Welding of cast iron material

Application fields for cast iron welding are

- Repair welding
- Production welding
- Construction welding.

Repair welding is to recondition damaged (cracked, broken or worn out) cast iron parts by welding to ensure further use.

Production welding means that a welding is needed within a production process of a cast iron part to ensure particular properties. Such weldings may be repair of foundry defects, correction of measurements or claddings.

Construction welding is to join cast iron parts to components of other materials in a construction unit. Casting parts used in this field are usually made of nodular- or malleable cast iron. Typical weldings are
- tubes and flanches made of ductile cast iron
- joining of cast iron with un- or high alloyed steel
- welding of wear resistant Mn-steel plates on to cast iron.

In general, 2 methods of cast iron welding are used:
- cold welding with non-matching consumables
- hot welding with matching consumables.

Hot welding
Hot welding is done with electrodes, gas welding rods or cored wires giving a colour and structure matching deposit.

Hot welding of cast iron needs a high pre-heating temperature of 400-650°C, depending on the size and shape of the part to be welded. Due to the high pre-heating and the additional high heat input through the welding process a large welding pool with a slow cooling rate is made. In consequence, hot welding is only suitable for flat position welding. The slow cooling or eventual post weld heat treatment gives a crack-free weld without any hardness peaks. The mechanical values can, depending on the heat treatment, reach the values of the base material.

Cold welding
For cold welding of cast iron electrodes MIG- and TIG-wires on iron-, nickel- and copper base are used. Parameters and procedures are selected to prevent excessive heating in the weld area. A temperature of max. 60°C should be maintained to avoid heat stress. Peening of the weld deposit helps to reduce welding stress. The advantages of cold welding in a repair weld are the possibility of positional welding and the prevention of deformations. In many cases the parts can be welded without having to be dismantled.

Production- and construction welding can be made without long thermal treatments and within a short time span. The heat load on the welder is very small by comparison to hot welding.

Groove preparation
For repairs the groove is made by gouging, by grinding or by chiselling. The gouging electrode is preferably used on heavy sections and on dirty, burnt or chemically affected cast iron parts.

The casting skin should be removed in the welding area to prevent binding failures due to impurities and oxides usual in such a skin. Prior to welding, residues of grinding wheels should be removed carefully. Oily parts can be treated with an oxyacetylene flame. On bad quality cast iron it may be necessary to remove the first deposit several times over, due to poor binding or due to excessive porosity, until a sound deposit can be obtained.

The notch effect of cracks can be reduced by drilling holes, one at each end of a crack. The crack itself should be prepared in a tulip form with generously rounded edges.