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MODULE 5

Special methods of fusion welding

Diffusion welding



Diffusion welding

- Diffusion welding in the solid state is defined as a method of achieving a monolithic connection formation of bonds at the atomic level and is governed by Fick's laws.
- Fick's laws of diffusion defines the diffusion flux of atoms of elements which is proportional to the diffusion coefficient of the components and their concentrations, depending on the distance.
- Second Fick's law defines the rate of change in concentration and can be used to determine the time required to create a diffusion joint.
- The actual concentration of metal in the welding process occurs under the influence of temperature and specific pressure corresponding to the contact surfaces.
- Joint approach consists of contact surfaces due to local plastic deformation guaranteeing mutual diffusion in the surface layers of the joined materials.



Stage process of diffusion welding

- Deformation Surface inequality occurs upon initial contact.
- In the second stage are moved vacancies and dislocation.
- Intensive diffusion processes occur in the third stage (in particular, bulk diffusion, surface diffusion less).



For diffusion welding are important to these parameters

- ▶ Temperature
 - ▶ It is influenced by the melting temperature of the material
- ▶ Pressure
 - ▶ Used 10 MPa - 20 MPa
- ▶ Time
 - ▶ It ranges from 3 minutes to 60 minutes according to the parameters material
- ▶ Great influence on the welding process and the environment in which welding is carried out (vacuum).



Benefits diffusion welding

- Possibility of connecting the thin and thick wall materials
- Weldability and very dissimilar materials
- Arises casting structure
- Parts do not deform, eliminating the mechanical machining after welding
- Hygienic environment without radiation, dust and fumes
- Process without directly affecting operation



Disadvantages diffusion welding

- ▶ Limitations dimensions size of the chamber weldments
- ▶ High equipment price
- ▶ Long welding times
- ▶ Difficult joint preparation



Safety diffusion welding

- ▶ Diffusion welding is a highly hygienic, because workers are not exposed to the effects in the classical welding and the contents of the vacuum chamber should be in the case of pollutants discharged to the atmosphere.
- ▶ From for contamination of the chamber and the surrounding environment recommended welded zinc, cadmium, lead and others.