

INNOVATIVE TECHNOLOGIES FOR MANUFACTURING AND RECONDITIONING OF PLASTIC DEFORMATION TOOLS

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Abstract: The paper presents a new concept for manufacturing and reconditioning of tools for plastic deformations, knife type for mechanical cutting and steel sheet bending die, that consist in realize modulated elements, interchangeable, cladded through welding in the zones (surfaces) subjected to wear with weld beads, using special filler materials coated electrodes and tubular wire type. The modulated elements are fixed on the active surfaces of the plastic deformation tools, with rapid interchanging possibilities, though increasing their the durability and reliability, with fabrication, exploitations and maintenance cost highly reduced.

Key words: electrode, tubular wire, cladding, modulated element

1. INTRODUCTION

The tools for plastic deformations, knife type for mechanical cutting and steel sheet bending die, are usually made of alloyed steel (with Cr-V and W), type EN 1.2581 and EN 1.2713, able to take over the complex loads that are subject to in exploitation. The active edges of these tool, being subjected to complex wears are deteriorated in time, diminishing their functional characteristics, dimensional precision and the appearance of manufactured products.

Nowdays, taking into account the raw materials crisis that the world is facing, a lot of companies are practicing the reconditioning of this type of tools through weld cladding or other known processes (Binchiciu & Iovanas, 1992).

The basic idea stated in this paper is the manufacturing of this type of tools from tenacious steels, unalloyed, able to take over the complex exploitation loads and in the active areas (surfaces) to mount modulated elements. (Iovanas, et al., 2009).

2. TOOLS MANUFACTURING TECHNOLOGY THROUGH CLADDING

During exploitations the active surfaces of the manufacturing tools, cold and hot pressing, are subjected to wear through abrasion under medium and high pressure combined with adhesion, corrosion and fatigue.

The introduction, recently, of the design concept based on determined durability principle, imposed the implementation of new types of products, namely with consolidated active surfaces (Iovanas & Iovanas, 2006). Therefore, the researches presented in this paper are proposing a simplification of the working procedures in the workshop, through introduction of modulated elements.

On spot analysis, of the demands for plastic deformation tools, emphasized the need to introduce in production two types of modulated elements, with active surfaces consolidated through weld cladding, namely:

- Modulated element for cutting knife on scissor (fig. 1, 2);
- Modulated element for bendig die (fig. 3, 4).

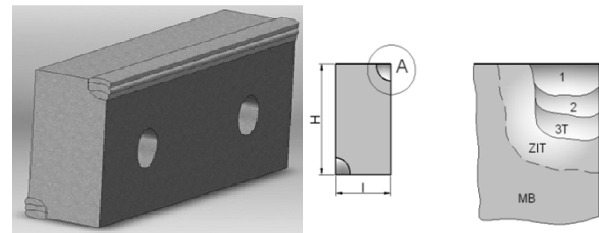


Fig. 1. Modulated element for cutting knife

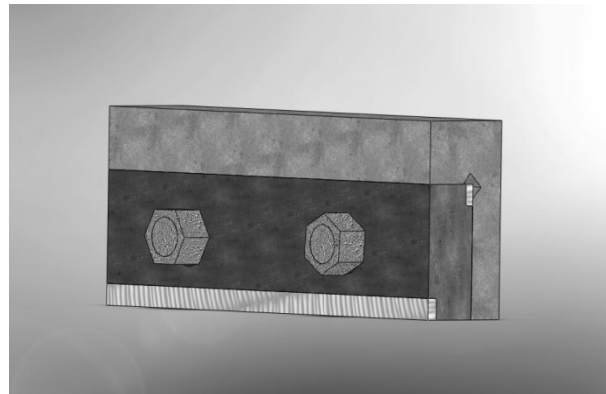


Fig. 2. Modulated element mounting on scissor

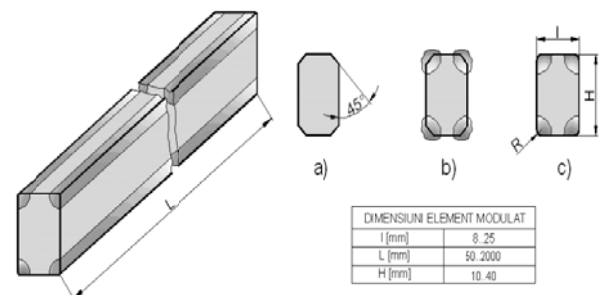


Fig. 3. Modulated element for bending die

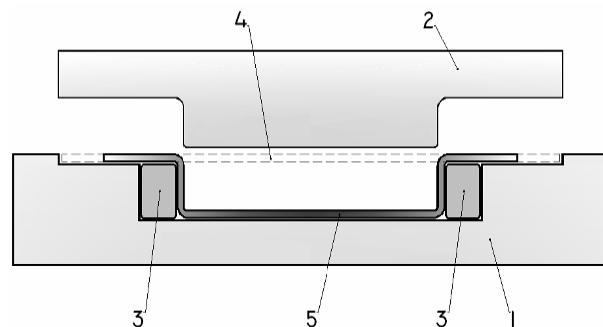


Fig.4. Die with modulated elements 1) inferior die; 2) superior die; 3) modulated elements; 4) steel sheet; 5) engine mount blank

The modulated elements are produced adapted to the shape and dimension of the active areas and are made in bi-metal variant, that is from tenacious steel type S 335 JR-EN 1.0045, clad on the active areas (surfaces) with weld layers (beads), with filler material alloyed depending the exploitation loads (Iovanas, et al., 2008).

The interchangeable modulate elements are practically made of parallelepipedical plated with dimensions adequated to the tool on which they are mounted and are fixed with short lateral weld beads in groove destined to carry on normally the deformation process that follows to be made by the tool.

The modulate elements were conceived so that to realize two active edges (in the case of cutting knife) or four active edges (in the case of sheet bending die). That can be used to a controlled wear. After each active edge has worn, a 90° rotation follows, until a complete wear of the modulated element. Then it is extracted and replaced with a new one.

The tools produced with the help of modulated elements were tested in exploitation, analyzing the working duration until first re-sharpening, as follows:

- For cutting knives, were used six knives for slab billet cutting, in two variants respectively classic knives made from alloyed steel type 30VCrW85 (EN 1.2581) and knives made with interchangeable plates from S 355 JR-EN 1.0045 (OL52) clad through welding, with specially elaborated filler materials, on two exactly contrary surfaces (fig. 1)

The operating hours for each knife type are presented in table 1 and 2.

Knife number	1	2	3	4	5	6
Operating hours	264	271	268	259	270	266

Table 1. Operating hours „t” for classic knives

Knife number	Operating hours	
	Edge 1	Edge 2
1	528	503
2	516	523
3	526	512
4	508	518
5	522	509
6	512	527

Table 2. Operating hours „t” of the knives produced through weld cladding, in[h]

- For sheet bending die were made six dies, used for fabrication, through hot plastic deformation of the piece “freezer engine”, in two variants: respectively dies made of alloyed steel type 55VMoCrNi16 (EN 1.2713) and dies made of other material respectively S 355 JR-EN 1.0045 (OL 52), that allows the mounting of modulated elements, that can be clad through welding, with specially elaborated filler materials, on four edges beads (fig.3).

The operating hours for each of the dies described above, till their removal from operation are presented in tables 3 and 4.

Die number	1	2	3	4	5	6
Working hours	107	89	103	106	114	100

Table 3. Operating hours „t” for classing dies

Die number	Working hours			
	Edge 1	Edge 2	Edge 3	Edge 4
1	128	130	127	121
2	117	119	116	118
3	123	125	122	124
4	127	129	126	128
5	116	118	115	117
6	120	122	119	121

Table 4. Operatin hours „t” for dies produced through cladding, in[h]

Analyzing the operation time for the two types of tools, it can be observed that, both in the case of knives made with interchangeable plates clad through welding and bending dies, it has multiplied approximately by two.

3. CONCLUSION

- Was presented a new manufacturing and reconditioning concept for tools used at processing through plastic deformation, concept that consist of realization of bi-metal type modulated elements, interchangeable, clad through welding in the areas (surfaces) subjected to wear with weld beads, using specially elaborated filler materials;

- Were conceived, realized and experimented interchangeable modulated elements from tenacious steels, unalloyed, cheaper, able to take exploitation loads and clad on the active edges (2 or 4 edges) with weld beads resistant to complex wear;

- The experiments made allowed the testing of the modulated elements (with 2 or 4 clad edges) for different tools type, observing an increase in the operation times of approx. 2 times.

- In the future, we intend to mass produce several tools for processing through plastic deformations, made with interchangeable modulated elements clad on 2-4 active edges, with weld beads, using filler materials specially elaborated for this goal;

- We intend to extend the researches on other types of tools.

4. ACKNOWLEDGEMENTS

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