e-Weldone
www.adorwelding.com
Sept - Oct 2010
Vol. 21

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

SELECTION OF TORCHES FOR MIG /MAG WELDING APPLICATIONS

ARC WELDING APPLICATIONS

Arc welding machines can be classified as manual, semi-automatic and automatic, depending on their use in different applications.

The welding processes in each category are:

- **Manual:** Shielded Metal Arc Welding (SMAW), Gas Tunsten Arc Welding (GTAW)
- **Semi Automatic:** Gas Metal Arc Welding (GMAW)
- **Automatic:** Submerged Arc Welding (SAW)

GTAW and GMAW can also be used in automatic mode.

PRODUCTIVITY OF WELDING PROCESSES

SMAW and GTAW are manual welding processes, at around 35% duty cycle, and dependency on the skill of welder is very high. This results in low productivity and higher cost. SAW process is generally fully automatic and yields high productivity with lower costs. However applications are limited for SAW process.

To overcome the problem of low productivity with MMAW, the semi automatic GMAW process has become very popular. This process is also known as MIG / MAG (Metal Inert Gas / Metal Active Gas) process.

Product Update

New Packaging for Welding Consumables

SAW Flux BAG

MIG & Flux Cored Wire Box

THE GMAW EQUIPMENT

A typical semiautomatic MIG / MAG welding machine consists of the following:

- **Power Source:** It delivers the required welding power for welding. (voltage and current)
- **Wire Feeder:** It feeds (pushes) the welding wire (welding consumable)
- **Welding Torch (Gun):** It actually feeds welding wire, shielding gas and required welding current up-to the welding groove

TYPES OF MIG / MAG WELDING TORCHES (GUNS)

As is evident, the welding torch plays a very important role in ensuring a defect free welding joint in MIG / MAG welding. In this article we will discuss some important features that will help select the right torch for MIG / MAG welding applications.

Type of Cooling

The torches are to be cooled either by cooling gas or circulating water. Hence they are referred to as gas cooled or water cooled torches.

Gas Cooled Torches:

This type of torch is very popular. It has low maintenance and is light in weight. The cooling of the torch is done by the same gas used for the shielding of the arc. Generally gas cooled torches are available up to current range of 400 amps.

Water Cooled Torches:

The heat generated at higher current (above 400amps at 60% or 100% duty cycle) is high. In this case, the gas is not able to keep the torch cool. For such high current applications, one has to necessarily use water cooled torches. Hence water circulation is done at torch head to keep the torch cool. This results in torch becoming higher in weight and also in cost. The cost of maintenance also goes up.

Current Range

Based on application and usage one has to select the right torch. Selecting right current and right duty cycle torch is very important. Using a 400 amps torch for applications that require 250 amps will unnecessarily increase fatigue of welder due to higher weight of

Secondary (Outer) Box for Electrodes

MIG Wires

- AUTOMIG 70S-6
- AUTOMIG 90S-D2
- MIGINOX 308
- MIGINOX 308L
- MIGINOX 309
- MIGINOX 309L
- MIGINOX 310
- MIGINOX 316
- MIGINOX 316L
- MIGINOX 410
- MIGINOX 430

RANGER 403 / 503

torch. Generally torches for semi automatic MIG / MAG welding are designed for 60 % duty cycle. Lower duty cycle torches will again create welder fatigue due to overheating of torch. Torches are available in current range of 180, 250, 400, 500, 600 amps.

Shape of Torch Head

The torch head can be designed with a swan neck or a straight head. The neck can be fixed, rotatable or of multiple length.

Swan Neck:

This type of head is used for semi automatic applications; the head is bent at the end for easy accessibility and weld visibility to the welder.

Straight Head:

The design of the head is straight. These types of torches are mainly used for weld automation. The torches are mounted on automation systems.

Type of Torch Head

Fixed Type:

In this type of torch design , the torch head is fixed in the torch handle.

Revolving Type:

In this type of design, the torch head can be revolved in 360 degrees. This feature is very important while welding the job with odd shape.

Length of Torch

The torches are available in various lengths. The most popular one is available in three meter length. The straight head machine mounted torches are available in the length starting from one meter to five meters.

Design of Torch Cable assembly

Co-Axial:

In this type of cable design, the copper conductor, wire spiral, gas hose and electric wires for torch switch are co-axially molded together

Non Co-Axial:

- Light weight, Compact design of Power source, Wire feeder and Torch
- Crater Voltage and Current control possible with ON/OFF switch
- LED Indications for Mains ON and Trip signal

In this type of cable design, all the cables, hose, wire spiral, electric wires are passed together through a protective sheathing.

Welding torches with Co-axial cable are more flexible and light weight as compared to welding torch with Non Co Axial

MAIN COMPONENTS OF WELDING TORCH

A high quality torch reduces operator fatigue, increases the service life of the torch, reduces replacement costs and ensures ease of changing components requiring replacement. Described below are the main components in a torch assembly; contact tips, gas nozzles and insulators are generally considered consumable since they tend to wear out due to the high heat inputs during welding.

Contact tube (popularly called contact tip):
Welding current is passed to the wire in this part. Contact tip size changes as per the size of wire used. (contact tip will be different for wire sizes of 0.8mm, 1.0mm,1.2mm,1.6mm and so on)

Nozzle:
It ensures proper covering of shielding gas over the weld puddle. Nozzles are also manufactured in different sizes depending upon the current range.

Gas Insulator:
It insulates the nozzle from the contact tip

Wire Spiral:
It guides the wire while it passes through the torch. These are to be used as per the welding wire size used.

End Connection:
This connects the torch to the wire feeder. There are various torch end connections available in the market. The Euro connection is the most commonly used end connection.

Torch switch:
With this operator can start or stop welding. There are two modes of torch switch operation, manly 2 Track and 4 Track operations.

Two Track Operation:
Welding starts after torch switch is pressed and welding stops by

releasing the torch switch.

Four Track Operations:
Welding will start after pressing and releasing torch. Welding stops after pressing and releasing torch switch. This mode is suitable while welding long weld beads continuously.

SELECTION OF TORCH

Each type of torch has its advantages and limitations. Deciding the type of torch to be used for a particular application depends on following main factors.

- Amperage requirements
- Duty cycle
- Work site and frequent movement requirements
- Weight and flexibility of torch. This is very important for the comfort of operator
- Size of the job. This will help in deciding the length of the torch
- Manual operation or automatic usage. Based on this one can decide the torch head design, swan neck or straight head

DECISION TO SELECT EITHER GAS COOLED OR WATER COOLED TORCH

Keeping welding torch cool is necessary to protect power cable, torch head and consumables like contact tip, nozzle, insulators from damage due to radiant heat of the arc and resistive heat from the current cable.

Cooling also protects operator from heat related injuries and provides more comfortable working conditions.

Welding amperage / current is an important factor when deciding between gas cooled or water cooled system. Generally gas cooled torches are recommended for low currents up to 400 amps and water cooled torches are suitable for higher amperage conditions i.e. above 400 amps, particularly for automatic MIG / MAG welding.

Gas cooled torches are available from 150 Amps to 400 Amps; water cooled torches are available from 300 Amps to 600 Amps capacity.

Water circulating units occupy space and are difficult to move around. Where space is a constraint and welding units are frequently moved around, it is preferable to use gas cooled torches.

Range of AWL MIG / MAG Torches

Ador welding has complete range of Gas cooled MIG / MAG welding torches. Kindly refer to the chart given below. This chart will help to select the correct torch for the specific application.

Torch Model	CO-Axial/Non Co Axial	Length	Standard Torch Head Option	Option of Straight Head	Type of Torch Cooling
MTG 250	Non Co Axial	One meter to Three Meter	Swan Neck	Yes	Gas
MTG 400	Non Co Axial	One Meter to Three Meter	Swan Neck	Yes	Gas
MTG 600	Non Co Axial	One Meter to Three Meter	Swan Neck	Yes	Gas
ADOR TW 180	Co Axial	One Meter to Three meter	Swan Neck	Yes	Gas
ADOR TW 250	Co Axial	One Meter to Three Meter	Swan Neck	Yes	Gas
ADOR TW 400	Co Axial	One Meter to Three Meter	Swan Neck	Yes	Gas

PREVENTIVE TORCH AND TORCH CONSUMABLES MAINTENANCE

- Check connections between wire feeder, cable, torch, the neck and consumables on a daily basis to ensure they are tight and undamaged
- Use right capacity of torch for application to ensure there is no overheating

- Ensure duty cycle of torch is 60% for semi automatic welding and 100% for automatic welding
- While welding, take care to keep torch at the right distance from job; too long a distance will give weld defects and too short distance will make wire stick, reducing life of torch consumables
- Move the torch during welding at right speed; moving it too fast or slow will give weld defects such as undercut, incomplete fusion, (travel too fast), incomplete joint penetration (travel too slow).
- Change consumables at regular intervals

To know how to improve productivity and increase service life of your MIG/MAG torches, please contact us at cmo@adorians.com. In the next issue we will detail features of TIG welding torches.

Project Engineering Solutions

ADOR Institute of Welding Technology

Welding & Cutting Solutions

Centre for Engineering Excellence