Shockwave Metalworking Technologies (SMT)

Explosion Cladding by Vacuum Technology

Whatever it is:
Small or Large, Thin or Thick, Standard or Exotic, Rain or Sunshine
We will Clad it for you

Innovations & Efficiency are our Secret
Preface

Explosive cladding is also known as explosion welding. It is the bonding of two or more dissimilar metals with the aid of explosives. It is accomplished by a high-velocity oblique impact between two metals. The impact produces sufficient energy to cause the colliding metal surfaces to flow hydrodynamically when they intimately contact one another in order to promote solid-state bonding. The metal surfaces are compressed together under high pressure from the explosion, and an atomistic bonding between the dissimilar metals will be accomplished.

Explosive cladding is a cold ‘pressure weld process (at room temperature)’. It is a method to weld metals that cannot be welded by conventional processes, such as titanium-steel, aluminium-steel and aluminium-copper. It can also be used to weld compatible metals, such as stainless steels and nickel alloys to steel.

The cladding metals are typically stainless steel, duplex steel, titanium, aluminium, copper, copper alloys, nickel, nickel alloys, tantalum, and zirconium. The base metals are typically carbon steel, stainless steel, alloy steel, copper and aluminium.

Explosion-welded clad metals are used in a wide range of industries like: oil and gas, chemical and petrochemical, desalination plants, steel mills & hydrometallurgy, aluminium smelters, shipbuilding, power generation, and other industries where corrosion, temperature and pressure are important parameters.

Main Cladmaterial Applications:

1. Corrosion Resistance layer
2. Aluminium / Steel - Transition Joint: Triplate®
3. Electrical Transition Joint (Anode - Cathode blocks)

Introduction

Shockwave Metalworking Technologies BV (SMT) was established in 1962 and involved in explosive cladding for more than 40 years. In 1985 a vacuum chamber for explosive cladding was developed.

At the moment 3 chambers are in use for the production of different type of clad plates. The largest chamber we developed is 15 meter long and almost 7 meter in diameter. SMT is an innovative and flexible company.

We offer a wide range of clad plates at competitive prices and within a very reasonable delivery time.

Because of our unique vacuum explosion technique, we can handle all type of material combinations and projects of different sizes. This technique is designed to protect the environment and to serve our clients.
Fabrication Process

The cladding process is started with the preparation (Grinding and Cleaning) of the surface of both base material and clad material. The clad material is placed on top of the base material and between the two materials we place spacers to keep an appropriate ‘stand-off’.

The assembly of the materials is accomplished in accordance with the clad set-up parameters (stand-off gap, quantity of explosives, surface protection, ignition point).

The clad assembly will be put in the vacuum chamber, on top of a prepared sand bed. The powder explosives will be applied on the clad surface together with the booster charge. After placing the electrical detonator, the vacuum chamber will be closed and the evacuation of the air will start.

When the under pressure reach the required value, the detonation of the explosive charge will take place by ignition the detonator at the control room. The cladded plates will be further prepared for finishing: Visual check, flattening, US examination, DT/NDT and packed for transport.
Applications

Our explosion-welded clad metals are used in different industries:

- Oil and Gas (Onshore & Offshore)
- Chemical and Petrochemical Desalination Plants
- Steel mills & Hydrometallurgy Aluminium Smelters
- Shipbuilding
- Power Generation
- Electrochemical
- Air-conditioning & Chillers Cryogenic
- Food & Beverage Pharmaceutical
- Pulp & Paper
- Mining
- Nuclear
**Materials**

The cladding metals are typically stainless steel, duplex steel, titanium, aluminium, copper, copper alloys, nickel, nickel alloys, tantalum, and zirconium.

The base metals are typically carbon steel, stainless steel, alloy steel, copper and aluminium.

<table>
<thead>
<tr>
<th>Cladding Metals</th>
<th>Base Metals</th>
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<tbody>
<tr>
<td>300 series SS</td>
<td>PLATES</td>
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<tr>
<td>400 series SS</td>
<td># CS A-55, A-516, A-537</td>
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<tr>
<td>Duplex &amp; Super Duplex</td>
<td># Alloy Steel A-387, A-204</td>
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<tr>
<td>Nickel Alloys</td>
<td>FORGINGS</td>
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<tr>
<td># Alloys 200, 400</td>
<td># CS A-266, A-350</td>
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<td># Alloys 600, 800</td>
<td># Alloy Steel A-387, A-204</td>
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<td># Alloys 625, 825</td>
<td>SS PLATES &amp; FORGINGS</td>
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<td># Alloys 900</td>
<td># 300 series</td>
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<td>Zirconium</td>
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<td>Tantalum</td>
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<td>Other Metals (on request)</td>
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**Product Type**

- Flat plates (square/rectangular)
- Round discs (heads/tube sheets)
- Pipes / LWN.

**Sizes / Capacity**

- Maximum Length: 11000 mm
- Maximum width: 4200 mm
- Maximum total area: 25 m2.
- Maximum piece weight: 25 MT
- Base material thickness: 1 - 500 mm
- Clad material thickness: 1 - 25 mm
**Advantages of Explosion Cladding under Vacuum**

- Short delivery time: complete production under one roof
- Excellent process control (no weather influences and circumstances)
- Because of vacuum, less explosives are required.

As results:
  - Less deformation
  - Hardness of the clad plate slightly increase
- Costs saving: thin layer of expensive material cladded on a thicker layer of cheap material.
- Metal combinations possible which are conventional impossible to weld.
- Original metal properties maintain.
- Joint/bond stronger than the weakest material.
- Oxide free atomic bond
- Electrical resistance of anode / cathode blocks nil.
- Required clad layer thickness in 1 step realized
- Smooth surface after cladding
- Intermediate quality control not necessary

**Quality & Testing**

- Procedures acc. To ISO 9001 (since 1992)
- Testing of the explosive cladded material:
  - Ultrasonic Testing
  - Destructive testing:
    # Tensile test
    # Bend test
    # Shear test
    # Impact test
    # Fatigue test
Independent inspection authorities: Lloyd’s, TUV, Stoomwezen, GL, DNV, ABS, Bureau Veritas, etc.
Certificates acc. to EN 10204 3.1, A, B, C of 3.2.
Our Market Areas

We are proud
To serve you

Shockwave Metalworking Technologies BV
Scherpenbergsebaan 49
4721 ST - Schijf - The Netherlands
P.O. Box 50, 4715 ZH - Rucphen - The Netherlands
Tel.: +31 165 343451
Fax: +31 165 343589
E-mail: info@smt-holland.com / info@triplate.com
Internet: www.smt-holland.com / www.triplate.com

SMT Clad Middle East FZE
P.O. Box 261298
Jebel Ali Free Zone
Dubai - United Arab Emirates
Tel.: +971 4 8871371
Fax: +971 4 8871372
E-mail: smtclad@eim.ae
Internet: www.smt-holland.com