



# Lubrication solutions for wire drawing



**BECHEM**  
LUBRICATION  
TECHNOLOGY





## Lubrication solutions for wire drawing

BECHEM – Lubrication solutions for industry

As the oldest German manufacturer of industrial lubricants, BECHEM is one of the leading producers of high-quality special lubricants and metalworking fluids today.

BECHEM products stand out through innovative formulations in the most diverse industrial applications – in machining and forming for metalworking processes, in coating technology and as for-life lubricants in various technical components.

A strong network of distributors and several national and international production sites ensure that BECHEM products are readily available worldwide.

**Tomorrow's technologies. Today.**

All indications and values correspond to latest knowledge and do not represent any product specification



# Lubricant solutions for the entire process chain

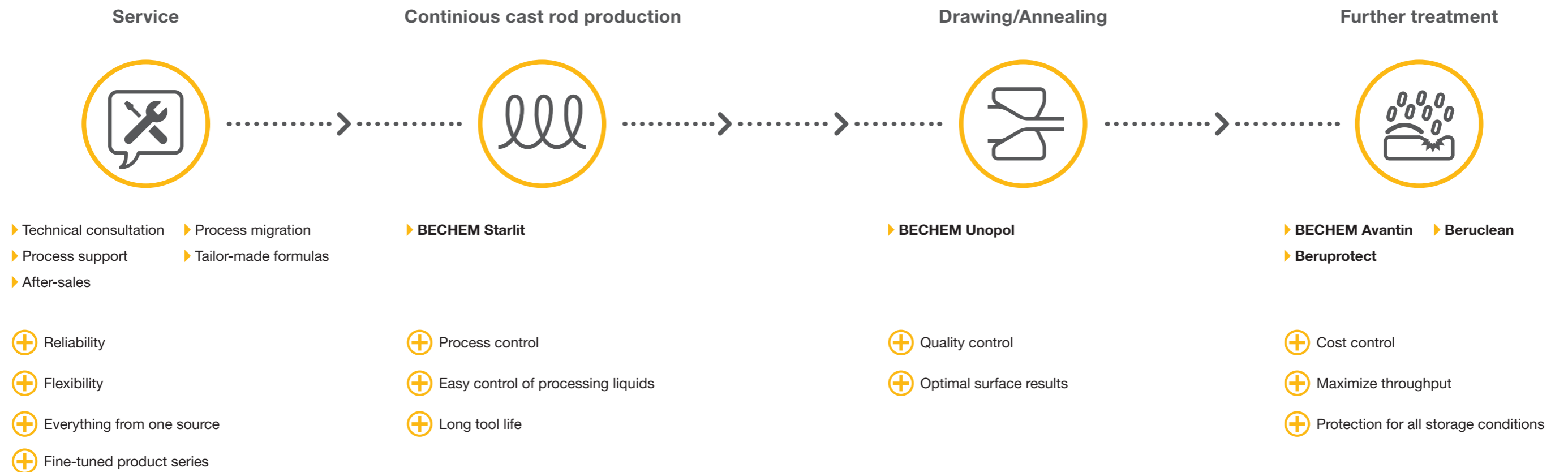
Everything from one source: BECHEM lubricants ensure maximum efficiency and performance over the entire process chain. For all process steps, from continuous cast rod, drawing, annealing, and downstream processing, BECHEM developed a fine-tuned product series offering a wide range of benefits.

Due to extended lifetime; maintenance is reduced, productivity is increased and the process is continuously improved. In addition, fewer suppliers enables lower cost and more efficient use of the lubricant. Cost-intensive damage and machine downtime can be prevented.

Ideal process maintenance is crucial for the extended lifetime and functionality of wire producing assets.

BECHEM provides technical consultation on the proper use of various lubricants, offering added value in terms of safety and reliability in production.

With its BECHEM Starlit and BECHEM Unopol product lines, BECHEM offers a highly capable range of products for wire drawing that exceed growing customer requirements in terms of environmental regulations, optimizing processes and combining methods. BECHEM products achieve high lubricity as well as excellent detergency and ensure surface qualities that do not require further treatment.

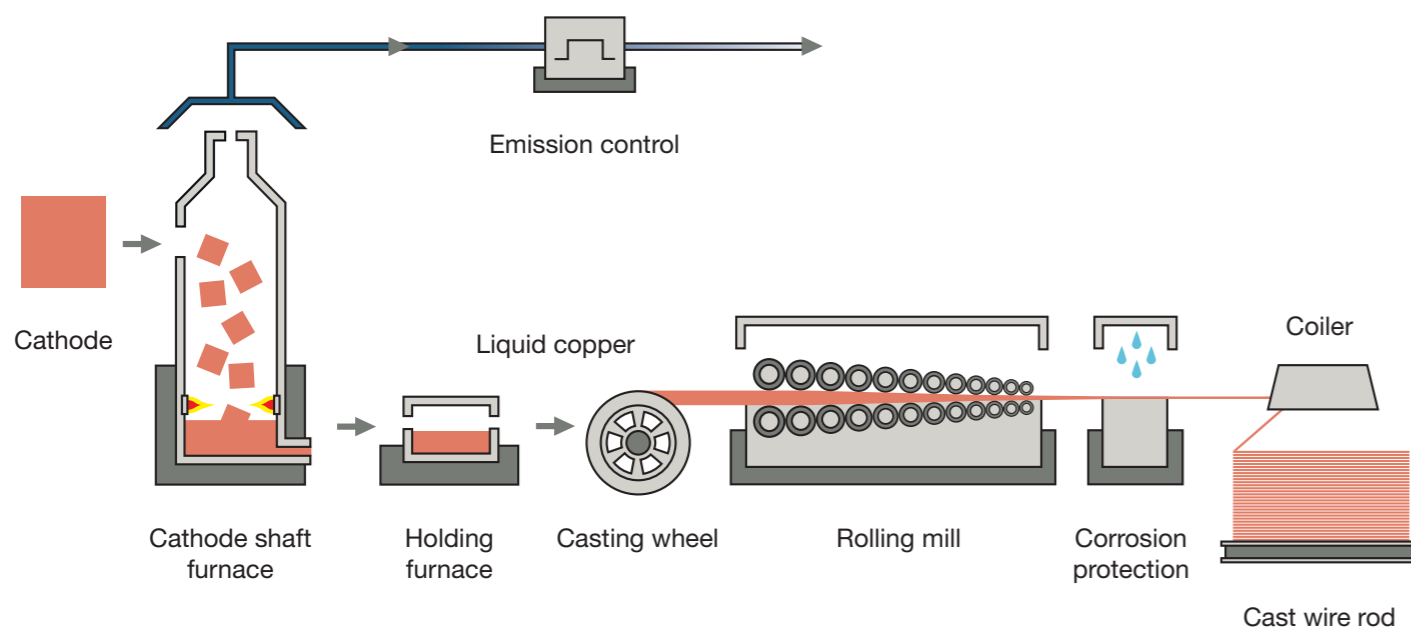
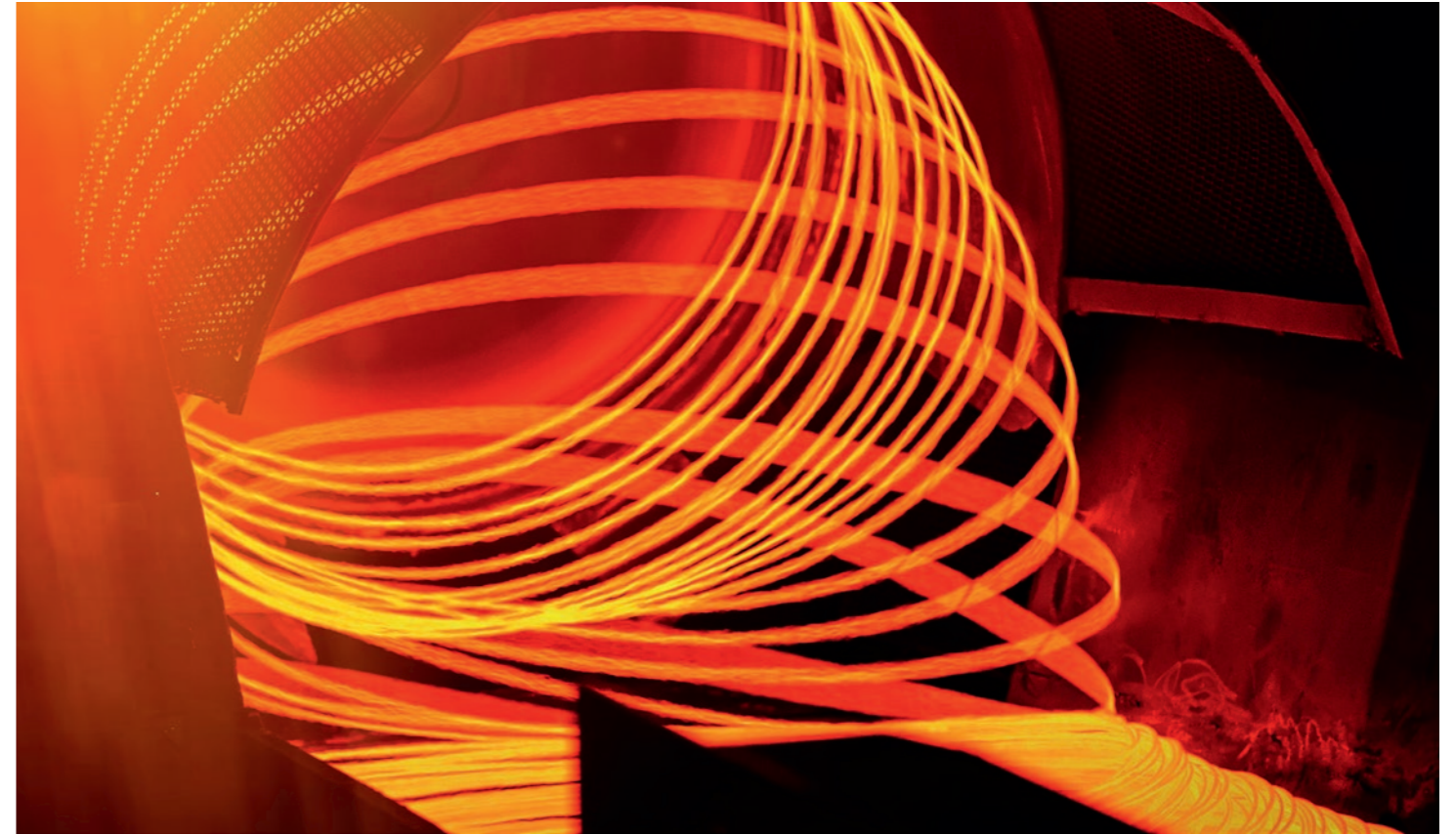


# Continuous cast rod

As part of continuous research and development, BECHEM provides a powerful range of lubricant solutions that enable smooth production processes in the wire industry. The continuous casting wire production workflow includes smelting, casting, rolling and cleaning. Copper cathodes are melted down at 1,200°C, added to the casting machine via troughs as liquid copper and then cast into an endless bar. Due to constant changes to the cross-section, the 900°C bar in the rolling train is transformed into a rod with a diameter from approx. 23.5 to 8 mm. Around 450°C the rod is surface-treated, cooled down to approximately 40°C and protected with a wax coating before winding into coils.

During up-casting, a parent wire with clean surface is drawn through smelted copper. The smelt adheres to the mother wire, meaning the wire diameter grows and is calibrated to the final diameter in a subsequent hot rolling process. Fully synthetic media from the **BECHEM Starlit series** meet the high requirements for producing high-quality, oxygen-free rod in an up-casting process.

BECHEM products make a major contribution to the reduction of manufacturing downtime is associated with high costs, and to extending the technical service life of equipment.



» BECHEM drawing lubricants ensure perfect wire surfaces and extend the roller service life. «



# Wire drawing

## Rod breakdown

Rod breakdown forms the base for perfectly drawn wire and strands made of copper and copper alloys. From an initial diameter of approx. 8 mm, the wire is drawn to a final diameter of 3.5 to 1 mm. The quality of the input rod is crucial for the end product. Production errors occurring in the first steps of the process can have a negative impact on the following drawing steps.

Selection of the drawing emulsion is extremely important in achieving optimal rod breakdown results. Products such as **BECHEM Unopol G 560** and **BECHEM Unopol G 600** stand for excellent performance and reliability in forming, service life, corrosion protection and even dirt-carrying detergency.

## Fine wire drawing

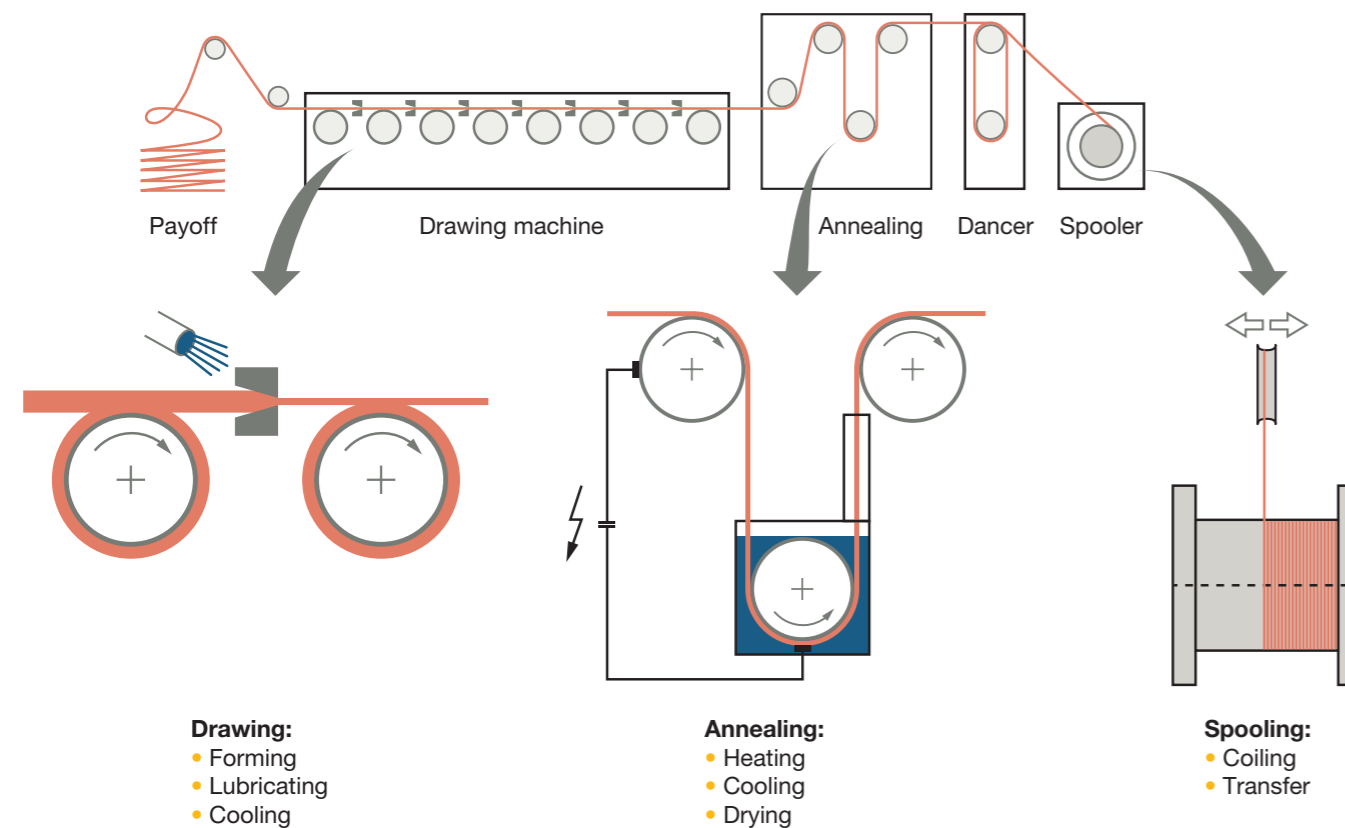
In fine wire drawing, multi wire machines are standard. At high speeds of more than 30 meters per second, up to 42 wires are drawn simultaneously with a inlet size of 1.8 to an outlet size of 0.05 mm. Malfunctions or even wire breaks have major effects on the production process in terms of time and money. Drawing emulsion tailored to the conditions is crucial and offers a major competitive edge.

Products such as **BECHEM Unopol F 811** and **BECHEM Unopol F 635** ensure a high degree of reliability. Long service life of drawing dies and emulsion as well as clean machines reduce costs while boosting efficiency.

## Annealing

Due to deformation during the drawing process, the hardened wire has to be soft-annealed in an inline annealing process. Here, the wire is temporarily heated to a temperature of up to 550°C. A protective atmosphere prevents oxidation. Next, the drawn wire is cooled in an annealing emulsion, then spooled.

In the production process, the annealing emulsion is the final medium coming into contact with the wire. Tailored to this challenge, water miscible annealing fluid **BECHEM Unopol SPG 623** achieves a high cleaning effect as well as excellent protection against corrosion, staining and discoloration.



» Clean drawing machines thanks to ideal wetting. «



# Copper wire drawing

## Hot rolling of copper

**BECHEM Starlit EM-CU** is a fully synthetic, water-soluble fluid, which is used for the production of copper wire on hot rolling mills. BECHEM Starlit EM-CU has excellent cooling and separating properties and thus supports extended tool life and a perfect wire quality. BECHEM Starlit EM-CU shows low foaming tendency, can be easily filtered and protects copper wire from discoloration.

## Multi purpose (Rod breakdown/Finewire)

Whenever a universal product for drawing rod, medium and fine wire is needed, **BECHEM Unopol U 570** is the first choice. It provides the required lubricity for rod drawing as well as the proper cleanliness of the wire when final diameters down to 0.15 mm are drawn. Bare copper as well as tinned and silver-plated wire is processed with BECHEM Unopol U 570 on single and multi wire systems. Properties: water miscible, long emulsion life, good cooling and lubricating effects, excellent cleaning capacity.

## Rod breakdown

**BECHEM Unopol G 560** is a high-performance drawing lubricant for use in rod breakdown and medium wire drawing. In an application concentration of 5–18 %, it is used on multi wire machines for drawing bare, tinned and silver-plated copper wire up to a final diameter of 0.20 mm. BECHEM Unopol G 560 combines good lubrication performance with a high cleaning effect and long emulsion life.

**BECHEM Unopol G 580** is a high-performance drawing lubricant for use in rod breakdown and medium wire drawing and up to a final diameter of 0.10 mm. In an application concentration of 5–18 %, it is used on multiple wire machines for drawing bare, tinned and silver-plated copper wire. BECHEM Unopol G 580 combines good lubrication performance with a high cleaning effect and long emulsion life.

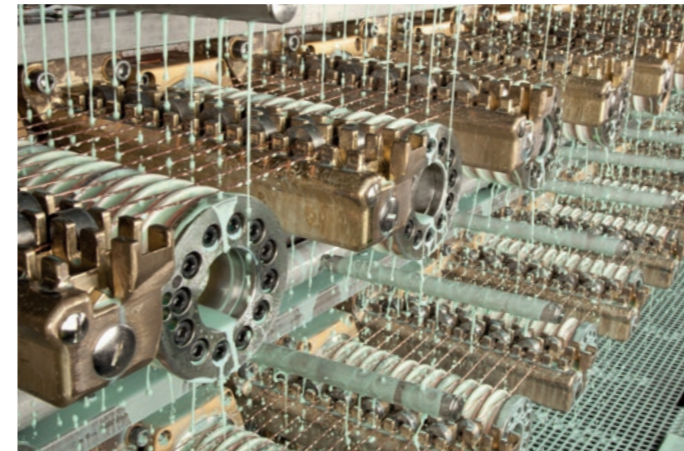
**BECHEM Unopol G 600** combines excellent lubrication and cleaning properties with a long emulsion life. BECHEM Unopol G 600 is used wherever profiled wire is drawn or high requirements to the surface of the drawn wire are placed, such as in enameled magnet wire production. BECHEM Unopol G 600 is used for bare and tinned copper wires in rod breakdown drawing from 8 down to 1.2 mm, in medium wire drawing or larger multiple drawing processes up to a final diameter of 0.20 mm.

## Fine wire drawing

**BECHEM Unopol F 811** combines the advantages of mineral oil based and fully synthetic products. In addition to excellent cleaning properties and long service life of the emulsion, it also guarantees the required lubricity, the necessary cleanliness of the system and extended lifetime of the dies. BECHEM Unopol F 811 has especially been designed for the use in multi wire systems, but is also suitable for single wire machines, for drawing bare, tinned and silver-plated wires down to final diameters of 0.10 mm.

**BECHEM Unopol F 635** is a drawing lubricant for bare, tinned, silver-plated and nickel-plated copper wire on single and multi wire machines up to a final diameter of 0.10 mm, in some cases down to 0.07 mm, as well as for enameled wire production. BECHEM Unopol F 635 is characterized by high performance, good cleaning effects and long emulsion life.

**BECHEM Unopol MH** ensures maximum cleanliness of wires and machines in fine drawing processes as well as a long emulsion life. For this reason, the drawing lubricant is used for bare, tinned, silver-plated and nickel-plated copper wire in drawing during enameled wire production as well as multi wire machines down to a final diameter of 0.07 mm.



## Annealing

High requirements in the area of inline annealing require specific products. The water miscible, special annealing fluid **BECHEM Unopol SPG 623** ensures the required cleanliness in rod breakdown, medium and fine wire drawing in addition to protecting the wire against oxidation. At an application concentration of 0.5–2.0 % the product offers an excellent cleaning effect as well as protection from corrosion, discoloration and spotting.

## Stranding auxiliary

Wherever cleaning, lubrication and protection after drawing and annealing are required, **BECHEM Unopol SP 930** is the right choice. It is used in spraying and dipping applications to clean and protect the drawn wire prior to spooling. The wire guiding gets smooth lubrication by a very thin, low viscous film of BECHEM Unopol SP 930, which protects the copper against discoloration during storage. This special spray oil is tailored to BECHEM drawing emulsions.

## Cleaning agent

Universal cold cleaning agent **Beruclean ECO** removes oil and grease, hydrocarbons, wax, tar and bitumen as well as paints and varnishes that are not fully hardened. For cleaning tools, workpieces, vehicles, motors, gears, machines, tanks, workspaces and chains. Manual application and use with mechanical or automatic cleaning systems. Beruclean ECO is free of aromatics, virtually odorless, readily biodegradable according to OECD 301 F, A7, H1-registered, as well as Halal and Kosher certified.

Mildly alkaline special cleaning agent **Beruclean 3050** is ideal for the cleaning of drawing dies. In addition, the low-foam cleaning agent removes industrial contamination on steel and iron materials, aluminum, tiles, plastic surfaces, equipment, industrial floors, engines and machinery. Characterized by an extremely low consumption, Beruclean 3050 is neutral to paints, rubber seals, plastics, textiles and aluminum. Cleaning can be performed manually as well as with high-pressure and stream jet tools or scrubber vacuum machines.





# Fully synthetic products replace drawing emulsions in copper wire drawing

For a long time already the fully synthetic drawing lubricants of the **BECHEM Unopol S** series have been successfully used for demanding wire drawing operations in fine and superfine drawing processes. Excellent drawing results and extended system life have been achieved at wire producers all over the world. The intensive research and development work of BECHEM guarantees the best quality and productivity in the modern business of wire drawing.

Through the continuous development of fully synthetic drawing lubricants BECHEM meets the challenge to substitute synthetics where drawing emulsions are used.

The **BECHEM Unopol S** series fully synthetic drawing lubricants are now available and exceed, by far, the performance of drawing emulsions and minimize emulsion related maintenance.

The use of BECHEM Unopol S 643 offers various advantages, especially compared to drawing emulsions:

- Very good lubricating properties, very low die wear
- Only low formation of copper salt (no blue drawing solutions)
- No sticky residues at high service concentrations
- Clean drawing machines based on optimal wetting
- Long lifetime of the drawing solutions
- No absorption of tramp oil
- Excellent filterability
- Hardness and electrolyte stability
- Very good bio stability
- Stable pH-value
- Low foam formation



## BECHEM Unopol S 643

BECHEM Unopol S 643 is a water soluble, mineral oil free drawing lubricant to draw bare, tin, nickel and silver plated copper wires down to a final diameter of 0.05 mm on single and multi wire drawing machines. Additional benefits are excellent drawing results with final diameters of > 0.10 mm in medium, fine and superfine wire drawing.

## BECHEM Unopol S 803

BECHEM Unopol S 803 is a water soluble and mineral oil free lubricant to draw bare, tin and nickel plated copper wires on single and multi wire machines down to a final diameter of 0.10 mm. Based on well selected synthetic lubrication components, anti-corrosion additives and wetting agents BECHEM Unopol S 803 solutions will not stick, show a low tendency to foam formation, are resistant to hardness and electrolytes and offer excellent cooling and lubricating performance.

## BECHEM Unopol S KF

BECHEM Unopol S KF is a water soluble, yellow-brown and mineral oil free lubricant to draw wires of copper and copper alloys as well as precious metals on single and multi wire machines down to a final diameter of 0.05 mm, sometimes even down to 0.03 mm. Based on well selected synthetic lubrication components, anti-corrosion additives and wetting agents BECHEM Unopol solutions will not stick, show a low tendency to foam formation, are resistant to hardness and electrolytes and offer excellent cooling and lubricating performance.

## BECHEM Unopol S 621

BECHEM Unopol S 621 is a water soluble, mineral oil free, fully synthetic lubricant for medium and fine wire drawing. Bare, tin, nickel and silver plated copper wires are drawn on single and multi wire machines with BECHEM Unopol S 621 solutions down to final diameters of 0.10 mm, sometimes even down to 0.07 mm. BECHEM Unopol S 621 is also suitable for use in enamelled wire production. Based on the content of synthetic lubrication components as well as selected anti-corrosion additives and surfactants, BECHEM Unopol S 621 solutions excel in the production of various wire types.

## BECHEM Unopol S 630

BECHEM Unopol S 630 is a water soluble, yellowish and mineral oil free fully synthetic lubricant for medium and fine wire drawing. Bare, tin, nickel and silver plated copper wires are drawn on single and multi wire machines with BECHEM Unopol S 630 solutions down to final diameters of 0.10 mm, sometimes even down to 0.07 mm. BECHEM Unopol S 630 is also suitable for the use in enamelled wire production. Based on well selected synthetic lubrication components, anti-corrosion additives and wetting agents BECHEM Unopol S 630 solutions will not stick, show only little tendency to foam formation, are resistant to hardness and electrolytes and offer excellent cooling and lubricating performance.

# Emulsions are the best option for drawing aluminum wire

The **BECHEM Unopol series** of drawing lubricants is one of the world's leading brands in wire production and processing. They are characterized by their excellent drawing performance and service life. By continually developing its products, BECHEM ensures maximum quality and efficiency, no matter the requirement in the demanding wire production process.

Traditionally, aluminum wires are drawn with oil. Especially in rod breakdown processes, relatively high viscous oils have been the state of the art for a long time. The use of such oils leads, however, to a contamination of machines and surroundings; since filtration of the used oil is only possible to a limited extent, processing residues and oil will stick on the wire surface.

The use of emulsions offers various advantages:

- Improved cooling
- Faster processing
- Easy wash off
- Low formation of residues
- Clean surroundings

This makes emulsions the best choice for producing aluminum wire. With **BECHEM Unopol AL**, BECHEM has established a line of wire drawing products for the demands in rod breakdown and multi wire drawing processes as well as enameled wire production.

Generally, all wire drawing machines operated with oil can be retrofitted to use emulsion technology. Even systems used for drawing copper wire can be converted to draw aluminum wire.

BECHEM is happy to assist you in migrating to this new technology.



With the introduction of the **BECHEM Unopol AL** series in aluminum wire drawing, traditional theories could be disproved. Less oil residues, best lubrication and a considerably cooler wire guarantees extraordinary drawing performance, as well as system-dependent higher drawing speeds; less wire breaks and better efficiency of the machines are the result.

## BECHEM Unopol AL 560

BECHEM Unopol AL 560 is a water miscible lubricant for drawing aluminum in rod and medium wire systems, which offers best lubrication properties and is suitable for drawing EC-aluminum as well as most aluminum alloys.

BECHEM Unopol AL 560 shows good foaming behavior even in soft water. Excellent cooling abilities and filterability ensure an outstanding performance in high demanding aluminum wire drawing processes.

Diameters from 12 mm or 9.5 mm down to 2 mm are processed with BECHEM Unopol AL 560 in concentrations of 10–25 %. As the surface of the drawn wire is very clean,

BECHEM Unopol AL 560 is also used for the production of enamelled wire. Here the usual service concentrations range is 8 to 12 %, depending on the starting and final diameter.

## BECHEM Unopol AL 570

BECHEM Unopol AL 570 is a water miscible lubricant for drawing aluminum in medium and fine wire systems. Starting from 3.5 mm, final diameters down to 0.10 mm are drawn on single and multi wire machines with BECHEM Unopol AL 570.

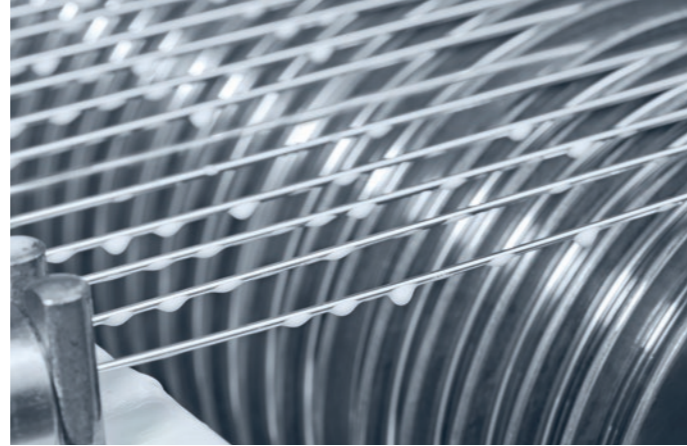
This quality combines good lubricity and cleanliness of the wire and the machine. Good filterability and low residues ensure a long service life and high wire quality. BECHEM Unopol AL 570 is applied in concentrations of 10–20 % depending on the application.



# Aluminum wire drawing

## Hot rolling of aluminum

**BECHEM Unopol Roll 570** is a water miscible, semi-synthetic lubricant for hot rolling of aluminum wire in continuous casting systems. It provides excellent lubricity combined with a high rinsing and cleaning power. Emulsions of BECHEM Unopol Roll 570 show excellent stability, even under severe circumstances and ensure an extremely long lifetime.



## Drawing oils

**Berudraw AL 2** is a very low-viscous oil for drawing aluminum wire down to a final diameters of 0.10 mm. It is well filterable, the film remaining on the wire after drawing evaporates in a subsequent annealing process, hardly leaving any residue.

**Berudraw AL 3** is a low-viscous oil for fine drawing of aluminum and its alloys in single and multi wire machines down to final sizes of 0.20 mm. Berudraw AL 3 shows very good lubricating properties combined with a long service life, a high oxidation stability and reliable corrosion protection. The product can be filtered with special filter paper to prolong lifetime, reduce dust and dirt level in the system and keep the wire clean.

**Berudraw AL 8** is a low-viscous drawing oil for drawing of EC-aluminum rod wire but also for medium wire systems where aluminum alloyed wire is drawn down to final sizes of 0.40 mm. Based on its well selected and proven combination of effective substances as well as the excellent EP-properties, Berudraw AL 8 shows high resistance to aging, reliable corrosion protection and long tool service life. The key benefit of Berudraw AL 8 is the filterability using special filter paper which keeps the system and the drawn wire extremely clean.

**Berudraw AL 20** is a medium-viscous drawing oil designed for rod breakdown of EC-aluminum but also aluminum alloys. In addition, it is used in medium wire systems down to final diameters of 0.50 mm. Berudraw AL 20 can be applied in dipping and spraying machines. Based on its well selected and proven combination of effective substances as well as the excellent EP-properties Berudraw AL 20 shows high resistance to aging as well as reliable corrosion protection and a long tool service life.

**Berudraw AL 50** is a high viscous drawing oil used to draw rod using aluminum alloys with a high tensile strength or EC aluminum with high reductions in immersion machines and drawing boxes at drawing speeds from 10 to 40 m/s. Beside round wires, profiles can also be drawn with high oil durability. Berudraw AL 50 is free of organic chlorine and sulfur.

## Corrosion protection grease

**BECHEM Unopol SV 2 KF** is a water-repellant corrosion protection grease with high thermal stability for electrical line systems. It is primarily used to lubricate steel aluminum ropes (power lines) and for protection against aggressive gases or liquid media, e.g. seawater, salt water and rainwater. Its high dripping point ensures stable long-term protection against corrosion, even at temperatures exceeding 120°C. The protective film remains flexible at temperatures down to -35°C and does not break. BECHEM Unopol SV 2 KF can be applied at ambient temperature, reducing operating costs by elimination of energy necessary to pre-heat prior to application.



## Service additive

Water-soluble wetting agent **BECHEM Unopol A 100** based on surfactant reduces surface tension, while improving the cleaning effect and stabilizing drawing emulsions/solutions. BECHEM Unopol A 100 is used to stabilize and improve detergency and wetting of older drawing emulsions.

**BECHEM Unopol A 200** is a highly active, water-soluble wetting agent based on selected surfactants. It is used to reduce the surface tension of rod breakdown, medium and fine wire emulsions, as well as to stabilize metalworking and drawing emulsions. BECHEM Unopol A 200 offers excellent cleaning properties, is emulsion-stabilizing and improves the gliding behavior of the wire while keeping the foaming tendency low.

**BECHEM Additive OH.** Water-soluble additive for increasing and improving the stability of the pH value. Properties: Water-soluble, highly concentrated, amine-free, compatible with BECHEM drawing media.

**BECHEM Additive BA.** Water-soluble additive for increasing and stabilizing the pH value. Properties: Water-dilutable, highly concentrated, compatible with BECHEM Avantin cooling lubricants and drawing media.

## Cleaning agent

Universal cold cleaning agent **Beruclean ECO** removes oil and grease, hydrocarbons, wax, tar and bitumen as well as paints and varnishes that are not fully hardened. For cleaning tools, workpieces, vehicles, motors, gears, machines, tanks, workspaces and chains. Manual application and use with mechanical or automatic cleaning systems. Beruclean ECO is free of aromatics, virtually odorless, readily biodegradable according to OECD 301 F, A7, H1-registered, as well as halal and kosher certified.

# BECHEM system solution

## BECHEM Avantin – water-miscible coolant lubricants

**BECHEM Avantin** is a product series of water-miscible cooling lubricants. Complex processes demand excellent cooling lubricant performance with maximum efficiency, lasting stability and extended tool life, made possible thanks to BECHEM's engineering expertise and a modern system structure. Clean machines that are protected against corrosion go without saying.

Products from the BECHEM Avantin series offer proven performance in terms of optimized tool service life and outstanding surfaces. They provide lubrication in areas susceptible to wear and are always tailored to the respective requirements. Oxidation-stable, semi-synthetic and fully synthetic product concepts provide ideal support for processes involving high thermal loads. Low-consumption BECHEM Avantin impresses with outstanding corrosion protection as well as excellent removal and transport of process materials and heat, staying cool when things get hot.



BECHEM Avantin was developed to achieve optimized efficiency for all machining processes.

## Hydraulic and gear oils

BECHEM hydraulic fluids reduce friction and wear, even at high thermal loads. Using special additives prevents corrosion even under extreme conditions. Hydraulic oils from the **BECHEM Hydrostar** and **BECHEM Staroil** series are used in applications requiring high thermal stability, oxidation resistance and an excellent air and water separation capacity.

High-performance gear oils and circulating oils from BECHEM meet requirements for wear protection even under high mechanical and dynamic loads. The **BECHEM Ovitol series** was developed for flood lubricated bearings in rolling mills. They feature an excellent water separation capacity, high corrosion protection and very good aging stability.

## Lubricating grease for bearings

BECHEM offers a wide assortment of lubricants for a broad range of demanding applications in roller and plain bearings, from strenuous high load applications and extreme temperature ranges, both high and low, as well as, high RPM and heavy-duty greases, BECHEM has a product for nearly every modern day need. Developed in accordance with the latest findings in the field of tribology, the range exceeds requirements on friction, wear and lubrication, as well as efficient and sustainable processes.

## Development expertise and service

Numerous products were developed in research projects in collaboration with customers and success partners. Involving our customers into our lubricant development process forms the foundation for future custom product solutions. Strong partners are available to us and our customers in developing cross-system concepts. Take advantage of the expertise and comprehensive technical services provided by BECHEM application engineers and get a one-on-one consultation focused on your production processes.

In many applications and components, lubricants and lubrication systems are a critical feature in development, and cannot be considered separate from the respective project. Product success hinges on lubricants tailored to the requirements profile. Powerful analysis is crucial here. At the BECHEM technical center, the latest chemical-physical testing and analysis systems are available that are used to characterize lubricants, to monitor their application, to analyze customer problems and finally to develop the appropriate lubricant solutions.

The performance capacity of the products used, and competent technical service, are crucial inputs to guarantee each industrial challenge is met with sufficient proficiency to create success stories. BECHEM has the necessary expertise to provide individual consultation to users and to assess the effectiveness of system solutions.

The BECHEM service department ensures continuous improvement of processes:

- Inventory/analysis on site
- Analysis at the BECHEM technical center
- Development of tailored system solutions
- Extensive tests in the work process
- Process-oriented technical support
- Optimized service life
- Improved working conditions for users
- Full fluid management

## Machine and floor cleaning

**Beruclean** cleaning agents are characterized by excellent cleaning results and a low-consumption formulation. They also ensure optimized performance characteristics and excellent efficiency. The special cleaning agents that are compatible with basic and other materials enable effortless removal of industrial soiling and effective cleaning and care of industrial floors, equipment, engines, vehicles and machines. They can be used on concrete, sealed and coated floors, as well as smooth floor surfaces such as, tiles or plastic. By virtue of their high separation force, they are particularly well suited for cleaning organic deposits such as oils, fats, waxes or tars while going easy on the surface.

Products of the Beruclean series do not attack aluminum, cast iron or steel surfaces. The Beruclean cleaning agents have been developed specifically for scrubber vacuum machines as well as high-pressure and steam jet tools, but they are also ideal for manual cleaning processes as well as for cooling lubricant changes, new use and maintenance.



Beruclean: For cleaning industrial floors, machines and equipment.



# Lubrication solutions for industry



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