

WELDING COMPARISON CHART

Manual SMAW Pipe Welding Versus Orbital GTAW

Introduction:

In the past, most potential users of orbital GTAW pipe welding equipment were more interested in quality, repeatability and access than in weld time. However, in recent years, potential users have been very concerned about reducing man-hours and have looked at orbital GTAW as a possible method.

Comparing any pipe welding task against another is usually a very difficult task unless all the particulars of the application are known. For manufacturers of orbital pipe welding equipment it is not wise to make specific statements about weld times, without knowing the exact particulars about the welding application.

With this in mind, Arc Machines, Inc. presents the attached weld data only as a starting point for discussions. The manual weld times are general estimates, not the best or worst case. The orbital weld times are very accurate, based on the weld particulars given; however they are not the best case.

How to Use the Chart:

- 1) Adjusting Manual Weld Times: The user should compare the weld times and the weld data used against their own application. As an example, many users require a manual GTAW root pass to their manual welds. This adds significantly to the weld time of small diameter pipe and was not included in the chart. Many manual field applications do not achieve an efficiency of 15%. The time should be adjusted to indicate these types of differences based on the user's application.
- 2) Adjusting Auto Weld Times: The times given are based on almost identical weld data as the manual times. It is common in auto GTAW to use weld preparations that require less filler, thus reducing weld times.
- 3) Intangible Factors: The following factors should also be considered and times added and subtracted based on the user's criteria:
 - a) Quality: Can you achieve the same levels with both processes? If not, what is its value to you?
 - b) Reject Rates and Repairs: Typically orbital GTAW will have reject rates of under 2%. If your manual reject rate is 10% then the manual weld times need to be increased by your average repair time.
 - c) Environment: Do the working conditions and weld access conditions reduce your true field efficiency? Generally speaking, most orbital GTAW equipment can be adapted so that environment does not slow down weld times.
 - d) Specialized Fixtures: Many of the weld times stated can be improved with fixtures designed for your specific application. In most cases the time improvement will more than pay for the additional hardware.

Summary:

As stated, exact weld application data is needed in order to derive an accurate cost justification for orbital pipe welding equipment. This chart, in itself, is not precise enough without these factors.

As an example, the attached chart indicates an average man-hour reduction of 25%. If the manual welds called out for a GTAW root pass, this figure would jump to an average of almost 50%. There are documented field welding studies done by our customers that have shown man-hour reductions as high as 75%.

Arc Machines, Inc. has many years of experience in successful orbital welding programs and will be glad to assist the user by giving accurate dependable information based on the users application. Please contact us at your convenience.

ARC MACHINES, INC.

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Comparison Data Facts

Common Data

Carbon Steel A106B Pipe

- (a) 37.5° Bevel Open Butt (not generally recommended for Auto GTAW)
- (b) In-Place 5G Field Weld
- (c) Preparation/fit-up/testing time not included.

SMAW Data

- (a) Field Efficiency 15%
- (b) 1/8 or 5/32 Electrode
- (c) Fill Rates Used:
 - *1 = 3 lbs./hr
 - *2 = 4 lbs./hr
 - *3 = 5 lbs./hr

Orbital GTAW Data

- (a) 0.035" or 0.045" Diameter Wire
- (b) Fill Rates Used:
 - *4 = 0.75 lbs./hr
 - *5 = 1.00 lbs./hr
 - *6 = 1.00 lbs./hr
 - *7 = 1.20 lbs./hr
 - *8 = 1.50 lbs./hr
- (c) Setup times added:
 - 4" and under - 2 minutes
 - 5" to 14" - 10 minutes
 - 14" and up - 20 minutes
- (d) Field efficiency 80%

Chart based on weld times only - Major savings can also be achieved by considering the following:
Quality / Reject rate / Weld conditions / Access / Reduced-fill weld preparations

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Pipe Size	Pipe Schedule	Wall Thickness	Fill Weight (Pounds)	Manual SMAW Weld Time	Orbital GTAW Weld Time	Savings
2"	40	0.154"	0.12	00:16 @ 3 lbs./hr	00:12 @ 0.75 lbs./hr	25%
	80	0.218"	0.16	00:21 @ 3 lbs./hr	00:16 @ 0.75 lbs./hr	24%
	DXH	0.436"	0.46	00:46 @ 4 lbs./hr	00:36 @ 1.00 lbs./hr	22%
2.5"	40	0.203"	0.18	00:24 @ 3 lbs./hr	00:18 @ 0.75 lbs./hr	25%
	80	0.276"	0.32	00:42 @ 3 lbs./hr	00:32 @ 0.75 lbs./hr	24%
	DXH	0.552"	0.84	01:24 @ 4 lbs./hr	01:11 @ 1.00 lbs./hr	16%
3.0"	40	0.216"	0.24	00:32 @ 3 lbs./hr	00:25 @ 0.75 lbs./hr	22%
	80	0.300"	0.41	00:54 @ 3 lbs./hr	00:42 @ 0.75 lbs./hr	22%
	160	0.437"	0.68	01:07 @ 4 lbs./hr	00:50 @ 1.00 lbs./hr	25%
4.0"	40	0.237"	0.38	00:51 @ 3 lbs./hr	00:39 @ 0.75 lbs./hr	24%
	80	0.337"	0.61	01:01 @ 4 lbs./hr	00:47 @ 1.00 lbs./hr	22%
	120	0.437"	0.87	01:26 @ 4 lbs./hr	01:05 @ 1.00 lbs./hr	24%
5.0"	40	0.258"	0.59	00:58 @ 4 lbs./hr	00:50 @ 1.00 lbs./hr	15%
	80	0.375"	0.85	01:24 @ 4 lbs./hr	01:08 @ 1.00 lbs./hr	19%
	120	0.500"	1.35	02:15 @ 4 lbs./hr	01:44 @ 1.00 lbs./hr	23%
6.0"	40	0.280"	0.75	01:15 @ 4 lbs./hr	01:00 @ 1.00 lbs./hr	20%
	60	0.432"	1.28	02:08 @ 4 lbs./hr	01:46 @ 1.00 lbs./hr	18%
	120	0.562"	1.95	03:15 @ 4 lbs./hr	02:36 @ 1.00 lbs./hr	20%
	DXH	0.864"	3.72	06:12 @ 4 lbs./hr	04:54 @ 1.00 lbs./hr	21%
8.0"	40	0.322"	1.11	01:51 @ 4 lbs./hr	01:33 @ 1.00 lbs./hr	17%
	80	0.500"	2.10	03:30 @ 4 lbs./hr	02:48 @ 1.00 lbs./hr	18%
	120	0.718"	3.56	05:56 @ 4 lbs./hr	04:42 @ 1.00 lbs./hr	21%
	DXH	0.875"	5.39	08:58 @ 4 lbs./hr	06:59 @ 1.00 lbs./hr	22%
10"	40	0.365"	1.60	02:38 @ 4 lbs./hr	02:15 @ 1.00 lbs./hr	15%
	80	0.593"	3.18	05:15 @ 4 lbs./hr	04:14 @ 1.00 lbs./hr	20%
	120	0.843"	6.64	11:03 @ 4 lbs./hr	08:33 @ 1.00 lbs./hr	23%
12"	20	0.250"	1.35	02:15 @ 4 lbs./hr	01:56 @ 1.00 lbs./hr	15%
	40	0.406"	2.17	03:47 @ 4 lbs./hr	02:58 @ 1.00 lbs./hr	22%
	80	0.687"	5.11	08:30 @ 4 lbs./hr	06:38 @ 1.00 lbs./hr	22%
	120	1.000"	10.10	13:27 @ 5 lbs./hr	09:10 @ 1.50 lbs./hr	32%
14"	20	0.312"	1.80	03:00 @ 4 lbs./hr	02:30 @ 1.00 lbs./hr	17%
	40	0.437"	2.71	04:31 @ 4 lbs./hr	03:38 @ 1.00 lbs./hr	22%
	80	0.750"	6.67	08:53 @ 5 lbs./hr	07:06 @ 1.20 lbs./hr	20%
	120	1.093"	12.80	17:03 @ 5 lbs./hr	11:00 @ 1.50 lbs./hr	35%
16"	20	0.312"	2.05	03:25 @ 4 lbs./hr	02:49 @ 1.00 lbs./hr	18%
	40	0.500"	3.90	06:30 @ 4 lbs./hr	05:07 @ 1.00 lbs./hr	21%
	80	0.843"	9.90	13:11 @ 5 lbs./hr	07:06 @ 1.20 lbs./hr	20%
	120	1.218"	18.40	24:30 @ 5 lbs./hr	15:36 @ 1.50 lbs./hr	36%
18"	20	0.312"	2.31	03:51 @ 4 lbs./hr	03:08 @ 1.00 lbs./hr	20%
	40	0.562"	5.29	08:48 @ 4 lbs./hr	06:52 @ 1.00 lbs./hr	22%
	80	0.937"	12.70	16:54 @ 5 lbs./hr	13:28 @ 1.20 lbs./hr	21%
	120	1.375"	24.80	33:00 @ 5 lbs./hr	21:00 @ 1.50 lbs./hr	36%
20"	20	0.375"	3.05	05:05 @ 4 lbs./hr	04:04 @ 1.00 lbs./hr	20%
	40	0.593"	5.92	09:51 @ 4 lbs./hr	07:39 @ 1.00 lbs./hr	22%
	80	1.031"	15.90	21:11 @ 5 lbs./hr	16:48 @ 1.20 lbs./hr	21%
	120	1.500"	33.10	44:05 @ 5 lbs./hr	27:54 @ 1.50 lbs./hr	37%