

Laser Welding Technology Engineering Manual Description

The main objective of the HDE Laser Welding Technology Engineering Manual is to explain the behavior of materials during laser welding and how the quality of the laser beam, beam delivery optics, tooling, weld geometry and shielding gases affect it. The Algorithms supplied with the Manual will assist you computing the weld schedules for conduction and keyhole weld. Computing the pulse shape and optimizing it to reduce transient heat and minimizing heat input.

Basic concepts in material processing

Classification of materials – material behavior
Critical characteristics of the laser beam

Industrial lasers and optics– selection of lasers for welding
CO₂, Nd:YAG, Direct Diode, Disk and Fiber lasers
Beam delivery optics, including process fibers
Laser beam metrology – selection of diagnostic devices

Pulsed laser welding

Characteristics of pulsed welds
Computation of pulsed laser parameters – home work
Computation of the pulse shapes –home work
Optimization techniques – **transient heat and cooling rate**
Examples of Industrial Applications

Continuous power (CW) laser welding

Characteristics of CW welds
Setting up a new CW laser welding job
Computation of pulsed laser parameters – home work
Optimization techniques – temporal and spatial
Examples of Industrial Applications **including LAM**

Metallurgy of laser welds

Surface preparation techniques
Alloying systems (several)
Welding dissimilar metals

Filler metals - selection
Re-welding laser welds

Weld geometry and shield gases

Tolerances for lap welds, butt and fillet welds
Tool design
Guidelines to handling **transient and bulk heat**
Selection of shielding gases – including use of air
Effect of the shielding gas on weld quality

Weld defects their sources and corrective actions.
Weld joint, heat sink, **surface tension**, etc.

Weld inspection methods

Conventional destructive – metallography
Non destructive – laser based ultrasonic, etc.

Real time weld monitoring

Documentation control

Relevant EN, ISO and AWS Standards
Review of the revised AWS C7.4 Laser Welding Standard.
Comparison of the EN, ISO and AWS Laser weld standards
How to define process parameters that are NOT covered by published Standards.

Coverage of **LASER WELD DEFECTS** and analysis of weld defects

1. Preventing weld defects (and then real time weld monitoring) is easier than correcting them afterwards!
Identifying weld defects and the sources of the defects are well covered in this book.
Look at the statics below.
2. Here are some statistics:

Total pages in the manual = 700 + hand-outs

- 35+% of the course is directly related to weld defects.
- 66+ photos and illustrations related to weld defects.
- 20 complete sections of the manual related to weld defects.
- 8 computational algorithms that relate directly to weld defects.
- Weld inspection methods (traditional) = several complete sections.
- Weld inspection methods (real time weld monitoring) = 3 sections,
- 127+ illustrations, 2 PPT, 1 video, and (time permitting) class demo of a working LWM system!
- Homework assignment: Use the supplied HDE mathematical algorithms to solve defective laser welds!

Take home the ‘text book’ on laser welding!

- This is the Laser Welding Technology Manual that was developed over the years and used in the Laser Welding classes presented by HDE.
- The HDE Welding Classes attracted thousands of professionals over the last **42 years!**
- These professionals came from major corporations, including from the ‘National Labs’.
- Attend and learn how to optimize the productivity of your laser welding process!
- **Minimize TRANSIENT HEAT, control the cooling rate to minimize DISTORTION and damage to adjacent materials**
- Adapt this information to Laser Additive Manufacturing (**LAM**)
- Learn how to achieve and maintain consistent quality laser welds!
- Learn how to maintain your competitive edge in the International manufacturing market!

Continued >>>>

