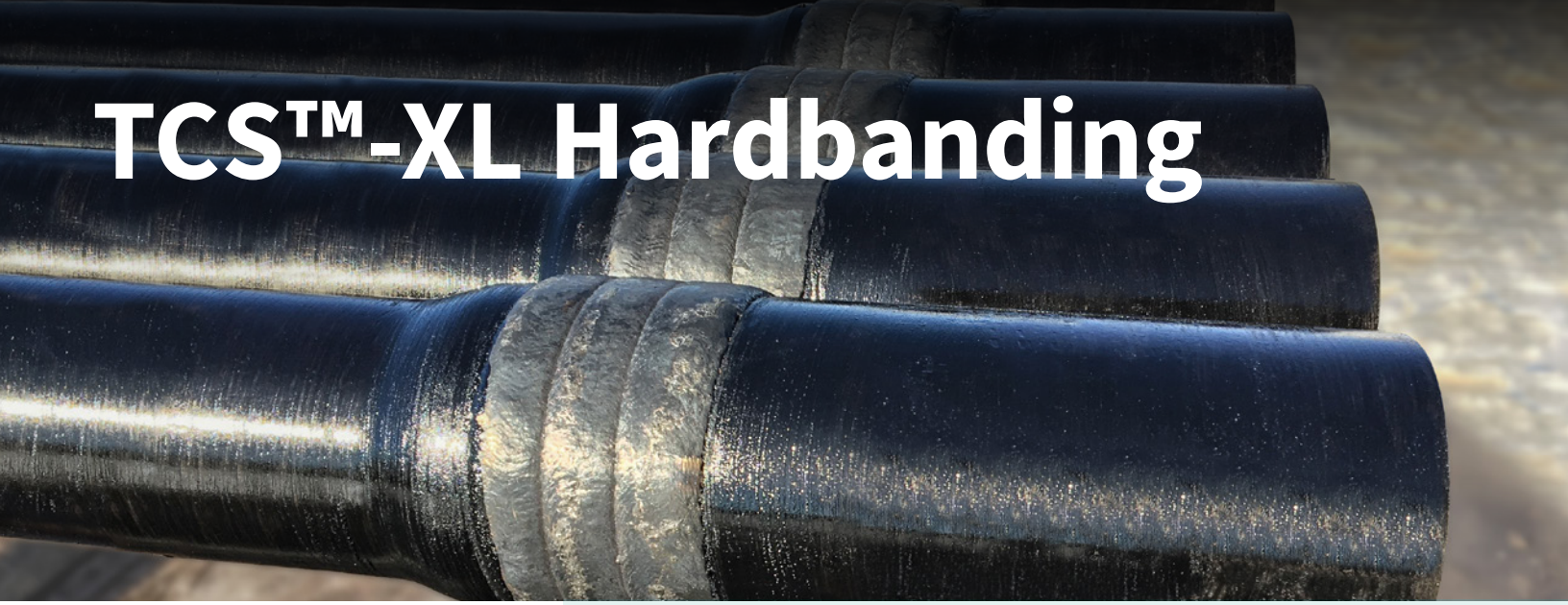
TCS™-XL Hardbanding



High Performance Hardbanding for Re-Application

From the industry leader in casing and tool joint protection, Tuboscope's TCS™-XL is a hardbanding alloy developed specifically for **re-application** of joints initially hardbanded with TCS-Titanium (TCS-Ti).

This innovatively designed hardbanding alloy combines Niobium as a base carbide with a mix of premium alloys that together form an exceptionally durable Chrome alloy matrix.

When overlaid on TCS-Ti, the results are wear resistance performance closer to TCS-Ti at a more cost-effective approach conducive for repetitive tool joint resurfacing.

The development of TCS-XL was driven by customer requirements for a more economical hardbanding for **re-application** that provides tool joint life comparable to that of TCS-Ti.

Through extensive thermodynamic and kinetic analysis of multi-alloy chemistries, as well as an intense study of metallurgical phase and transformation diagrams, our R&D team produced this new welding overlay product design.

Technical data: Hardness 57–59Rc

Why is it so good?

Design of alloy and microstructure

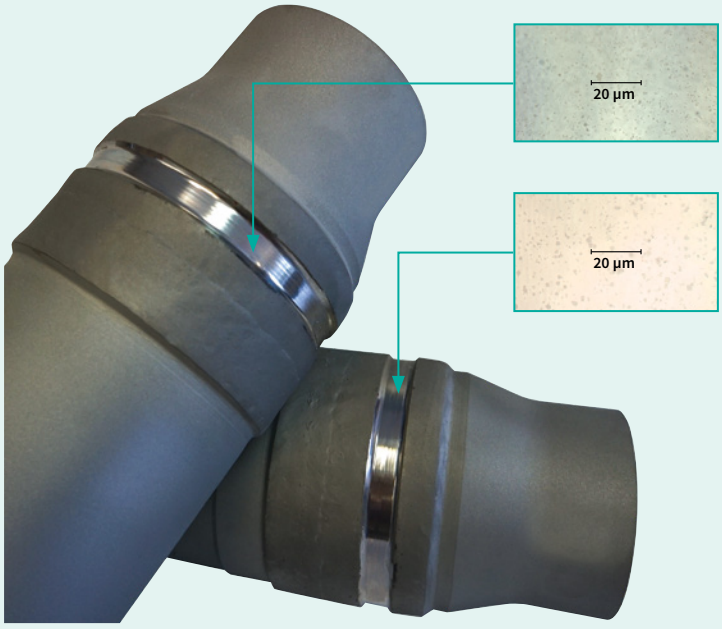
The original tool joint hardbanding chemistry is fundamental in developing the microstructure of TCS-XL for re-application. Research, development, and numerous trials revealed that the eutectic alloy produced ***when a Niobium carbide overlay is applied on top of a Titanium carbide base alloy results in an enhanced level of wear resistance comparable to the original Titanium carbide alloy*** (TCS-Ti).

TCS-XL is a very crack resistant alloy. The chemistry and microstructure is designed to avoid relief cracks on application by itself or when combined with TCS-Ti for enhanced performance. Uniform dispersion of carbides within a strong martensitic matrix further enhances the alloys wear resistance.

Design of metal cored wire

A combination of special arc stabilizers provides a configuration for spray transfer deposit of the wire under the arc attributing to excellent weldability.

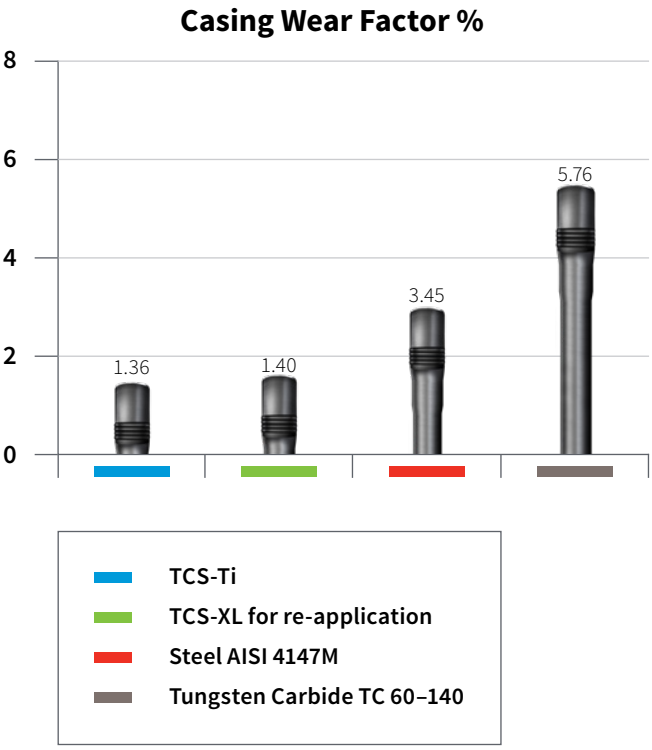
Micro inoculation of alloys in the powder fill of the wire enable uniform dispersion of carbides for enhanced abrasion resistance.



Single pass for re-application showing Niobium carbides in a martensitic matrix.

TCS-Ti plus for re-application showing a combination Niobium Titanium carbide in a martensitic matrix.

Casing Wear Test Results



Independent test results available on request.

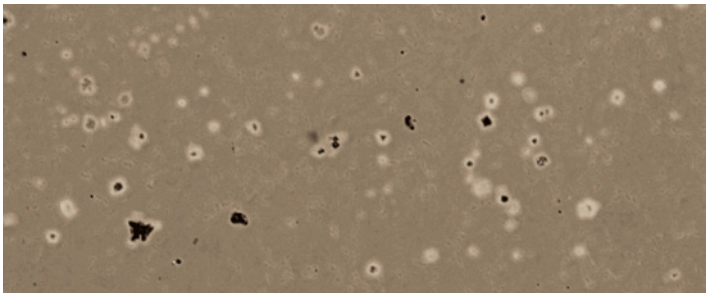


Figure 1
Original TCS-Ti microstructure showing typical fine distribution of Titanium carbides in a matrix of martensite.

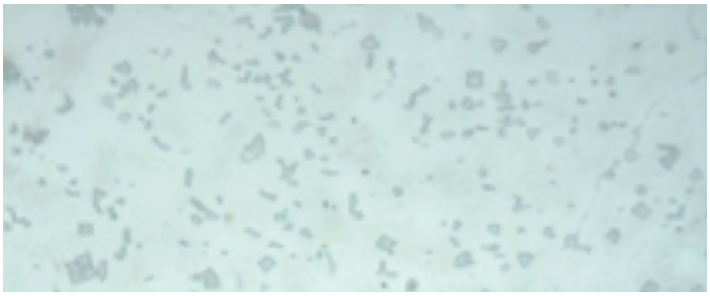


Figure 2
The TCS-Ti + for re-application microstructure shows an even distribution of combined Titanium and Niobium carbides. The formation of these carbides consists of a Titanium carbide center surrounded by a Niobium carbide shell. These combined carbides support high abrasive wear resistance but at the same time exhibit no increase in the very low crack sensitivity of a typical TCS-Ti microstructure. The matrix continues to be that of martensite.

Features and Benefits

- Unique alloy and microstructure provides enhanced performance
- Designed to be applied over TCS-Ti for optimum performance but can also be applied over itself or TCS-8000
- Hardness >57/59Rc on single deposit overlay
- Gas shielded TCS-XL provides very high deposition efficiency > 100 %
- Crack resistant and visually crack free deposits
- No spalling of weld material
- Casing friendly overlay
- Extremely low coefficient of friction
- Very high stress abrasion resistance
- Impact *(and wear)* resistant
- Spray transfer deposition for improved weld appeal and application

All TCS hardbanding alloys are designed, formulated and tested by Tuboscope's exclusive R&D team of designers, metallurgists and engineers. Our state-of-the-art manufacturing facility produces the highest quality materials, available for export to all regions of the world.