SURFACE TECHNOLOGY COATINGS

THE ONLY FACILITY IN AUSTRALIA THAT HAS IT ALL

SERVICE GUIDE

Vacuum Heat Treatment

PVD Hard Thin Film Coatings

www.surftech.com.au

Surface Technology Coatings is a division of sutton

INNOVATION
THROUGH TECHNOLOGY

SURFACE TECHNOLOGY COATINGS

The Company

Surface Technology Coatings (STC) is a part of Sutton Tools, a family owned Australian company operating since 1917. STC was established in 1988 to provide a Physical Vapour Deposition (PVD) coating service to industry. Since that time, STC has grown to be at the forefront of heat treatment and surface engineering technology.

STC is the only commercial facility in Australia offering high pressure quench vacuum heat treatment and PVD hard thin film coatings all on the one site. Additionally, STC offers a complete regrinding and recoating service.

STC carries out research and development with Australia's leading Universities and research organisations to develop innovative services that keep STC ahead of the competition.

INNOVATION THROUGH TECHNOLOGY

Vacuum Furnaces inside the Surface Technology Coatings plant

Drills receive Titanium Nitride coating

VACUUM HEAT TREATMENT

TurboTreater® and ToolTreater®: The best in vacuum heat treatment

Surface Technology Coatings (STC) offers premium quality vacuum heat treatment using the latest technology from Abar Ipsen. Our 12 bar TurboTreater® furnace with convection heating has enabled STC to gain Ford (FMC) provisional supplier status, recognising STC as a heat treatment supplier for high pressure die casting applications. The patented nozzle design, cylindrical hot zone and sophisticated computer control gives the TurboTreater® a competitive edge in quenching large workpieces up to 1 tonne, reliably and repeatedly.

Our 6 bar ToolTreater® furnaces feature convection heating and directional nozzles for through load cooling, giving advantages in uniform quenching of multi-component or slender workpieces.

The benefits of our combined technologies include:

- Minimal workpiece distortion
- Excellent temperature uniformity (±5°c)
- Reduced cycle times - quicker customer service
- Metallurgically clean surfaces - eliminating additional processes to remove scale and oxide
- Ecologically clean and safe
- Reliable, reproducible results due to fully programmable computer control
- QA documentation can be supplied with every furnace batch
- Choice of radial or directional quenching to suit furnace load

Heat treatment processes and materials suitable for Vacuum Heat Treatment

STC specialise in premium quality vacuum through hardening and tempering of high speed steels, hot work steels, cold work steels, martensitic stainless steels and age hardening steels.

The aim is to provide the customer with a heat treated product that has the optimum combination of hardness and microstructure while keeping distortion to a minimum.

Quality Control

STC has built its reputation on being able to offer a high quality, reproducible and guaranteed product back to the customer every time. Having the latest testing and analytical equipment, our metallurgical laboratory can process test samples for certification of every process batch. This commitment to quality allows us to be a Quality Endorsed Company (ISO 9001) and meet today's stringent quality requirements.

Our experienced technicians accurately record all processing parameters and monitor all processing variables. They will work directly with your material, design or manufacturing engineers to determine the optimum processing methods to meet your requirements.

12 bar TurboTreater® vacuum furnace
1 tonne capacity
Furnace Capacity 600mm x 600mm x 1000mm

PVD HARD THIN FILM COATINGS

Surface Technology Coatings (STC) is Australia's only company providing a combined coating, heat treatment service and nitriding to industry with ultra-hard thin film coatings based on Physical Vapour Deposition (PVD) technology. Using world-leading Oerlikon Balzers technology, coatings are available to solve a wide range of problems relating to friction and wear, thereby improving tool performance and increasing tool life.

Tools or components to be coated are first inspected to ensure suitability for coating, and then cleaned using an automatic multi-step process to ensure that they are physically and chemically clean. This is of crucial importance to the success of the coating operation.

Benefits of Surface Technology PVD coatings include:

- Longer tool life - 300% to 1000% increases are typical compared to uncoated
- Increased productivity - tools can be run at higher feeds and speeds
- Uniform thickness - will not alter critical dimensional tolerances of components or parts
- Corrosion resistant - thermally and chemically stable; not affected by most acids and alkalis
- Smoother workpiece surfaces - one half the co-efficient of friction of uncoated surfaces results in better surface finish in machining and better mould release in casting operations
- Lower maintenance costs - the significant increase in tool life means fewer tool changes and less down time
- More regrinds possible due to the wear land being significantly reduced on coated tools

Quality

To ensure the PVD coatings produced at STC meet both the requirements of the customer and compliance with ISO 9001 and other applicable standards, full visual assessment of coated items are carried out prior to despatch of components to customers. As part of STC total coating services, a continuous programme of coating development projects are in operation with various research organisations world-wide to ensure we maintain our high level of coating technology.

To meet today's stringent quality standards, STC has set up a comprehensive range of facilities. These include a metallurgical laboratory and a range of hardness testing equipment. The laboratory has access to optical and electron microscopes, as well as a comprehensive range of analytical apparatus for performing routine quality assessments and development work.

PVD Coating Table

Cutting Tools	Forming Tools
Drills	Punches
Taps	Dies
Endmills	Fine Blanking Tools
Milling Cutters	Extrusion Dies
Broaches	Forging Tools
Countersinks	Stamping Tools
Reamers	Wire Draw Dies
Router Bits	
Circular Saw Blades	**Moulding Tools**
Gear Cutting Tools: • Hobs • Shaper Cutters	Plastic Forming Tools: • Injection • Compression • Extrusion
Carbide Inserts	
Screw Machine Tools	Die Cast Moulds
Circle Form Tools	Ceramic Powder Compacting

Component Wear Parts	Medical Devices
Fuel Injection Systems	Dental Tools
High Performance Bearings	Surgical Tools
Pump and Compressor Parts	Prosthesis

Oerlikon Balzers INNOVA PVD coating unit
500kg capacity

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Materials that can be coated

- All secondary hardening tool steels.
  - HSS Grades, eg: T-15, M-2, M-35, M-42,
    ASP Grades - Cold Work Tool Steels, eg: D-2, A-2.
  - Hot Work Tool Steels, eg: H-13, H-11.
- Stainless Steels - 300 series (Austenitic) stainless, 400 Series (Martensitic) stainless, age hardenable Ph stainless (above H-950), eg: 304, 420, 410C, 17-4 Ph.
- Carbide and Cermets - All carbide grades are acceptable.
- Carbide Tipped Tools - Can be coated when brazing materials are free of Zinc and Cadmium.
  Note: Please consult Surface Technology Coatings before sending carbide tipped tools for coating to verify contents of brazing materials.
- Pre-hardened steels, eg: P20.
- Miscellaneous - Ampcoloy 940, 945 and others, Beryllium coppers, Titanium and Titanium Alloys, Nickel and Nickel Alloys, Inconels, monels, aerospace and refractory metals and alloys.

Materials that can be coated but may lose hardness

- Heat treated materials such as carbon and low alloy steels with tempering temperatures below 450°C will lose hardness points due to coating temperatures.

Materials that cannot be PVD Hard Thin Film Coated

- Assemblies, tools or parts that are glued, pinned, pressed or screwed together in a fixed or permanent position.
- Any alloy materials which contain Zinc, TiN or Cadmium and other low vapour pressure alloy additions.
- Leaded alloys, fusible alloys and most aluminium, zinc and magnesium alloys having low melting points.

Surfaces that are best for PVD Hard Thin Film Coating

- Fine ground surfaces with a bright finish are best for maximum coating adhesion.
- Ground surfaces should be free of burns, cracking and grinding wheel glazing.
- Free cutting CBN grinding wheels produce excellent surfaces for coating due to lower grinding temperatures.

Tool surfaces that can be coated after specialised cleaning

- Milled or Machined Surfaces
- EDM Cut Surfaces
- Surfaces cut by shaving
- High temperature brazing
- Black or steam oxide surfaces
- Nitrided surfaces
- Polished or lapped surfaces
- Glass beaded surfaces

These surfaces can be successfully coated. However, due to varying surface conditions, testing may be required to achieve the best coating adhesion.

Other surfaces requiring special treatment before coating

- Rusted surfaces
- Tools with paint or wax markings
- Tools with layout die or protective plastic coatings
- Chrome plated surfaces
- Nickel plated surfaces
  Used dies or moulds should be free of residual material (dry or wet blast)

Trade Name	TiN	TiCN	CrN	Futura Nano	Alcrona	X.Ceed*	Aldura*	Blu
Coating	TiN	TiCN	CrN	TiAlN	AlCrN	AlTiN	TiAlN + AlCrXN	Steam Oxide
Coating Structure	Mono Layer	Gradient Coating	Gradient Coating	Nano Layer	Mono Layer	Mono Layer	Bi Layer	NA
Coating Thickness*	1-3 µm	2 - 4 µm	3 - 5 µm	4 µm	4 µm	4 µm	4 µm	NA
Micro-hardness	2300 HV	3000 HV	1750 HV	3300 HV	3200 HV	3300 HV	3300 HV	NA
Coeff. of Friction vs Steel	0.4	0.4	0.5	0.3 - 0.35	0.35	0.4	<0.4	NA
Thermal Stability	up to 600°C	up to 400°C	up to 700°C	up to 900°C	up to 1,100°C	up to 900°C	over 1,100°C	NA
Colour	Gold - Yellow	Blue - Grey	Silver - Grey	Violet - Grey	Blue - Grey	Blue - Grey	Blue - Grey	Blue - Black

*Only available on application. Certain pre-conditions may apply.

INNOVATION THROUGH TECHNOLOGY

Pre-conditions for PVD Coatings

Materials that can be coated include carbides, high speed steels, hot work tool steels, certain copper alloys, stainless steels and nitridable alloy steels. Cold work tool steels can be coated if they are tempered at least three times at the maximum secondary hardening temperature. In general, all materials that can withstand a coating temperature of 500°C without softening or distortion, can be successfully PVD coated. Certain coatings are applied at 600°C and these are in general only suitable for carbide substrates.

Brazed parts can also be coated if the brazing material is temperature resistant (melting point >600°C) and does not contain cadmium or zinc. Our first recommendation is that each new application should be evaluated using the combined knowledge of the tool user and coating centre specialist to choose the best pre-treatment and coating.

Conditions on Components

The components must be held for coating and they must have holes, threads or surfaces that can remain uncoated. To coat a component all over generally requires two coats which is charged accordingly. It must be possible to mechanically mask surfaces which are to remain uncoated.

Components with internal surfaces (holes, slots) can also be coated. Depending on the geometry of the component, the coating thickness decreases with the depth of the hole or slot. Blind holes and female threads must be free of hardening salts and other contaminants. It is for this reason vacuum heat treatment is strongly recommended when PVD hard thin film coatings are to be applied.

For components that have been previously used in service prior to coating, please inform our staff as out-gassing is required to optimise coating adhesion.

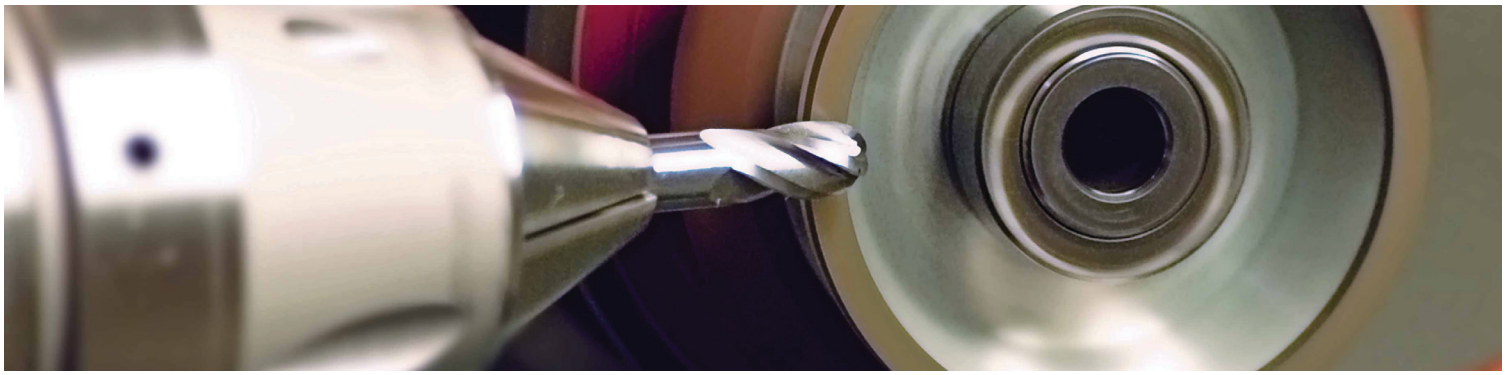
Stripping Service

Surface Technology Coatings can chemically strip old coatings from ferrous components. The process takes place at low temperature and only removes the coating, leaving the substrate in its previously uncoated condition. If it is necessary to rework or recoat a component, speak to our engineers to see if stripping will give you superior results.

Regrinding

A full regrinding facility is offered on site. HSS and carbide can be reconditioned by our highly experienced personnel with reproducible, high quality results. We also manufacture HSS and carbide for general, automotive and aerospace applications.

- Reduce your tooling costs
- State-of-the-art regrind and coating facility
- HSS/Powdered Metallurgy/Carbide



TITANIUM NITRIDE

TiN

TiN was the first PVD wear resistant film coating introduced at Surface Technology Coatings, using the world's leading low voltage electron beam technology by Oerlikon Balzers. TiN is the standard general purpose coating for protecting a wide variety of tools and parts from wear. TiN is a good choice for the machining of iron based materials, die casting and plastic mould tooling.

TiN is also a good coating for wear part applications demanding resistance to abrasive and adhesive wear. TiN is also an attractive gold colour. LVEB TiN is extremely smooth.

Applications and benefits

- General purpose use
- 3 to 8 times longer tool life
- Wide range of materials
- Higher tool speeds and feeds than uncoated tools

Improved performance with

- Wide range of cutting tools in both HSS and Carbide
- Plastic moulds and moulding machine parts
- Slitting knives for the plastic and paper industries
- Wear parts
- Medical and dental instruments
- Forming tools

Colour	Gold - Yellow
Coating Thickness	1- 3 µm
Microhardness	2300 HV
Thermal Stability	up to 600°C
Coeff. Friction vs Steel	0.4

TITANIUM CARBONITRIDE

TiCN

TiCN has a fine grain dense structure that provides excellent toughness and high hardness. TiCN is harder and tougher than TiN, consequently it exhibits a high resistance to edge chipping.

This coating is a good choice for milling, forming and punching tools that encounter high mechanical stresses. TiCN is also recommended for applications cutting highly abrasive and/or gummy materials such as cast iron, brass and some cast aluminium alloys. LVEB TiCN is extremely smooth.

Applications and benefits

- High performance applications
- Difficult to machine materials
- Abrasive materials, eg: cast iron and aluminium alloys
- Adhesive materials, eg: copper and copper based alloys
- Higher speeds and feeds possible for enhanced machine productivity compared to TiN
- Wear resistance and toughness superior to TiN

Improved performance with

- Higher speed conventional milling
- Gear cutting tools
- Heavy duty stamping
- Plastic moulds and extrusion tools for plastics containing >30% glass fillers (abrasion resistance)
- Deep drawing tools

Colour	Blue - Grey
Coating Thickness	2 - 4 µm
Microhardness	3000 HV
Thermal Stability	up to 400°C
Coeff. Friction vs Steel	0.4

CHROMIUM NITRIDE

CrN

CrN was developed to solve wear problems in special application areas where titanium based coatings were not successful.

CrN resists adhesive wear, corrosion and oxidation. It is recommended for the machining of aluminium and copper, high temperature die casting applications, hot forging of brass and tooling for PVC moulding and extrusion. It is harder than conventional chrome plating and the PVD coating process used to apply CrN has no negative environmental side effects. LVEB CrN is extremely smooth.

Applications and benefits

- Specialised applications
- Cutting and forming of copper, nickel, and monel metal
- Enhanced thermal stability and oxidation resistance
- Excellent corrosion resistance
- Low internal stress of coating results in excellent adhesion under high loads

Improved performance with

- Die casting of aluminium & zinc alloys
- Replacement for hard chrome plating
- Copper machining
- PVC plastic moulding and extrusion tools

Colour	Silver - Grey
Coating Thickness	3 - 5 µm
Microhardness	1750 HV
Thermal Stability	up to 700°C
Coeff. Friction vs Steel	0.5

TITANIUM ALUMINIUM NITRIDE

TiAlN

Futura Nano

TiAlN produced in the INNOVA, is a great all round coating for both HSS and carbide tools, especially in applications where there is a high thermal load. TiAlN has a nanolayered structure which was engineered to give an optimum balance between hardness and internal stress. High internal compressive stresses help to reduce the propagation of cracks through a coating therefore delaying the onset of failure. TiAlN also has improved sliding properties.

Applications and benefits

- Abrasive materials, eg: cast iron and heat treated steel
- Difficult to machine materials, eg: stainless steel
- Higher speeds and feeds
- Reduces or eliminates use of coolants

Improved performance with

- Higher speed and feed machining
- Dry or MQL machining
- Machining of harder materials

Colour	Violet - Grey
Coating Thickness	4 µm
Microhardness	3300HV
Thermal Stability	up to 900°C
Coeff. Friction vs Steel	0.3 - 0.35

ALUMINIUM CHROMIUM NITRIDE

AlCrN

Alcrona

AlCrN, produced in the INNOVA, is a Titanium free coating for broad application in machining and forming operations. Alcrona has remarkable wear resistance at lower speeds and feeds and under high mechanical loads. At higher speeds, where hot hardness and oxidation resistance are important, Alcrona excels, compared to Titanium based coatings, with an operating temperature up to 1100°C.

Alcrona is applicable to HSS and carbide tooling and for forming and forging operations, as well as cutting operations. Alcrona has shown great results in machining a wide variety of hardened steels up to 54 HRC both with and without coolant as well as low alloy steels and high tensile steels.

Applications and benefits

- Low alloy steels and high tensile steels
- Hardened steels up to 54 HRC
- Forming, punching, blanking and hot forging

Improved performance with

- High speed machining
- Dry or MQL machining
- Higher productivity

Colour	Blue - Grey
Coating Thickness	4 µm
Microhardness	3200 HV
Thermal Stability	up to 1100°C
Coeff. Friction vs Steel	0.35

ALUMINIUM TITANIUM NITRIDE

AlTiN

X.Ceed

AlTiN, produced in the INNOVA, represents the pinnacle of Titanium based PVD coatings. AlTiN is a high performance coating suitable only for carbide tools, due to its high deposition temperature, which gives improved adhesion in severe applications. For a Titanium based coating it has high hardness, excellent oxidation resistance and high service temperature. Good results have been obtained with this coating on tools used for machining Ti alloys, Inconel and other difficult to machine materials. AlTiN is also applicable in high speed cutting and hard machining (> 52HRC).

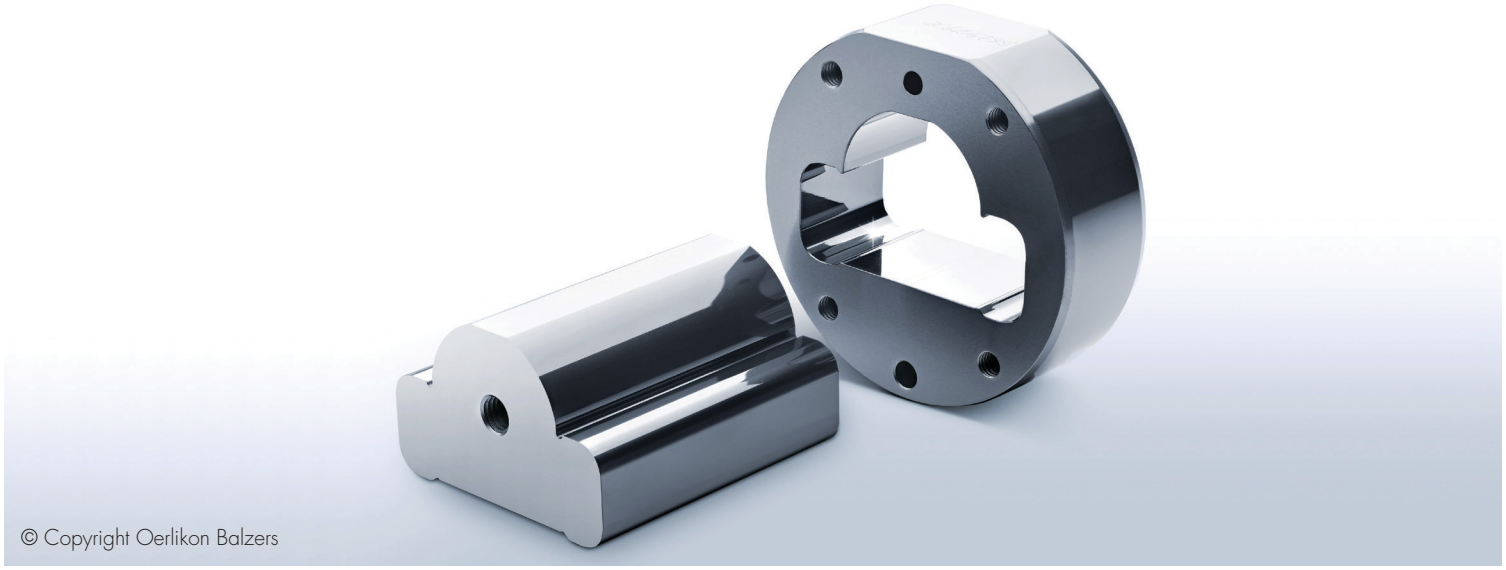
Applications and benefits

- Hard materials
- Difficult to machine materials, Ti alloys, Inconel
- High speeds and feeds

Improved performance with

- High speed machining
- Dry or MQL machining
- Machining of hard materials (>52HRC)

Colour	Blue - Grey
Coating Thickness	4 µm
Microhardness	3300 HV
Thermal Stability	up to 900°C
Coeff. Friction vs Steel	0.4



ALUMINIUM CHROMIUM NITRIDE BASED

TiAlN+AlCrXN

Aldura

TiAlN + AlCrXN, produced in the INNOVA, is a bi-layered coating. Aldura combines the excellent adhesion, thermal barrier and strength properties of TiAlN with the superior hot hardness, oxidation resistance and thermal barrier properties of an AlCrN based, nanocrystalline top coating. The top coating dramatically limits the possibility of oxidizing the TiAlN coating. Therefore, increasing the maximum service temperature of this combined coating well beyond TiAlN alone. Consequently, Aldura is the next generation coating for difficult to machine and hardened materials in both roughing and finishing applications.

Due to its high deposition temperature Aldura is not suitable for HSS tools.

Applications and benefits

- Hard materials, eg: moulds & dies
- Outstanding in difficult to machine materials, Ti alloys, Inconel
- High speeds and feeds
- Carbide tools

Improved performance with

- High speed machining
- Dry or MQL machining
- Machining of hardened steels (>60HRC)

Colour	Blue - Grey
Coating Thickness	4 µm
Microhardness	3300 HV
Thermal Stability	over 1,100°C
Coeff. Friction vs Steel	< 0.4

STEAM OXIDE

Blu

Steam Oxide is produced in a controlled dry steam furnace at an elevated temperature. The steam treatment of ferrous metals forms a thin, hard, well-adhered, blue-black oxide film called magnetite (Fe_3O_4). The process is often referred to as 'blueing' or 'blackening'.

The oxide layer produced is porous thereby retaining oil which lowers friction in ferrous applications. Thus, avoiding the problems of pick-up, cold welding on taps and 'built-up edge' on cutting edges.

The Ox process is environmentally friendly using water + heat to produce dry steam.

Applications and benefits

- Ferrous Metals, eg: HSS
- Prevents chip build-up on the cutting edges

Improved performance with

- Cutting sticky ferrous materials
- Increased corrosion resistance

*Not recommended in cutting applications for very soft or non-ferrous materials.

SURFACE TECHNOLOGY COATINGS

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