An Implementation of Ultrasonic Welding for Poly-Propene Boxes

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Abstract: Lately, Interestingly with the Conventional Techniques, Ultrasonic Type of welding has been one vital among its significant applications and materials. The holding of some materials is consistently troublesome. As the unregulated size of the grain and the delicate mechanical properties are not quite the same as the regular welding procedures. Moreover, this research paper provides various clarification of Ultrasonic welding procedure on thermoplastic material such as Polypropene etc. In Market there are abundance of ultrasonic welding machine providers are available as these machines have huge demand. We are able to be part of research team of one such company naming "SANITEK PLASTOWELD SOLUTIONS". They are a one of the keen trader and finest manufacturer in this industry area. The company has been established in the year 2010. Their name in the market is been taken as one of the best producers of these type of machines etc. The main reason for using Ultrasonic type of welding instead of conventional welding is that it provides great welding looks. Earlier boxes were stapled and nowadays these Polypropene boxes are joint by using ultrasonic welding. Ultrasonic welding provides No corrosion of joints which means packaging is good and chances of rejection of packed items are minimal. This machine is designed to weld one or more welding spot together which make it viable for production. The main purpose of this research is to provide and develop such machines for larger companies in order to boost their production.

***Index Terms* – Ultrasonic Thermoplastic welding, Polypropene- boxes, SANITEK PLASTOWELD SOLUTIONS**

I. INTRODUCTION

Ultrasonic welding is an interaction normally utilized in numerous ventures for welding little parts with high paces of creation. The welding is finished with the assistance of high-recurrence vibration in the request for 20 kHz to 40 kHz. When welding is finished utilizing ultrasonic vibrations between 2 work pieces then it is called ultrasonic welding. Ultrasonic welding is a Spotless and quick interaction for making welds between the work pieces. It is a sort of spot welding where the weld is made because of the mechanical vibrations and intermolecular holding. Ultrasonic welding is a strong state welding measure.

Certain attributes make ultrasonic welding not the same as customary welding techniques are as follows:-

1. Electrodes are not utilized in ultrasonic welding as on account two electrodes are being used in traditional type of welding for joining of two pieces.

2. In ultrasonic type of welding there is no need of filler metals. Formation of welding is due to functioning metals intermolecular holding. No use of any foreign filler material in this process.

3. In traditional welding techniques, there are sparkles given out but in ultrasonic welding there is no such sparkles comes out.

When the electric supply is turned on, transformer produces the alternating current due to the presence of inductors. Then this Produced alternating current is transferred to transducer where it is changed over to high recurrence mechanical reverberations. After that, this vibrations are transmitted to sonotrode commonly known as Horn. The use of Horn is to apply pressure as well as mechanical reverberations on work pieces. Due to this vibrations there is friction generated between work pieces which are in contact and temperature between them also increases. This sudden increase in temperature is quite enough for weld formation between work pieces.

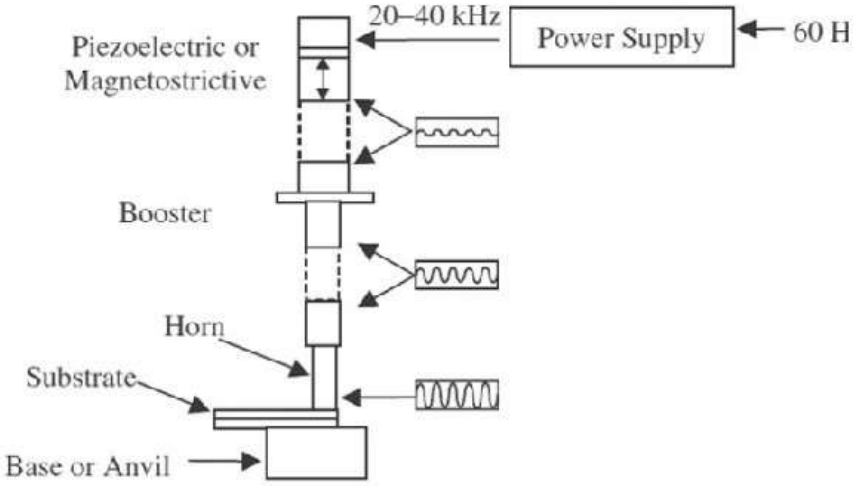

Fig. 1 Working of Ultrasonic welding Machine

II. SCOPE OF PROJECT WORK

1. Development of machine with welding arm 1050 mm length with load capacity of 50 kg considering Factor of safety 2.
2. Design the complete system using CATIA V5R20. Analysis to be done using ANSYS Workbench for load capacity of 500N.
3. Usage of material Mild Steel.
4. Theoretical calculation for material selection And Comparison with analytical data.

III. DESIGN CALCULATIONS

Customer manufacturing Polypropene boxes of fixed sizes

Table. 3 Size of boxes

Sr. no	Length	Width	Breadth
1	300	300	300
2	450	300	450
3	600	300	600
4	600	450	450
5	750	300	450
6	750	450	450

So, from the above sizes of boxes given we need to find the welding arm length to be used. While selection of length of welding arm

1/3% clearance needs to be provide so that worker can rotate boxes after welding is done.

Length of arm = (max length of box) + 0.33(max length of box)

= 750 +0.3*750

= 997.5 mm

So we have selected the length of Arm to be 1050 mm

Similarly vertical Height at which arm needs to be welded is selected based on worker ergonomics.

Height of worker is between 5.2 feet - 5.9 feet .Then the height increases to length 1575 mm and Height of welding arm is 950mm

Simultaneously, the Working height is in level to chest so that inspection can also be done visually of welding process.

At this height worker feel easy to work also rejections are minimum.

Length of Horizontal Beam is selected from welding arm length

Length of Horizontal Beam = Length of arm = 1050mm

50 mm is added extra to horizontal so that PLC needs to be mounted on the front side of Horizontal Beam

So the total length of Horizontal Beam is 1100 mm**.**

Fig. 3 Box Specimen

IV. CAD DRAWING AND MODEL

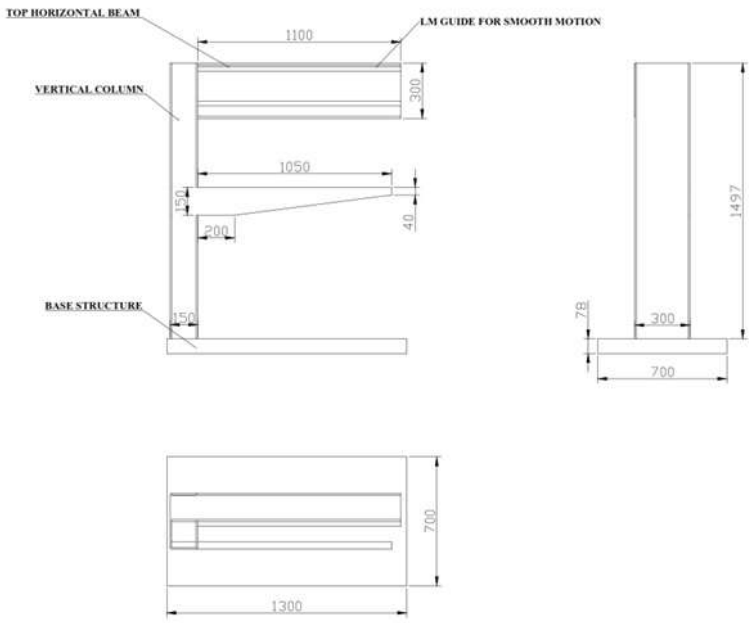

Fig. 4.1 CAD Drawing

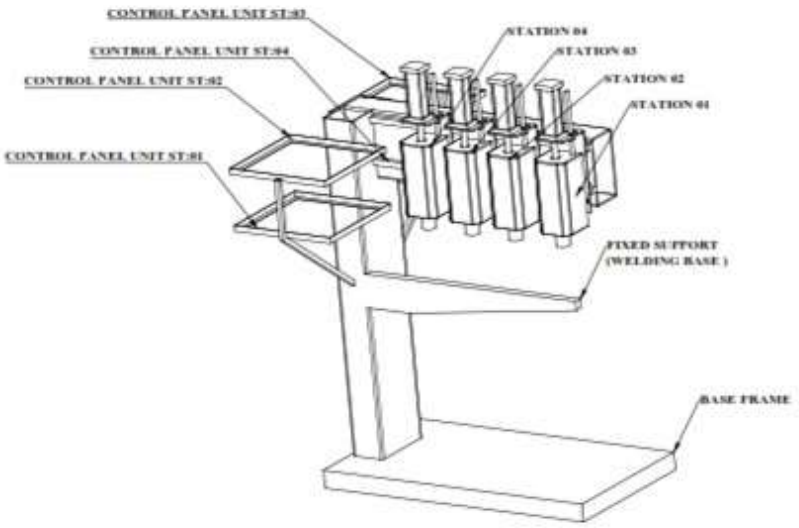

Fig. 4.2 CAD Model

V. ANALYSIS AND RESULTS

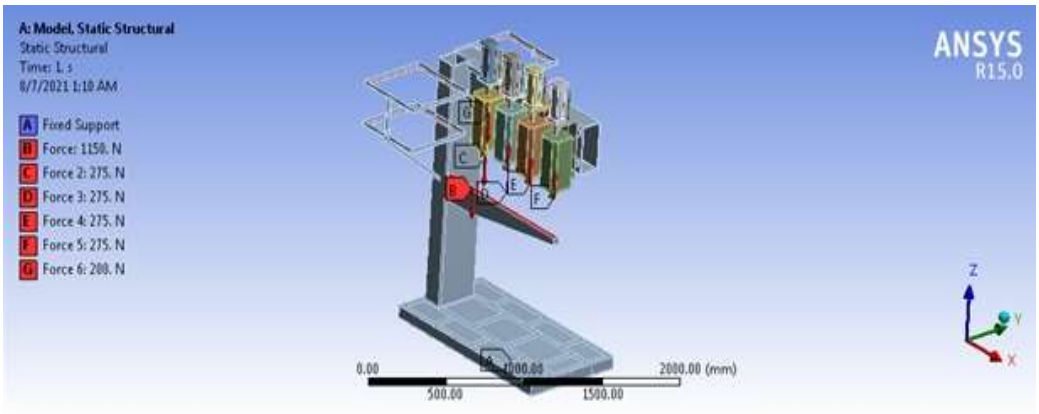

Fig. 5.1 Stress distribution on complete system

Table. 5.1 System Stress and Deformation

Complete System Analysis for increasing load		
LOAD (N)	STRESS (MPA)	DEFORMATION (mm)
2200	5.317	0.126
2450	5.6764	0.15
2700	6.0358	0.174
2950	6.3952	0.198
3200	6.7546	0.222
3450	7.114	0.246
3700	7.4734	0.27
3950	7.8328	0.294
4200	8.1922	0.318
4450	8.5516	0.342
4700	8.911	0.366

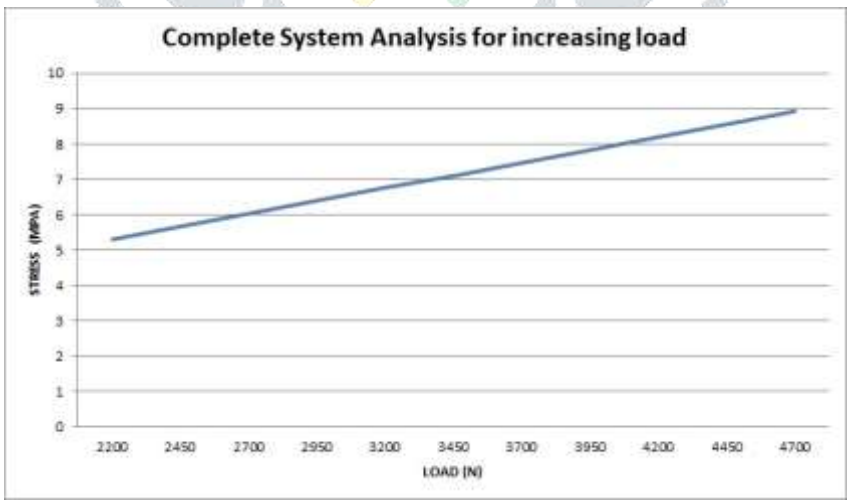

Fig. 5.2 Analytical Chart of Stress vs Load of complete system

From above Results and test of machine, it is concluded that Stress and deformation occurred in machine are in permissible Limit.

VI. TESTING OF MODEL

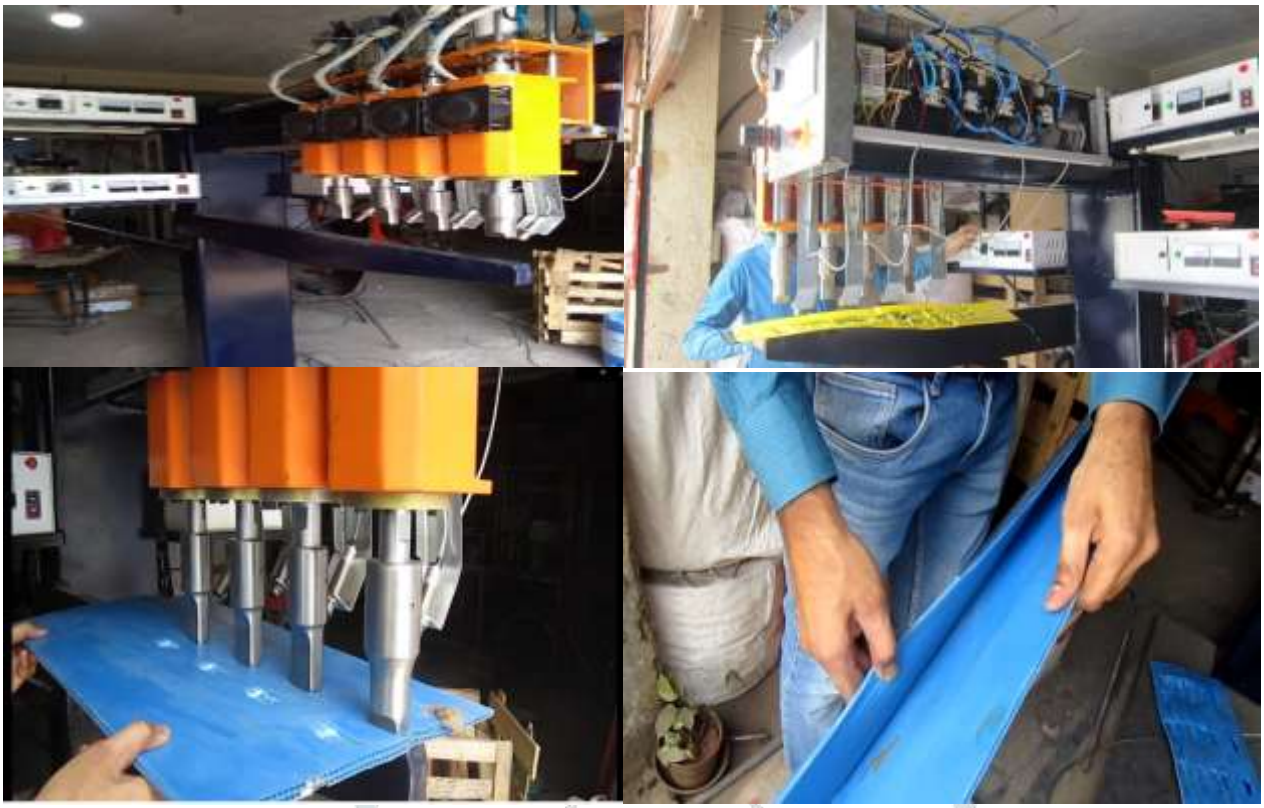

Fig. 6 Real Testing Images

VII. CONCLUSION

We come to conclusion our design for ultrasonic welding machine is safe .As of now, the ultrasonic framework is generally utilized in individuals' job .like ultrasonic crushing in the drug store, ultrasonic welding and ultrasonic washing in the turning and weaving, ultrasonic test and ultrasonic break discovery in the projection. Simultaneously, it has affirmed that ultrasonic has further developed proficiency and brought accommodation. For various applications, we should dependent on the diverse capacity bit by bit total the hypothesis examination and the plan then, at that point take the particular applications for it.

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