WILLOWCHEM
TECHNOLOGY

Stainless Steel

Surface Finishing

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Willowchem Technology specialise in the supply of a range of products for the surface treatment of stainless steels including:-

Applications & Industrial Sectors

- **Medical**
- **Surgical**
- **Biochemical**
- **Pharmaceutical**
- **Semiconductor**
- **High Vacuum**
- **Food & Beverage**
- **Architectural**

Cleaning & Degreasing

Pickling & Descaling

Electropolishing

Passivating & Desmuting

Sanitising & Disinfecting

Services Include:

Advice & Consultations	**Analysis Trials & Tests**
Product Development	**Project Management**
Problem Solving	**Servicing & Maintenance**

Stainless Steel

Cleaning Degreasing, Pickling & Electropolishing, Passivating and Sanitising Steel is the specialist field of Willowchem Technology Limited. We develop, manufacture and implement process technologies to remove contamination and damage produced in fabrication and machining operations as well as enhancing and optimising surface properties. Our personnel are surrounded by a wealth of expertise and knowledge gained over many years within the industry and includes partners and associates that strengthen our ability to supply high quality up to date chemical & electrochemical technology.

Why Treat Stainless Steel?

It is well known that Stainless Steel gains its major surface corrosion properties from the presence of Chromium within its formulation which reacts with oxygen in the atmosphere to produce an inert surface layer. This layer protects the material from attack and if damaged will automatically repair itself by reoxidising. This is true if the surface is not masked by residues, contaminates and the material is also undamaged. Typical manipulation techniques employed in the manufacturing processes can easily create contamination, damage and changes to the surface structure. This can result to substandard characteristics, which do not meet the criteria and performance for which the material was specified.

Effects of Manufacturing Operations

Sheering & Cutting

When cutting and sheering material burrs are produced, which can both be a hazard and has the potential to contaminate product media and damage other parts in an assembly.

Grinding & Polishing

The heat created in these operations can change the surface structure and also smear the surface dragging in undesirable contaminates.

Bending & Manipulation

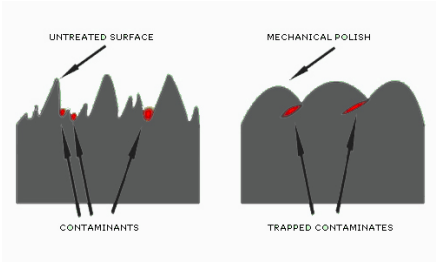
Most machine shop tools used in this process are carbon steel and create huge surface pressures that can embed contaminant particles from its own base material and atmospheric dust, coolants and general workshop consumables including grease and oils.

Turning & Milling

Both these operations use coolants which may contaminate the surface. Fast machining speeds can smear surface layers, especially when using blunt tools. Localised overheating can also change the material structure.

Welding & Heat Treatment

Both these processes produce surface oxides which are firmly bonded as part of the surface layer and do not display the same characteristics as the base material. The oxides are hard deposits which are difficult to remove, although these will corrode easily in the atmosphere.



Areas of Concern

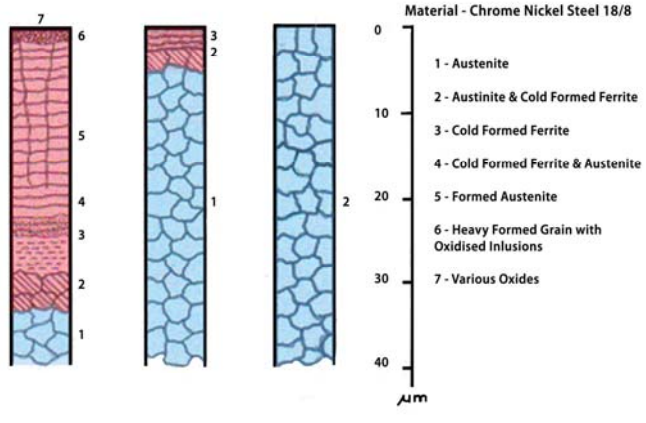
Surface Contamination

Shop floors in most factories have a variety of consumable products to aid their manufacturing processes including grease and oils for lubrication. Airborne dust particles can easily settle on both the fabrication and manipulation tools and devicesused in manufacture.

Changes to the Material Structure

Each material is produced under controlled temperature conditions and methods, to enable a particular structure to form. Inducing heat in the material by thermal treatment , fast machining, grinding and polishing techniques can enter the critical temperature zone, which the material is formed. If unable to control these conditions, changes in the structure of the material can easily occur as shown above.

Influence of Surface Treatment on Depth of the Mechanical Modified Layer



According to J. Wuff, The Metallurgy of Surface Finish Cambridge / Mass

Surface Finishing

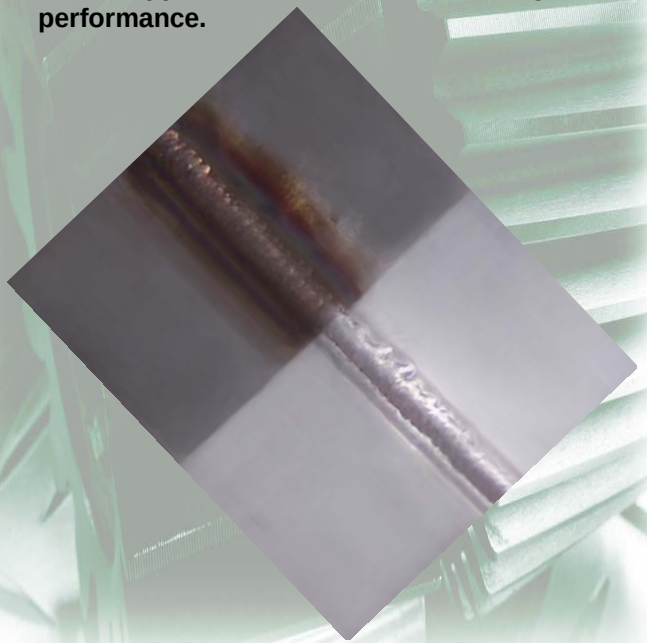
The methods and techniques used in the process of stainless steel surface finishing are a technology in their own right and should be fully understood in application and reasons behind the requirement of each process.
These processes are categorised as follows:

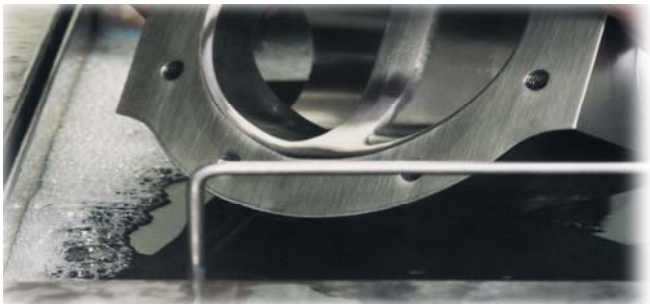
- **Cleaning & Degreasing**
- **Pickling & Descaling**
- **Electropolishing**
- **Passivating & Desmuting**
- **Sanitising & Disinfecting**

Willowchem Technology have a range of products to tackle the challenges of removing surface contaminants and exposing undisturbed chemically clean layers of material which are durable and have their full properties restored.

Cleaning & Degreasing

Whether destined for another surface finishing process or going for despatch, all fabrications and components should be thoroughly cleaned after manufacture. Sometimes it is necessary to clean assemblies in between manufacturing steps to ensure contamination is not an issue. This can often be a problem when leading onto heat treatment or welding operations, as surface contaminants are easily absorbed into the upper surface layers and extremely difficult to remove. The subsequent masking effect which can occur and insufficient cleaning can both impair the overall appearance as well and reducing its performance.





Pickling & Descaling

The thermal oxides from any heat treatment process and welding are mainly, iron oxides of various states. They will readily corrode and in almost every application, will contaminate product media in which they are in contact with. The removal of these oxides is paramount in order to maintain the surface properties of stainless steel.

Mechanical treatments can remove the bulk of these oxides, although these methods can smear the surface, entrapping contaminates which may later be released, causing failure to the function of the product. For an example, If an abrasive wheel is employed to remove the oxides, it has a dual action of decontaminating and recontaminating the component.

Localised Pickling – With Paste & Gel, applied by brush, roller or spray
Immersion Pickling – Where the whole or part of the item is immersed into a tank
Anodic Pickle – An electrolytic method, employing non toxic solutions in a tank with a rectifier

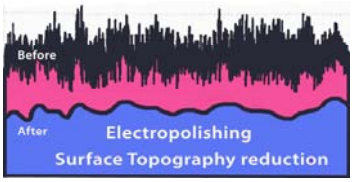
Ultimate Surface Finishing

Electropolishing

Electropolishing is the ultimate process in the surface finishing of stainless steel and produces a superior finish with unique properties. The process is carried out by immersion in a tank with an electrolyte and a rectifier. Having the opposite effect of electroplating, the process removes a layer of material, between 5 to 40um (microns). As the process has no impact to the surface, the process solution temperature is far below the critical structure formation zone. This renders the surface pure and chemically clean and thus undisturbed, crystalline structures are exposed. These surfaces have several features and characteristics unmatched by any other finishing process.

Increased Corrosion Resistance

Selective removal of iron, enriches the surface with Chromium and Nickel. Oxygen Is then liberated at the positive side of the Electrolytic process. Thus, oxidising recently exposed layers, further improving the corrosion resistance.



Typical surface topography reduction and micro roughness elimination by the electropolishing process

Ultra Clean

By removing the damaged and contaminated surface layers, the process exposes pure crystalline, ultra clean base material. This restores the original properties of the material and makes the surface suitable for ultra-clean applications. Further more, external surface stresses in the upper layers are relieved. Component sizing may also be undertaken by employing tightly controlled parameters.

Micro Finishing

The flow of the current and the natural action is to remove the peaks at a faster rate than the troughs on the surface topography, leading to the elimination of micro roughness and has a further feature of deburring. Additionally, the surface is super smooth, making it hard for deposits and residues to attach themselves which makes the surface exceptionally easy to clean.

Passivation

To ensure a fabrication or components corrosion resistance is optimised prior to delivery, it should undergo a passivation stage. Employing high oxidising agents, all surfaces are either sprayed or immersed in a solution which readily oxidises the Chromium. This rapidly forms the inert layer of the material and creates the critical surface property relied upon in service. Several methods of passivation are employed depending on the alloy, pre-treatment and type of application. Both ISO 15730 and ASTM A967 Stainless Steel passivation specification, details each process in depth.

Sanitation & Disinfecting

We are under constant attack from bugs causing diseases to young and old. Hospitals and public areas are well known to be ideal sites for these pyrogens to grow and fester. Some bacteria known to be resistant to common antibiotics, makes this task of containing epidemics even more difficult to control. Ongoing cleaning programmes must be employed stringently to keep the spread of disease to a minimum. Both existing and new equipment, should be sanitized to minimise the effect of the above.

Surface Finishing Product Range

The brief summary of our product range shown below and further detailed product data sheets are available on request.

PRODUCT	APPLICATION	METHOD
CLEANER	**RANGE**	
Cleaner 60	A concentrated highly efficient stainless steel cleaning product that may be applied by spray and diluted for use in immersion processes.	Solution maybe applied by pump action hand spray of used dilute in an immersion application.
Cleaner 61	A low classification “Irritant” stainless steel cleaner with high cleaning power.	Applied by spray by 1000 ml trigger sprays or pump action spray device.
PICKLE	**RANGE**	
Pickle Gel 50	A universal clear pickle gel, capable of efficiently removing all types of thermal oxides and weld discolouration	Brush or roller on, 15 – 30 minutes application
Pickle Solution 80	A full strength pickling solution capable of combating the most difficult and stubborn thermal oxides and weld scales.	Mixed 1:1 with water and for immersion and enclosed spray processing only
Pickle Solution 81 ***(Inhibited)***	An inhibited pickle solution that lowers the fume evolution and stabilises the process on initial application	Mixed 1:1 with water and for immersion and enclosed spray processing only
ELECTROPOLISH	**RANGE**	
Electrolyte 90	A highly efficient universal electrolyte capable of processing a wide range of stainless steel alloys.	For electrolytic processing in accordance with the product data sheet.
Electrolyte 91 Medical Grade	Similar to that of Willowchem 90 but with the added factor of first fill solution only contain high grade stainless steel metal in solution and the product is supplied with full certification of analysis and conformity.	For electrolytic processing in accordance with the product data sheet.
First Fill 90 & 91F	For first filling of tank the electropolishing products require metal in solution and therefore may be supplied precondition and ready for use.	For use when starting up a new electropolishing installation.
High Specific Gravity 90 & 91 HGS	Due to the hygroscopic nature of the electrolyte (Absorbs water for the atmosphere) Willowchem HGS may be added to a working solution in order to maintain the specific gravity within the limits detailed in the data sheets.	For use as additions on an electropolishing installation to increase the specific gravity.
Anodic Etch 95	An electrolytic non toxic pickling alternative highly effective electrolyte capable of processing a wide range of stainless steels.	For electrolytic processing in accordance with the product data sheet.
PASSIVATION	**RANGE**	
BioPass	A multipurpose Desmut, Passivation Sanitiser. Non Hazardous & Biodegrade.	Applied by spray by 1000 ml trigger sprays or pump action spray device.
Passivation 70	Nitric acid based concentrate to making up solutions inline with ASTM A697	Usually mixed 1:1 with water for immersion or spray application.
Desmut 71	Sulphuric acid based product for rapid desmutting following pickling or electropolishing	Usually mixed 1:1 with water for immersion or spray application.

The Willowchem Technology promise is to offer the most advantageous solution that is equally beneficial to all concerned. Our product development solely is based on the requirements of our customers and present market demands.

Additional Product & Services

The Willowchem Technology promise is to offer the most advantageous solution that is equally beneficial to all concerned. Our product development solely is based on the requirements of our customers and present market demands.

Misc. Products

Miscellaneous products are available that compliment the Willowchem range including:

- **Safety & Spillage Kits**
- **Personal Protective Equipment**
- **Test Kits**

Plant & Equipment

Wide range of equipment available from single supply to full turnkey systems

14 litre R & D development electropolishing tank

Pickling & Electropolishing Plant

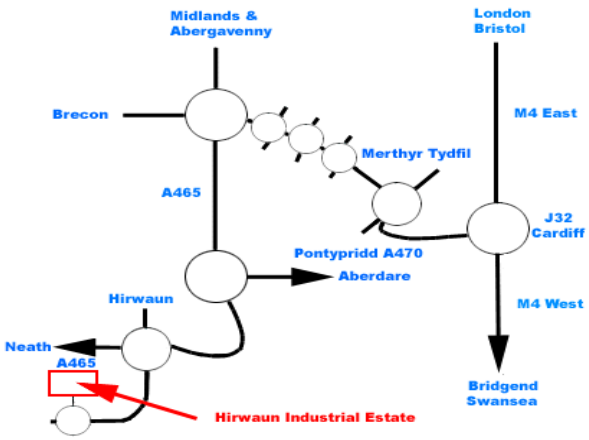
Advice & Consultation

Whatever your requirements, Willowchem Technology are able to offer advice and consultation to suit you needs.

Fixtures & Jigs

Fixtures and jigs are available from standard ranges and purpose build. Plastic immersion baskets

How to Find Us



How to find us

Willowchem Technology Limited is located 22 miles North-West of the city of Cardiff. Leave the M4 motorway at junction 32 at Cardiff, heading for Merthyr Tydfil on the A470 dual carriage way for approximately 15 miles.

By-passing Merthyr Tydfil, join the A465, Heads of the Valleys road, heading South for Neath.
At the next roundabout (5 Miles) head straight on.

At the second roundabout (1 Mile) turn left leaving the A465 and follow signs for the Hirwaun Industrial Estate. Go straight on at the next roundabout and then take the next right turn, then turn left, left, and left again. Willowchem Technology Limited is on you right hand side.

Willowchem Technology Limited

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