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To Study and Analysis the Effect of Different Combinations of Welding Flux and Wire on Weldment Properties for L-SAW Process API X65Grade HSLA Steel Line Pipe : A Review

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ABSTRACT

Nowadays the Recent trend in the demand for large diameter pipe and high wall thickness, in order to improve transportation capacity, the gas and oil companies has been use more efficient piping systems for greater transportation facilities. The API-5L X65 grade HSLA steel is one of the most common pipeline materials in the oil industry. This project cover, effect of different combination of flux and wire on longitudinal SAW welded high wall thick line pipe. Different trials were taken to Study and Analysis the effect of Different combinations of Flux and Wire.

Keywords: Oil and gas line pipe, API 5L-X65 Grade HSLA steel, weldment quality, weldment quality, Tandem SAW.

I. INTRODUCTION

Line pipe are used to transport oil, gas and water. Longitudinal submerged arc welding is one of the Welding process to weld and manufacture a line pipe. API X65 grade High strength low alloy steels have been widely used for crude oil pipeline transportation in the petroleum industry. The steel pipe industry has conducted extensive effort to develop line pipe steel grade with superior mechanical and metallurgical properties. The need to achieve higher strength with sufficient toughness and ductility has pushed the development of high strength steels aiming at performance and durability to operate in harsh environment. Tandem submerged arc welding is used. To fulfill stringent working conditions as well as higher transportation rate the weldment should possess better soundness.

II. SUBMERGED ARC WELDING (SAW)

The submerged arc welding process utilizes the heat of an arc between a continuously fed electrode and the work. The heat of the arc melts the surface of the base metal and the end of the electrode. The metal melted off the electrode is transferred through the arc to the workpiece, where it becomes the deposited weld metal. Shielding is obtained from a blanket of granular flux, which is laid directly over the weld area. The flux close to the arc melts and intermixes with the molten weld metal, helping to purify and fortify it. The flux forms a glass-like slag that is lighter in weight than the deposited weld metal and floats on the surface as a protective cover. The weld is submerged under this layer of flux and slag, hence the name submerged arc welding. The flux and slag normally cover the arc so that it is not visible. The unmelted portion of the flux can be reused. The electrode is fed into the arc automatically from a coil. The arc is maintained automatically.

III. LITRATURE REVIEW

2003M.K Graf , H.G Hillenbrand, C.J heckmann[1] The Paper is Presents and overview of the current requirements for high strength steels and associated developments. The technical possibilities are described. Also in the future additional substantial improvements can be realised.

2005A. Fragiel1, R. Schouwenaarf2, R. Guardián3 and R. Perez[2] They investigated the chemical and microstructural characteristics commercially available API 5L X65 steels. The Parameters associated with mechanical properties were evaluated. Mechanical properties obtained from the different steels are similar in their magnitudes, therefore there is not appreciable.

2006 by c. sudha, v. thomas paul, a. l. e. terrance, s. saroja, and m. vijayalakshmi[3] This paper present the microstructure and microchemistry of hard and soft zones in a dissimilar weldment between 2MCrlMo and 9Cr-lMo ferritic steel subjected to post weld heat treatments. Carbon driven by Diffusion activity gradient across weld interface is found the result in the formation of a soft zone in the low Cr side and a carbide-rich hard zone provided direct evidence for the precipitate on of carbides in the hard zone of dissimilar weldments between 9Cr-lMo and 2%Cr-lMo steels subjected to PWHT. Secondary phases in hard and soft zones have been established. Average carbon content in the hard zone was found to be 0.39%.

2008 by j. e. ramirez [4] This paper was study about the General compositional and microstructural characteristics, including nonmetallic inclusions, of high-strength steel weld metals. Including nonmetallic inclusions, were experimentally characterized. The weld metals were deposited using different welding processes and commercially available welding consumables with nominal strengths ranging from 490 to 840 mpa. The content of carbon most of the deposited weld metals from 0.05 to 0.1% ranges. In microstructural observed that weld metals with higher alloying additions do not readily retransform during reheating induced during multipass welding. The nonmetallic inclusions in most deposited HSS weld metals ranged from 0.2 to 0.6%. The volume fraction of nonmetallic inclusions was as high.

2013J. Capelle , J. Furtado , Z. Azari , S. Jallais G. Pluvinage[5] This paper Present Safe transport of carbon dioxide by pipes needs a careful choice of the constitutive pipe materials to prevent brittle crack propagation after ductile or brittle failure initiation. Based on this methodology the selected API 5L X65 pipeline steel could be used for dense CO2 transportation.

2015 B. beidokhti and r.pouriamanesh [6] has investigated Effect of metal composition microstructure and mechanical properties check some test. The microstructure and mechanical properties of API 5L – X65 tandem submerged arc welded pipeline steel welds were improved using different combination of filler metal. The Result more acicular ferrite was formed in microstructure, which better properties were achieved.

2015 B. nabavi, m. goodarzi, and v. amani[7] has investigated weld metal microstructure was studied by optical and scanning electron microscopy. In alloy 263 and alloy X, The weld microstructure and mechanical properties due to welding by different Ar-N_2 shielding gases were observed. Experimental results that the dendritic structure of the weld was refined by increasing N_2 in Ar for both alloys. Result was found tensile strength and hardness have been augmented with increased nitrogen in the shielding gas.

2015 Nidhi Garg, Sanjay Panwar[8] This paper present hardness measurement after cooling the steel. Result

of change in media hardness altered. Metallographic examinations decomposition of austenite into martensite and ferrite with formation of fine precipitate particles within ferrite matrix and segregation find precipitate particles along the lath boundaries.

2015W.cho, d. v. kiran, and s. j. Na[9] In this Research constant heat input per unit length was maintained and flux consumption per unit length was analyzed for different welding conditions. The same heat input was applied in the SAW-T process, the SWPL and bead shapes are different in all nine cases investigated in this study.

2016 Kahraman sirin & sule y. sirin & erdinc kaluc[10] This Paper Investigate Submerged arc welding is extensively used in pipe production. Vickers hardness, CVN impact toughness and tensile strength tests have been conducted. The weld electrode contains B and Ti micro-alloy elements that can produce high toughness WM. This work shows the importance of the selection of weld electrode composition in order to improve the mechanical properties of steel welds.

2017Pravin R. Ingole[11]This Paper present the investigation was evaluate the fracture toughness of welded API X65 steel plates the limited number of reported works on the subject. Presence of Nb and V imparts precipitation hardening effect to the API X65 steel, such that it has satisfactory combination of strength and toughness parameters by API service requirements.

IV. CONCLUSION

After studied all these research papers, I concluded that research about effect of different combinations of flux and wire on X65 grade HSLA steel line pipe. We study and analysis weldment mechanical properties of different test trial, microstructure analysis and chemical test of different wire and Flux of HSLA steel pipe.

V. REFERENCES

[1]. M K Graf, H G Hillenbrand, C J Heckmann, K A Niederhoff, High strength large diameter pipe for long distance high pressure gas pipeline, Europipe 2003

[2]. A. Fragiel, R. Schouwenaarf, R. Guardián and R. Perez, Microstructural Characteristics of Different Commercially Available API 5L X65 Steels, Journal of New Materials for Electrochemical Systems 2005.

[3]. Hard Zone in Dissimilar weldments of Cr-Mo Steels, Sponsored by the American Welding Society and the Welding Research Council, April 2006

[4]. j. e. Ramirez, Characterization of High-Strength Steel Weld Metals: Chemical Composition, Microstructure, and Nonmetallic Inclusions, Sponsored by the American Welding Society and the Welding Research Council, March 2008 VOL. 87

[5]. J. Capelle, J. Furtado, Z. Azari, S. Jallais G. Pluvinage, Design based on ductile–brittle transition temperature for API 5L X65 steel used for dense CO2 transport, Elsevier 2013

[6]. B. Beidokhti and r. pouriamanesh, effect of filler metal on mechanical properties of HSLA welds, welding journal October 2015

[7]. B. Nabavi, m. goodarzi, and v. amani, the effects of nitrogen addition in ar gas on weld metal microstructure and mechanical properties of alloy 263 and alloy x were studied, welding journal February 2015

[8]. Nidhi Garg, Sanjay Panwar, effect of austenitization and cooling on hardening of x65 grade line-pipe Hsla steel, International Journal of Science, Technology & Management ,Volume No 04, Special issue no. 01, may 2015

[9]. W.cho, d. v. kiran, and s. j. na, Analysis of the Flux Consumption and Metal Transfer for Tandem Submerged Arc Welding Process under

Iso-¬Heat Input Conditions, welding journal october 2015.

[10]. Kahraman sirin & sule y. sirin & erdinc kaluc, Influence of the chemical composition of weld electrode on the mechanical properties of submerged arc welded pipe, Springer March 2016

[11]. Assistant Professor Pravin R. ingole, Evaluation of fracture toughness of Welded High Strength Low Alloy Line-Pipe Steel, International Journal of Engineering Science and Computin 2017.