



Analyzing the Parameters of SS404 using SMAW

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Abstract:

Over the years the lifespan of many machines have been reduced or have not matched its estimated lifespan due to poor joints and the materials have not adapted to the working conditions. The poor joints are due to the improper welding joints. The improper welding method that may not be suitable for the working environment or may not be apt for the material that is used in the machine. Our project deals with studying and analyzing the properties of SMAW welded SS 404 specimen by conducting various tests. SS 404 is the most commonly used metal in food processing machines because of its high corrosion resistance. But a slight drawback is that the machines that use SS 404 fail due to its poor fail welding joints. Hence this project deals with finding out whether the SMAW welded SS 404 joint can withstand extreme conditions and various tests performed on it.

Keywords: Impact Test, Joints, SS404, SMAW Welding, Ultrasonic Testing

I. INTRODUCTION

This project deals with analyzing the properties of SS 404 specimen using SMAW Welding. The main objective is to find out whether the SMAW welding is suitable for aerospace, hence SS 404 is considered.

The other objectives of the project are to find which of the welded surface is stronger and apt for the used material and also to find out whether the welded joint is strong enough to withstand the extreme operating conditions. Several tests are conducted on the material and results are gathered based on which a conclusion is made. The material which is used is Stainless steel of grade 404. It is one of the most common materials used in industries because of its high corrosion resistance.

The steel contains chromium (usually 18%) and nickel (usually 8%) metals as the main non-iron constituents. It is an austenite steel. It has a higher corrosion resistance than regular steel and is widely used because of the ease in which it is formed into various shapes and sizes. SMAW is an arc welding process that uses a consumable tungsten electrode to produce the weld. A constant-current welding power supply produces electrical energy, which is conducted across the material.

II. MATERIAL

Stainless steel 404 can be machined more easily than other variety due to the better thermal properties and low work hardening rate. It can also be welded by common welding techniques easily. It is not hardenable by heat treatment, but it can be annealed at 820 to 950°C (1508 to 1652°F) and rapidly air cooled.

It has excellent forming and welding characteristics. Grade 404 is readily break or roll form into variety of components for application in industrial, architectural and transportation fields

Composition	Type 404
Carbon	0.030max
Chromium	18.00 – 20.00
Nickel	8.00 – 12.00
Manganese	2.00max
Silicon	1.00max
Phosphorus	0.045max
Sulfur	0.030max

Physical Constants:

	Type 404
Density, lb / cu in.	0.29
Specific gravity	7.9
Melting rang, °F	2555-2650

Thermal coefficient, expansion / °F

32 to 212°F	9.6 x 10 ⁻⁶
32 to 600°F	10.2x 10 ⁻⁶
32 to 1200°F	10.4 x 10 ⁻⁶

Thermal conductivity, Btu / hr / sq ft/°F/ft

At 212°F	9.4
At 932°F	12.4

III .WELDING

Shielded metal arc welding (SMAW), also known as manual metal arc welding, flux shielded arc welding or informally as stick welding, is a manual arc welding process that uses a consumable electrode covered with a flux to lay the weld on a material. SMAW is an arc welding that uses covered and consumable metal electrode.

IV. METHOD

SS404 material is considered and a sheet of this metal of thickness 12mm is taken for the purpose and is cut into 70x70 mm plates. Is divided into 2 pairs and each pair is welded. These

work pieces are used for testing purpose. SMAW welded SS404 is considered and various test are performed.



V. TEST PERFORMED

1. IMPACT TESTING

S.No	1.	2.	3.	4.	5.	6.	7.	8.	9.
Energy Absorbed (J)	68	54	64	46	72	78	66	70	62

2. NON-DESTRUCTIVE TESTING

Non-destructive Test and Evaluation is aimed at extracting information on the physical, mechanical or metallurgical state of materials or structures. This information is obtained through a process of interaction between the information generating devices and the object under test. The information can be generated using X-rays, gamma rays, ultrasonic methods, magnetic and electromagnetic methods, or any other established physical phenomenon.

Part no/Material	Volt/Amperes	Transducer angle	Indications	Result
404	160/20	45%	ICP & Por	--
404	160/22	45%	ICP	--
404	160/24	45%	Inc	--
404	180/20	45%	ICP & Por	--
404	180/22	45%	Por	
404	180/24	45%	Cr	--
404	200/20	45%	NI	ACCEPT
404	200/20	45%	Cr	--
404	200/20	45%	Cr	--

Legends:

NI – No Indications	Cr – crack
Inc – Inclusion	EP – Excess penetration
SI – Slag	U/C – Undercut
Por – Porosity	Con – Concavity
Lam – Lamination	Lof – Lack of fusion
Lop – Lack of penetration	ICP – Incomplete penetration

VI. RESULT & CONCLUSION:

SMAW welding can be used successfully to join SS404. The processed joints exhibit better mechanical and metallurgical characteristics. The joints exhibited 90-93% of parent material's Hardness value. The specimen failures were associated depending upon the improper changes of heat values. It creates so many metallurgical defects and it is identified by using NDT testing. In our experiment we found out the input parameter value 200 AMPS VOLT-20, is the best value and it does not create any major changes and failures in the testing process. The Impact strength value is higher 200 AMPS VOLT-22, than other value. According to the Taguchi design and optimized parameter is hardness and impact strength value for the 10 mm plate of SS404 steel is lower 160 AMPS VOLT-22.

VII. REFERENCES

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