LASER CLADDING

Surface treatment with minimal deformation

Surface treatment with minimal deformation

Laser cladding is a locally applicable welding technique. The biggest advantages of this technique are the minimal deformation of parts during cladding and the cost-reduction, since you can save on a new part and at the same time the properties of the material are kept.

It is applicable in almost any industry that involves metals. Think for example of petrochemical, power industry, bulk- and container handling, paper industry, maritime industry, offshore industry, etc.

Examples of applications:

Run-down/worn out shafts, bearing pockets, valves and valve fittings, seals, cylinders, turbine blades, spread keyways, etc.

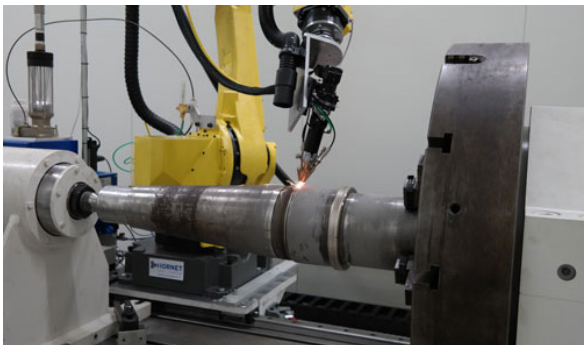
Dimensions:
- Shafts with a length of up to 8 meters and an outer diameter of 3-4 meters.
- Objects that can be placed on a rotation table with a height of 3 meters and an outer diameter of 3-4 meters.
- On-site service: the lasercladrobot is fully mobile and can therefore be used on location.

Quick action

With the advent of our new lasercladservice we are capable of fully unburdening you. Together with our service-oriented assembly division and machining division, the years of broad experience of our engineers and our own transport division, we can offer you a complete package.

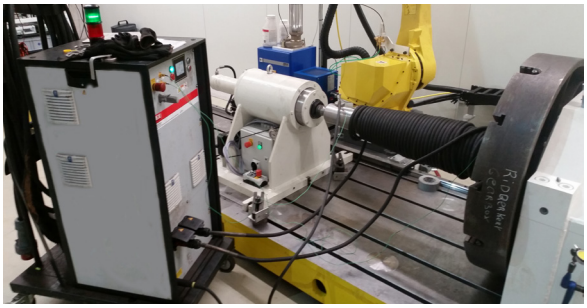
Using these capabilities we will return your workpieces to you as quickly as possible, in original conditioned state, so that you can fully utilize your parts as soon as possible.

We will advise regarding the best solution and proceed to overhaul or preventively treat your workpieces.

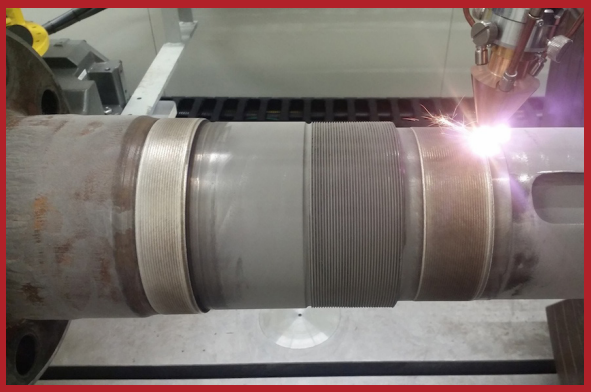


Heat treatment for the improvement of the final quality of lasercladding

In the initial development phase in the field of laser cladding, crack formation was the only serious risk. We are now capable of wholly estimating these risks. Therefore, in some cases we will still advise against cladding. We have also developed a heating process with which we can minimize the risk of cracking.



The workpiece is heated using induction. For this procedure, cables are placed around the workpiece.



Is lasercladding an option?

This technology is a relative newcomer on the market, and thus still raises questions:

- Can this size/shape be cladded?
- What added material is used?
- What can we expect in comparison with other surface treatment techniques?
- Why should we leave our "old" trusted technique?
- And many other questions could be raised

We will always strive to achieve a fitting solution for your workpiece. We will give honest and transparent advice. These core values are important to us, so we will never accept work of which we are not 100% sure it is feasible with our lasercladrobot.

Service-oriented and cost-saving

With the arrival of our lasercladunit a new team has been appointed that is able to unburden you with respect to reparation and prevention treatment of your parts. Examples are restoration to original dimensions and application of corrosion- and wear-resistant layers.

The team is composed of two employees that are completely focused on lasercladding. Dennis Kweldam is the lasercladspecialist in charge of full treatment of the workpiece, and Clark Kloos and Bas Versnel are responsible for the commercial side of the business-unit.

You can count on a team that guarantees a fast and professional treatment of your parts. Additionally, you are welcome to contact us through your usual contact.

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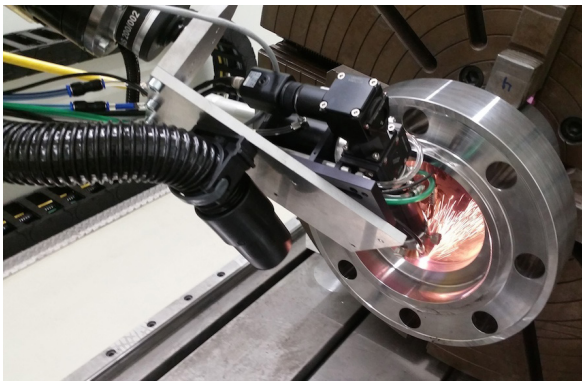


GBS laser cladding quality control

In order to provide the customer with an optimal product, we at GBS perform extensive testing on the quality of the cladding material. It is always our goal to produce perfect cladding quality. For each clad- and basic material GBS checks for the following aspects:

Visual inspection

The outside of a cladding layer can tell a lot about the expected material quality.

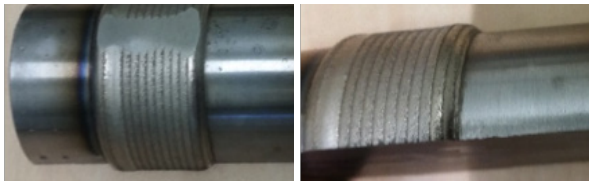
The quality is judged based on external defects (cracks, pores, etc.)

Surface of a pure cobalt-chrome cladlayer (left), crack formation in martensitic stainless steel (right).

Destructive testing

After an initial inspection on defects in the surface several cross-sectional cuts are made to inspect the cladlayer on different levels.

A hardness measurements on several points is also made through the layer wherever the hardness of a layer is also a good indicator.



A cross section of a test piece (right)

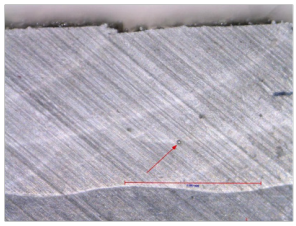
Macrolevel

The contrast can be enhanced (by means of etching the cross-section) between the base material, transition layer and cladding material. The cross-section is placed under a digital microscope, and the weld is inspected with a magnification of 20 to 200x.

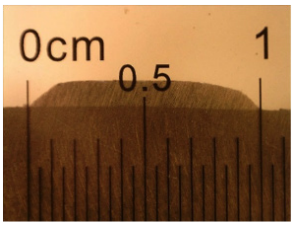
Several cladlayers at different magnifications, clearly visible contours and transition layers.

On the cross-section a check on macro-level for material defects is done for:

- Presence of subsurface pores
- Cracks below the surface
- Impurities
- Layer thickness
- Transition layer
- Overall weld quality/purity



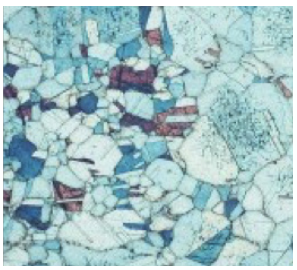
Impurity in cladding layer, less than 1 micron



Checking weld size

Micro level

In addition to the standard quality control there are other options to clad and test various material combinations, based on research. The material can be inspected on a micro level in the laboratory, with inspection of the weld quality at the crystal level.



Crystal structure of an etched test piece, viewed under a microscope at 500x magnification.

Also other mechanical properties can be obtained by means of, among other things, tensile tests, hardness measurement, etc.

Our lasercladunit in Oud-Beijerland

Here you see depicted the lasercladunit, where we manufacture your workpieces in a professional manner under the highest safety standards.

Our lasercladunit can be used on-site

Transport package

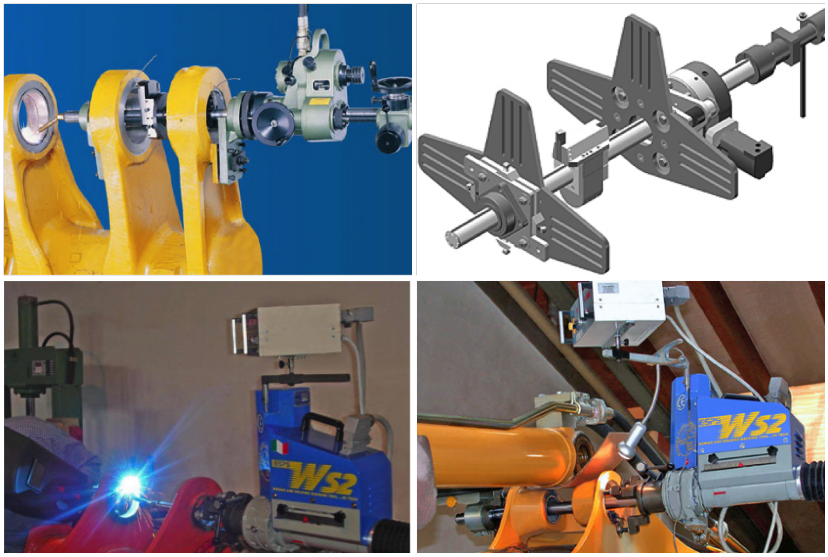
Control boxes 50kg, L900 B700 H400 and 50kg, L600 B600 H800
Optical cooling 20kg, L510 B450 H710
Powder feeder 15kg, L400 B400 H1500

We are currently developing auxiliary machinery for the cladding of shaft journals and drilling holes on-site. In the future we will also combine this with on-site machining.

Depending on the application, we need to bring the following equipment:

Manipulator for drilling hole / shaft tap

50 kg L1000 B400 H 400



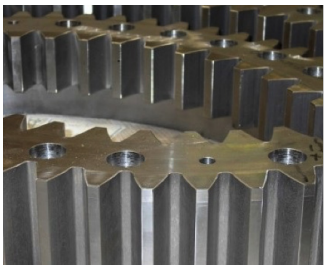
Free-form robot

400kg, L800 B1500 H 1700
50kg, L600 B400 H400 and 100kg, L700 B500 H800

Laser cladding is often a better alternative

Boriding

Boriding is a thermal chemical surface treatment of ferrous metals, which results in a very hard and wear resistant surface made of iron boride.



Properties of boriding

- Hard and wear resistant surface after operation
- Reasonable corrosion resistance
- After surface machining hardened surface
- Heat transfer between 500C - 1000C.
- Thermal chemical surface treatment

Laser cladding as alternative

- In addition to applying hard, wear-and corrosion-resistant layers laser cladding is very suitable to bring back parts to original dimensions.
- No chemical process to make hard and wear-resistant layers.
- Perfect corrosion resistance.
- Minimal heat input and therefore low risk of distortion.
- For each purpose, there is a suitable additive material which has the best characteristics for the environment of the workpiece
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Wire spraying

In autogenic wire spraying a metal wire is melted in a gas / oxygen flame and is atomized with compressed air. The flame temperature at autogenic wire spraying is 2,800 to 3,200 ° C. This enables different metals and alloys to be sprayed. Autogenic wire spraying is often used for corrosion protection and repair purposes. The adhesion obtained with autogenic wire spraying is mainly mechanical. Chemical and physical factors play a small role. The injection layer is durable.

Properties of wire spraying

- Mechanical cover layer
- Wear-resistant spray layer.
- Flame temperature is 2800C -3200C

Laser cladding as alternative

- A metallic coating, which means that the filler material is connected with the base material.
- Wear-resistant and corrosion-resistant layer after lasercladding.
- Heat input to the workpiece is minimal.

Hard chrome plating

With hard chrome plating you can provide your workpieces with flow and anti-adhesive properties. The treatment creates a layer on the workpiece with good adhesion properties with respect to the parent material. Different materials, such as steel, cast iron, bronze alloys and stainless steel are suitable for hard chrome plating. You can use hard chrome plating on worn-out parts and thus save on buying new parts. Hard chrome is generally used to protect the workpiece against formation of corrosion and wear layers.

Properties of hard chrome

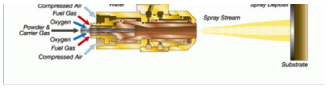
- Wear-resistant and corrosion-resistant layers.
- Surface treatment.
- Available for preventive work and repairs.
- From 2017 onwards the legislation will be tightened for (chemical) chromium processing. Only authorized companies holding a license may still hard chrome plating.

Laser cladding as alternative

- Specific additional materials used to make workpieces corrosion and abrasion resistant.
- Filler material is mixed together with the base material.
- Can be used for (local) recovery and preventive machining of the workpiece.
- High powder efficiency.

HVOF spraying

The HVOF spraying process differs fundamentally from other thermal spray processes in that the powder particles are transported with a very high speed and a low temperature to the workpiece. It forms a coating, for example, a stellite coating, on the substrate with a high density and a particularly high adhesion value.



Properties of HVOF spraying

- Coating with a high density and a particularly high adhesion value.
- Fine microstructure.
- Good anti-corrosion properties after surface treatment.

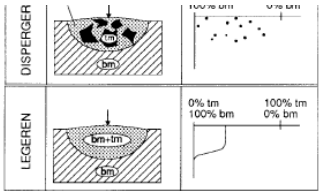
Laser cladding as alternative

- Filler material and base material retain their specific properties, and mix together in the workpiece, resulting in better properties of the part.
- Corrosion resistant after treatment, and with the specific filler material also very durable.
- Metallic coating with anti-corrosive properties and / or wear-resistant layer.

Laser cladding is often a better alternative

Laser alloying / dispersing

During the processes mentioned above, extra material is added to the base material. With laser alloying the added material is molten, in contrast with laser dispersion, where the material does not melt.



Properties of alloying/dispersing

- Capable of increasing hardness significantly
- Mechanical connection.
- Wide range of additional materials possible.

Laser cladding as alternative

- Application of hard layers.
- Metallic coating with anti-corrosive properties and / or wear-resistant layer.
- Corrosion resistant after cladding of the part.
- Additional material is determined based on the base material and purpose of the part.
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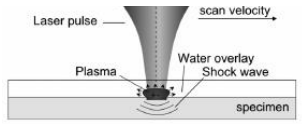
Laser shock hardening

During laser shock hardening, which is also known as laser peening, a strong shock wave is produced by means of a strong short laser pulse that acts on the workpiece surface. Usually, at the same time a transparent material (e.g., water) is applied to the base material in order to increase the pressure build-up. During this process, the material is deformed and will subsequently yield higher hardness, provided that it is one of the metals which exhibit work reinforcement (aluminum, titanium and manganese).



Properties of laser shock hardening

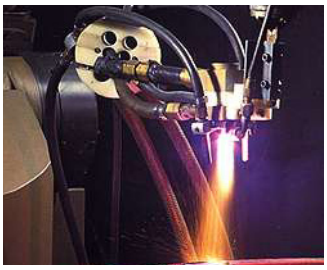
- High hardness yield.
- Reinforcement of the microstructure of the part.
- No cost for additional materials used.

Laser cladding as alternative

- Part is corrosion and abrasion resistant, if desired, after cladding.
- Improvement of the base material.
- Through the addition of powder, the workpiece has improved properties after treatment.

Plasma spraying

Plasma is the name that is given scientifically to a gas when it is used in a state of increased energy. It forms, in the set of states of aggregation as solid, liquid and gas, the fourth state. Plasma is a strongly dissociated and ionized gas stream of very high temperature and energy content.



Properties of plasma spraying

- Fine microstructure.
- Anti-corrosion properties.
- Low porosity
- Diverse material choices.

Laser cladding as alternative

- Retention of properties of the base material and powder.
- High corrosion resistance.
- Each filler material has its specific property.
- Minimal heat input so minimal distortion

Speedi Sleeve

An oil seal only closes tightly when the tread on the shaft meets very high standards. This area should not be too smooth or too rough, show no trace of machining or mechanical damage and be completely free of corrosion. Shafts which have been post-processed by means of honing, grinding or blasting, frequently visually appear to have the appropriate roughness. In reality, however, these treatments hide a screw-shaped profile that was caused by pre- or after-machining. This profile has a pumping action that lets out the lubricant or (the other way around) dirt to the inside. A Speedi-Sleeve is a stainless steel (steel 304) sleeve with a thread that meets the highest standards. Thus, the Speedi-Sleeve is a component that will save in the cost of a new shaft, because much lower requirements need to be imposed on the shaft itself.

Properties of Speedi Sleeve

- Repairing worn shafts.
- Save on new parts.
- Fast processing.

Laser cladding as alternative

- Restoration to original dimensions and preventative work.
- Save on buying new parts.
- Long lifespan.
- Improvement of the base material.
- Corrosion and wear resistant (if desired) after cladding.

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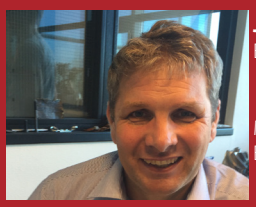

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