

THERMIT WELDING

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WHAT IS THERMIT WELDING ?

Thermit Welding is a welding process utilizing heat generated by exothermic chemical reaction between the components of the thermit (a mixture of a metal oxide and aluminium powder).

The molten metal, produced by the reaction, acts as a filler material joining the work pieces after solidification.

Thermit welding is an effective, highly mobile, method of joining heavy section steel structures such as rails.

Essentially a casting process, the high heat input and metallurgical properties of the Thermit steel make the process ideal for welding high strength, high hardness steels such as those used for modern rails.

THE PROCESS OF THERMIT WELDING

The necessary heat for joining metal of thermit welding is obtained from chemical reaction of metal oxide and metal reducing agent. Usually iron oxide is used as a metal oxide and aluminium or magnesium is used as metal reducing agent. The strong chemical attraction of aluminium for oxygen is the basis for thermit process.

First the thermit mixture is ignited by a burning magnesium ribbon. The ignited temperature of thermit is about 1200 ° C. When ignited in one spot of mixture, the heat reaction spreads through the mass.

The aluminium merging with the oxygen of metal oxide and setting free the iron, which is deposited on joint portion into the mold as a highly superheated liquid metal. If theoretical temperature is about 3000 ° C of thermit, due to chilling effect of crucible the temperature is reduced about 2500 ° C. So it is sufficient for welding temperature.

Thermit Welding is mainly used for joining steel parts, therefore common thermit is composed from iron oxide (78%) and aluminum powder (22%). The proportion 78-22 is determined by the chemical reaction of combustion of aluminum: $8Al + 3Fe_3O_4 = 9Fe + 4Al_2O_3 + HEAT$

The combustion reaction products (iron and aluminum oxide) heat up to 4500 ° F (2500 ° C). Liquid iron fills the sand or ceramic mold built around the welded parts, the slag (aluminum oxide), floating up, is then removed from the weld surface.

Thermit Welding is used for repair of steel castings and forgings, for joining railroad rails, steel wires and steel pipes, for joining large cast and forged parts.

ADVANTAGES

The heat necessary for welding is obtained from a chemical reaction and thus no costly power supply is required. Therefore broken parts (rails etc.) can be welded on the site itself.

- * For welding large fractured crankshafts.
- * For welding broken frames of machines.
- * For building up worn wobblers.

- * For welding sections of castings where size prevents there being cast in one piece.

- * For replacing broken teeth on large gears.
- * Forgings and flame cut sections may be welded together to make huge parts.
- * For welding new necks to rolling mill rolls and pinions.
- * For welding cables for electrical conductors.
- * For end welding of reinforcing bars to be used in concrete (building) construction .

LIMITATIONS

Thermit welding is applicable only to ferrous metal parts of heavy sections, i.e., mill housings and heavy rail sections. The process is uneconomical if used to weld cheap metals or light parts .

EXEMPLES

Railroad thermit welding exemple: <http://youtu.be/5uxsFglz2ig>

Railroad thermit welding explained animation: <http://youtu.be/7MKnrhs9ock>