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THE COLLEGE OF AERONAUTICS

DEPARTMENT OF PRODUCTION AND INDUSTRIAL ADMINISTRATION



Test Report No. PLBO/15

Intermittent cutting tests with tools of RD107,

RD110 and S1P, having radiused cutting edges



SUMMARY

Tools of grade SIP, RD107 and RD110 with radiused cutting edges were tested to failure cutting slotted bars of EN9 at 600 f.p.m., 0.010 in/rev. feed and 0.10 in depth of cut. The results showed that there was a reduction in the frequency of early tool failure as compared with unradiused tips. A statistical analysis showed that there was no significant difference between the mean tool lives of the three grades.

Test conditions

The following conditions were used during the tests:-

Work material:

EN9 slotted bar .

Depth of cut:

0.10 in.

Feed:

0.010 in/rev.

Cutting speed:

600 f.p.m.

and the tools used were:-

and a state of the	and the second s		
RD107	NT289	RDllO	NT294
· ·	* .	ח ב בתקו	90cm/
•	-		-
RD107	NT291	RD110	NT297
RD107	NI 292	RDILO	NT298
	RD107 RD107	RD107 NT289 RD107 NT290 RD107 NT291 RD107 NT292	RD107 NT290 RD110 RD107 NT291 RD110

Test results

The tests were carried out as described in Test Report No. PLBO/14, the flank wear of the tools being measured at each interval of three minutes cutting time and the criterion of tool failure being that (1) the surface finish changed markedly, (2) there was a step in the newly machined surface or (3) the noise and cutting vibrations became excessive.

Tables 1-3 show the flankwear and time to failure of the three grades tested. Figures 1-3 show the tool life of each grade in graphical form and figures 3-5 show histograms of the tool life taking intervals of one minute. The shaded portions of figures 3-5 are the results from the previous tests using tools having no edge radius.

From the histograms it can be seen that radiusing the cutting edge of the tips tended to reduce the early failures, as was suggested in report PLBO/14. The same report also suggested that radiusing would have a greater effect on RD107 and RD110 than on S1P, but this was not borne out by the results.

From the tabulated results the mean time to failure was:-

S1P 7.6 min RD107 5.9 min RD107 4.3 min

A statistical analysis, using a student 't' test with a Bessel correction for the bias of small samples, shows that there is no significant difference between these mean tool lives.

Conclusions

The results showed that radiusing the cutting edge gave an expected reduction in the number of early tool failures and a statistical analysis of the results showed that there was no significant difference between the mean tool lives of the three grades tested.

Table 1

Grade: Speed:

SlP 600 fpm

Depth of cut: Material:

.10 in.
EN9 slotted bar

Feed:	0.010			racoca acat.	my brouded bar
Tip No.	Time min.	Fl Fa	.ankwear Fb	Fc	Remarks
NT250/Al	3 6 6.3	.046 .078 .0815	.064 .0885 .090	.025 .0315 .036	
NI250/A2	3 5.75	.060 .0865	.048 .0825	.034	
NT250/A3	3 6 9	.018 .0225 .035	.019 .027 .035	.013 .020 .026	Nose chipped
NT250/A4	3 6 8.1	.0195 .024 .043	.0345 .044 .068	.023 .028 .037	10 Mar dag dag and 100 Ad and dag dag dag dag dag dag dag dag dag da
NT250/Bl	3 6	.0505 .065	.0505 .067	.042 .053	Cutting edge chipped
	3 6 9 12 14.1	.018 .025 .030 .057 .107	.020 .025 .030 .048 .107	.013 .019 .023 .0395 .058	
NT250/B3	3 6 9	.021 .025 .040	.021 .025 .068	.01 ⁴ .021 .02 ⁴	Chipped
NT250/B4	3 6 9 12	.012 .016 .021 .094	.015 .021 .027 .087	.012 .019 .025 .035	
NT277/1	3 6 9 12	.0185 .025 .0295 .099	.0115 .016 .060 .102	.008 .0135 .033 .0465	
NT277/2	3 6 7.3	.022 .068 .101	.030 .0625 .107	.015 .019 .0235	
NT277/3	3 6	.059 .070	.055 .089	.015 .018	Nose failure
NT277/4	3 6 7•3	.016 .027 .070	.0195 .027 .076	.0135 .020 .040	
NT278/1	3	.059	.110	.025	Chipped
NT278/2	3	.055	.081	.056	Chipped
NI278/3		.011	.146	.039	maj ann am subject que una sua sua mar sua
NT278/4	3 6 9	.020 .0265 .0355	.019 .025 .076	.016 .0195 .026	Chipped

Table 2

RD107 600 fpm 0.010 in/rev. Grade: Speed: Feed:

Depth of cut: 0.10 in. Material:

EN9

Tip No.	Time	ברים -	nkwear		The state of the s
TTD NO.	min.	F18 Fa	inkwear Fb	·Fc	Remarks
NT289/1	3	.019	.0135	.008	
. 12.	6	.028	.0225	.016	en e
	9	.033	.0285	.021	
		.135	.1135	.028	Flank chipped
VT289/2	20 sec.	.071	.075	•073	Burr on edge
VT289/3	3	•044 ::0.	.033	.016	k
	4.6	.0635	.070	.025	Nose failure
WI289/4	3 6	.0225	.075	.034	
		.0475	.115	.075	The statement and the entering the sea course of the statement of the stat
NT290/1	.3.	-	•	.010	The second secon
-	5.9	.057	•08 <u>95</u> : .	.0165	Surface finish change
MT290/2	3	•049	.055	.018	
	3.2	.050	.125	. 020	The time time that the time to the time time the time the time time time the time time time time time time time
WI290/3	3 4.2	.054	.058	.017	
-		.178	.178		Chipped
VI290/4	3	.0205	.0205	.015	en en war en
	6 6.7	.103 .138_	.084 .128	.022	Nose failure
			e que sura prim una prim gran cuca coma entre e	.023	MODE TOTTALE
VT291/1	3	.0255 .034	.0255 .034	.016 .025	
en de gante e partir de la composition	8.9	.067	.087	.032	Chip stuck to flank
VT291/2		.029		.035	ng and data and tray and gain and tray and tray and and one of the ball and the and and the and data base and M
·	3. 6	.075	.090	.035	Chip stuck to flank
vi291/3	3	.020	.033	.0145	of tell amount and tell and and part the second and tell
	, 6 m a a a m	.0265	.083	.023	
(1.50 pm) typ aga end side ena de		.035	.142	.025	
T291/4	3	.017	.017	.017	
an we see group To the borns	6	.023	.023	.023	e de la companya de l La companya de la co
	<u>, , , , , , , , , , , , , , , , , , , </u>	.115	.060	.031	Nose failure
VT292/1	3	.046	•059	.030	
	3.9	.122	.138	.030	transi dan ani dan merumpu dan ani dan gan ani dan ani Dan dan dan dan dan dan dan dan dan dan d
T292/2	1.2	.110	.121	.059	
WI292/3	3 4.1	.0215	.090	.0275	
and these area and and the test they are	4.1	.058	.141	.029	in the second se
WT292/4	3	.040	.019	.014	:
	3 6 9 12	.047	.032	.023	and the state of t
	9	.051 .076	.037 .0725	.031 .0335	(Alle

Table 3

				Tant	= J	
	Grade: Speed: Feed:	RD110 600 fpm 0.010 in/	rev.	en de la companya de	Depth of cu Material:	t: 0.10 in. EN9
	Tip No.	Time	Fa Fa	'lankwear Fb	Fe	Remarks
	NT294/1	3	.170	.168	.028	Nose chipped
	NT294/2	3 3•7	.073 .106	.073 .104	.029 .034	Chipped
	NT294/3	13 sec.	.078	.0825	.0125	Nose failure
*	NT294/4	3 4.4	.026 .033	.037 .137	.020 .0275	Change in surface finish
	NT296/1	3 6 8	.020 .027	.0155 .024	.0155 .022	The state of the s
	-	8	.070	.110	.033	Change in surface finish
e e e e e e e e e e e e e e e e e e e	NT296/2	3 6 6.7	.022 .072 .091	.022 .050 .113	.016 .025 .027	Nose chipped
	NT296/3	3 6 6.4	.021 .093 .098	.016 .087 .091	.016 .023 .025	
	NT296/4	3 6 7•7	.055 .070 .072	.055 .068 .1105	.015 .0245 .0365	e en pagama app des seul projects, que pel seul des des disse de la company, des del del des app est del del d
	NI297/1	38 sec.	.133	.109	.010	Nose failure
	NT297/2	3 4.7	.061	.045	.021	Chipped
	NT297/3	20 sec.	.130	.125	.026	Chipped
	NI297/4	3 4.6	.024 .107	.C17 .104	.019	Nose failure
erine en le la	NT298/1	3 4.4	.025 .0545	.054 .075	.025 .030	
# · v. •	NT298/2	3	.021 .039	.021 .031	.013 .023	
and the second	The second second second	9 10.1	.045 .012	.037 .095	.032 .035	Change in surface finish
. • »	NT298/3	2.2	.078	.129		
	NT298/4	1.1	.102	.117	.016	
	1					

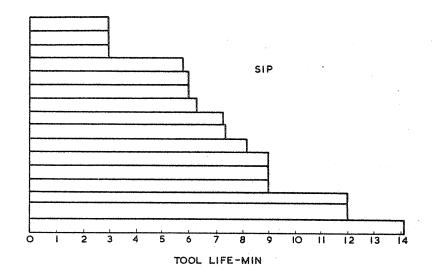


FIG. I.

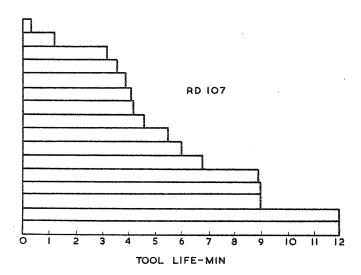


FIG. 2.

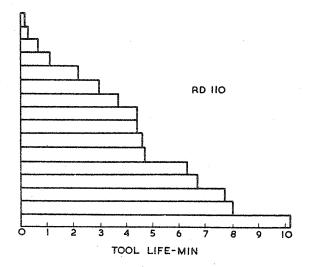
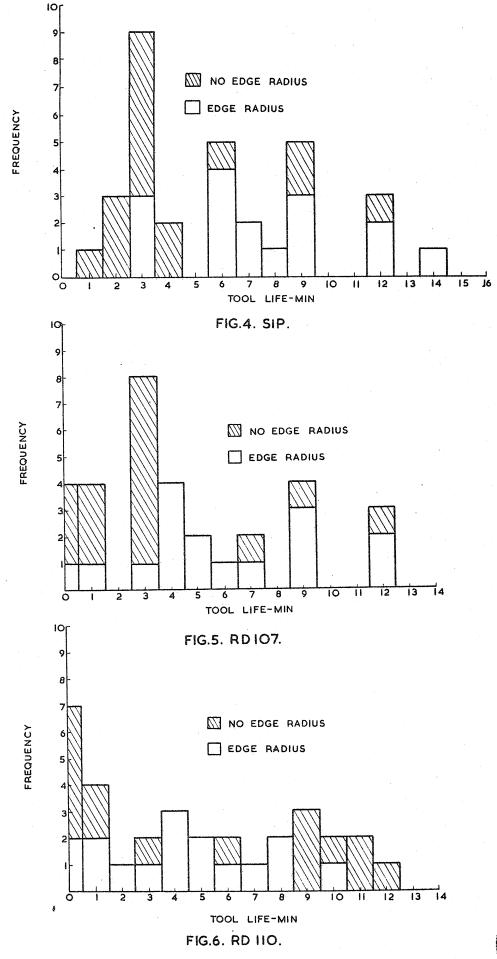


FIG. 3.



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