

## **SOLUTION OF PROBLEMS MAGNETIC FIELD DURING GAS PIPELINE WELDING**

- 1. M.Sc. Sead Avdić, - EWE, „Remontmontaža“ Tuzla**
- 2. Ph.D. Sead Pašić, University in Mostar**
- 3. B.S.M.E Azur Hasanagić, „Remontmontaža“ Tuzla  
Bosnia and Herzegovina**

### **ABSTRACT :**

*At welding some alloyed steel with high contents nickel and carbon steel with large thickness can be appeared magnetic field on piece of work.*

*Magnetism to cause problems and difficulty during to establish arc, bring up to remove „ blow „ arc by desire direction, it does not melt down in the same direction edge of groove and to cause connection mistakes, root unpenetration mistakes, or even full put out of action welding.*

*In scientific work is present gas pipeline welding with high concentration line of magnetic force. Base material of pipeline is carbon steel stable on low temperature A333 Gr.6, dimension Ø406,4x12,7 mm i (API) 5L x Gr. 52, Ø406,4x6,35mm.*

*Demagnetization of pipeline have done method of roll up cable for welding around piece of work ( tube ). After demagnetization and establish arc, welding is performed on the plan welding and with parameters gave in technology sheet.*

**Key word :** magnetic field, demagnetization, welding, pipeline, parameters of welding, machine for welding.

### **1. INTRODUCTION**

In realization project of reconstruction gas pipeline, one of the most important technology is welding technology. At weldability steel by which made pipe, depends choice welding technology. So, pipe material is defined, quality of welding connection, and with that safety and reliable all gas pipeline depends about choice filler metal, welding technology and quality of performed works.

Pipes of gas pipeline made by carbon steel which stable on low temperatures. Low contents of carbon, so that micro alloyed elements like : niobium, titan and vanadium with corresponding treatment thermomechanical gave to them good mechanical properties. Must be satisfied combinations high strength, ductility, weldability as and high resistance to appear cold crack.

At these type steels, high strength is result of combination different mechanism to become strong. Micro alloyed elements have main role in obtain good properties. Titan made particles TiN on raise temperatures, and on that way escape increase grain during many-sidedness warming and cooling, so that additional contribute deposit to become strong on low temperatures made fine particle carbon nitride. Niobium has influence on speed of rekristallize at final rolling where comes up to create fine ferrite at austenit – ferrite transformation. Vanadium increase hardness deposit smallness and coherent carbid in ferrit matrix.

These materials are disposed to appear magnetic field which make difficult action of welding, to do him sometimes almost impossible. Because complexity problems to create and welding of pipeline, importance safety and dependable all gas pipeline, everything is regulated welding technology which give the best properties welding connection.

## 2. WELDING TECHNOLOGY

Welding technology and pipeline controls KJP „ Sarajevogas “ PIU gas - Mjerna stanica Kladanj performed by request from technical documentation ( ENERGOINVEST – ITP sarajevo – cr. Br. O 10140010898, D 521621120124), Contract number 3 NCB/2 – 98 R.M. TZ, Europe norm ( EN 29 692, EN 22 553, EN 25 817 ) and other technical regulations for this type works.

As data from technical documentation base materials are carbon steel stable on low temperatures (ASTM) A 333 Gr. 6, A 350 LF2 and A 420 Gr. WPL6 dimensions Ø406,4x12,7 mm and (API) 5LxGr. X 52 Ø406,4x6,35 mm.

Table 1. Chemical structure of base material

Material	C [%]	Si [%]	Mn [%]	P [%]	S [%]	Cr [%]	Mo [%]	Ni [%]	V [%]	Cu [%]
A 333 Gr. 6	≤0,30	~ 0,10	0,29÷1,06	≤0,048	≤0,058	-	-	-	-	-
A 350 LF2	≤0,30	0,15÷0,3	≤1,35	≤0,035	≤0,040	-	-	-	-	-
A 420 Gr.WPL6	≤0,30	~ 0,10	0,29÷1,06	≤0,048	≤0,058	-	-	-	-	-
5L X Gr. X 52	~ 0,17	-	~ 1,40	~0,045	~ 0,045	-	-	-	-	-

Filler metal is electrode E Ti Mo, RUTILEN 13 ( manufacturer „ Željezara „ Jesenice ) or EZ 11 F Mo, EZ 11 F ( manufacturer „ Elektroda „ Zagreb ) and electrode EVB 60, EVB 50 (manufacturer „Željezarna“ Jasenice) or EZ 65B, EZ 50B ( manufacturer „Elektroda „ Zagreb ). Filler metals must be leggaly to put into storage.Before using required performed visual control filler metals. Welding is not allowed with electrode with damage covering.

Table 2. Chemical structure of welding seam

Mark	C [%]	Si [%]	Mn [%]	P [%]	S [%]	Cr [%]	Mo [%]	Ni [%]	V [%]	Cu [%]
E TiMo	0,10	0,30	0,50	-	-	-	0,50	-	-	-
EVB 60	0,10	0,40	1,30	-	-	-	0,35	-	-	-

Table 3. Mechanical properties of welding seam

Mark	Rp 0.2% [N/mm <sup>2</sup> ]	Rm [N/mm <sup>2</sup> ]	A <sub>5</sub> [%]	Av [J]	Av [J]
E TiMo	> 450	530÷590	> 22	> 65 (20 <sup>0</sup> C)	-
EVB 60	> 520	620÷700	> 22	> 47 (-20 <sup>0</sup> C)	-

Preparation of flute is performed mechanical processing, and shape of flute by technological sheet in enclosure, technical documentation and EN 29 692. Before starting surface welding of flute and 15 mm by one and another side flute is cleaning to metal radiance.Scattered tacking of edges performed by the same technological action like and root welding. Distance between tacking of edges 90<sup>0</sup>, and length by 10 and 15 mm.

Tacking of edges before beginning of welding are clean and visual inspect.

Preheat is performed on temperatures 120-150<sup>0</sup> C and by end of welding provide is slowly cooling welding seam under asbestos blanket.

Table 4. Specification welding action

Welding action	Root	111(E)		<b>Special remark :</b> <ul style="list-style-type: none"> <li>• Technological sheet for but welding pipeline <math>\phi</math> 406,4 x 12,7 mm.</li> <li>• Surface welding clean up to metal radiance</li> <li>• Welding performed with two welders diametrical and diametrical oposed</li> <li>• Ignition and interrupt bends performed only in seam</li> <li>• Every starting new passage to move in relation previous by 15 up to 20 mm</li> <li>• Scattered tacking of edges performed same technological action like welding seam</li> <li>• Distance between tacking od edges is <math>90^\circ</math></li> </ul> Preparation of welding seam, welding, control and others by standard EN 29 692; EN 22 553 i EN 25 817
	Filler	111 (E)		
Type seam	V (but welded )			
Position of welding	PA, PE, PF			
Type gas	-			
Dimension	t{13			
Base material	A 333 Gr. 6			
	A 333 Gr. 6			
Preheat	120-150 [°C]			
	Control	Thermochalk		
Filler metal :				
Electrode	Root	E Ti Mo	Pole +	
	Filler Metal	EVB 60 i E Ti Mo	Pole: +	
Wire for welding	-			

### 2.1. Shape of connection and welding sequence

Before beginning of welding check does preparation groove performed by tehnological sheet and permit instructions. Ignition and discontinue arc doing only in seam. Welding performed with two welders, diametric and opposite. Every begining new passage to move in comparative on previous for 15 up to 20 mm. All welding seam after welding good clean by dirt. Parameters and welding plan gave in technological sheet. Maximum try that welding performed by technological sheet in contribution. Welding which is not give in technological sheet, performed in accord with project documentation, EN 29 692, EN 22 553, EN 25 817 and others tehnical regulations.

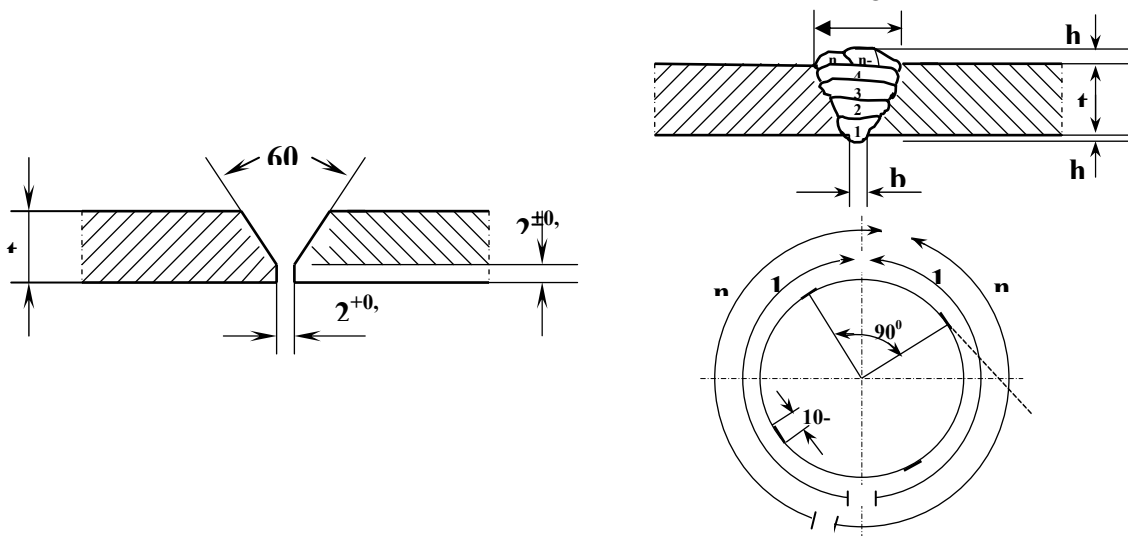


Figure 1. Shape of connection and welding sequence

### 3. PIPELINE DEMAGNETIZATION ON MEASURING STATION „ KLADANJ “

Action demagnetization has performed on this way : cabal for welding from one source electrical power is roll up on the end existing pipe ( 8 spiral ), and after that with pliers for welding to press down end of cable by mass. The second source of electrical power for welding is pleaced one the way that tile on the cable by mass, put in crevice seam and with electrode try does exist „ arc blow „.

When finished all preparations for demagnetization ( roll up cable, connecting with source of electrical power and others ) doing „ to shock „ material for demagnetization. Machine for welding is the first adjust on 10 (A) with delay 5 (s) and after electrical power came back on 0(A).

Action is repeating with increase of electrical power every time by 10 (A) up to 150 (A), and when with 150(A) came back on 0 (A), and after that increase on 30 (A) performed check of demagnetization.

Electrical power can test increase or doing exchange of pole or direction roll up cable. In concrete case successful demagnetization is performed with electrical power by 140(A).

When established that don't have demagnetization then seam normal welding by instructions give in WPS sheet, and after that seam welding possible to remove circle from pipeline and that device using for another welding ( filling out ).

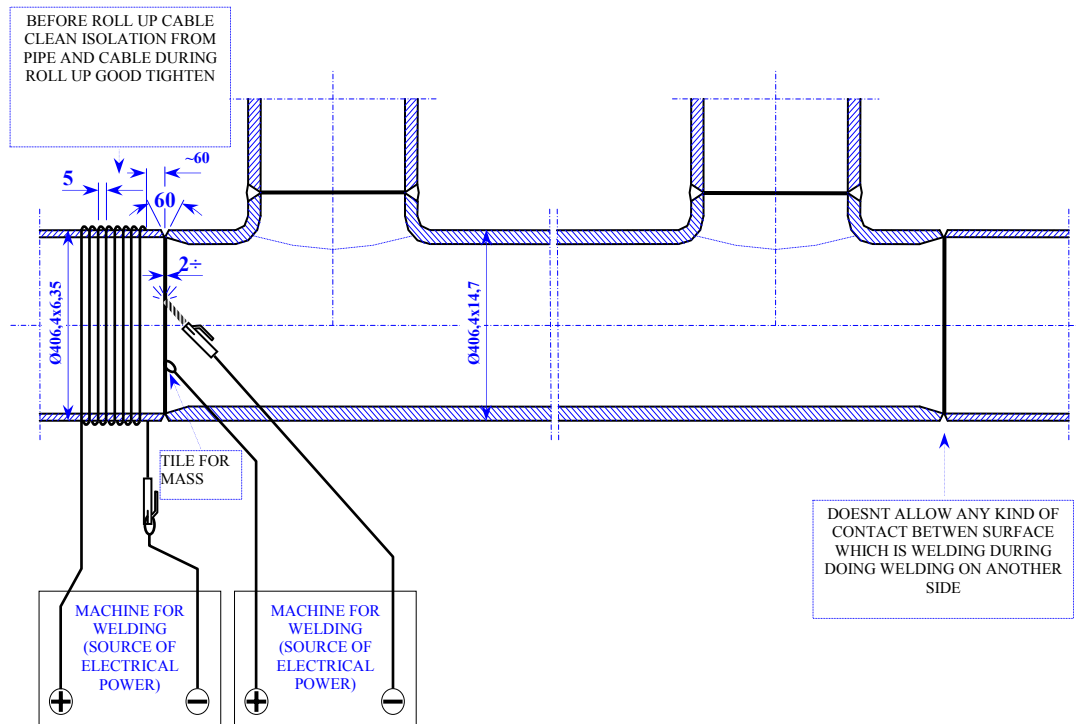


Figure 2. Scheme roll up at pipeline demagnetization

#### 4. CONCLUSION

Welding like product technology, supervision and coordination of welding during construction or reconstruction gas pipeline are very complicated and integrate row activity necessary performed to issue tehnological because make safe high-quality of works. It has special importance because specific material which is use for gas pipeline from aspect to carry in heat, choosing filler metal and welding tehnology.

Phenomenon magnetic field on piece of work which is welding additional make difficult take issued welding technology, during necessary additional skills for deverb „ blow arc „, and successful establishment electrical arc what is base good welding seam.

#### 5. REFERENCES

- [1] M. Novosel, D. Krumes : Posebni čelici, Sveučilište u Osijeku
- [2] Grupa autora : ITP zavarivanje, Tom 2 i 4, Rad, Beograd, 1980
- [3] Lukačević Z. : Zavarivanje, Slavonski brod, 1998.
- [4] Smith. D. : Welding skills and technology, New York, 1984
- [5] Juraga I., Ljubić K., Živčić M.: Pogreške u zavarenim spojevima, Zagreb, 1998.