

SigmaWeld Accelerated Tig (S.W.A.T) : Making Tig Faster

Today if you have to manufacture Stainless Steel , alloy steel, titanium vessels which are 6 to 8 mm thick, the material needs to be welded in multiple passes. First of all the surface needs to be edge prepared , that means grinding or bevelling of the plates throughout the length, then the fit-up, root pass, hot pass and then multiple passes till the capping is achieved. Even when we weld this in automation we have to keep the inter pass temperatures in mind and allow the time in between passes to ensure the temperatures do not exceed the interpass limit.

This means a typical 8mm thick 1 meter to 1 meter long weld seam would take approx 100 minutes to edge prep and weld. Image if we could do the same in minutes.

Sigmaweld Weld Accelerated TIG (S.W.A.T) is a GTAW process which requires no edge bevelling, uses as little as 10% of the gas normally required and produces highly repeatable, x-ray quality welds with superb cap and root aesthetics. Thicknesses up to 10mm can be welded in a single pass without edge preparation. This means that the time taken for edge preparation plus the multi-pass welding can be reduced to single pass. A typical 6 hour job (edge preparation and welding multi-pass) can be done in minutes.



Figure 2 S.W.A.T used in Tube Mill to increase productivity

The fundamental behind this process is intentional increase in arc pressure to the point where it extends the crater to the bottom of the pool. The surface of the weld pool will become anchored to both top and bottom surfaces to form a stable structure. This stable arc is moved along the weld path as keyhole. The arc is supported by Purging Gas on the back side and Shielding Gas from the torch.

For example in Tube Mills where typical thickness of 8.5mm use a PT (Plasma – Tig) combination and speeds of upto 175mm / minute. This process was replaced with S.W.A.T (SigmaWeld Accelerated TIG) a variant of the KeyHole GTAW process, using only the TIG Torch with the new process the mill speeds of 400 mm / minute were easily achieved. Figure 1 shows a 5mm tube welded by S.W.A.T. Figure 2 shows the penetration and profile of the 8.5mm thick, SS304 Tube.



Figure 1 Penetration Profile of 8.5mm thick tube single pass welding with S.W.A.T

The production was more than doubled, only one power source was used for S.W.A.T (GTAW) and filler wire consumed during the process was less than half of the Plasma – TIG combination.

Similarly, for Nickel Alloy plates of 8mm, up to 3 passes were needed to be welded using standard GTAW process. With S.W.A.T this could be done in a single pass.

Table 1 Productivity Comparison Manual GTAW Vs Automated GTAW Vs S.W.A.T

Parameters	NORMAL GTAW	Automated GTAW	S.W.A.T
Num of Pass	Root + 3 Pass	Root + 1 Pass	Single Pass
Welding Speed	55mm/ min	100mm/min	300mm/min
Edge Prep Time	30 min	30 min	-
Welding Time/meter	72 min	20 min	3.33 min
Total Time	102 min	50 min	5 min

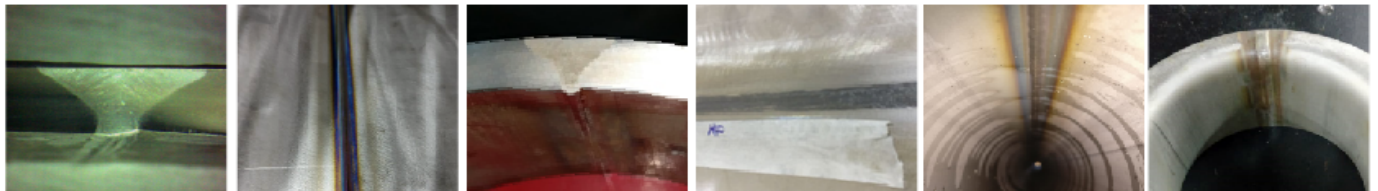
As shown in Table 2 welding of 8mm plates could be welded under 5mins using SWAT compared to the standard GTAW manual welding time of upto 100 mins and 50 minutes when welded in Automated GTAW with Cold Wire Feeding.

Coupon plates of SS304 of thickness 2.72mm, 4.12mm,6.0mm and 8.0mm were made and subjected to ASME IX tests to check for RT, Macro, Tensile 1, Tensile 2, Micro (On Weld), Micro (On PM& HAZ), Hardness, Root Bend 1, Root Bend 2, Face Bend 1 and Face Bend 2.

The samples passed the acceptance criteria for each of the above tests.

Further trials have been conducted on Cobalt Alloys, Titanium , Nickel Alloys upto 8mm thickness. The results are very high speed welds with exceptional quality.

For thicknesses above 8mm and upto 14mm can be welded with added filler wire.



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