HYBRID LASER ARC WELDING (HLAW)
HLAW Welding Process
HLAW Process

**Laser**
- Full penetration
- High welding speed
- Low heat input

**GMAW “MIG”**
- Fills joint
- Slower weld cooling
- Gap & fit-up tolerance

**Weld Characteristics**
- Excellent weld quality
- Small Heat Affected Zone (HAZ)
- Fine grain structures

**Cost Advantages**
- Single pass full penetration from one side
- High productivity/speed
- Low consumable costs
Slow Motion Video

Laser Hybrid Welding

Mild Steel
Bead-On-Plate
5 kW, 1 m/min
HLAW Single Pass Full Penetration Weld From One Side
SAW vs. HLAW

**SAW**

Travel speed 12-15 in/min
3/8” Thick
60% Penetration

**HLAW**

Travel speed 75 in/min
3/8” Thick
100% Penetration
HLAW Weld Test (PQR) Macroetch

HLAW
0.188” Thick
10x Magnification

HLAW
0.375” Thick
7x Magnification
HLAW Weld Procedure Qualification

- AWS D1.1-2010 Structural Welding Code-Steel
  - Categorized as “Other Welding Processes,” per Clauses 3.2.3 and 4.16.2
  - Permitted per Clause 4.16.2 by Customer approval of PQR and WPS
  - Process variables established and agreed upon by Contractor and Customer

- Procedure Qualification Record (PQR)
  - Weld tests including inspection/mechanical results

- Welding Procedure Specification (WPS)
  - Weld recipe based on PQR