

Technical Newsletter from
ADOR WELDING LIMITED
Formerly **Advani - Oerlikon Ltd.**

ADVANTAGES OF AUTOMATIC SUBMERGED ARC WELDING OF BEAMS INTRODUCTION

This article will present the results and advantages of SAW welding over SMAW, GMAW process based on the estimation of costs spent on welding of Beams. Costs for full welding of the Beams are tallied for different welding process such as SMAW, GMAW and SAW. The SAW welding process is integrated with Automation and is called Plus/H/Box Beam Welding System. The outcome of welding process comparison and combination of SAW welding with Automation is presented and discussed.

INCREASING USE OF SUBMERGED ARC WELDING (SAW)

In recent years steel structures are been increasingly used in the erections of heavy manufacturing plants, factories, power plants and commercial infrastructures due to their higher strength and long life. To meet the increase in demand of such industries, Beams have to be manufactured and supplied at higher production rates. The Beam can be manufactured at higher production rates, when the time required for welding the Beams is reduced. In a single pass of welding in FCAW, GTAW, GMAW process, 4-6mm fillet can be achieved. But with a single pass of SAW process, we can get up to 14mm fillet. Hence in comparison, SAW process can deposit weld material in a single pass where FCAW, GTAW, GMAW processes require 2-3 passes. Also other factors such as use of lesser consumables, elimination of welding fumes increase advantages of the use of SAW process for full welding of Beams. Welding the Beams using automatic welding systems such as Plus/H/Box Beam welding systems increase the

Updates

Welding Application & Technical
Center at Chinchwad, Pune.



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Mr. Satish M. Bhat appointed as
Managing Director of Ador Welding
Limited with effect from
11th May 2012.

Product Updates

productivity considerably. The Plus/H/Box Beam welding systems is an automatic SAW welding system in which tilting of the Beams for welding all the four edges is done only in single station. It also has a Trolley mounted Column and Boom, which travels along the welding axis of Beam carrying out the welding. The total system is controlled by means of centralized and sophisticated control panel.

WHY TO CHOOSE SAW PROCESS

- **First let us consider the savings in time**

The sample calculation given below shows the number of passes required for 20mm thick plate and cost incurred per kg of weld metal deposited for SMAW, GMAW and SAW processes:

Process	Unit	SMAW	GMAW	SAW
Size of Electrodes	mm	4mm	1.2mm	4mm
Fillet Size considered	mm	12	12	12
Deposition Rate	kg/arc hr	2.1	5.7	9
Welding Speed	mm/min	125	175	275
Deposit per pass	gms/m/pass	280	543	545
No. of passes Required	Nos.	2	1	1
Arc time	arc min/m	16.05	5.91	3.74
Arc Duty	%	20	30	50
Total weld length (= 12m X 4 corners)	meters	48	48	48
Total Time = $\frac{\text{Total weld length}}{\text{Welding speed} \times \text{Arc duty\%}}$	minutes	3840	914.3	349

From the above, it can be seen that the SAW process consumes only 9% of the time taken by SMAW process & consumes around 38% of the time taken by the GMAW process.

- **Second, let us consider the savings in costs**

Maestro 600 | Maestro 800
Maestro 1000 | Maestro 1200
SAW Welding Equipment



- Choice of Boom mounted or Tractor mounted models with Diode / Thyristorised Power Source.
- Boom mounted comes with a choice of manual, semi-motorised and fully motorised cross slides.
- Twin wire attachment is optionally available - helps achieve 20-30% higher weld deposition rates.

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COST COMPARISON PER KG. OF WELD METAL					
A.	Process		SMAW	GMAW	SAW
B.	Filler Metal Product		E7018	ER70S-3	F7P2EH14
C.	Wire/Electrode Size (mm)		5.0	1.2	3.2
D.	Welding Current (amps)		220	180	500
E.	Deposition Rate(kg.per arc hour)		2.1	5.7	9.0
F.	Operating Factor (% arc hour)		20	30	50
G.	Labour & Overhead cost per hour (Rs)		87.50	87.50	87.50
H.	Wire/Electrode Cost per Kg. (Rs.)		103.00	342.55	105.40
I.	Wire/Electrode Deposition Efficiency(%)		65	98	98
J.	Flux Cost per Kg.(Rs.)		0.00	0.00	68.00
K.	Flux Consumption(kg per kg. of weld metal)		0.0	0.0	1.1
L.	Type of Shielding Gas		NIL	Ar+CO2	NIL
M.	Shielding Gas Cost per Cu. Meter (Rs.)		0.00	114.00	0.00
N.	Shielding Gas Consumption (LPM)		0.0	25.0	0.0
a	Equipment Cost (Rs)		65000	90000	350000
O.	Deposition Rate (kg.of weld metal/man hour)	E*F/100	0.42	1.71	4.50
P.	Time Required to deposit 1kg. of weld metal(hr)	1/O	2.38	0.58	0.22
Q.	Labour&Overhead cost per kg. of weld metal(Rs.)	G*P	208.33	51.17	19.44
R.	Wire/electrode required per	(1/I)*100	1.54	1.02	1.02

Retrofit Head WH 15 [F] Retrofit of SAW Welding Head



- Economical solution for using old SAW welding power sources available with customer, which otherwise are not useful, since old SAW welding head is beyond repairs.
- Saves cost of SAW power source since new power source is not required.

more



**Service Clinics
during the month of April 2012**

	kg. of weld metal (kg.)				
S.	wire/electrode cost per kg.of weld metal(Rs.)	H*R	158.46	349.54	107.55
T.	Flux required per kg. of weld metal(kg.)	1*K	0.00	0.00	1.10
U.	Flux cost per kg. of weld metal(Rs.)	T*J	0.00	0.00	74.80
V.	Shielding gas required per kg.of weld metal(cu-M)	(N*0.060)/E	0.00	0.26	0.00
W.	Shielding gas cost per kg.of weld metal(Rs.)	M*V	0.00	30.00	0.00
X.	Welding Consumable cost per kg.of weld metal(Rs)	S+U+W	158.46	379.54	182.35
Y.	Total Operating Cost per kg. of weld metal (Rs.)	Q+X	366.79	430.71	201.80
Z.	Weld metal deposit per 8 hr. shift (kg./shift)	O*8	3.4	13.7	36.0
b	Equipment Cost per kg.of weld metal(Rs)	P*0.1458*a/1000	22.56	7.67	11.34
	Total Cost per kg. of weld metal (Rs.)	Y+b	389.36	438.38	213.14

From above sample calculations sheet, we see that in case of SAW process (with the use of an appropriate flux), a wider weld bead is created and the process is capable of bridging much larger weld gaps with consistently high quality weld with minimum operator skill as compared to other conventional processes. Further the arc on time in case of SAW can be increased by automating the process, which will certainly increase the production in combination with twin wire, since with twin wire we will get 25% higher deposition.

AUTOMATED PLUS/H/BOX BEAM WELDING SYSTEM:

- **OVERALL EQUIPMENT DESCRIPTION:**

1. The Plus Beam welding machine is an automatic welding system, which is mainly used for straight longitudinal welding of tack welded plus beams.

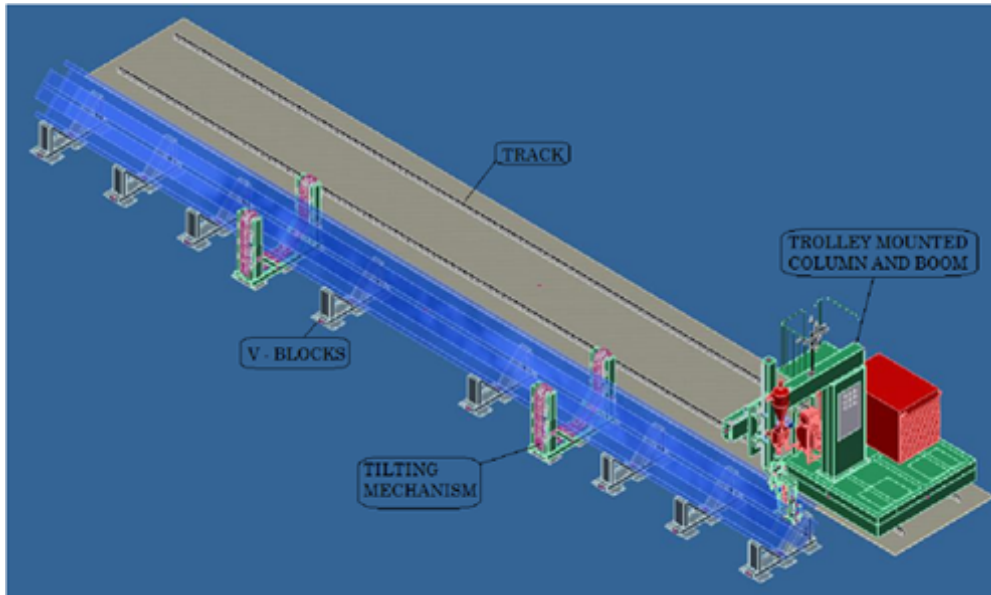
- M/S TEXMACO LTD.
AGARPARA, KOLKATA - 110 machines
- M/s SPEED CRAFT LTD.
PATANA , BIHAR - 18 machines
- M/S BHOLARAM STEEL PVT. LTD. PATANA, BIHAR - 20 machines
- M/s PRATIBHA PIPE & STRUCTURAL LTD. WADA, THANE, MAHARASHTRA - 20 machines
- M/S UNIVERSAL CONSTRUCTION MACHINERY & EQUIPMENT LTD. PUNE, MAHARASHTRA - 9 machines

Ador Welding Academy (AWA)



**Schedule of Welding Courses
January 2012 to December 2012**

2. The system generally consists of following subassemblies:
 - A. Trolley mounted Column and Boom which moves on track/rails,
 - B. The tilting system which is designed for 360 degree rotation of beam.
 - C. V-blocks on which the Beams are supported.
 - D. Flux re-circulation unit provided on the flux hopper ensures optimum use of flux with minimum wastage.
 - E. Twin wire SAW welding outfit of capacity 1200 amps at 60% duty cycle.
 - F. Guide Roller System with pneumatic pressure system for tracking the weld joint.
 - G. Remote Pendant for fine adjustment of wire during the welding operation.

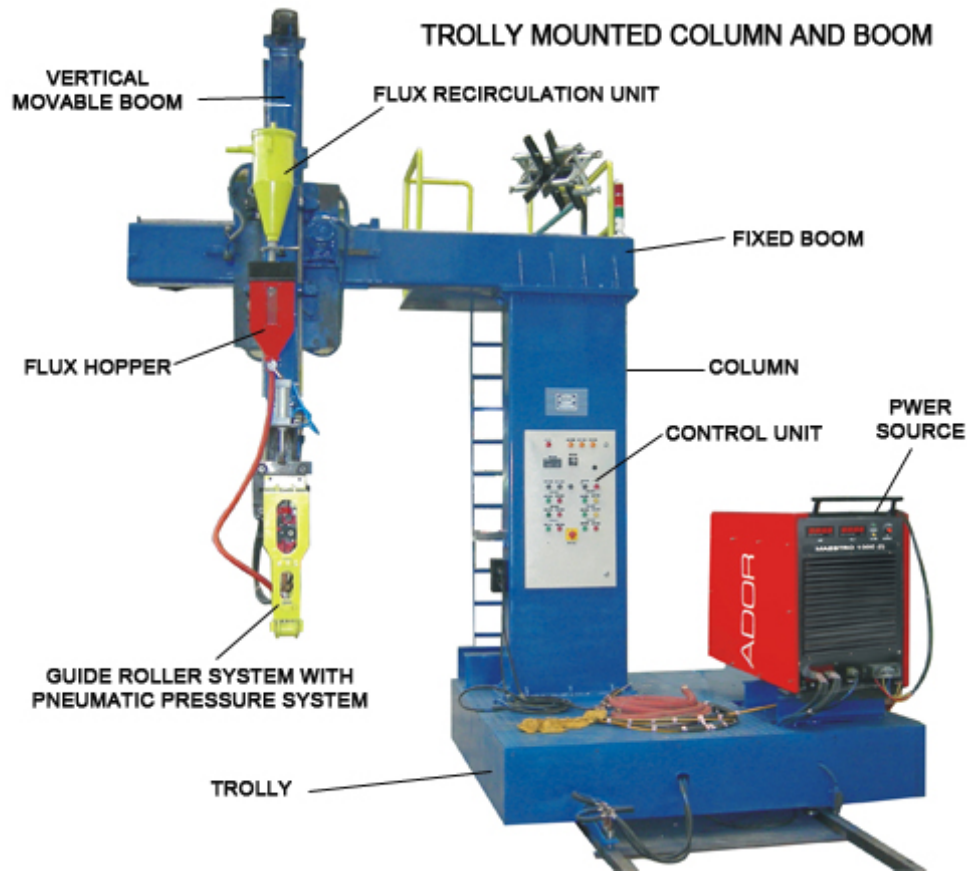


3D Model View – Complete Set Up of Plus/H/Box Beam Welding System.

- **Trolley mounted Column and Boom:**

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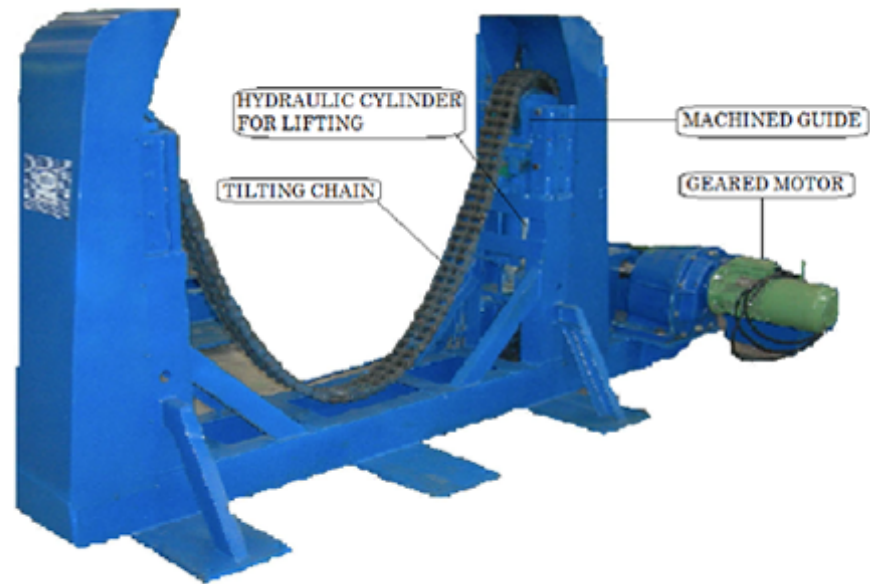
For Welding &
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Trolley Mounted Column and Boom.

1. The trolley mounted Column and Boom has saddle system and movable vertical boom. The change in the Beam size/welding position can be adjusted by moving the saddle left/right and vertical boom up/down. These left/right and up/down motions are motorized.
2. The weld head is mounted on spring loaded carriage and 45 deg. tapered rollers, so that the weld head gets guided properly against the faces of Beam along the welding line and the welding is completed without any fatigue to operator. The weld head, flux hopper and recirculation unit are mounted on vertical boom, and move up/down/left/right as a single unit.
3. Control Panel is fixed in the main column itself and the power source on the trolley. The trolley has sufficient space for the operator to stand so that he can control the whole system and keep a watch on the welding.

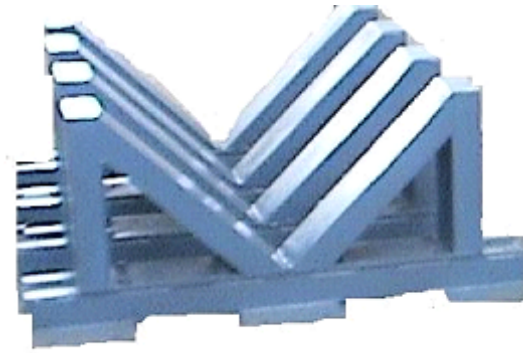
- **The Tilting system:**



Tilting System.

1. The Tilting mechanism is mainly fabricated from channel and plates. Each mechanism is equipped with heavy chain, with the help of which the Beams are lifted up and rotated.
2. The lifting system works on hydraulics or electricity. Guide blocks supporting the sprockets are sliding up/down in machined guides. The drive to the rotating chain is by a geared motor.

- **The V Blocks:**



1. The V Blocks are fabricated from channel and plates. The Beams rest on these blocks while conducting the welding.
2. The Tilting system and V Blocks are aligned inline, exactly parallel to the trolley movement.

- **Operation of the System:**

1. Load the tack welded plus-beam on the V Blocks with EOT crane.
2. Set the welding parameters. Open the flux dispensing valve.
3. Press the cycle start button. Welding and Trolley mounted Column and Boom along with welding head will start simultaneously. Flux re-circulation unit will collect & deposit the un-used flux back into the flux hopper.
4. At the end of welding, to stop the welding and linear movement of head press the cycle stop button.
5. After completion of welding on one edge, lift the Beam by pressing the Beam up button. After hydraulic cylinders lifts the Beam, press rotation start button to rotate the Beam by 90 degrees and bring up the second welding edge.
6. Now place the Beam down on V blocks by pressing the Beam down button.
7. Repeat the above procedure for all the four edges. After completion of welding , un-load the welded plus-beam with the help of shop floor EOT crane.

- **Advantages of the system:**

1. The centralized operator friendly control of the system makes the operation of the system simpler and trouble free.
2. Precise motion of the Trolley and specially designed guide roller system results in best welding quality.
3. Perfect alignment of V Blocks and Tilting system drastically reduces the Beam handling time.
4. The flux recirculation unit reduces the wastage and time required to fill the hopper with flux.
5. The summation of all such features cuts the cost per Beam in terms of money and time. The result is higher productivity with best quality and profitability.
6. Space requirement is very less compared to other beam welding lines.
7. All four welding edges of Plus Beam are welded in Single station only.
8. Same system can be used for full welding of Box Beam, with incorporation of locking pins.
9. By doing minor modification in the Support Block or V-Block same system can be used for full welding of H-Beam, up to 1000mm size.
10. Cost effective system to start H-beam, Plus Beam & Box Beam production Line.

CONCLUSIONS:

From above statistics, we can say that, automated SAW welding described above will be the ideal solution for full welding of Beams as:

1. The Centralized operator friendly control of the system, make the operation of the system simpler and trouble free.
2. Precise motion of the Trolley and specially designed Guide Roller System results in best welding quality.
3. Perfect alignment of V Blocks and Tilting system drastically reduces the Beam handling time.
4. The Flux recirculation unit reduces the wastage and time required to fill the Hopper with Flux.
5. The summation of all such features cuts the cost per Beam in terms money as well as time. The result is higher productivity with best quality and profitability.
6. Space requirement is very less compared to other beam welding lines.
7. All four welding edges of Plus Beam are welded in Single station only.

For more information, Please write to us cmo@adorians.com or visit www.adorwelding.com



Welding Consumables



Welding & Cutting Equipment



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www.adorwelding.com

cmo@adorians.com

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