Laser Welding in SUS Tube Manufacturing

In metal tube forming and welding – most often it is the weld that is the weak point. This is due to a change in the metal structure (grain size) during the welding process – exposure to extreme high temperature. Often the tube are annealed at very high temperature to bring back this welded area back to its original metal form or grain size. The customer must ensure a perfect uniform grain size in the metal structure after welding and as such annealed the tube after forming and welding.

This process of annealing either in-line or off-line is quite cost intensive and not always a necessity – then it is the weld quality that play a major role.

As you may know both TIG and Plasma Welding will leave a large Weld Bulge (weld over-thickness on the surface of the tube) and Weld Sag (weld overthickness on the lower side of the welded area) also the actual weld area is very large and the actual grain size in this area very large indeed. Often impurities are also dragged in to and fused in to the weld area during the weld process. The weld can often be seen as the ‘brittle’ part of the tube and will break / split either in the weld seam area or directly next to it during heavy load – or expansion and pressure as occurs during the corrugation process for example.

Many companies currently use Austentic Steels such as 1.4301 (SS 301) – high quality stainless steels for these applications which will allow both TIG, Plasma welds as well as Laser welds. The Laser weld given that we have practically no weld bulge or sag and the area is very small of the weld seam there is also minimal change to the grain size – will always lead to the Laser Weld being much better and stronger.

Companies such as corrugated pipe often try to reduce cost by moving to Ferritic Materials Steel and here the TIG and Plasma weld will have quite an impact – (negative) on the strength of the actual weld seam. Often these tubes will fail the burst tests. The nature of the composition of the steel is that during the process the weld is impacted. In Laser welding this does not occur. (Here we could write a whole University thesis on the subject and the impact of welding on steel etc.) Hence Laser welding is much favoured which works well for all processes.)
THE Production Equipment for Metal-Plastic Multilayer Pipes

Process steps

- Metal tape
- Precise forming stations
- Metal pipe before welding
- Laser welded metal pipe (Wall thickness down to 0.08mm)
- Metal pipe after coating
- Metal pipe wound on coils

Dual tape pay-off
- Laser cross welder
- Tape accumulator
- Tape capstan with tension control
- Forming stations and longitudinal laser welder
- Coextrusion in dual layer cross head
- Dual coiler
Special metal plastic pipe production solutions

- Multi Layer pipe welding systems
- MP Metal plastic pipe production systems
- MP Automotive precision pipe production systems
- Precision metal pipe production plants in stainless steel, Inconel and other alloys for the automotive and aeronautic industries
- OVM Overlap metal plastic pipes including products with continuous perforated tapes
- Foam insulated PEX + multi layers pipes

Irrigation pipe production systems

- Irrigation thin wall pipes with flat dippers
- Irrigation thick wall pipes with flat PC or NPC dippers
- Irrigation pipes with cylindrical dippers
- Irrigation tapes
- Complete production plants
- Quality control solutions

Components

- Metal tape accumulators
- TIG cross welders
- Laser cross welders
- Laser punching machines
- Special equipment
- Spool or coil wrapping equipment
- Etc.

Subject to change in order to follow progresses
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MP Metal-Plastic Multilayer Pipe Production Equipment

Construction with up to 3 layers composed of:

Metal layer in Copper – Steel or Aluminium
Glue layer for perfect bonding
Outer pipe with different resins including cross linked Polyethylene

MP Pipe

- Very even layer distribution
- High production speed
- Laser welding for thin wall liners down to 0.08 mm thickness
- TIG welding for thicker products
- Equipment for continuous production including TIG and laser cross welder
- Strip calibration for optimum welding
- Very compact implantation of the line