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QUANTIFICATION AND ANALYSIS OF TECHNOLOGICAL PARAMETERS RELEVANCE IN CONTINUITY WITH CUT AREA QUALITY

Abstract:
Manufacturing system production quality with technology AWJ is influenced by various factors. Important influence has on it also technological parameters set of manufacturing systems from those every in other range and to it corresponding importance influences quality and working cost in manufacturing systems.
The article busies with manufacturing systems with technology AWJ and technological parameters influence on cut area quality at cutting steels HARDOX. The article presents the results of experimental research technological parameters influence. In the article the principles and recommends for firms that perform working manufacturing systems with technology AWJ are also formulated.

Keywords:
technology AWJ, technological parameters influence, cut area quality

INTRODUCTION

Manufacturing system production quality with technology AWJ is influenced by various factors. Important influence has on it also technological parameters set of manufacturing systems from those every in other range and to it corresponding importance influences quality and working cost in manufacturing systems. The article presents experimental research results of manufacturing systems technological parameters influence on parameters quality of cut area aimed at activity importance stating choice three technological parameters on cut area quality at cutting steels HARDOX with technology AWJ. On foundation of experiments evaluation mathematical models are created and on their basis activity importance of choice three technological parameters on parameters of cut area quality is stated a graphical represented. Stating technologic parameters activity importance enables at working states diagnostification to concentrate on these parameters that decisively influence cut area quality and to judge their activity also in wider context in bond on working cost and economical effectiveness of manufacturing systems with technology WJ working. In the article principles and recommends for firms that perform working manufacturing systems with technology AWJ are also formulated.

TECHNOLOGICAL PARAMETERS SIGNIFICANCE AND RELEVANCE IN CONTINUITY WITH CUT AREA QUALITY

From concrete mathematical model it is possible to state with help of the programme STATISTIKA to stale and graphically to represent technological parameters influence significance value in percent on competent cut area quality parameter.

Technological parameters significance is stated in the form of significance diagram for concrete mathematical model (numerical functional dependence of technological parameters influence on parameters of cut area quality) with utilization of the programme STATISTIKA in entering into relations with:

- *parameter of cut area quality*
- *thickness of cut material*

At solution was stated and graphically represented significance set for:

- *5 parameters of cut area quality (roughness of surface Ra, Rz, Ra4, Ry4 measured in distance 4 mm from cut area top edge, deviation angle of water jet Ø)*
- *4 cut material thicknesses 6, 10, 15, 40 mm*

EXPERIMENTS

Entirely 45 samples (9 samples from every sheet thickness 6, 10, 15, 40 mm and to it 9 samples from 6 mm thick sheet cut with increased values of cut head speed by 50 percent against speed „v"). Number of all cut areas (at 3 areas on every sample) presented the value 135. Figure 13 presents lucidly set of all cut samples.

Fig. 1 Set of all 45 cut researched samples

Table 1 contains specimen from data measured on samples

Thickness of sample h						40 mm	
Identification of Sample		Technological Parameters				Qualitative Parameters	
Number of sample	Number of area sample	m_A [g/min]	p [MPa]	v [mm/min]	t [s]	Ra	Rz
	1	170	300	10	240	3,65	20,84
I		170	300	60	40	4,09	21,90
	3	170	300	80	30	6,95	24,96
	4	170	340	40	60	2,90	19,79
II		170	340	60	40	3,92	21,00
	6	170	340	80	30	5,87	23,64
	7	170	380	40	60	2,83	19,11
	8	170	380	60	40	3,66	20,81
III		170	380	80	30	4,10	22,90
	10	220	300	40	60	2,75	18,67
IV		220	300	60	40	3,46	20,56
	12	220	300	80	30	4,07	21,10
	13	220	340	40	60	2,71	17,14

EXPERIMENTS EVALUATION AND DISCUSSION

Figure 2 presents specimen of concrete diagram from set of diagrams of three technologic parameters significance v, p, m_A and absolute member. The absolute member shows accuracy of model functional dependence. On foundation of it significance diagram was created but mainly total activity of the others little significant technological parameters.

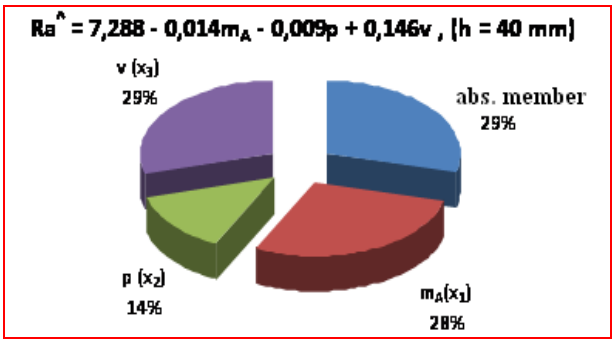

Fig. 2 Significance diagram of mathematical model technological parameters for cut area quality parameter Ra (h=15mm)

In table 2 significances of three technological parameters on fire parameters on five parameters of cut area quality for thickness of cut material 40 mm are stated. The data (v, p, m_A, absolute members) stated in table 2 for Ra are taken over from significance diagram for Ra on fig. 2. Data for further parameters of cut area quality stated in table 2 (Rz, Ra4, Rz4, Ø) are

taken over into it from analogous significance diagrams (for Rz, Ra4, Rz4, Ø).

Table 2 Technological factors significance, h= 4 mm

Technological parameter + absolute member	Significance of technological parameters %				
	Parameter of cut area quality				
	Ra	Rz	Ra4	Rz4	Ø
v	29	24	39	38	28
p	14	10	7	1	15
m_A	28	26	22	19	28
absolute member	29	43	32	42	29

NEW KNOWLEDGE AND RECOMMENDS

Shown knowledge are applied for cutting of abrasion resisting steel HARDOX 500, thickness 40 with technology AWJ.

- from judged three technological parameters on 5 choice parameters of cut area quality parameter v has the greatest significance, parameter m_A has something smaller significance and parameter p in average less than half significance
- it is possible to improve cut area quality mainly roughness of cut area surface in deep 4 mm from cut material surface (Ra4, Ry4) with change of parameter v
- it is possible most to influence parameter of cut area roughness Rz with change of parameter m_A
- it is possible with change of parameter p to improve cut area quality mainly Ø, Ra much less it is possible to influence parameter Ra4 and on minimum measure only parameter Rz4
- total influence of further technological parameters shows most at parameters Rz, Rz4 minimum and nearby equal influence at parameters Ra, Ø.

Analogously it is possible to formulate knowledge and recommends also for further researched thicknesses of cut material and on their foundation also knowledge influencing from mutual comparing conclusions for single cut thicknesses.

UTILIZATION REGIONS AND MAIN CONTRIBUTIONS

Knowledge are utilizable in scientific area (original mathematical models, activity significance of three choice technological parameters), but also in firms working manufacturing systems with technology AWJ and in pedagogical process.

CONCLUSION

The article busies with actual technology AWJ for firms working manufacturing systems and acute problematic of activity significance choice technological parameters on cut area at cutting abrasion resisting steels HARDOX with technology AWJ. On the basis of evaluated experiments conclusions and recommends are elaborated and concrete examples are stated.
The solution creates one from foundations for modeling and simulation of technological parameters on cut area quality influence with establishing systems working with technology AWJ. It is possible to utilize methodic of exercised solution in article in the form of analogy also for further especially relative jet technologies. The article presents partial knowledge of dissertation work [3] solution and partial results of the grant work VEGA solution.

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