ADVANCES IN PULSED GMAW FOR ALL POSITION WELDING

Ron Payne, General Manager
Liburdi Dimetrics
Discussion Points

- Liburdi Orbital GMAW Technology
- Inverter Based Power Supplies
- Metal Beam
- Orbital GMAW Success Stories
- Paradigm Shift from Mechanized to Automated

“Automation is the single most important growth sector in the welding industry”

AWS Paper on the Future of Welding
Orbital GMAW Solution | ‘K’ Weld Head

- Quick release clutch mechanism for rapid 360° setup, cable wrap and weld head positioning
- Compact radial & axial size
- On-board spool holder (flux core or solid core wire)
- Pipe ranging from 4” and up
- Flat plate, ID & Large diameter vessels (requires optional adapters and tracks)

Ideal for field / shop pipeline, power pipe, process pipe, overlay welding and structural.

Orbital GMAW Solution | ‘K’ Weld Head | Video

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DESIGN, PRODUCTION AND SERVICE OF WELDED CONSTRUCTIONS AND PRODUCTS

Orbital GMAW Solution | O Head System

- LCX Universal Controller with Lincoln s350 with STT
- O Weld Head
- Orbital Pendant with optional welding lens

Orbital GMAW Solution | ‘O’ Weld Head

- Spring loaded STT contact on the head eliminates standard “clamp on” set up.
- Integrates Ethernet based S350 with STT module.
- STT open root passes followed by pulse MIG or flux cored fills.
- Designed to run self shielded flux core wire.
- Encoder feedback on travel and programmable lead/lag
  - Key to success with self shielded flux core wire
  - Enables wire speed control and torch lead/lag as function of position
- Knurled wire feed rollers to accept flux cored wires
- Quick disconnect umbilical for easier setup and handling
Orbital GMAW Solution | LCX Controller

- Seamless compatibility with a variety of industry power sources.
- Fully compatible with Liburdi Dimetrics Gold Track pipe welding systems.

Choice of CABINET, PROTECTIVE SHOCK-PROOF CASE or ALL-IN-ONE ORBITAL FIELD KIT

Ideal multi-process controller is suitable for TIG, MIG and PLASMA.

Orbital GMAW Solution | LCX Controller | Lincoln s350 STT

Advantage LCX + STT
- Reliable open root pass and complete back bead
- Reduced burn-through and distortion
- Ensures excellent sidewall fusion
- Reduced Cost, using 100% CO2, lowest cost gas when welding carbon steel
- High speed quality open rootwelds

Lincoln STT | Open Root Pass with STT | Reduced burn-through
Orbital GMAW Solution | Orbital Pendant (*Optional welding lens)

- Easy to operate. No programming required.
- Improved form factor (reduced pendant height)
- Side handle support
- Optional integrated welding lens

Works well with Orbimig™, P300™, GTVI™ and GTVP™

Orbital GMAW Solution | Metal Beam

- Digital reincarnation of Dimetrics patented GMAW system from 1980s
- Highly collimated spray transfer
  - Precise pinch effect with excellent arc stability
  - Minimal expulsion events
  - Shorter arc length while maintaining spray transfer when compared to inverter waveforms
- Deep Penetration at high switching frequencies
  - Enables heavy and zero gap root welding with conventional double bevel geometry
- Based on GTVI Power Supply
  - PGMAW-GTAW switchable
  - Backward compatibility with all Dimetrics full function weldheads

STANDARD PULSED SPRAY MODE

0.045" ER70 carbon steel
280 AMPS 27V
Hydroelectric Penstock Weldment
Forest Kerr, BC, Canada

- K Head
- Pipe Size: 9.2 ID, WT: 1 and 3/4
- Number of Welds: 27
- Reject Rate: 0% (UT, MT, and VT)
- Material: SA 516 Gr. 70N
- Only equipment maintenance required during 42 day project was replacement of weld liner
K Head used to weld double wall fuel pipes which transport fuel from onsite backup fuel farms to the pump station in emergency situations.

Located half mile south of the Harvey and Algiers canals, the west closure complex consists of a navigation flood gate, flood walls, levees and a pump station.

Sole purpose is to reduce the risk to residence and businesses in this area from storm surge.

Pump station houses 11 pumps, each rated at 800,000 gallons per minute. The largest pumps ever produced.
Utilities
West Closure
New Orleans
K Head + Orbimig II

Manual welding 6 hrs to weld 24" carbon welds with semi-auto flux core.

Machine welding 25 minutes each, rolling and 30 minutes doing vertical ups and 2G.

Lauren

PIPE WELDING SYSTEM:

- Repair rates 0.6%.
- Labor savings per weld 67%.

- Welders were able to produce three welds for every one made by conventional (manual) means.
- Number of certified welders required was reduced.
Orbital mechanized MIG welding using Liburdi Dimetrics (K-Head), LCX controller and Miller/Lincoln power supplies.

Typical Results:
- 50%–70% labor hour savings versus manual SMAW process
- Higher duty cycle due to increased "arc on" hours (as high as 80% vs. 25%)
- Higher operator efficiency vs manual welding:
  - Typical manual efficiency - 40%/50%, Typical mechanized efficiency - 90%
  - Less operator fatigue especially welding pre-heated pipe
- Higher weld deposition rates - 3.4 lbs/hr vs 8-9 lbs/hr (1.4–1.8 kg/hr vs 3.6–4.1 kg/hr)
- Lower repair rates (usually 0.5% or less)
- Lower joint prep time using standard V-bevel or compound bevel
- Can tolerate joint gap up to 0.157" (4mm) and misalignment up to 0.079" (2mm)
- Controlled heat input assists with high tensile material (X80, X100) and duplex steel welding

Sample Weld Program:
20" dia. x 0.500" wall (508mm x 12.7mm)
- Material – Carbon Steel Pipe, 30° V-bevel
- Weld Time – 45 minutes
- Average Deposition Rate – 6.2 lbs/hr (2.8 kg/hr)
- Using manual SMAW weld would have a weld time of 90 minutes.
  Cost per joint would be approximately 100% higher.

36" dia. X 0.688 wall (900mm x 17.5mm)
- Material – Carbon Steel Pipe, 37° V-bevel
- Weld Time – 165 minutes
- Average Deposition Rate – 6.4 lbs/hr (2.9 kg/hr)
- Using manual SMAW weld would have a weld time of 336 minutes.
  Cost per joint would be approximately 100% higher.

24" dia. X 1.81 wall (610mm x 50mm)
- Material – Carbon Steel Pipe, compound bevel 37°/10°
- Weld Time – 11.3 hours
- Average Deposition Rate – 6.3 lbs/hr (2.9 kg/hr)
  * Using manual SMAW weld would have a weld time of 23.7 hours
Development
Paradigm Shift from Mechanized to Automated Welding

- Coordinated motion of torch theta and Oscillation axes for improved sidewall fusion on conventional prep
  - “Walking the Cup”
- Improved torch proximity control based on GTAW AWC technology
  - Automatic Height Control (AHC)
- Improved weld vision using digital imaging technology
  - Utilize weld pool imaging for seam tracking and adaptive fill
- Heavy land (.13") (3.3mm) conventional bevel machine root using Metal Beam technology

Liburdi FireOptic lens
1920x1200 resolution Scaled to 720P Digital Capture
Thank You

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