Electrolyte 90

PRODUCT DATA SHEET

Willowchem Technology Electropolishing Electrolyte 90 is universal and capable of processing a range of alloys including austenitic, ferritic, martensitic and duplex stainless steel.

Product Features

Having many advantages over old technology including:

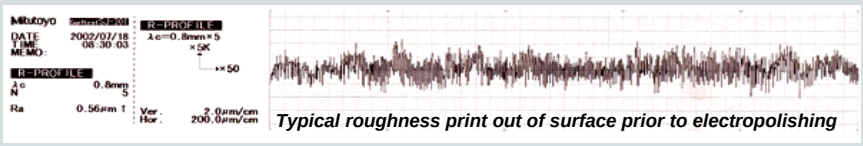
- ***Operational at a wide range of temperatures, from 45 – 95 C. Overheating and requirement for expensive cooling systems are greatly reduced.***
- ***Remains stable throughout a wide range of metal concentrations , leading to lower processing costs.***
- ***Excellent uniformity and throwing power compared to other electrolytes.***
- ***Ability to consistently control an average material removal rate +/- 2 – 3 um.***
- ***Operates through a wide range of specific gravities.***
- ***Longer life, capable of absorbing more metal only requiring top up solution and desludging.***

Processed to remove contamination from manipulation through manufacturing, optimising corrosion resistance, clean ability & producing a highly reflective chrome like finish.
Image: Courtesy of Cooper Crouse Hinds Ltd.

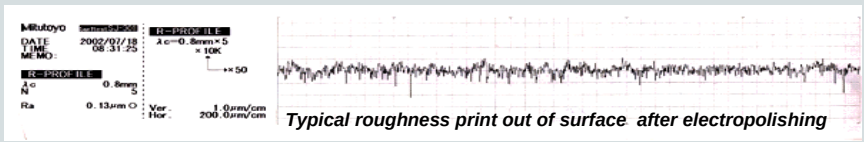
Electropolishing

Electropolishing is the preferential electrolytic dissolution of a material surface, employing an electrolyte as the medium in which metal ion's migrate between one potential and the other. Similar to electroplating, although the opposite, the work piece is positively charged (anode) and negatively charged (cathodes) are either fixed or flexible. When applying a low voltage through the electrolyte solution with a DC transformer rectifier the reaction that takes places dissolves metal ions preferentially from the exposed peaks of the surface topography. Thus removing contamination and exposing undisturbed metallically pure surface layers which are ultra clean, exceptionally smooth, corrosion resistant and bright.

Electropolishing dramatically reduces micro roughness by dissolving metal ions faster at the exposed peaks, leading to lower Ra values, although most important is the smoother surface topography.



Typical roughness print out of surface prior to electropolishing



Typical roughness print out of surface after electropolishing

Willowchem Technology Limited

Web: www.willowchem.co.uk ***Email: sales@willowchem.co.uk***

Stainless Steel Surface Finishing, Products & Consumables, Plant / Equipment & Consultation

Electrolyte 90

PRODUCT DATA SHEET

Applications

Willowchem 90 is suitable for Electropolishing and electrochemical deburring components manufactured from austenitic chrome-nickel-molybdenum steel and 13-17% ferritic chrome steels. Carbon and low alloy steels may be deburred in this electrolyte process.

Sampling & Process Trials

Method of steel manufacture greatly affects the performance of the electrolyte and therefore it is always recommended to carry out sample trial prior to performing a full scale production run.

Maintenance

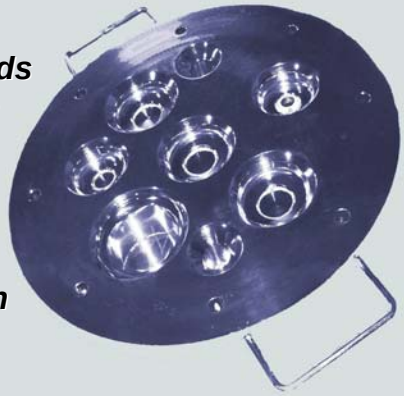
Cathode sheets should be removed daily and cleaned. Simple immersion in the first rinse (dragout) for 2 – 3 hours is normally sufficient. Care must be taken to ensure the cathodes are dry before replacing into the electrolyte. The tank should be cleaned annually as a minimum, depending on the usage. The specific gravity should be recorded daily and adjusted accordingly. Analysis service is available from Willowchem Technology, further details on request.

Environmental Issues

The rinse waters produced when working the Electrolyte are acidic and contain suspended heavy metals which have been removed from the substrate when processing. The waste waters may only be passed through a drainage system with the appropriate approvals and discharge licenses obtainable from the local water authority. Alternatively the rinse water should be stored and removed by a licensed waste contractor. The effluent is however free of hexavalent chromium.
Extraction should be employed when operating the electrolyte to remove fumes from the operator. The electrolyte is not an ozone depleting product and may be recycled to produce first fill solutions.

Health & Safety

Willowchem 90 Electrolyte is a mixture of concentrated acids and additives. Great care must be taken when handling the product and particular attention must be given to existing official safety regulations and current legislation. Personal protective clothing (apron, gloves and goggles) must be worn at all times when handling the product. The Health & safety data sheet applicable to this product must be read in conjunction with this operating data sheet.



Willowchem Technology Limited

Web: ***www.willowchem.co.uk*** ***Email:*** ***sales@willowchem.co.uk***

Stainless Steel Surface Finishing, Products & Consumables, Plant / Equipment & Consultation

Electrolyte 90

PRODUCT DATA SHEET

Technical Instruction & Application Data

Pre-Treatment

Components should be free of grease, soil, scale and dry before immersion in the electrolyte. Should and foreign matter be present, the components should be first degreased and where required descaled prior to processing. Most common greases and soils maybe removed in a warm dilute solution of Willowchem 60 (10 – 20% v/v) or spray application of Cleaner 61. Willowchem 80 & 81 Pickling solution or Pickle Gel 50 are suitable products to remove thermal oxides from either heat treatment or welding processes which must be removed prior to electropolishing. Alternatively, Willowchem 95 Anodic Etch process may be used, employing a non toxic solution and rectifier..

Electro-Chemical Polishing & Deburring

Current Density: *5 – 40 amps/dm²*
Process Times: *between 2 – 20 minutes.*
Actual times and power will be governed by the degree of finish and amount of deburring required.

Current Loading: *1 – 1.2 Amps per litre.*
Material Removal Rate: *Approx 11 – 15 um - 100 amin/dm²*

Note: *This is an average removal rate as more material is removed from the edges which are high current density areas.*

Contact Jigging Fixtures (Anode) & Cathodes

In order to pass the current through the components either insulated copper jigging fixtures or titanium racks should be employed. Titanium is not attacked by the process when anodic, although is not as conductive as copper alloys. Copper alloyed contacts should be replaceable as they are attacked and eroded by the process.

The distance from one component to another should be a min of 30 mm

Cathodes should be made using chrome-nickel steel. The cathode should not be less than 1.5 times the component surface area.

The distance between anode and cathode should be approximately 100 mm. Auxiliary cathodes (internal cathodes) should be employed when processing hollows or recessed areas.

Willowchem offer a full range jigs fixtures and baskets. Details available on request.

Technical Instruction & Application Data – Cont.

Internally Electropolishing

Post Treatment

First Rinsing: ***On removal from the electrolyte components should be rinse in water. It is often preferable for the first rinse tank to be a drag out (This is a rinse that contains some electrolyte). Following the drag out the component should be thoroughly rinse in clean fresh water.***

Desmuting / Passivation: ***Whilst processing, some complex metal salts are produced and remain on the surface. These salts are not readily dissolved in water and therefore a desmut solution may be employed.***

Willowchem BioPass is an idea solution for desmuting, passivation and sanitation. Non Hazardous and Biodegradable, complies with alternative methods under ASTM A967 and is a biocide inline with EN Protocol Standards. The surface is free of bacteria spores, fungi or viruses as well as Passivating, leaving your component in pristine condition. Willowchem also manufacture and stock conventional Desmut & Passivation solutions available on request. Should the component have folds or recesses that trap the electrolyte, an alkaline neutralising agent may be used. Ultrasonics is a very effective method of removing product residue from these areas.

Post Rinsing & Drying: ***If final desmuting, passivation and sanitation is carried out with Willowchem BioPass, then there is now need to final rinse as the product degrades into harmless byproducts that is none harmful to aquatic life. If conventional methods are used then the components should be thoroughly rinsed in clean fresh water. Employing dip and spray rinsing techniques are the most efficient. Final rinsing with deionised hot water produces the best results and aids to flash dry components. Drying may be carry out normally in atmosphere or by employing filtered hot air blowers***

Electrolyte Usage

Every 1000 Amp hours approx 6 kg of electrolyte will be used. When the metal concentration is above 4% part of the solution should be removed and topped up with fresh product.

Drag out of the electrolyte is approx 150 – 400 g/m² of component

Your local distributor or agent will be able to advise on actual amounts to be removed according to your individual requirements.

Electrolyte 90

PRODUCT DATA SHEET

Summary of Technical Data

Type of Materials to Process	Finish Obtainable
Austenitic Chrome – Nickel – Molybdenum	*Bright – High Lustre*
13 – 17% Ferritic Chrome Steel, Carbon	*Bright – Clean*
Carbon & Low alloyed steels	*Deburr Only*
Material Removal Rate:	11-15 um /100 A/mindm²
Distance between components:	30 mm
Distance between Cathode & Anode:	100 mm
Cathode to Anode Ratio:	1.5 minimum
Temperature Range:	50 – 90 °C
Voltage:	5 – 8 Volts
Current Range:	5 – 40 Amps/dm²
Current Loading:	1.0 – 1.2 Amps/litre
Metal Range:	1.0 – 4.0%
Electrolyte Usage:	6kg per 1000 A/hrs and 150- 400 g/m² drag out

Electrolyte 90 is supplied in 30 kg containers & 1500 kg IBC' Special discounts are available for Bulk purchases, First Filling of tanks & ongoing supply contracts.

Specific Gravity: - As the electrolyte absorbs metal and potentially water from the atmosphere, close observation must be made of the specific gravity.
Typically, specific gravity of a solution containing between 1.5 – 2.5 % is approximately 1.76 – 1.77 kg/l @ 20°C.
A table of these theoretical specific gravities is given in the appendix.

Plant & Equipment Requirements

Heating: ***The electrolyte usually operates between 45 – 95°C and due to the hygroscopic (absorbs moisture from the atmosphere) nature of the product must always be heated. Glass porcelain or PTFE sheathed heaters are normally employed as they are resistant to the electrolyte.***

Cooling: ***Heat is produced under process conditions due to the application a current. Should the production be at such a level that this causes the product temperature to rise above the set limits and process components out of specification, cooling may be employed by either direct or external heat exchangers.***

Agitation: ***To avoid gas streaking and produce uniform areas, often agitation is employed to disperse natural process gases. This maybe carried out by either air, pump, mechanical stirring or reciprocating flight bar.***

Transformer Rectifier: ***Typically 12 – 15 Volts @ 100 – 1000 Amps, depending on component size.***

Willowchem Technology Limited

Web: ***www.willowchem.co.uk*** ***Email:*** ***sales@willowchem.co.uk***

Stainless Steel Surface Finishing, Products & Consumables, Plant / Equipment & Consultation

PRODUCT DATA SHEET

Electrolyte 90

Willowchem Technology has many resources available, combined with our partners and associates the list of activities and scope of supply is comprehensive. These activities include:

Products

- Cleaning & Degreasing Solutions
- Pickling Gels & Solutions
- Electropolishing Electrolytes
- Passivation & Desmuting Solutions
- Sanitising & Disinfecting Agents

Services

- Advice & Consultation
- Sub-Contract Operations
- Analysis Trials & Tests
- Product Development
- Project Management
- Investigations & Problem Solving
- Servicing & Maintenance