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EXPERIMENTAL ANALYSIS ON CAUSES OF ARC BLOW

A Minor Project Submitted
To
Jawaharlal Nehru Technology University Hyderabad
In partial fulfilment of the requirements for the award of the degree of
BACHELOR OF TECHNOLOGY

IN

MECHANICAL ENGINEERING

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ABSTRACT

Welding is a fabrication process that join materials, the material used is mild steel (MS plate). By using high heat to melt the parts together and allowing them to cool, causing fusion. Welding is a distinct from lower temperature techniques such as brazing and soldering, which do not melt the base metal. Arc welding is a type of welding process using an electric arc to create heat to melt and join metals. A power supply creates an electric are between a consumable or non-consumable electrode and base material using either direct arc or alternating currents. To study the weld properties on a butt joint by using are welding process. First, we took mild steel. By

using the electrode E6013 we have filled V groove. The forward arc blow eliminates the irregularities in the solidified weld by remelting the peaks formed in front rather than in back of the advancing arc.

CHAPTER 1

INTRODUCTION

1.1 Welding:

Welding is a manufacturing process that joins materials, usually metals, by using high heat to melt and cool the parts together to create a fusion. The welded pieces unite into one entity. Welding differs from low-temperature techniques such as brazing and soldering, which do not melt the base material instead they deposit other material as joining material. In addition to melting the base metal, filler metal is usually added to the joint to form a pool of molten material (weld puddle). As it cools, the weld configuration (butt, full penetration, fillet, etc.) is stronger than the base metal.

Pressure can also be used in combination with heat or alone to create welds. Welding also requires some form of protective shielding to protect the filler metal or molten metal from contamination and oxidation. Welding can use a variety of energy sources including gas flames (chemical), arcs (electrical), lasers, electron beams, friction, and ultrasound. Welding is often an industrial process, but it can be performed in a variety of environments, including outdoors, underwater, and in space.

Welding is a dangerous activity and requires precautions to avoid burns, electric shock, visual impairment, inhalation of toxic gases and fumes, and exposure to intense UV radiation.

1.2 Types of welding:

Welding processes can be classified into different types based on electrode, filler material, shielding gas, source energy, etc. Few of the processes are listed below.

1.2.1 Gas Metal Arc Welding (GMAW):

Gas Metal Arc Welding is also called as metal inert gas welding (MIG). It is a semi-automatic, quick process where filler wire is fed through the gun, and shielding gas is expelled around to protect from environmental impurities. The filler wire is fed on a spool to act as an electrode as well. The tip of the wire acts as an electrode and the base metal melts as filler metal to create the weld. This process is continuous and parameters should be preset according to welding requirements. A versatile process for welding an extensive list of metals that produces clean, smooth and visually pleasing welds.

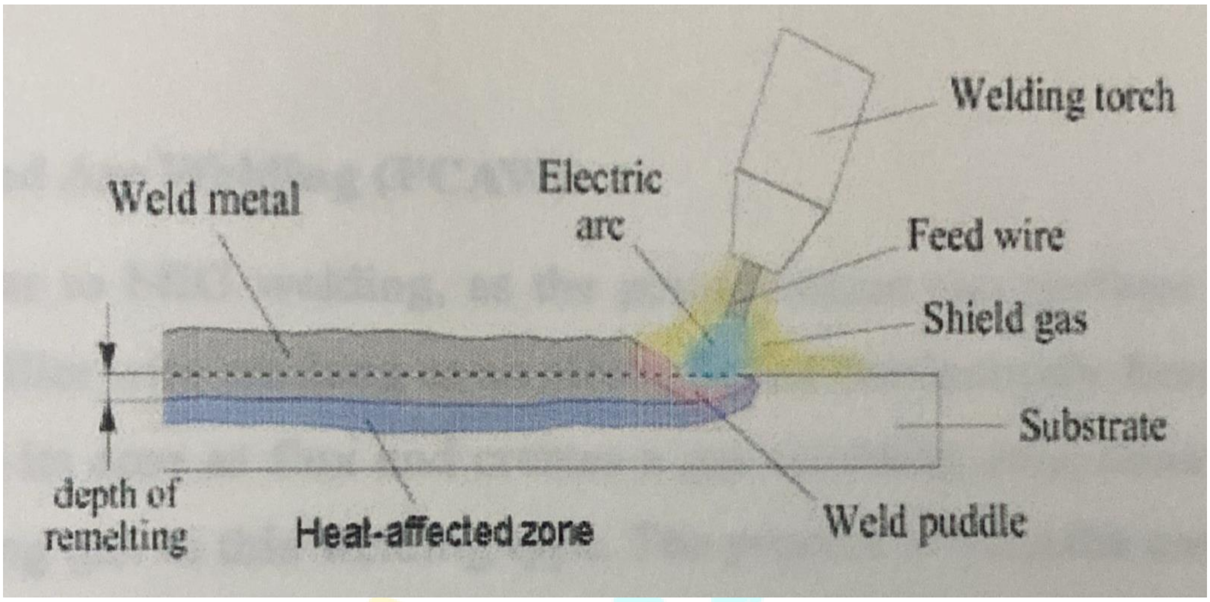

Fig.1.0 Gas Metal Arc Welding

1.2.2 Shielded Metal Are Welding (SMAW):

It is popular welding because of its low cost, and easy and simple operability. The process comes with spatter welding that needs clean up, essentially. The filler material here is a replaceable stick electrode.

It generates the arc when the end of the stick contacts the base metals. The heat of the arc melts the electrode's filler metal to make the weld. It coats the stick electrode with a flux that creates a shielding cloud to protect the weld zone from oxidation. The flux on cooling changes into slag, which needs to chip off. The bright side of the process is that it is possible to perform the process of SMAW welding outdoors and in adverse weather like wind and rain.

Fig.1.1 Shielded Metal Are Welding (SMAW)

1.2.3 Flux Cored Arc Welding (FCAW):

FCAW is similar to MIG welding, as the power source can perform both types of welding. MIG welding needs filler wire working as an electrode fed continuously from the gun. Conversely, FCAW has a wire with its core as flux and creates a gas shielding zone around the weld. No need for any external shielding gas in this welding type. The process is versatile and works for thick metals. The welding process is efficient and works well for heavy metals with high-heat welding. No need for any external gas makes it a choice of welding at a lower cost. It is useful for thicker metal and is used in heavy equipment repair.

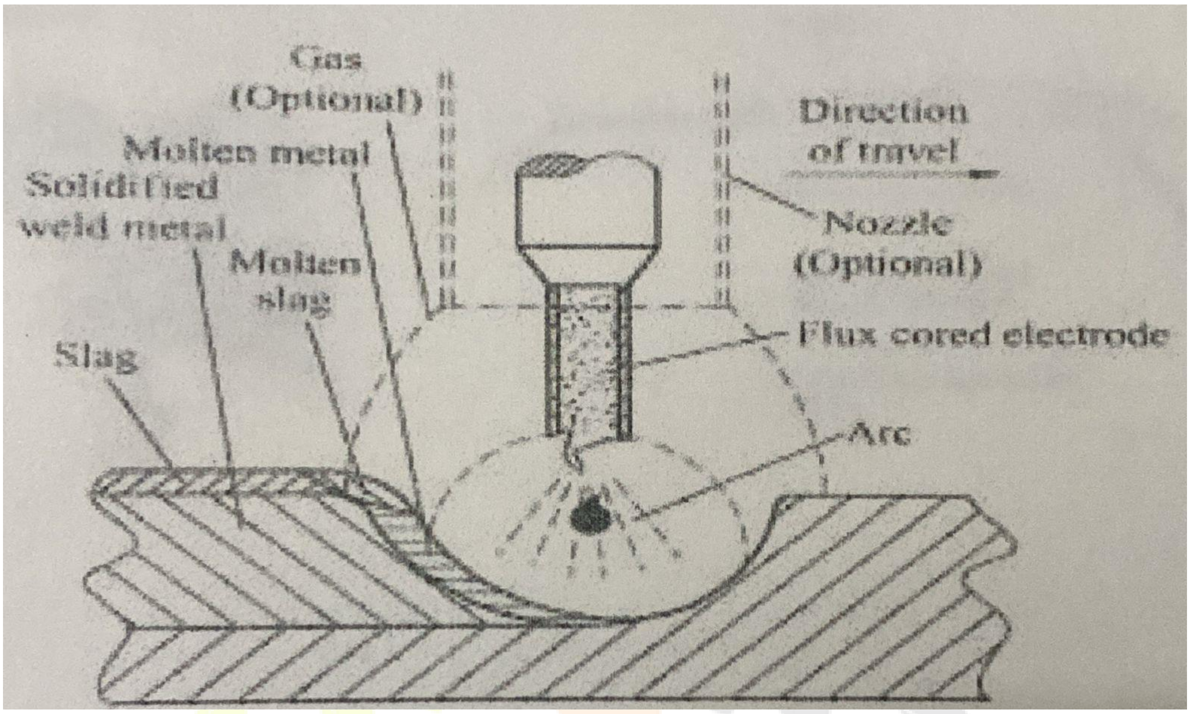

Fig.1.2 Flux Cored Arc Welding (FCAW)

1.2.4 Submerged Are Welding (SAW):

This type of welding involves the covering of metal pieces, welding wire, arc, and welding joint by a blanket of flux. It makes the process safe as there are no emissions of welding fumes, strong arc lights, and flying slags. The flux barrier protects the human and robot whosoever is performing the welding.

It is a faster process for high-production industries. SAW produces strong welds with deep penetration, with minimal preparation quickly and efficiently

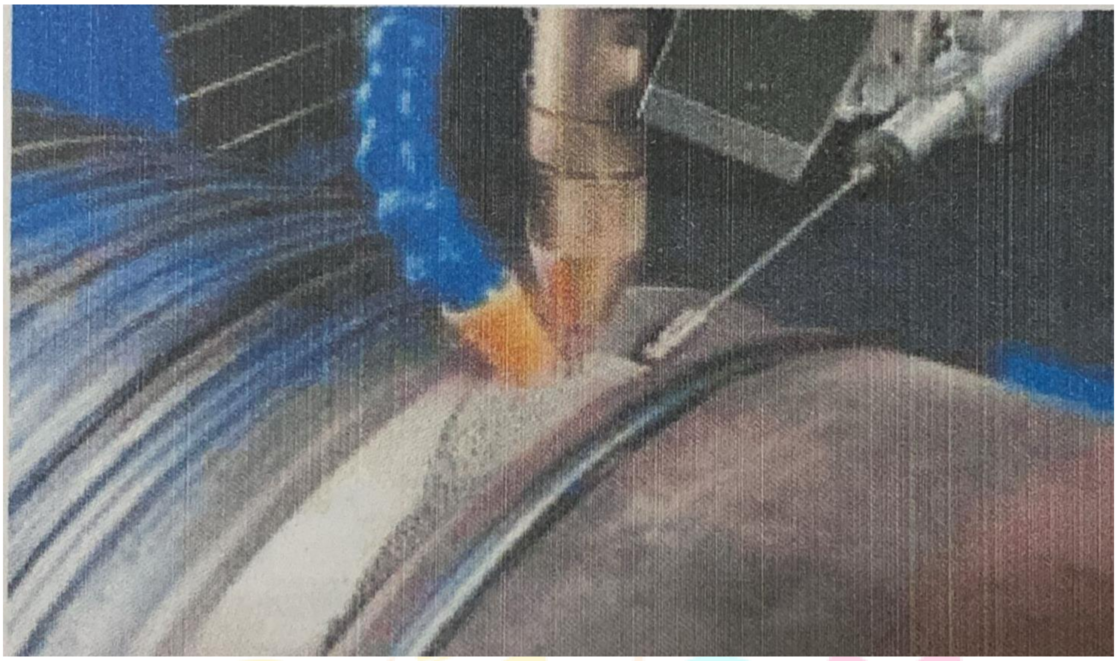

Fig.1.3 Submerged Are Welding (SAW)

1.2.5 Oxyacetylene Welding:

One of the hottest methods of welding at 3500 degrees Celsius. The temperature of welding here reaches seven times as hot as the biggest, hottest pizza oven. It generates heat when a mixture of fuel gases and oxygen passes in a torch. The process involves three types of flames: neutral flame, carburizing flame, and oxidizing flame. The advantages of the welding process are many. It is portable because of pressurized gas filled in a handy steel cylinder. It is fairly easy to use, and versatile for different sizes of metals. It is a very safe and economical option where a novice can perform easily

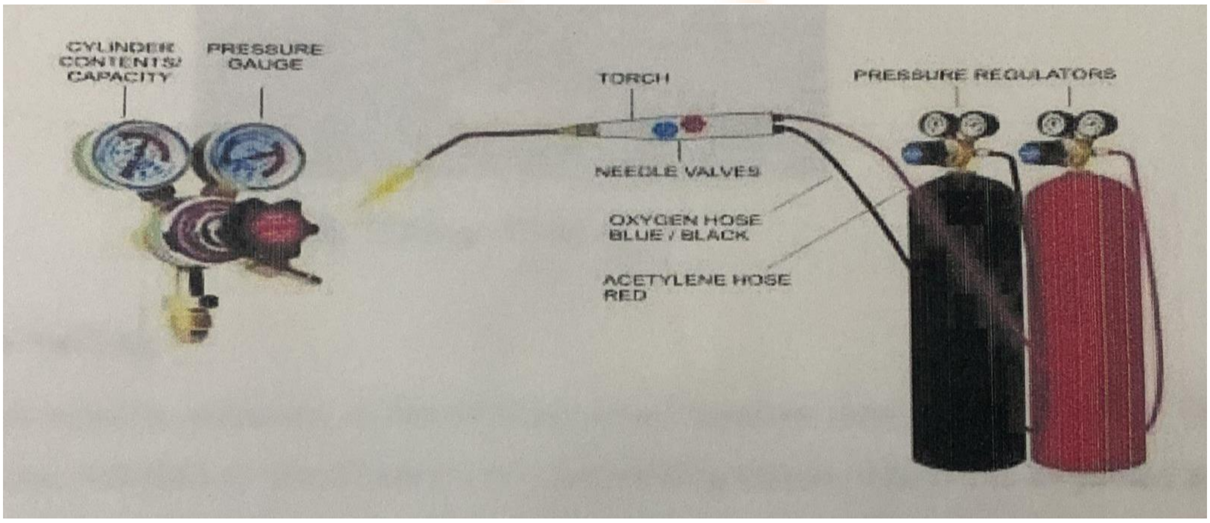

Fig.1.4 Oxyacetylene Welding

1.2.6 Thermite Welding:

When thermit (a mixture of aluminium powder and iron oxide) is ignited it leads to an exothermic reaction non-violent. The excessive heat melts the metal and pours at the needed joint surfaces. The liquid metal solidifies on cooling to create a solid welding joint. It is a simple and fast method to join similar and dissimilar metals. This welding process does not need any power supply, the only need is to heat the thermite at 1300 degrees Celsius.

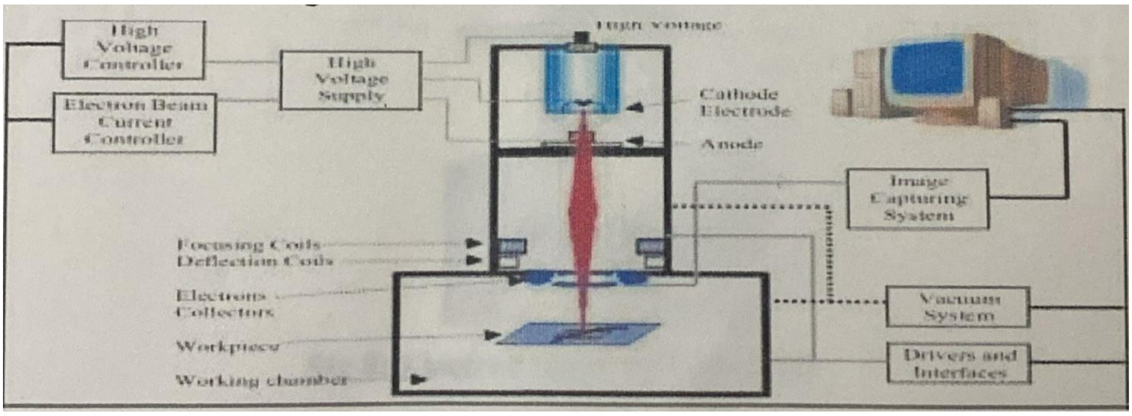

Fig.1.5 Thermite Welding

1.2.7 Forged Welding:

The metal here heated to a malleable state which hammered into the desired form and finally cooled to set in the shape. The process came into mind while a blacksmith working on metal. It is not limited to these professionals only, but forge welding happens to be a choice in the aerospace industry

Fig.1.6 Forged Welding

1.2.8 Electron Beam welding:

Firing the ray of high-velocity electrons at the welding metal involves this type of welding. The energy from the electron transfers to the sheets to melt the welding metals, which can be joined and fused. The type of welding is employed in multiple industries like automated automotive parts, and high-end aircraft engine industries. This can be a useful tool in aerospace components, bimetal saw blades, and transmission assemblies. It is a perfect choice to seal electrical components. The technique is good for dissimilar metals of various melting points and thermal conductivities. This welding method is good for thin and thick metal.

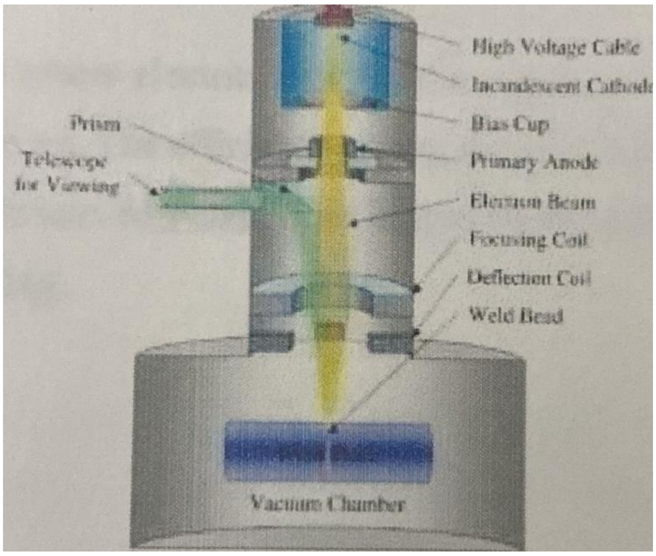

Fig.1.7 Electron Beam Welding

1.2.9 Plasma Are welding:

A newer technique was developed in 1954 and is similar to TIG welding. They pass the electrical current through an orifice of the nozzle protected by gases for the ultimate accuracy to weld a small area. It produces a narrow bead, pleasing weld, and strong, and speedy welding. The method used an extremely high temperature for a deep and stronger weld This can be a useful tool in aerospace components, bimetal saw blades, and transmission assemblies. It is a perfect choice to seal electrical components. The technique is good for dissimilar metals of various melting points and thermal conductivities. This welding method is good for thin and thick metal. It makes the process safe as there are no emissions of welding fumes, strong arc lights, and flying slags. The flux barrier protects the human and robot whosoever is performing the welding.

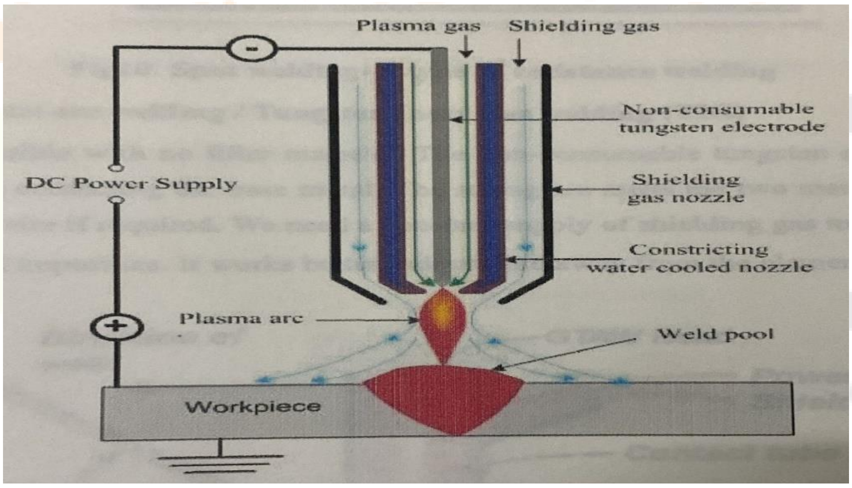

Fig.1.8 Plasma Arc Welding

1.2.10 Resistance Welding:

This is a thermoelectric process where electric resistance is employed to create heat, leading to a molten state of material being joined. The efficient welding process is pollution-free with minimum electricity consumption as well. It uses two electrodes in spot welding where the tip of the electrode produces heat and fusion on cooling

Fig.1.9 Resistance Welding

1.3.3 INTRODUCTION TO STICK WELDING

In stick welding, contact between the rod electrode and workpiece ignites the arc. This creates a short circuit for a fraction of a second between the two poles, meaning that current can then flow.

The arc burns between the workpiece and the electrode. This creates the required fusion heat.

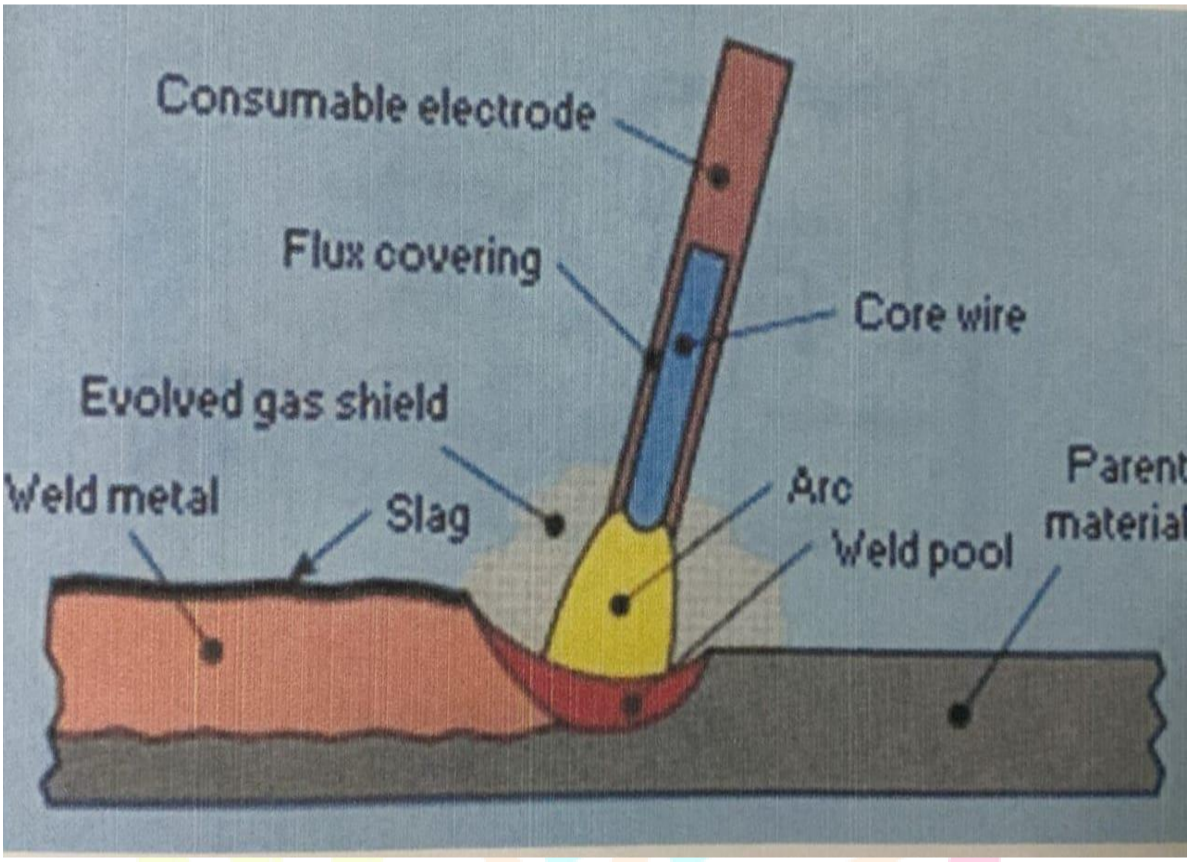

Fig 2.0 Stick Welding

Manual metal arc welding (MMA or MMAW), also known as shielded metal arc welding (SMAW), flux shielded arc welding or stick welding, is a process where the arc is struck between an electrode flux coated metal rod and the work piece welding, fit for working outdoors. As the anode starts to thaw, the flux covering around it forms a cloud of gases that protects the melted metal and stops corroding.

For this reason, it's also known as shielded metal arc welding. The gas cloud calms on the pool of melted metal when cooling and changes into slag. It has to be chipped away after you're through with welding.

The SMAW procedure is relatively easy and doesn't need a lot of particularized gear. Although stick welding is among the most widely used welding techniques, it needs expertise and training to achieve clean, premium quality stick welds.

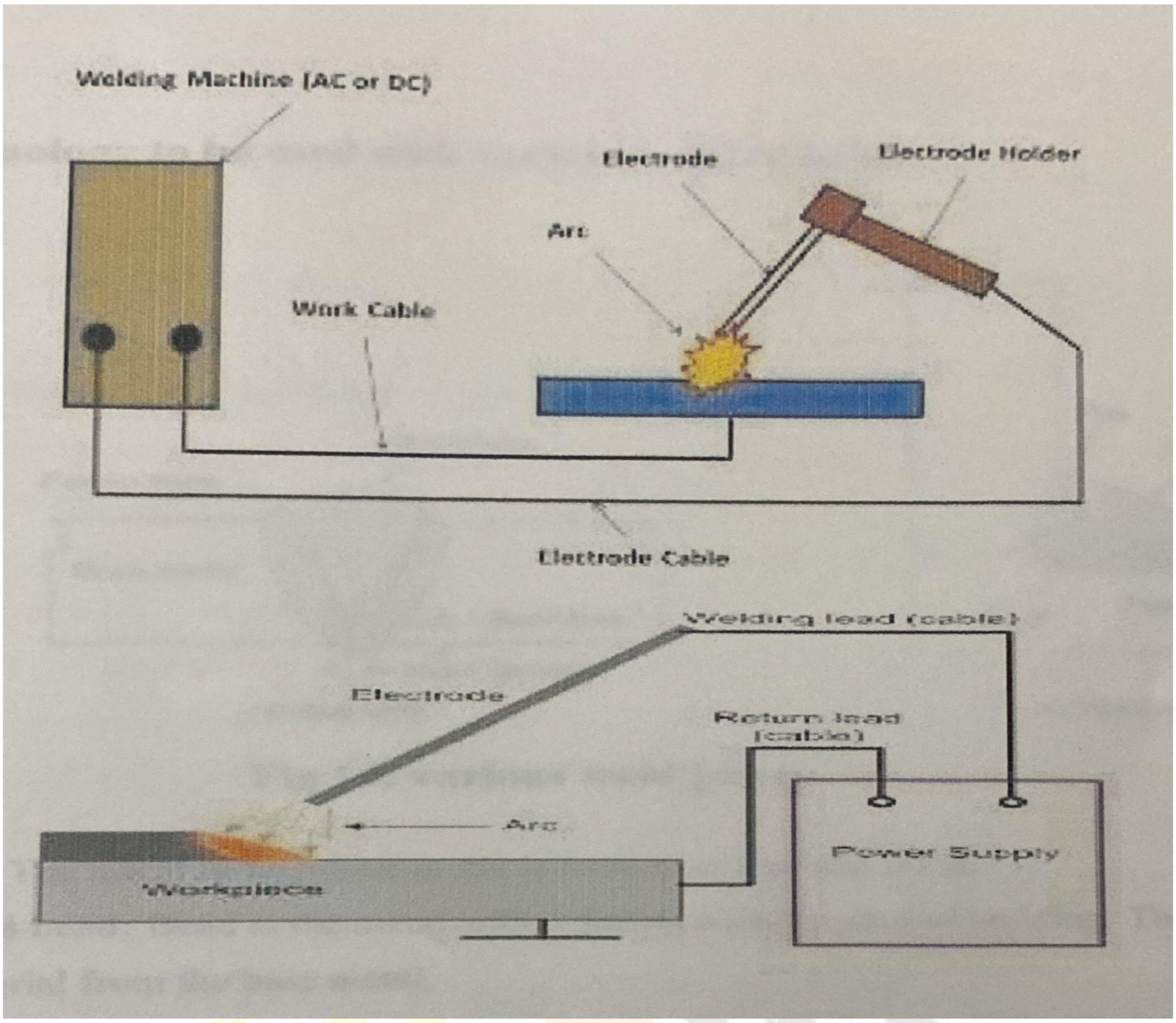

Fig 2.1 Welding Technique

As the anode starts to thaw, the flux covering around it forms a cloud of gases that protects the melted metal and stops corroding. For this reason, it's also known as shielded metal arc welding. The gas cloud calms on the pool of melted metal when cooling and changes into slag. It has to be chipped away after you're through with welding. Manual metal are welding (MMA or MMAW), also known as shielded metal arc welding (SMAW), flux shielded arc welding or stick welding, is a process where the arc is struck between an electrode flux coated metal rod and the work piece welding, fit for

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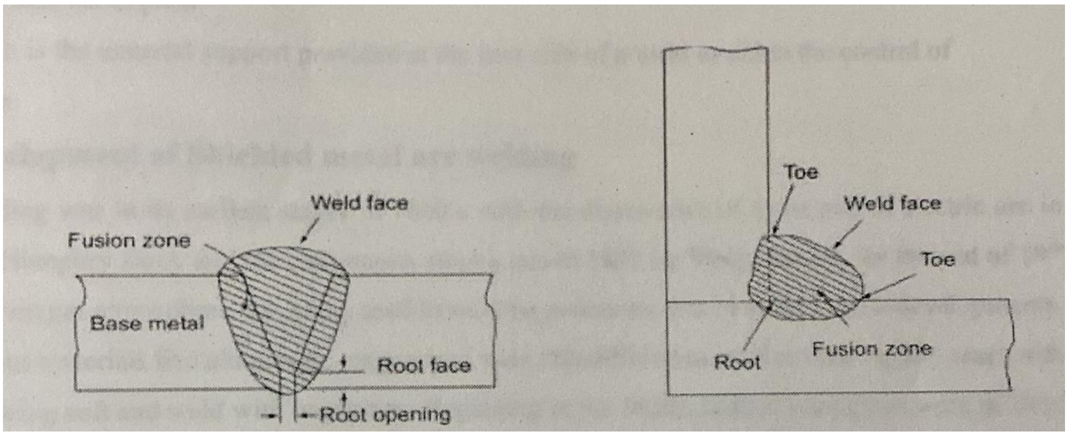


Fig 2.2 Various Weld Joints

Bade metal: The metal to be joined or cut is termed as the base metal.

Bead or weld bead: Bead is the metal added during a single pass of welding. The bead appears as a separate material from the base metal.

Deposition rate: The rate at which the weld metal is deposited per unit time is the deposition rate and is normally expressed as kg/h.

Root: It is the point at which the two pieces to be joined by welding is nearest.

Weld face: It is the exposed surface of the weld, as shown in Fig.

Weld metal: The metal that is solidified in the joint is called weld metal. It may be only base metal or a mixture of base metal and filler metal.

Weld pass: A single movement of the welding torch or electrode along the length of the joint which results in a bead is a weld pass.

Penetration: It is the depth up to which the weld metal combines with the base metal as measured from the top surface of the joint.

Toe of weld: It is the junction between the weld face and the base metal

Fillet weld: The metal fused into the corner of a joint made of two pieces placed at approximately 90 degrees to each other.

Puddle: The portion of the weld joint that melted by the heat of welding is called puddle. Track weld: A small weld, generally used to temporarily hold the two pieces together during actual welding, is the tack weld.

CHAPTER 2

LITERATURE SURVEY

Sanjeev Gupta 2016 Performed the experiment to optimize the condition for performing the welding on Utra-90 specimen in which he varies the current and voltage while keeping the gas flowrate constant and observed that welding joint not made property below 50A and 200A since then burning of specimen stated.

Ravinder & S.K. Jaral 12 studied the parametric optimization of Arc welding on stainless steel1202] and mild steel by using Taguchi method and found the control factor which had varying effect on the tensile strength, are voltage having the highest effect and also found the optimum parameter for tensile strength current 80A. Are voltage 30V.

Dr. Simha 13| carried on the effect of welding process parameters on the mechanical properties of stainless steel -316 [18C-8N] welded by TIG welding. The specimen size is 40x15×15mm for experimentation observed that the welding current has a significant effect though filler rod does have some effect similar to current but compared to current it is less significant. MINI TAB software is used for the prediction of the hardness, impact strength and depth of penetrations.

Javed Kazi et al. represent a review on various welding techniques in international journal of modern engineering research publications in 2015. Their prime focus is on fulfilment of objectives of industrial application of welding with producing better quality product at minimum cost and increases productivity. The attempt is made to understand various welding techniques and to find the best welding technique for steel. Special focuses have been put on TIG and MIG welding. For this study they analysed strength hardness, modulus of rigidity, ductility, breaking point, % elongation etc. at constant voltage on hardness testing machine and UM.

Naitik s Patel et al. they carried out the features highlighting the TIG as a better prospect for welding then other processes especially for joining of two dissimilar metals with heating therapy or applying the pressure or using the filler material for increasing productivity with less time and cost constrain. They made an attempt to understand the effect of TIG welding parameters sha welding current, gas flow rate, welding speed, that are influences on responsive output parameters such as

Jail mil 2004) 171 self-drilling screw joint for cold rolled steel channel portal. The conclusion of easing by the first author that widely used bolted and plate moments connection is not suitable.

They knew joint of portal frames constructed from thin cold formed channel sections. The order traditionally used joint configuration of a joint with two bolts is end is ending plates may need to be sized conservatively.

Shah qurram Ashok bhai steel consumption is more in industrial shed structure using hot willed steel and cold rolled steel sheets as compared to industrial shed structure using cold formed steel sections. The weight is more in industrial shed which use of hot rolled sheets. The weight of industrial shed with cold formed sections is reduced with 32.03% than industrial shed structure with hot rolled sheets. An attempt is being carried out the comparison between hot rolled and cold milled

steel.

D. Devakumar & D.B Jabaraj the gas tungsten arc welding (GTAW) of sheets 2mm thickness of hot rolled medium and high tensile structural steel (HRS) is carried out to investigation of mechanical properties and composition analysis through energy dispersive analysis of X ray DAX) to find out the hardness test, tensile test, bend test to determine the mechanical properties of the weldments. The increase in the weld zone micro hardness and formation of dendritic delta ferrine microstructure, when compared with HRS parent metal having elongation grained austenite with ferrite and the HRS parent metal having fine grains of ferrite, caused the joint efficiency of the HRS weldments to increase.

Ruangyot Wichienrak & Somchai cold rolled steel industry in type of batch sealing furnace, the mechanical properties of steel sheet have variation by each position. The meters of annealing temperature and time were analysed to work out the source of mechanical properties

Chunquan Liuetal study and investigation of mechanical properties of hot rolled and cold rolled steel. In experimental steel, processes by quenching and tempering (Q&T) heat treatment. exhibited excellent mechanical properties of hot rolled (strength of 1050-1130 MPa) and cold rolled steel (strength of 878-1373 MPa). The fracture modes of hot rolled sample. quenched from 650c, and cold rolled sample, quenched from 650e.

Bread Wolter & Gred Dobmann In forming of steel by hot rolled and cold rolled steels a broad range of semi-finished and final products can be produced with a specific, custom tailored technological properties. Micro-magnetic techniques, like 3MA have been reached a sophisticated level of industrial standard and are ready to be integrated into the production process of steel manufacturers. Mechanical properties, like tensile, yield strength and hardness as well as residual or structural stress level can be predicted with high accuracy.

Chandele tal. presented theoretical predictions of the effect of current, electrode polarity. electrode diameter and electrode extension on the melting rate, bead height, bead width and weld penetration in Submerged Arc Welding. They indicated that the melting rate in SAW can be increased by using (1) higher current (i) straight polarity (li) a smaller diameter electrode and (iv) longer electrode extension. The percentage difference in melting rate, bead height, bead with and bead penetration has been found to be affected by the current level and polarity used. They have concluded, the increase in the current level does not make at hat when a smaller diameter electrode is used, significant effect on the percentage change in the weld bead geometrical parameters

Chandel and Seow, presented the mathematical prediction of the effect of current, polarity wed, electrode diameter and its extension on the melting rate, bead height, bead width and weld SAW They concluded that for a given current (heat input) the melting rate can be aced by using electrode negative polarity, longer electrode extension, and smaller diameter alsodes. There are two other ways to increase the deposition rate without increasing the heat ip these are: (1) using a twin arc

mode and (ii) adding metal powders.

Gans raj and Margan |16], developed analytical models to establish a relationship between process parameters and weld bead volume in SAW of pipes. They also carried out the optimization of weld bead volume using the optimization module available in the MATLAB software

Mostafa and Khajavi, described the prediction of weld penetration as influenced by Flux Cured Arc Welding process parameters like welding current, are voltage, nozzle to plate distance. derode-to-work angle and welding speed. The optimization result shows penetration will be I'm when welding current, are Erdal Karadeniz voltage, nozzle-to-plate distance and electrode-to-work angle is at their maximum possible value and welding speed is at its minimum value.

et al., have investigated the effects of various welding parameters on weld in Erdemir 6842 steel of 2.5 mm welded by Robotic Gas Metal Arc Welding Process. The welding current, are voltage and welding speed have been chosen as variable process parameters. The depths of penetration have been measured for each specimen after the welding operations and the of these welding process parameters on penetration have been determined. The welding currents in step of 95A, 105A and 115 A, Arc voltages in steps of 22V, 24V and 26 V and welding speeds in steps of

7,10 and 14 mm/s have been used for all experiments. has been found that increase in current; substantially increases the depth of penetration while crease in voltage, very slightly increases the penetration. The highest penetration has been served at 10mm/s welding speed.

Cats and Parmar _ developed mathematical models by using fractional factorial technique pict the weld bead geometry and shape relationship for Submerged Are Welding of micro nel in the medium thickness range of 10-16 mm. The response factors namely head, weld width, reinforcement, dilution, weld penetration shape factor (WPSF), weld moment form factor (WREF) as affected by wire rate, open circuit voltage, nozzle to- distance, welding speed and work material thickness have been investigated and analyzed

CHAPTER 3

EXPERIMENTATION

1.Material Selection:

Mild steel plates of sizes 175x30x6 mm3 were selected as base material because this material is widely used for the engineering applications in the industries. Mild steel has the excellent weld ability. The metal is mostly used for the fabrications work and building of structures. This metal is also widely used in constructional field, automobile field etc., due to its excellent weld ability.

2.Selection of Groove angle:

Selection of a correct joint design of a welded member leads to perform within load service, corrosive resistant atmosphere and safety. The weld joint which we use to join the welded members should have the required load bearing capacity when the load is applied in any direction. This should have good surface finish to make a sound weld joint. It should be designed in such a way that it will produce minimum distortion and residual stresses in the weldment as well as it should be economical. Since the distortions and residual stresses are main causes for the failure of weld joints.

Based on thickness and width of the base plate , single v groove angle should be between 60 and 70 degrees. Then the specimen was beveled to the required angles with a hand grinding machine. In this procedure the mild steel plates were held fixed in the bench vice. Then the grinding wheel was allowed to bevel the edges of the plates to the required angles. The spatters formed on the surfaces of the steel plates. The grinding process being performed is shown below.

Fig 2.3 Grinding of MS Plate

3.Arc Welding:

Arc blow in V-joint welding can be a challenging issue, but there are several techniques and practices that welders can employ to minimize its impact. Here's a step-by-step guide to the welding process for a V-joint, with a focus on addressing and preventing arc blow

- **Joint Preparation:**

- Ensure that the V-joint edges are properly cleaned and beveled. Good joint preparation is essential for achieving a sound weld. Remove any contaminants, oxides, or debris from the surfaces to be welded

- **Electrode Selection:**
- The appropriate welding electrode for the specific materials being welded is **E6013**. Consider factors such as electrode polarity, diameter, and coating. Experimenting with different electrodes can help find the one that minimizes arc blow.

- **Adjust Welding Parameters:**

- Optimize welding parameters such as current, voltage, and travel speed. These parameters can influence the intensity of the magnetic field and, consequently, the severity of arc blow. Experiment with different settings to find the combination that minimizes the effect of magnetic forces.

- **Joint Alignment:**

- Ensure proper alignment of the V-joint. Misalignment can exacerbate arc blow, so take the time to align the pieces accurately before welding.

- **Workpiece Grounding:**

- Implement effective grounding for the workpieces. Proper grounding helps to minimize unwanted magnetic fields and contributes to stable arc behavior.

- **Welding Technique:**

- Experiment with different welding techniques, such as weaving or oscillating the electrode. Adjusting your technique can sometimes help overcome arc deflection issues.
- **Monitor and Adjust:**
- Continuously monitor the welding process and be prepared to make adjustments as needed. If arc blow occurs during welding, pause and assess the situation before continuing. This may involve tweaking parameters or making real-time adjustments to your technique.

➢ **Post-Weld Inspection:**

- After completing the weld, inspect it for quality. Look for signs of incomplete fusion or other defects that may have resulted from arc blow. If necessary, make additional passes to ensure a strong and reliable weld. By carefully considering these steps and experimenting with different variables, welders can develop effective strategies to mitigate arc blow during V-joint welding processes. It's important to note that the optimal approach may vary based on factors such as material composition, joint geometry,

Fig 2.4 Arc Welding MS Plate

CHAPTER 4

TESTING

HARDNESS TEST:

In hardness test we can use Rockwell Hardness Testing machine during this process we need to consider 15 zones on the work piece. The work piece is placed on the hardness testing machine the load is applied on the work piece in varies zones .Observe the readings from the hardness testing machine of work piece and note down the readings.

The load should be applied on various zones marked on the MS plate.The load measured on each zone should be measured in "HRB".

From this it has been concluded that the hardness value of weld zone is higher than any other zone. From the hardness test results it has been concluded that the hardness of the low-speed weld is greater than the high-speed welding which is not very advisable. And the lowest hardness values were found in low-speed welding which is also not recommended.

Fig 2.5 Hardness Test on MS Plates

LPT TEST:

This process can be done without breaking the welded material. In this process the weld defects can be evaluated. Basically, non-destructive testing is Liquid penetration test, Visual inspection test, Magnetic particle test, Radio grapy test, Ultrasonic test, Eddy current test, Leak test. We preferred Liquid penetration test. The basic requirements of LPT are penetrant removal, developer, dye penetrant.

Equipment	Manufacture	Model	Date of Manufacture	Date of Expiry
Penetrant	Oriental chemical works	115P	July 2021	June 2023
Developer	Oriental chemical works	115D	August 2023	June 2025
Penetrant Remover	Oriental chemical works	115PR	November 2021	December 2023

Fig 2.6 Penetrant, Penetrant Remover

AND Developer

Included in LPT are:

1. **PRE-CLEANING:** This can be done by using cotton waste or brush.

Fig. 2.7 Cleaning of MS plates

2. **APPLICATION OF PENETRANT:** The dye penetrant can be sprayed on the weld pool and wait for some time. This time is known as dwell time.

Fig.2.8 Application of penetrant **Fig 2.9 Penetrant applied**

3. **PENETRANT REMOVAL:** By using penetrant remover we can remove the penetrant from the work piece.

Fig 3.0 Penetrant Removal

4. **APPLYING OF DEVELOPER:** Developer can be sprayed on the work piece and dwell time can acts under observation.

Fig 3.1 Applying of Developer

5. **OBSERVATION:** Some weld defects can be evaluated on the work piece. Post cleaning: During this process developer is removed and work piece can be cleaned.

Fig 3.2 Weld Defects

TENSILE TEST:

In tensile test the work piece is placed between two fixtures of Universal testing machine (UTM) and Gradual load (pull force) is applied on both sides. Thus, the material reaches its yield strength and starts breaking. From this test we can evaluate the strength of two work pieces of high-speed weld and low speed weld workpieces. After calculation of elongation, we can conclude that the work piece of low-speed welding has more tensile strength as compared to high-speed welding. So, we prefer low speed welding work piece is best suitable for industrial application. Thus, the maximum load applied was 55kN where the fracture was observed. The load is applied till the failure is observed. Initially, the deformation was not observed till 55 kN. Thereafter, the steady deformation is observed. The deformation observed was of 20mm when the fracture has occurred. The results are as follows

Fig 3.3 Elongation of specimen

Fig 3.4 Failure of specimen

Fig 3.5 Universal Testing Machin

CHAPTER 5

RESULTS & DISCUSSION

HARDNESS TEST:

Hardness test is carried on Rockwell Hardness Machine in which a diamond point indentor is indented is indented on the work piece with 55kgf load.

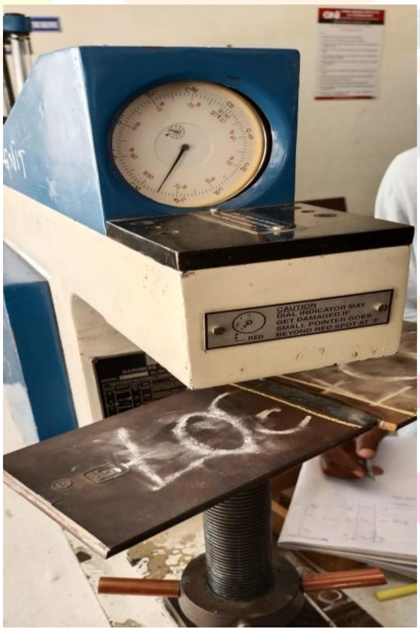
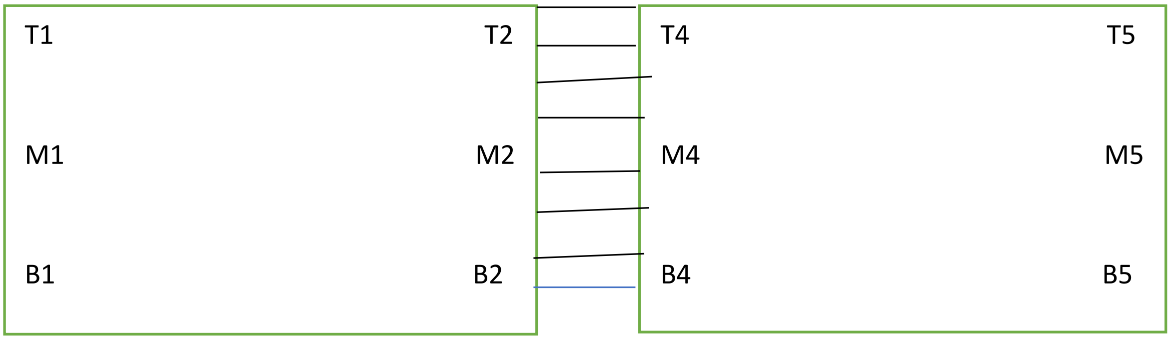


Fig 3.6 Rockwell Hardness Machine

Hardness test reading is as follows:



- T1=266 HRB M1=276 HRB B1=170 HRB
- T2=167 HRB M2=160 HRB B2=147 HRB
- T3=190 HRB M3=100 HRB B3=193HRB
- T4=186HRB M4=175HRB B4=190 HRB
- T5=172HRB M5=173 HRB B5=160 HRB

LPT TEST:

In Penetration test the weld material is applied with penetrant which expose the internal defects of the weld joint

Fig 3.7 Cap Side of MS plate

Cap Side Defects:

- SP-Spaten
- UC-Under cut
- UF-Under Fill

Fig 3.8 Root Side of MS plate

Root Side Defects:

- L.O.P - Lack of Penetration

TENSILE TEST:

Tensile Test is carried on Universal Testing Machine to find out the tensile strength,elastic module strain and poisson's ratio and deflection after the tensile

load applied

MS Plate Dimensions:

Gauge Length=175mm

Specimen: Mild Steel

Width=30mm

Thickness=6mm

Load and elongation of the Specimen:

SNO.	LOAD	Elonagated length	DELECTION
1	102KN	180mm	5mm

Fig 3.9 After Testing on UTM

CONCLUSION

After testing the weld joints by using dye penetration test the following are the defects like porosities, cracks and lack of penetration are observed. The weld effects are raised due to improper welding, residual stresses, distortion, inclusions, fluctuations, in voltage and current, selection of suitable electrode for material which is used for welding. The weld defect reduces the strength of weld joint. After LPT, hardness test & tensile test are performed. We have observed that properties of hardness in cap is less than the root specimen and also hardness of welded zone is greater than heated effected zone and base metal. In tensile test we observed that the maximum elongation and breaking point. Finally, we conclude that strength of weld joint is greater than parent material.

FUTURE SCOPE

In future, we perform various non-destructive tests on the weld to know the internal defects such as ultrasonic NDT, radiography NDT etc. We also analyse the microstructure with a help of optical microscope which is interfaced computer. The effect of current and material on the weldment

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