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Dr. **ZAOUI MOUSSA**,
Dr**. FARSI CHOUKI**,
University of M'sila, Algeria
Dr. **ZHUKOV SERHII**, Kryvyi Rih National University, Ukraine

IMPROVEMENT OF WELDED PIPE JOINTS FOR MINING EQUIPMENT

Mining enterprises use many steel pipes for pumping sludge from ore dressing waste. These pipes are often repaired by welding. This work requires a lot of time and high quality connections. In this regard, the research below have been performed.

The macrographic examinations enabled us to conclude that, the weld bead has a satisfactory penetration lacking defect. They confirm the visual examinations which reveals a regular cord and of beautiful aspect. It is noticed that the heat treatment does not change the macrographic structure except on the level of dimensioning of the grains. This obliges someone to see the size and the nature of the grains by micrographic examinations. The zone of connection is the seat of a thermal contribution in short and rather important conditioning the enlargement of the grains and the formation of an acicular structure, It is thought that the zone of overheating is the seat of structures which have the reduced plastic properties of the welding and weaken the structure slightly. The structure of our product after welding is primarily ferritic with some small islands or beaches of pearlite (percentage of weak carbon).

External master keys (4^{th} and 5^{th}) where the cooling speed is more important, give a needle structure characteristic which is a ferrite out of balance.

Internal master keys (having undergone treatments of reheating give a regular structure of ferrite, the coalescent ferrite needles end in structures closer to the state of balance or in mixed textures). The lower part of the joint thus corresponds to heated master keys several times than zones regenerated (master keys 1 and 2), have a ferritic structure with regular grains. The weld bead presents broad zones affected by the heat which can be treated as being ZAT1 and ZAT2. The ZAT1 close to the zone of connection, where the temperature is lower than 1100°C (zone of standardization), We can meet a fine structure which is due to the effect of a heating during short times and which did not reach the temperature of transformation AC3. In this zone metal acquired higher mechanical properties compared to those of the base metal which remained far from the action of heat. This phenomenon explains the increase in the hardness recorded in this zone. The ZAT2 having undergone a transformation leading to an incomplete recrystallization because the temperature remained constant between AC1 and AC3. At this temperature the most noticeable structure is the coarse ferrite grains accompanied by fine grains of ferrite and pearlite. In the zone close to the ZAT2, one observes a recrystallization which restores the form and initial dimensions of the grains deteriorated by the plastic deformation imposed by rolling. Beyond this limit the structure is identical to that of the base metal. This recrystallization results in a fall of the micro hardness. The analysis with the Charpy pendulum sheep highlights for product SG3 deposited by MIG welding may lead ductile character of the rupture at the ambient temperature and even at - 20 °C, and an unquestionable brittleness with the die of – 40°C. The analysis of facies reveals this brittleness within an overall ductile behavior because the level of the loads is close except for the temperature - 40 °C where a weak energy is observed.

It is Noticed that brittleness corresponds to ferrite and pearlite structure that can be found in various forms. The applied heat treatments affect little the structure of the base metal but the effect is spectacular on the joint, where it is noticed a considerable change inducing a total recrystallization which lead to a fall in microhardness on the level of the joint but lead to an increase in impact strength on the other hand. This Ci is justified by the return towards a ferritic structure because ferrite is fragile at low temperatures.

High tensile residual stresses, at or above the yield stress level, exist near the weld toe area, especially at the weld start/stop location. The magnitude of the residual stresses reduces quickly as the distance from the weld toe increases.

Post Weld Heat Treatment (PWHT) does not relax residual stresses completely from the socket-welded piping joints; the maximum tensile residual stress relaxes about 48%, where as the maximum compressive residual stress relaxes 50%. The reason that the residual stresses do not relax completely by PWHT is the different cooling rates at different locations of the welded joint, especially near the weld area. Different cooling rates regenerate residual stresses which are not much different from those originally introduced by welding.

The residual stress distribution does not change much when the slip-on gap in the socket weld joint is reduced to zero. Hence, the increase in fatigue life of socket welds with no slip-on gap is unrelated to residual stress. The improvement in fatigue life may come from the change in failure mode, which in turn, may be influenced by the change of the external load stress or strain distribution.

Fabrication of piping weld joint by *quarter circumferential welding* yields a more favorable residual stress distribution than the *full circumferential welding* pass. Less distortion and increase in fatigue life are observed in the earlier method of welding.

Moreover, in the quarter circumferential welding it does not matter much if the last welding pass is on the socket side or the pipe side. In case of the full circumferential welding, the location of the last pass does influence fatigue life, as demonstrated by Barsoum.

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L. I. MAKHARADZE, Doctor of Technical Sciences, Professor,
S.I. STERYAKOVA, engineer, researcher G. Tsulukidze Mining Institute, Georgia

TECHNOLOGICAL SCHEME OF A MULTISTAGE HYDROTRANSPORT FACILITY FOR TRANSPORTATION OF FOSSILS AND OTHER SOLID LOOSE MATERIALS BY PIPELINES AT FAR DISTANCES

The article reviews the technological scheme of a multistage hydrotransport facility for transportation of fossils and other solid loose materials by pipelines at far distances. To perform its function, it has a mechanism for obtaining hydraulic fluid which is installed inside the drum and consists of auger and quill shafts which are fixed to the axis between the intake pump wings. Inside the chamber for producing a