Тема занятия: «Выявление сварочных дефектов»

Цель занятия: выучить новый лексический материал по теме «Выявление сварочных дефектов»; совершенствовать навыки чтения и перевода текста профессионального направления; систематизировать знания, ответив на контрольные вопросы по теме занятия.

Уважаемые студенты! Ознакомьтесь с материалами практического занятия на тему «Выявление сварочных дефектов». Конспект занятия выполняйте **в рабочей тетради письменно**, **обязательно указывая дату занятия, тему занятия, номер упражнения.** Ответы предоставить преподавателю на проверку **до 14. 04. 2023 г.** в электронном виде **(фотоотчёт)** на e-mail mikagol2605@mail.ru. Телефон преподавателя для консультации и возникающих вопросов: 072-14-15-816.

С уважением, Голодюк Марина Викторовна.

1. **Выпишите в словарь и выучите новую лексику.**
2. **Прочитайте и устно переведите текст «Welding defects».**
3. **Выполните письменно упражнения к тексту.**

Welding defects

Vocabulary

lack of fusion - непровар (шва)

lack of penetration - недостаточная глубина провара

undercut - подрез

lamellar tearing - расслаивание, образование продольных трещин

single pass / run - однократный / единичный проход

edge cutting - срез кромки

heat input - эффективная тепловая мощность, погонная энергия

transverse - пересечение, (поперечное) движение

torch weld - шов, полученный при газовой сварке

rapid traverse - быстрый ход, форсированная продольная подача

burn through - проплавление, прожог

core rod - сердцевина электрода

flux cored rod - электрод / стержень с флюсовой сердцевиной

flux coating - электрод / стержень с минеральным / флюсовым покрытием

shrinkage - усадка

stiff frame - жесткая рама

residual stress - остаточное напряжение

segregation - расслоение, сегрегация

hot crack - горячая трещина, горячий крекинг

parent metal - основной металл

weld bead - наплавленный валик (металла)

transverse cracking - поперечное растрескивание

open weld - шов с зазором между кромками

solidification cracking - образование усадочных трещин

to withstand - выдерживать, противостоять

contraction - напряжение сжатия

ratio - коэффициент, соотношение

impurity - примесь, постороннее включение

Common welding defects include lack of fusion, lack of penetration or excess penetration, porosity, inclusions, cracking, undercut, lamellar tearing. Any of these defects are potentially disastrous as they can give rise to high stress intensities which may result in sudden unexpected failure below the design load.

To achieve a good quality joint it is essential that the fusion zone extends to the full thickness of the sheets being joined. Thin sheet material can be joined with a single pass and a clean square edge will be a satisfactory basis for a joint. How-ever, thicker material will normally need edges cut at a V-angle and may need several passes to fill the V with weld metal. Where both sides are accessible one or more passes may be made along the reverse side to ensure the joint extends to the full thickness of the metal. Lack of fusion results from too little heat input and / or too rapid traverse of the

welding torch (gas or electric). Excess penetration or burning through arises from too high a heat input and / or too slow traverse of the welding torch. It is more of a problem with thin sheet as a higher level of skill is needed to balance heat input and torch traverse when welding thin metal.

Porosity occurs when gases are trapped in the solidifying weld metal. These may arise from damp consumables or metal, or from dirt, particularly oil or grease, on the metal in the vicinity of the weld. This can be avoided by ensuring all consumables are stored in dry conditions and the workpiece is carefully cleaned and degreased prior to welding.

Inclusions occur when several runs are made along a V-joint when joining thick plate using flux cored or flux coated rods and the slag covering a run is not totally removed after every run before the following run.

Cracking can occur due to thermal shrinkage or due to a combination of strain accompanying phase change and thermal shrinkage. In case of welded stiff frames, a combination of poor design and inappropriate procedure may result in high residual stresses and cracking. Where alloy steels or steels with a carbon content greater than 0.2 % are being welded, self-cooling may be rapid enough to cause some brittle marten site to form. This will easily develop cracks. To prevent these problems a process of pre-heating may be needed, and after welding a slow controlled post-cooling in stages will be required. This can greatly increase the cost of welded joints, but for high strength steels, such as those used in petrochemical plants piping, there may well be no alternative.

Solidifying cracking is also called centerline or hot cracking. They are called hot cracks because they occur immediately after welds are completed and sometimes while the welds are being made. These defects, which are often caused by sulfur and phosphorus, are more likely to occur in higher carbon steels. Solidification cracks are normally distinguishable from other types of cracks by the following features: 1) they occur only in the weld metal - although the parent metal is almost always the source of the low melting point contaminants associated with the cracking; 2) they normally appear in straight lines along the centerline of the weld bead, but may occasionally appear as transverse cracking; 3) solidification cracks in the

final crater may have a branching appearance; 4) as the cracks are open they are visible to the naked eye.

On breaking open the weld the crack surface may have a blue appearance, showing the cracks formed while the metal was still hot. The cracks form at the solidification boundaries. There may be evidence of segregation associated with the solidification boundary. The main cause of solidification cracking is that the weld bead in the final stage of solidification has insufficient strength to withstand the contraction stresses as the weld pool solidifies. Factors which increase the risk include insufficient weld bead size or inappropriate form, welding under excessive restraint, material properties, such as a high impurity content or a relatively large shrinkage on solidification.

Joint design can have an influence on the level of residual stresses. Large gaps between components will increase the strain on the solidifying weld metal, especially if the depth of penetration is small. Hence weld beads with a small depth to width ratio, such as is formed when bridging a large wide gap with a thin bead, will be more susceptible to solidification cracking. In steels, cracking is associated with impurities, particularly sulphur and phosphorus and is promoted by carbon, whereas manganese can help to reduce the risk. To minimize the risk of cracking, fillers with low carbon and impurity levels and relatively high manganese content are preferred. As general rule, for carbon manganese steels, the total sulphur and phosphorus content should be no greater than 0.06 %. However when welding a highly restrained joint using high strength steels, a combined level below 0.03 might be needed.

3. Выполните письменно упражнения к тексту.

1. Найдите в тексте английские эквиваленты данных слов и словосочетаний:

1) подрез; 2) расслаивание; 3) растрескивание; 4) прожог; 5) смазка; 6) расчетная нагрузка; 7) однократный проход (горелкой); 8) обратная сторона шва; 9) включение; 10) эффективная тепловая мощность;

2. Вставьте нужное слово или словосочетание.

1. These defects can give rise to … intensities. 2. Thin sheet material can be joined by a … pass. 3. Two or more passes may be made when both sides are …. 4. Lack of fusion may result from too rapid … of the welding torch. 5. Higher skill is needed to … heat input and torch traverse. 6. To avoid porosity the work-piece should be … prior to welding. 7. Cracking occurs due to … shrinkage.

3. Переведите на английский язык следующие предложения.

1. Зона сплавления должна охватывать всю толщину свариваемых листов.

2. Пористость возникает, когда в застывающем металле задерживаются газы.

3. К непровару приводит недостаток тепловой мощности и слишком высокая скорость движения горелки.

4. Для предотвращения растрескивания необходим поэтапный прогрев до начала сварки.

5. Так как пористость может быть следствием использования влажных электродов, их нужно хранить в сухом месте.