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ANALYSIS OF WELDED JOINTS Ct.20 (GOST) WITH ATIG PROCESS OF WELDING

Assistant Professor Darko R. Bajic
University of Montenegro, Faculty of Mechanical Engineering
Cetinjski put bb, Podgorica
Montenegro

ABSTRACT
The application of conventional TIG-welding procedure is not able to answer in full to the needs of modern market from the aspect of productivity and economy. Using the emergence activation of oxidation-reduction processes in zone of welding by surface – active and electronegative elements (ATIG-procedure) the technological caracterisctics of electric arc become better.
By introducing of microquantities of easy ionizing elements into a welding zone, there are making conditions for a control and operating of technological charateristics of electrical arc at welding. Under influence of plasma flow and components of activating melting material conditions of seam metal crystallization are imroved. Seam forming with tiny crystal desoriented prime structure increases resistance to warm crack forming.
At work are presented research metallographyc results of welded joints with ATIG-process of welding carbon structural steel Ct.20 (GOST 1050-74).
Keywords: welding, welding flux, ductile fracture

1. INTRODUCTION
While welding steal using conventional TIG- action, welding is limited by thickness of pipe or plate wall. Reduce of welding time i making up high quality welded conection is posible using activating smelter [1,2,3,4]. By using this welding action is posible produce high-quality welded conection of steal thickness up to 12 mm in one side welding and up to 22 mm in two side welding. Those welded conections operate in very bad work conditions (high work temperature, high work presure and very agresive environment). Having all this in mind, it is clear that welded conections must have high visoku operating safety and confidence. Mechanical characteristis of metal conection, specialy stretch hardness and resistants, must be almost identical with characteristic of basic metal.

By introducing of microquantities of easy ionizing elements into a welding zone, there are making conditions for a control and operating of technological charateristics of electrical arc at welding. Under influence of plasma flow and components of activating smelting material conditions of seam metal crystallization are imroved. Seam forming with tiny crystal desoriented prime structure increases resistance to warm crack forming. Explanation is placed in fact that in ATIG welding increase value of critical speed of deformity who is producing those cracks.

2. PARAMETERS OF WELDING
Welding of steal samples C_T.20 dimensions Ø32x6 mm made in two passage without askance and clearance between welded edges (Figure 1). With first welding passage is produced welding of pipe using activating smelter, to complete throughwelding of welded edges. As we get concave conection area, second passage with alluding to get necessary elevationand and to make stronger seam is produced using aditional materijal, electrode wire Sv-08G2S (GOST). Chemical structure of basic steal material C_T.20 and electrode wire is in table 1.

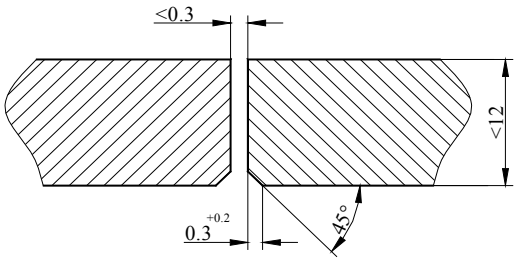


Figure 1. Conection S-39 (GOST OR 1513-72).

Table 1. Chemical structure of basic steal material and electrode wire (GOST)

Examinating object	Mass participation, %					
	C	Si	Mn	Ni	Mo	Cr
Basic material (ГОСТ 1050-74)	0,17÷0,24	0,17÷0,37	0,35÷0,65	≤0,25	0,25÷0,35	≤0,25
Sv-08G2S	0,05÷0,11	0,7÷0,95	1,8÷2,1	≤0,02	-	≤0,2

In table 2 is regime review of steal C_T.20, in speed of welding v=5,33 m/h.

Table 2. Regime of steal welding C_T.20 (Ø32x6 mm)

Num	Curent I_z, *A*	Tension U, *V*	Consumption of argon *l/min*		Arc length ℓ_{el}, *mm*	Remark
			Protection of arc	Protection of seam root		
1	70	9,8	10	-	2,5	Material splicing
2	105	9,4	10	4	1,25÷1,5	Sa welding flux
3	95	9	10	-	≈3,5	Using of electrode wire

After welding samples are exposed to thermical treatment – high dismissal at temperature 650°C (2 h). Cooling of samples is perform in two phase: first in furnace until geting 500°C temperature, and after that cooling of samples on room temperature until complete cooling .

3. MACRO AND MICROSTRUCTURE ANALYZE

Macrosnapshot of welded connection is showen on Figure 2. Under torment in 2% nitalu in welded connection we have clear noticed three zones: WM-weld metal, HAZ- Heat Affected Zone and PM-parent metal.

Microstructure WM of first welding passage (level "0" Figure 2) is ferrite-perlite. Compact ferrite net is separated by borders of ex austenitic grain, Figure 3a. Microstructure HAZ, is ferrite- perlite with tendency smalling to the connecting line - LS (Figure 3b) to PM (Figure 3c). Microstructure PM is ferrite- perlite, Figure 3e.

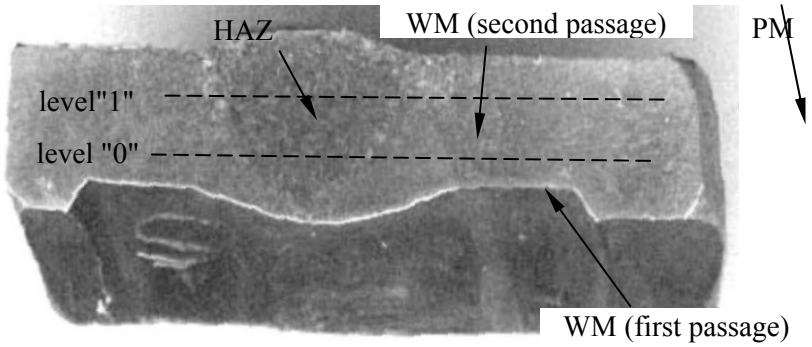
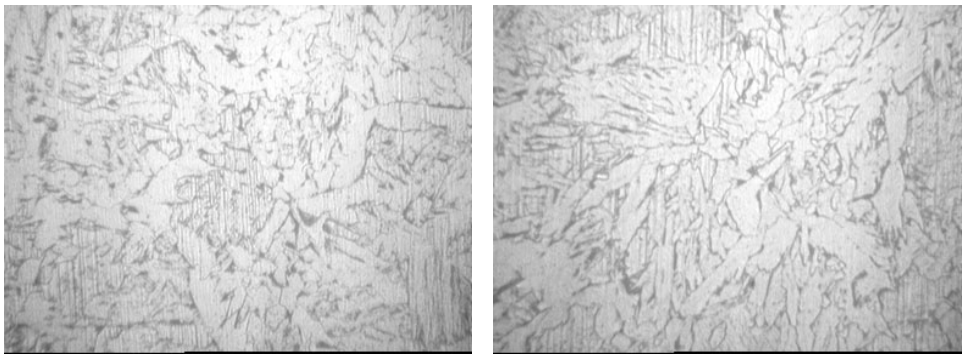
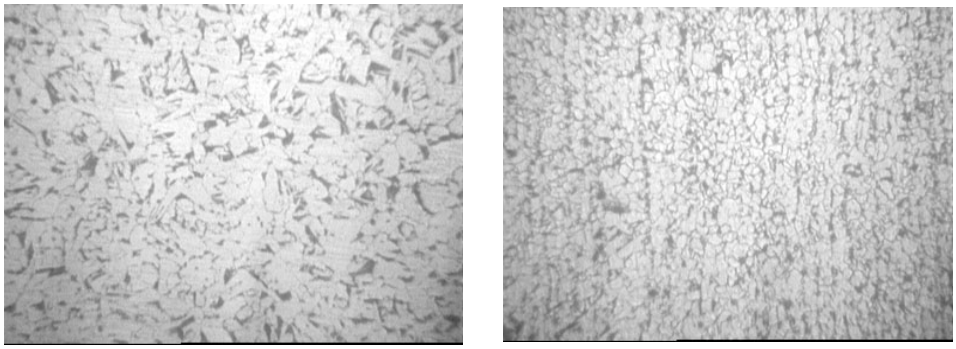


Figure 2. Macrosnapshot of welded steal connection C_T.20 using electrode wire in second passage



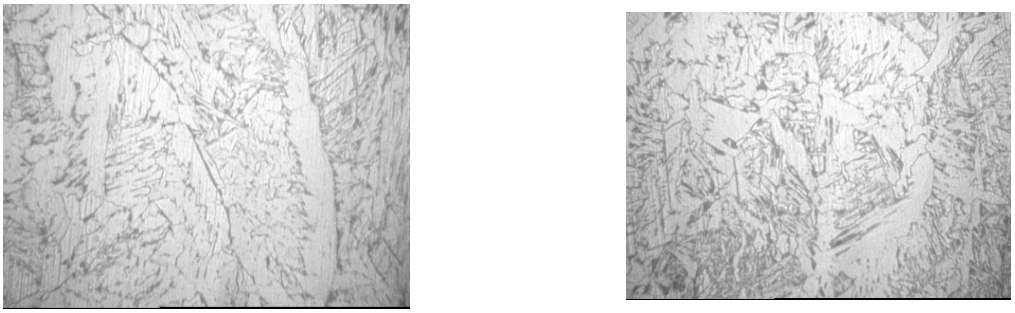
a) PM x140 b) HAZ 1 (next to LS) x140



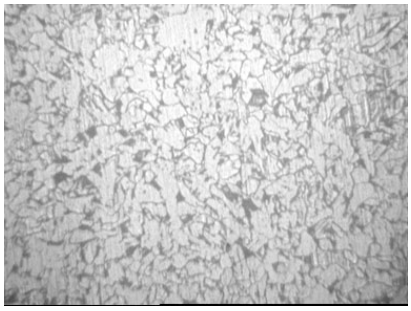
c) HAZ 2 (next to PM) x140 c) PM x140

Figure 3. Microstructure of first welding passage (level "0" figure 2)

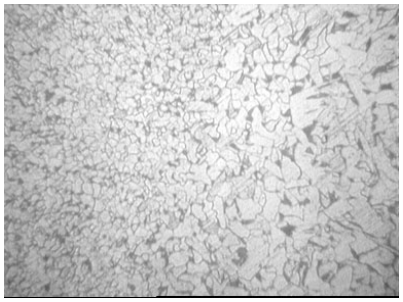
Microstructure of second welding passage figure 4 (level "1" figure 2), have similar characterization as first passage.



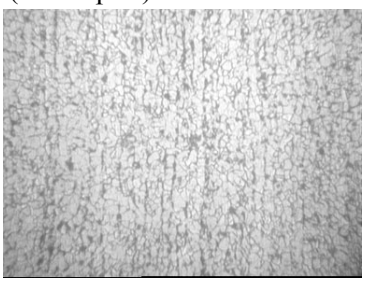
a) PM x140 b) HAZ 1 (next to LS) x140



c) HAZ 2 (cental part) x140



d) HAZ 3 (next to PM) x140



e) OM x140

Figure 4. Microstructure of second welding passage (level "1" figure 2)

4. REFERENCES

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