LESSON PLAN

Date_____ Trade:- Welder

Name_____ Unit/Lesson:-Thirty Seven

Subject:- Thermit welding process, equipments, thermit mixtures types and applications.

Use of Baking Strips and Bar.

Motivation:- In previous lesson we discuss about Electro slag and electro gas welding.

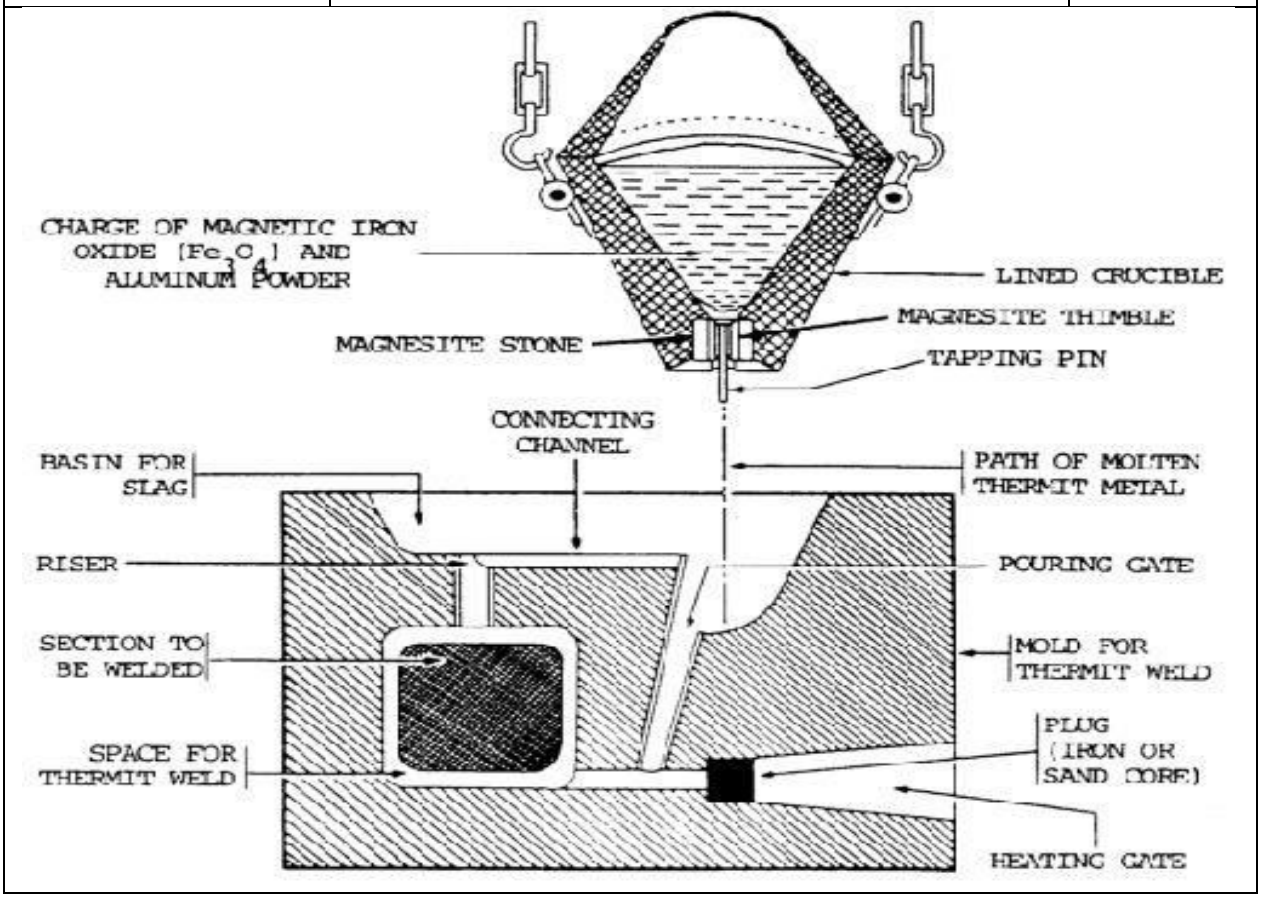
These processes are used for thick plates.

PREPARATION

1) (Materials, Tools, Models, Charts and other aids)

INTRODUCTION:- Thermit welding process is mainly used for rail track repair. Thermit process have a crucible which contain thermit mixture ,welder fire this mixture and complete joint.

Topic	Information Point	Spot Hint
Thermit Welding	Name thermit derived from Thermite which is mixture of aluminum powder and iron oxide. Dr. Goldsmith event this mixture in 1895.	



Process	Thermit mixture fire in crucible with the ignition ribbon which made by barium peroxide. After fire mixture generate 3000°C temperature and mixture melt and complete the joint.	
Step for start process	1. Lining up- First lining up weld joint 2. Cleaning- Clean the weld area. 3. Wax Pattern- Make wax pattern of joint. 4. Sand mold- make sand mold around wax pattern. 5. Preheating the job- preheat the job for remove wax pattern. 6. Ignition the thermit mixture-by chemical reaction ignite the thermit mixture and now the molted metal ready for complete the joint. 7. Poring- melted metal fill in the pattern and complete the joint.	
Chemical Reaction	$\frac{3}{4}Fe_3O_4 + 2Al \rightarrow \frac{9}{4}Fe + Al_2O_3 \quad (\Delta H = 838\,kJ/mol\ of\ oxide)$ $3FeO + 2Al \rightarrow 3Fe + Al_2O_3 \quad (\Delta H = 880\,kJ/mol\ of\ oxide)$ $Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3 \quad (\Delta H = 860\,kJ/mol\ of\ oxide)$ $3CuO + 2Al \rightarrow 3Cu + Al_2O_3 \quad (\Delta H = 1210\,kJ/mol\ of\ oxide)$ $3Cu_2O + 2Al \rightarrow 6Cu + Al_2O_3 \quad (\Delta H = 1060\,kJ/mol\ of\ oxide)$	
Type of mixture	1. Plain thermit 2. Mild steel thermit 3. Cast iron thermit 4. Rail welding mixture.	
Limitation	Used for ferrous metal only.	

Weld Backing

To counter this need for a high level of welder skill, mechanical methods of weld-based control have been developed. If the rear of the joint can be accessed, the external bead profile can be machined or ground to an acceptable form – perhaps even to a smooth, flat, continuous surface. Alternatively, the bead can be deposited from the rear of the joint and the internal profile treated. If the rear of the joint cannot be accessed, a physical weld bead or backing support is the only alternative to allow the welder to be certain of producing a smooth, flat, coke-free weld that should not lead to corrosion or stress fracture. A number of backing methods for providing mechanical support and preventing contamination are available

1. Ceramic tile backing strip
2. Permanent backing bar
3. Temporary backing bar
4. Consumable inserts
5. Inert gas
6. Glass-reinforced fiber tape

Ceramic Tile Backing Strip

Ceramic tile backing (see fig.1) has been designed to meet the requirements of the slag processes submerged arc welding (SAW), fluxcored GMAW, and MMA welding.

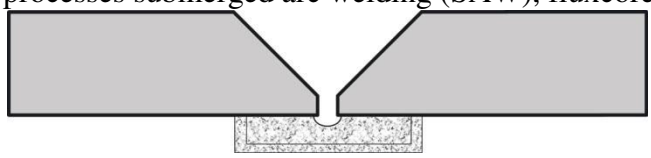


fig.1

The slag is contained within the tile recess below the weld and protects and shapes the external bead. Ceramic tiles usually are held on an adhesive tape that can be affixed to the backside of the weld.

Permanent Backing Bar

Protecting and shaping the weld bead by providing a permanently attached strip of material similar to that being welded is popular (see fig.2).

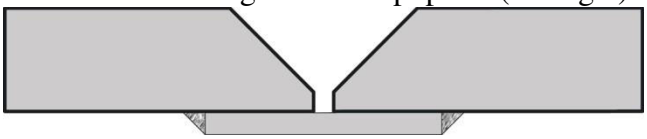


fig.2

It is inexpensive, easily applied, and requires little special skill.

The backing bar becomes a permanent feature of the joint, which may be undesirable from an aesthetic point of view, depending on the part. It also presents a fatigue notch to the weld root. Once fabricated, the backing bar is tack welded into position. A permanent backing bar is unlikely to be used where a product or gases flow through pipework because of possible entrapment and flow disruption.

Temporary Backing Bar

Another type of backing bar support can be clamped in place for welding and removed after the joint has been completed (see fig.3).

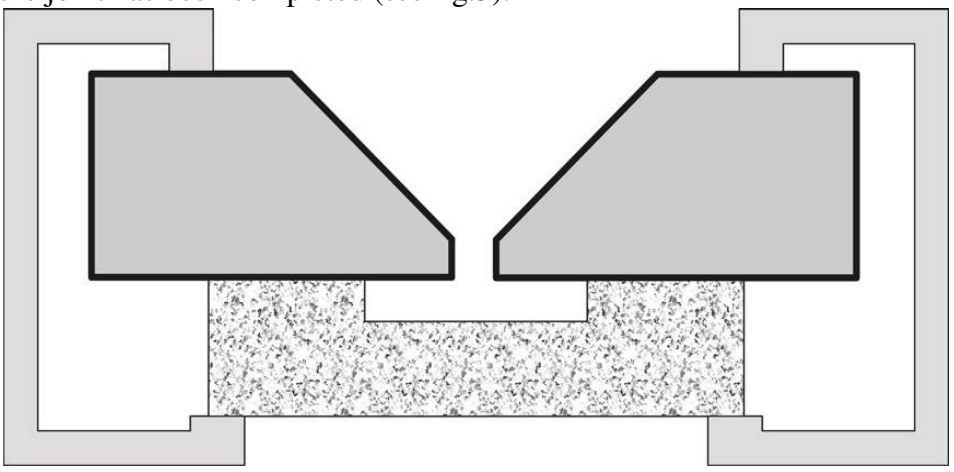


fig.3

To ensure the bar cannot be welded to the joint, this temporary support often is water-cooled and manufactured from copper.

The manufactured temporary backing bar is held in place by a suitable tool or fixture that allows it to be removed easily after welding.

This application can be time-consuming for low-volume manufacturing because of the complexities of set-up and the need for removal after welding, bearing in mind that water cooling lines are attached.

Consumable Inserts

Shaped inserts are available in a range of materials designed to be metallurgically compatible with the weld metal. During deposition of the root bead, the insert is melted into the weld pool. This technique produces a consistent root profile and is available in a limited range of materials, Standard insert material includes the common grades of stainless steel, but some of the nickel alloys, such as MONEL® alloy, INCONEL® alloy, and HASTELLOY®, may not be available in the form required.

Typical inserts are known as A shape, EB-, J_, and K-type inserts (see fig.4).

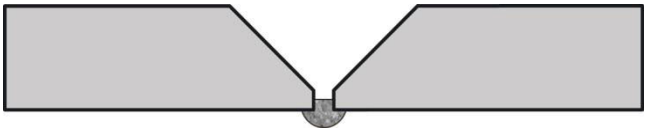


fig.4

Availability of these inserts depends on the availability of the raw materials in the form required for the insert material.

Inert Gas

Although originally intended to be used to butt weld tube with the GTAW process, inert gas backing has been extended to linear butt welds (see fig.5).

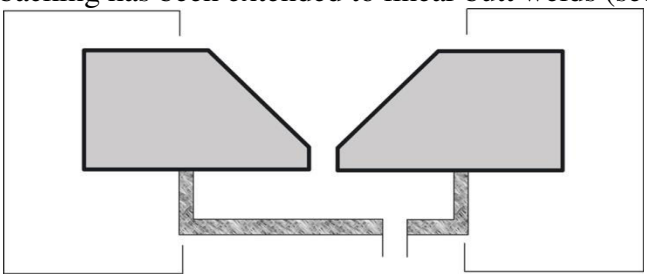


fig.5

When nominal gas sealing is provided at the ends of the joint seam, a gas pressure is created under the bead that is sufficient to provide protection from contamination and act as support for the molten metal. Inert gas backing produces good root profiles.

Argon is the most common inert gas for backing, and where there is no metallurgical or chemical restriction, nitrogen also can be used. Helium often is used as a backing gas in the US, because of its relatively low cost, while argon with a 2 to 7 percent hydrogen content can be used for oxide reduction purposes, assuming the hydrogen content has no detrimental metallurgical effects on the weld.

Glass-reinforced tape

In another technique, self-adhesive, thermally stable, inert tape is applied to the underside of the joint

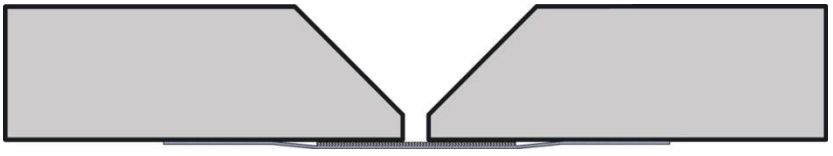


fig.6

The tape is aluminum foil centrally overlaid with a band of woven, continuous-filament glass fiber cloth. It is cut to length and stuck to the underside of the joint to be welded.

Questions:-

1. What is thermit welding?
2. What is main use of thermit welding?
3. What is limitation of thermit welding?
4. Write the three types of bars.

Next Lesson:- GTAW process –brief description, difference between ac and dc welding.

Assignment:- Thermit welding process, equipments, thermit mixtures types and applications.

Checked by……. Instructor ……..