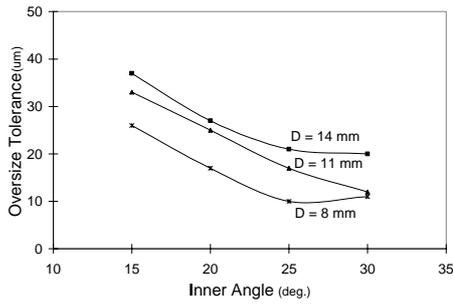
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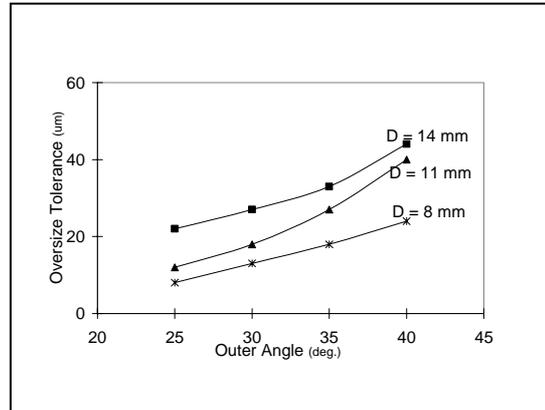
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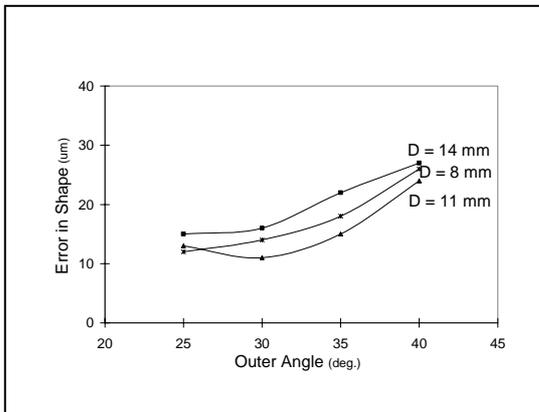




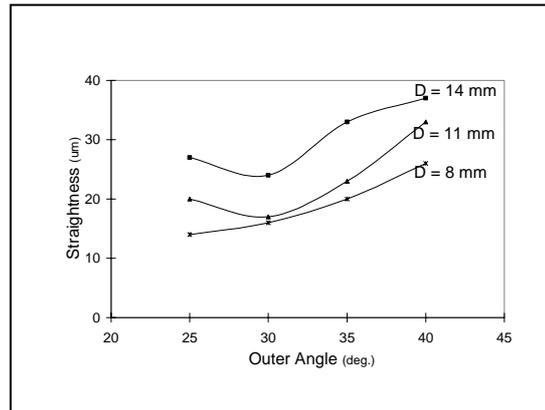
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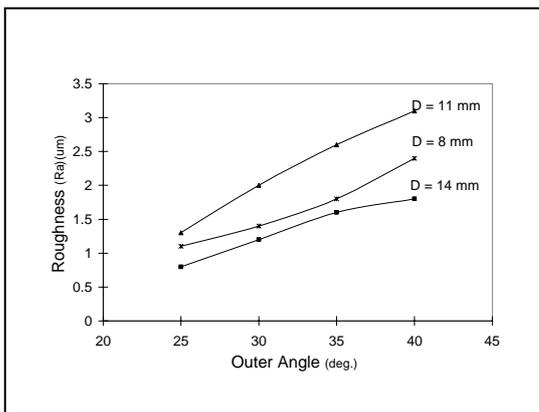
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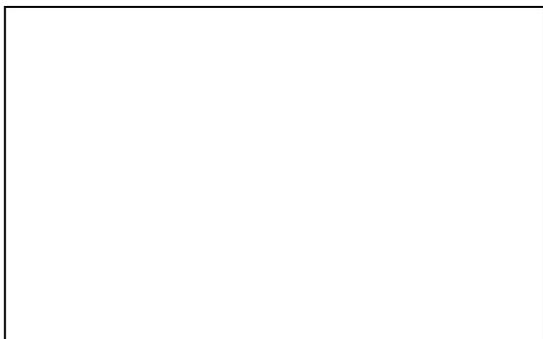
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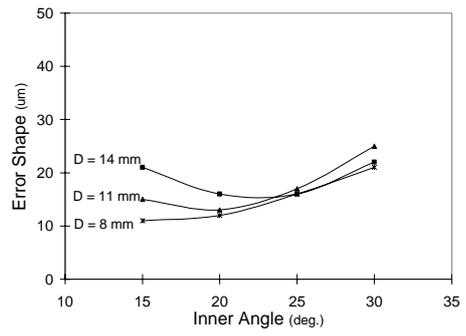
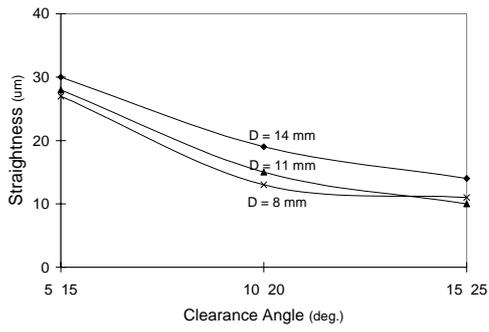


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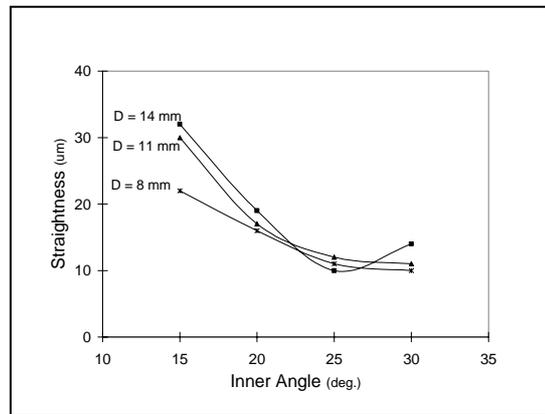
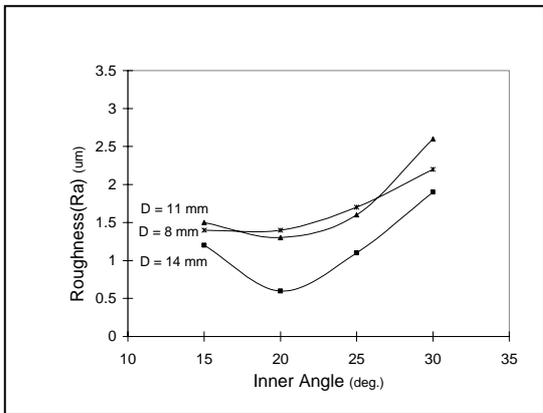


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