iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** X **Month of publication:** October 2020

DOI: https://doi.org/10.22214/ijraset.2020.31877

Comparison of Mechanical Properties, Heat Affected Zone of 304 Stainless Steel of Joints by TIG Welding, & Electric Arc Welding

Agajuddin Beg[1], Mahmood Alam[2]
[1]*M. Tech. (Dual Degree) Department of Mechanical Engineering, Integral University, Lucknow*
[2]*Asst. Professor, Department of Mechanical Engineering, Integral University, Lucknow*

Abstract: The new research work includes research on sewing theory, as well as the efficiency of the TIG welding parameter of the SS304 Stainless Steel Sheets. Resistant stitching is a method that creates a weld on the surface of two identical metals. Increasing pressure, as well as current, texture, and TIG heating depend on two electrodes, usually made of copper, similar to stains. The electrodes are shaped like a disk, and they rotate as the material passes between them.
Look. to them. This helps the electrodes to stay in constant contact with the metal to achieve continuous, long welds. Electrodes can move or move an object. Edge welding on scattered working parts is a continuous process of joining using electrode wheels.
The purpose of ANOVA is to identify a statistically significant factor. It gives a good idea of how the machine parameter affects the response, as well as the value level of the object being considered. Includes ANOVA table, as well as signal level signal. The F test was performed to investigate the significance of the process parameter. A high value of F indicates that the object is very important in influencing the machine's response. Welding speed is a very important factor in our investigation, and it plays a major role in influencing the effect of welding effect. The most important factor in determining the hardness of the welding area is the difficulty of welding. Warm heat. Among the selected parameters, the welding speed also affects the strength of the weld joint impact. During welding seam, as well as TIG welding, the hardness of the weld area is affected by the welding temperature conditions of stainless steel sheets. Both sewing methods, as well as TIG welding techniques, or making good use of welding parameters, Taguchi's method can be used effectively.

I. INTRODUCTION

WELDING is a permanent joining method used to attach various materials such as metals, alloys or plastics together to their contact points by heat or pressure. During welding, the composite work pieces will melt into the visible connector, and a permanent bond can be obtained after hardening. To build a welding pool for molten material, fittings are installed. Which gives you a strong bond after tightening between objects. The hardness of the material depends on a variety of factors, such as metallurgical changes that occur during welding, changes in the weld area due to rapid hardening, oxidation rate due to the air reaction of the building material, and the size of the joint position to improve cracks [1].

A. Shielded Welding Metal Arc (SMAW) or Manual Welding Metal Arc

Arc welding, when using a liquid-based electrode, is the most common type of operation. As the electrode melts, the flow disappears, and a protective gas is released, which protects the weld area from oxygen and other gases, and produces slag binding to the soluble filler as it travels to the weld tank from the electrode. The slag floats on the surface of the weld pool, and protects the weld in the air, while tightening. Current Temperature At TIG temperatures, high temperatures can cause a piece of work to explode, as well as damage. At TIG temperatures, the low current setting leads to adhesion to the filling wire. Deeply the temperatures that need to be installed for a long time to include the same amount of filling material, the high temperatures affected by the heat can also be seen in the current low temperature. Current fixed mode will change the wind power to keep the current arc stable.

B. Welding Voltage

The welding power can be changed or adjusted, depending on the TIG Welding equipment. The high starting strength allows for quick start arc, as well as a wide range of working tip size. Higher concentrations can lead to significant changes in welding performance.

C. Equipment Requirements

Features of a 304 grade stainless steel machine

Table 1.1 304 stainless steel, 1⁄2 hard, 1 - 2 stainless steel machine components, and full durability presented in table

Grade	Tensile Strength (MPa) min	Yield Strength 0.2% Proof (MPa) min	Elongation (% in 50mm) min	Hardness	
				Rockwell B (HRB) max	Brinell (HB) max
304 annealed	515	205	40	32	297
304 1/2 hard	1034	758	18	32	297
304 full hard	1276	965	9	32	297

Stainless Steel 304 Grade 304

Grade 304 is the highest level of molybdenum, the second most important at 304 among iron-free metals. Molybdenum provides 304 structures that can withstand rust better than Grade 304, especially anti-corrosion, and corrosion corrosion in chloride areas. The construction, as well as the welding, have excellent features. Easily create brakes or roll on various aspects of industrial, construction and transportation applications. [2] There are also excellent heating features for Grade 304. The low-carbon type 304, Grade 304L, is not sensitive (grains of carbide limit rain). It is also widely used in heavy twisted materials (over 6 mm) At high temperatures, the 304H range works well, such as the stable range of 304Ti, and its high carbon content. The austenitic structure also provides excellent strength at these distances, even down to cryogenic temperatures. The mechanical features of the SS304 steel are shown in Table 1.2.

Features of stainless steel equipment 304

The mechanical properties of stainless steel 304, 304L, 304H are presented in Table 1.2.

Grade	Evalution Tensile Strength (MPa) min	Yield Strength 0.2% Proof (MPa) min	Elongation (% in 50mm) min	Hardness	
				Rockwell B (HRB) max	Brinell (HB) max
304	515	205	40	95	217
304L	485	170	40	95	217
304H	515	205	40	95	217

II. BOOK RESEARCH

Magnesium alloy AZ31B sheets are welded using a heat-resistant coating with coating. An investigation of welding restrictions on joint structures was investigated. A compound with a large nugget, and a high shaving load was obtained under the current area of low heat. Improving the electrode strength, as well as extending the shrinkage time helps prevent the formation of pores, as well as improve the shear cohesion of the solid under appropriate temperature conditions. The results show that with magnesium alloy welding [3], a method is possible. Simultaneous placement of two electrode wires with a lead wire that is usually connected to a DC power source, and the next wire connected to an AC power cord is required by the arc welding process of a two-wire wire. The profile of the weld beads, as well as the mechanical properties are greatly affected over time, as well as the current track track, as well as the welding speed in the welding installed. The study presented detailed studies on the impact of weld metal size, as well as HSLA standard steel machinery structures in a single pass tab that includes advanced wiring harnesses, tracking cables, and welding velocity. Understandably, the penetration of weld beads is strongly influenced by lead wire. At present, As the width of the weld beads, as well as the height of the reinforcement is sensitive to existing wire tracks. The capacity of the weld dam is increasing with high-quality caravans now, as well as short heartbeats, which has led to a decrease in cooling rate, and poor mechanical properties.

As the growth of hardening layers such as acicular ferrite is inhibited. On the other hand, increasing the welding speed reduces the heat input rate, thereby improving the cooling rate, as well as the properties of the weld bead machine. A series of strong relationships are defined to measure the size of weld beads, as well as mechanical properties as a function of welding conditions. A positive correlation between predicting strong relationships, and the following calculated results is observed [9].

Additional studies of the mechanical effect of austenitic-ferritic stainless steel have been tried in this study. The efficiency of the parameters, the integration of microstructure-mechanical structures, and the degradation behavior are major contributions to the study. To achieve sound welds, only the weld parameter combination is used. The mechanical properties of different steel parts are similar to stainless steel. Examination of rust-resistant joints shows that different welds show less corrosion resistance compared to ferritic, as well as austenitic stainless steel. Due to its high flow pressure, and the increase in the thermal conductivity equity [12], the interface on the stainless steel austenitic side is likely to show residual residual pressure.

As a means of mass production, the process of welding disputes, especially the joining of various materials, is gaining increasing industrial acceptance. One of the fields using the above process is the tool industry. In this study [9], experimental settings were developed, and developed to meet the conflicting conflicts of parts of equal width. Setup is designed as a continuous push, and the transition from a conflict to a building can be done automatically. For testing, high-speed steel (HSS - S 6-5-2), as well as medium-carbon steel (AISI 1040) were used. Post-weld installation was applied to the joints at 650 ° C for four hours. Next, welding parameters should be available to the members. Strength over time is determined by pressure, fatigue, and impact impact testing. Joints, and effects compared to the strength of solid materials. Later, at a meeting behind the members, differences in strength, and structural differences were found, as well as testing. The outcomes acquired were contrasted and those from past examinations.

From the above book, the next reading gap has been identified.

Not much has been tested during the TIG, as well as seamless installation with the Taguchi process and L27 orthogonal selection in the weldability studies of sheets SS304, SS304 & SS304.

There have been a few attempts to obtain high impact strength, as well as rigidity on the slope of stainless steel sheets during the TIG welding process using the Taguchi system. Using ANOVA, as well as the signal sensor to achieve maximum impact strength, and the difficulty of the members using the Taguchi process, the welding parameters of the SS sheets were not widely studied

III. COMMUNICATION, AND WORK

A. *Weld Ability Test In SS304 Seam Welding*

Table 4.1 lists the responses tested. Concept Expert 7 software was used for the analysis of rated responses. In this study, the L27 orthogonal array, with 3 columns, and 27 rows were used. Twenty-seven tests are required to investigate welding parameters using orthogonal array L27. The signal-to-noise measurement results are given in Table 4.1.

Table 4.1 Response parameters.

Exp. No	Input parameters			Response Value		S/N ratio	
	Pressure (Kgf/cm^2)	Speed (rpm)	Temp (°C)	Impact (BHN)	Hardness (J)	Impact	Hardness
1	60	30	40	0.300	83.48	10.4576	-10.4576
2	60	45	50	0.333	67.81	9.5511	-9.5511
3	60	60	60	0.400	80.39	7.9588	-7.9588
4	80	30	40	0.242	82.14	12.3237	-12.3237
5	80	45	50	0.333	86.75	9.5511	-9.5511
6	80	60	60	0.285	91.75	10.9031	-10.9031
7	100	30	40	0.400	89.70	7.9588	-7.9588
8	100	45	50	0.383	91.75	8.3360	-8.3360
9	100	60	60	0.400	68.84	7.9588	-7.9588

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue X Oct 2020- Available at www.ijraset.com

Table 4.1 (Prosecuted)

10	100	30	50	0.307	75.07	10.2572	-10.2572
11	100	45	60	0.400	94.95	7.9588	-7.9588
12	100	60	40	0.292	76.25	10.6923	-10.6923
13	60	30	50	0.228	77.87	12.8413	-12.8413
14	60	45	60	0.400	89.70	7.9588	-7.9588
15	60	60	40	0.360	86.75	8.8739	-8.8739
16	80	30	50	0.353	71.31	9.0445	-9.0445
17	80	45	60	0.363	86.75	8.8019	-8.8019
18	80	60	40	0.363	77.87	8.8019	-8.8019
19	80	30	60	0.307	84.86	10.2572	-10.2572
20	80	45	40	0.360	88.21	8.8739	-8.8739
21	80	60	50	0.400	94.95	7.9588	-7.9588
22	100	30	60	0.304	79.12	10.0063	-10.0063
23	100	45	40	0.400	73.91	7.9588	-7.9588
24	100	60	50	0.440	62.41	7.1309	-7.1309
25	60	30	60	0.366	88.21	8.7304	-8.7304
26	60	45	40	0.480	66.81	6.3752	-6.3752
27	60	60	50	0.436	83.48	7.2103	-7.2103

B. Signal-to-Noise (S / N) rating rate

In order to determine the effect of each selected item in the responses, the S / N noise level must be calculated for each item. Symptoms have shown that the effect of moderate response, as well as sound is determined by the effect on the central response deviation, indicating sensitivity of the test output to the sound features. The required S / N rating should be selected based on prior knowledge, expertise, and understanding of the process. The S / N rating can be selected according to the target purpose in which the target is set, and there is a vertical shape that is ignored or vertical (vertical structure). In this study, the S / N rating was chosen on a 'larger than' scale to increase responses. The S / N rating for the 'big best' goal is calculated as follows in all responses,

Better size: S / N ratio = -10 log

1 n 1

10 □ 2

i□1

i

The results of the Taguchi test are described in Table 4.2, and are given in figures 4.1 & 4.2, obtained using the mathematical system MINITAB 13, using the data provided above and the formula selected above to calculate S / N.-environmentcity welding (S), is the most important factor affecting impact strength. Welding heat (T) has a low effect. The significant effects of S / N formation indicate that the abundance of variables will increase the impact strength of the weld joint**.**

Table 4.2 Response table for signal and audio ratios

Level	Pressure (Kgf/cm^2)	Speed (rpm)	Temperature (°C)
1	-8.884	-10.209	-9.146
2	-9.613	-8.374	-9.098
3	-8.695	-8.610	-8.948
Delta	0.198	1.835	0.198
Rank	2	1	3

Figure 4.1 A summary of the key outcomes of the SN ratios

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue X Oct 2020- Available at www.ijraset.com

Figure 4.3, and Table 4.3 show that the welding speed (S) is the most important factor, and the welding temperature (T) is the least important factor in the welding field hardness.

Table 4.3 Spelling Answers Table

Level	Pressure Kgf/cm^2	Speed rpm	Temperature ^0C
1	0.3670	0.3132	0.3552
2	0.3340	0.3836	0.3570
3	0.3709	0.3751	0.3597
Delta	0.0369	0.0703	0.0044
Rank	2	1	3

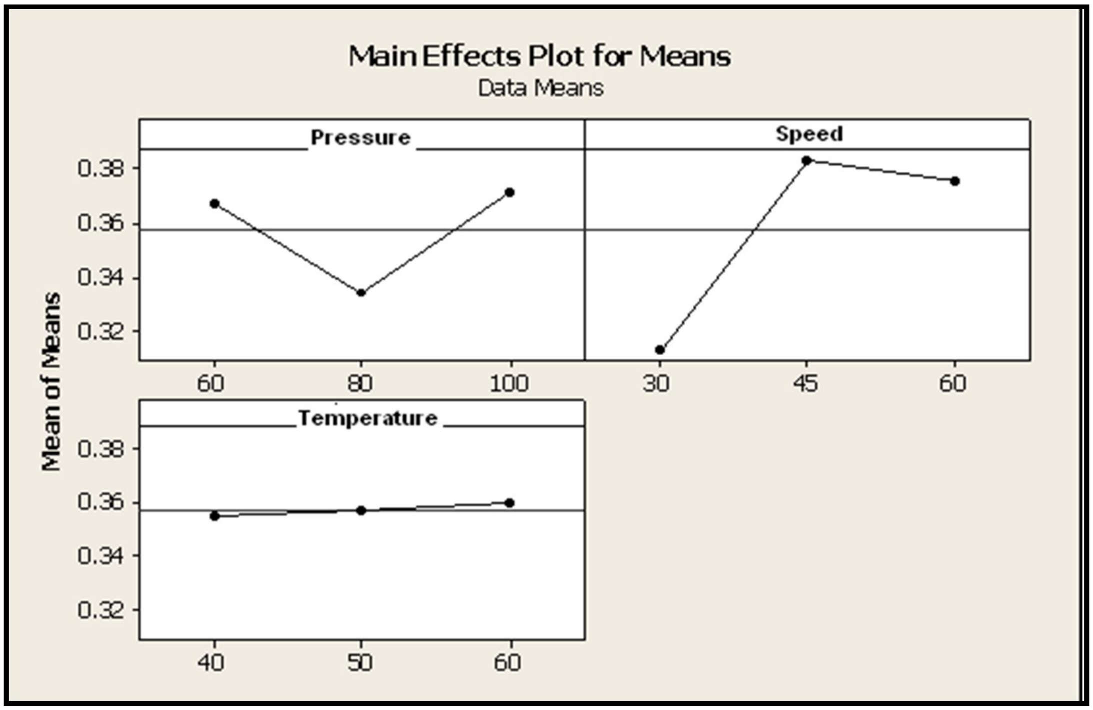


Figure 4.2 Diagram of the Main Outcome Measures

C. Diversity Analysis (ANOVA)

The purpose of ANOVA is to investigate which parameters of the welding process have the greatest impact on quality indicators. This is done by dividing the variance of the S / N ratio including the total deviation of the S / N ratio to the donations, as well as the parameters of each welding process. For each process parameter, the percentage contribution is the total square deviation that can be used to calculate the change in the value of the quality function in the process parameter. In addition, the F test can also be used to determine which welding process parameters have the greatest impact on quality characteristics. In general, changes in the welding process have a significant impact on quality performance when the F value is high.

Research on impact dynamics, and complexity

The purpose of ANOVA is to identify a statistically significant factor. It gives a good idea of how the machine parameter affects the response, as well as the value level of the object being considered. Table ANOVA means, and signal-to-noise ratio is calculated, and is shown in Tables 4.4, and 4.5 below. The F test was performed to investigate the significance of the process parameter. A high value of F indicates that the object is very important in influencing the machine's response. In our study, the welding speed is highly considered, and plays a major role in influencing weld strength. Welding iron is the most important factor affecting the weight of the welding field.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue X Oct 2020- Available at www.ijraset.com

Table 4.4 Analysis of variance outcomes

Source	DF	SS	MS	F	P
Pressure	2	0.007395	0.003697	1.27	0.303
Speed	2	0.026545	0.013272	4.55	0.024
Temp	2	0.000090	0.000045	0.02	0.985
Error	20	0.058390	0.002919		
Total	26	0.092420			

S = 0.0540323 R-Sq = 36.82% R-Sq(adj) = 17.87%

Table 4.5 Variance analysis for hardness

Source	DF	SS	MS	F	P
Pressure	2	167.75	83.87	0.97	0.394
Speed	2	32.49	16.25	0.19	0.829
Temp	2	169.32	84.66	0.98	0.391
Error	20	1720.63	86.03		
Total	26	2090.19			

S = 0.0640625 R-Sq = 39.62% R-Sq(adj) = 19.37%

IV. AND FINAL ADMISSION

The following conclusions are drawn from the analysis of the experimental data, as well as the various parameters described in the current survey.

Burning sheets from SS304

Using a moisture-resistant process, stainless steel sheets (grade 304) are successfully bonded together.

Among the selected parameters, the welding speed has a significant impact on the impact strength of the weld joint.

The hardness of the Weld area is affected by the temperature of the welding during welding of stainless steel sheets.

Taguchi's design method can be used effectively to refine welding parameters.

V. FUTURE WORK TIME

TIG weldability SS304, SS304 ,, and SS304 can be studied using non-traditional methods of optimization, such as Genetic Algorithm, Particle Swarm, etc.

Seam and TIG welding parameters can be designed to achieve maximum combined strength.

Weldability research can be analyzed using non-traditional methods of optimization, such as Genetic Algorithm, Particle Swarm, etc.

DEFINITIONS PROVIDED

[1] Building materials, and buildings, iv. 31, pages3339-3345. The effect of welding parameters on the composition of various materials using brazing alloy fillers 'Alaa Muhsin Saeed, Zuhailawati Hussain, Ahmad Badri & Tadashi Ariga 2010,'

[2] Diary Engineering Science Journal, 'k. 7 kk. 80-91. Ammar Azeez Mahdi, Salih Kareem Waheed and Abdul Wahab Hassan Khuder 2013, 'Effect of Using Copper Cartoons on 304 Members of Austenitic Stainless Steel Seam Welding,'

[3] Materials for construction, and construction, vol. Effects of welding parameters on composite magnesium alloy materials including welding metal with cover covers '31, 4853-4857, p.

[4] 2008, Optics & Laser Technology, Anawa, EM & Olabi, AG, vol. Fourties, p. 379-388, 'Using Taguchi method to maximize the welding pool of different laser-welded parts.'

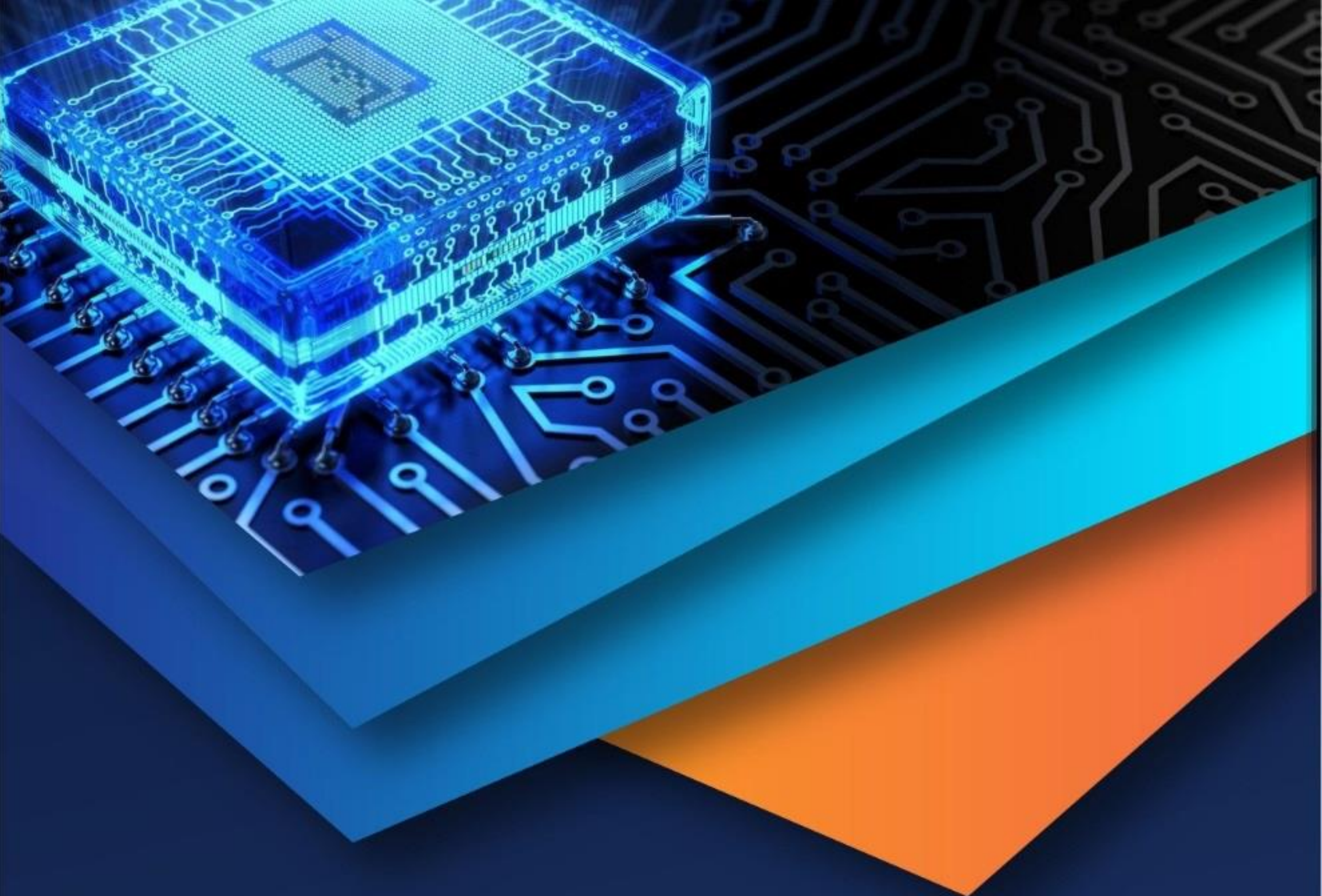
[5] Bappa Acherjee, Arunanshu S Kuar, Souren Mitra & Dipten Misra 2012, 'Modeling welding laser transmission modeling, and polycarbonate analysis using FEM, and RSM Optics & Laser Technology hybrid method, vol. 44, pages 995-1006.

[6] Strengthened nylon 66, nylon 6, and polypropylene vibration welding air intake manifolds', Composites, vol. 35, page. 1107-1116. Bates, PJ, Mahb, JC, Zoub, XP, Wangb, CY and Bobbye Baylis 2004, '

[7] Arrange, and building materials, vol. Koilraj, M, Sundareswaran, V, Vijayan, S & Koteswara Rao, SR 2012, 'Friction stir welding of various aluminum alloys AA2219 to AA5083 Process optimization optimization using the Fourty-two Taguchi method. Oops. 1-7. Uh, pages.

[8] Electronics Institute, Bulgaria Academy of Sciences, Vol. 77, pp. 413-421, Koleva, E 2005, 'Criteria of electron beam welding, plus improvement of thermal efficiency'

[9] Kirana, DV, Basub, B & Dea, 2012, 'Journal of Technology of Materials Processing, vol.' The effect of flexible processes on the performance of weld beads in HSLA steel's two tandem submers arc welding, '212, pp. 2041-2050-2050.
[10] Uh. 10. Minumin Sahin 2005, 'Ining High Speed Friction Welding of Steel, and Medium Carbon Steel,' Journal of Processing Materials, vol. 168 of 202-210 pages.
[11] Sathiya, P, Abdul Jaleel, MY, Katherasan, D & Shanmugarajan, B 2011, Optimization of laser butt welding parameters with various performance performance, Optics & Laser Technology, vol. 43, pages 660-673.
[12] Sathiya, P, Aravindan, S, Noorul Haq, A & Paneerselvam, K 2009, 'Materials Processing Technology Journal, vol.,' Optimization of friction welding parameter using advanced computational techniques' 209, pages 2576-258.
[13] Satyanarayana, VV, Madhusudhan Reddy, G & Mohandas, T 2005, 'Dissimilar Metal Friction Welding of austenitic-ferritic stainless steels,' Journal of Applied Technology, vol. 160, pages 128 -137.
[14] Uh. 14. Only fifteen. The use of Taguchi-based techniques to determine the limitations of the arc-focused arc in Hardfacing 'Journal of Materials Processing Technology, vol. 128, pages 1-6, Tarng, YS, Juang, SC & Chang, CH 2002, '
[15] Fifteen. Yousefieh, M, Shamanian, M & Saatchi, A 2011, 'optimization of pulsed current gas tungsten arc welding (PCGTAW) parameter for super duplex corrosion resistance in stainless steel (UNS S32760) welds using the taguchi process,' Journal of Alloys , plus Chemicals vol. 509, pages 782-788.



10.22214/IJRASET

INDEX COPERNICUS
45.98

IMPACT FACTOR:
7.129

TOGETHER WE REACH THE GOAL
IMPACT FACTOR:
7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY