



CREOSOTE Treated Timber

What you need
to know

Lonza

Wood Protection



Information to help you move forward...

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Why Use Wood

Timber is one of the most environmentally friendly construction materials available. Versatile, naturally renewable, warm and beautiful, it is light in weight and yet strong with excellent load bearing and thermal properties.

Wood Preservation

Wood preservative treatments are essential to ensure we make the most of sustainable timber products to be used for **railway sleepers, poles for electricity and telephone lines and agricultural fencing and revetment projects.** They are also very important for the European economy.

 **6 million m³** of timber (approx) is preservative treated in the EU every year

Preservative treatment of wood helps to avoid:

- **Wood decay, mould and sapwood stains caused by fungi**
- **Attack from wood destroying insects such as termites, carpenter ants and various beetles**
- **Shortened service life of the timber products**

Creosote – current position

Creosote, a distillate product from coal-tar, has been used for many decades as a wood preservative.

Creosote is a mixture of many compounds and contains polycyclic aromatic hydrocarbons (PAHs), some of which have been considered as persistent, bioaccumulative and toxic, or very persistent and very bioaccumulative.

Creosote therefore meets the Biocidal Products Regulation (BPR) exclusion criteria as a result of its Classification, Labelling and Packaging (CLP) classification as **carcinogenic category 1B.**

Creosote currently survives on Social Economic grounds as a comparative assessment report carried out by the Swedish Chemical Agency (KEMI) in 2016 concluded that not approving creosote would have disproportionate negative impacts on society when comparing the risks to human health and the environment.

Creosote is an active substance so will be reviewed against its current approval which is due to **expire on 31 October 2020.**

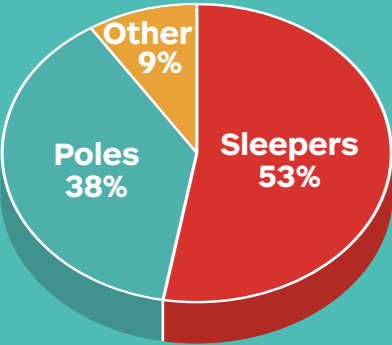


Currently very few products have been authorised under the BPR or its predecessor the Biocidal Product Directive (BPD) that can substitute creosote products to protect railway sleepers, utility poles or fences. It has been argued that if a renewal of the authorisation is refused, current treaters using creosote would be forced out of the market, putting end users under stress.



EU market overview

The main areas of creosote treated wood are for **railway sleepers**, **utility poles** and other markets such as **fencing** and **crib walling**.



Utility Poles

In many EU countries a large percentage of overhead cable lines are run on creosote treated wooden poles.

Creosote treated utility poles are widely used in Sweden, Ireland and the UK.

Around **20-25,000** new poles are installed in Sweden every year.

In UK & Ireland every year – **120,000** utility poles are replaced and **40,000** new poles are installed.

Treated Pole market split 50/50

50% Copper organic wood preservatives
50% Creosote.

For example, in Finland every year around **10,000** new wooden poles treated with copper organic are installed.

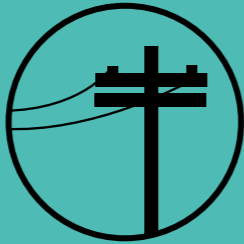


Creosote treated PINE poles in UK and Scandinavia

30-40 years
SERVICE LIFE

Creosote treated SPRUCE poles in Germany

30-35 years
SERVICE LIFE



Other Markets

The total agricultural area in the EU is very large, and wooden fencing can be used to indicate the borders of the property and to enclose animals.

The **agricultural, equestrian, highway fencing** and **crib walling** sectors all benefit from pressure treated and creosote treated wooden fences and landscaping timbers.

These are very important sectors for creosote alternatives as these may be the markets that transition first, due to legislative drivers.

This sector is dominated by water based copper organic preservatives. However, long service life performance is desired by landscaping contractors and farmers leading to demand for modern industrial strength oil based preservatives.

Railway Sleepers

Wooden sleeper volume has been constant at **200,000 m³** per year across the last decade.

In 2010, on high speed tracks, wooden sleepers represented more than **20%** of the market share in Sweden, Finland, France, Belgium, Poland, Austria, Norway and Switzerland. On the lower speed tracks, wooden sleepers are used in a greater proportion.

In Sweden, Poland, Norway, France and Belgium wooden sleepers represent more than **50%** of the whole market share.

Creosote treated PINE sleepers in UK
40 years
SERVICE LIFE

Creosote treated OAK/ AZOBE sleepers in France
30-40 years
SERVICE LIFE

Creosote treated BEECH sleepers in Germany
30-35 years
SERVICE LIFE

What can replace CREOSOTE treated timbers?

What can replace creosote treated poles?

Utility Poles

Creosote treated timber already competes with a number of alternative materials:

- **Copper organic water based preservative treated wooden poles**
- **Concrete poles**
- **Steel poles**
- **Fibre reinforced composite poles**

Wooden Poles

Traditional wooden poles are very often the preferred solution over concrete or steel poles, as ground conditions vary widely and wooden poles are comparably **light and easier to transport**.

Wooden telecommunication poles weigh around 100 kg and are often **light enough to be moved by hand**.

Wood is a **sustainable material** and provides great **flexibility** during placement of hardware and cable apparatus.

Holes are **easily drilled** to fit the exact hardware needs and requirements. In addition, fasteners such as lags and screws are easily applied to wooden structures to support outside plant (OSP) apparatus.



Technical & Environmental advantages of Wooden Poles

- **High weight to strength ratio**
- **Flexible in many climates**
- **Easy to handle and install**
- **Do not require earthing like steel**
- **Insulation properties**
- **Sustainable material**
- **Workable material**
- **Easy to climb**
- **Naturally aesthetic**
- **Good in fire situations**

Concrete Poles

The most widespread use of concrete poles is in **marine environments** and **coastal zones** where excellent corrosion resistance is required to reduce the impact of sea water, salt fog and corrosive soil conditions (e.g., marsh land).

Their heavy weight also helps the concrete poles resist the high winds possible in coastal areas.

The various designs for concrete poles include **tapered structures** and **round poles** made of solid concrete; pre-stressed concrete (spun-cast or statically cast); and a hybrid of concrete and steel.

The drilling of installed concrete poles is not feasible. Users can have the attachment hardware cast into the concrete during the pole manufacture.



Steel Poles

Steel poles can provide advantages for **high-voltage lines**, where taller poles are required for enhanced clearances and longer span requirements.

Tubular steel poles are typically made from 11-gauge galvanized steel, with thicker 10- or 7-gauge materials used for some taller poles because of their higher strength and rigidity. For tall tower-type structures, 5-gauge materials are used.

Although steel poles can be drilled on-site with an annular drill bit or standard twist drill, it is not a recommended practice. As with concrete poles, bolt holes could be built into the steel pole during manufacture for use as general attachment points or places for steps to be bolted into the pole.



Fibre-reinforced Composite (FRC)Poles

FRC poles cover a family of pole materials that combine fibreglass (fibre) strength members with a cross-linked polyester resin and a variety of chemical additives to produce a **lightweight, weather-resistant** structure.

FRC poles are hollow and similar to the tubular steel poles, with a typical wall thickness of 0.25 to 0.5 inch with an outer polyurethane coating that is ~0.002 inch thin.

As with all the other non-wood poles, FRC poles cannot be mounted with the traditional climbing hardware of hooks and gaffs. FRC poles can be pre-drilled by the manufacturer, or holes can be drilled on site. Attachments using lag bolts, teeth, nails, and staples are unacceptable for FRC poles. Through-bolts are used instead of lag bolts for maximum bonding to the pole and to avoid loosening of hardware.



What can replace creosote treated sleepers?

Railway Sleepers

Creosote treated timber already competes with a number of alternative materials:

- **Copper organic water based preservative treated wooden railway sleepers**
- **Concrete sleepers**
- **Steel sleepers**
- **Plastic/composite sleepers**

Wooden Sleepers

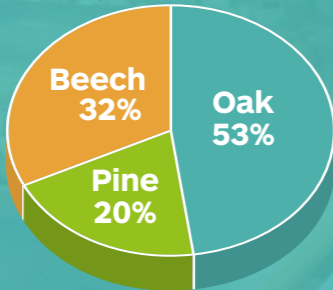
The purchase of wood sleepers has been constant at around **200,000 m³** per annum in the last decade.

In 2010, wooden sleepers used on the main track represented more than **20%** of the market share in Sweden, Finland, France, Belgium, Poland, Austria, Norway and Switzerland. On the lower speed tracks, wood sleepers are a greater proportion. In Sweden, Poland, Norway, France and Belgium wood sleepers represent more than **50%** of the market share.

In many European countries, wood is used for the switches, due to its flexibility when compared to concrete and steel sleepers.

In order to maintain existing wooden sleeper lines when replacing broken ones, sleepers with the same characteristics need to be used. Mixing different materials on one line leads to technical difficulties.

3 types of wooden sleeper are used in Europe:



Wooden Sleepers

10-30 years
SERVICE LIFE



Advantages of Wooden Sleepers

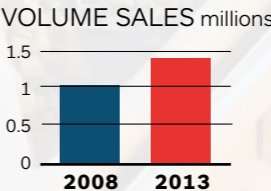
- **Wooden sleepers are so light and easy to transport, install and maintain.**
- **Wooden sleepers have a large application in the railway track, suitable for any section.**
- **Traditionally has lower cost than other kinds of railway sleeper.**

Disadvantages of Wooden Sleepers

- **Can be affected by humidity.**
- **Creosote treated sleepers can be hard to recycle, making them more expensive.**
- **Service life of wooden sleeper is shorter (10-30 years).**

Concrete Sleepers

Concrete sleepers are increasingly common with purchase volumes increasing from nearly 1,000,000m³ in 2008 to 1,400,000m³ in 2013.



Concrete sleepers are mostly manufactured from pre-stressed concrete. It is a technique which introduces internal tension to the sleeper before casting, which reduces the damage from external pressure during service.

In general, concrete sleepers are used in the high speed railway markets. Concrete can bear more loads, which provides the possibility of higher speed.

Concrete sleepers were first used in France and they became common after 1945.

At present, concrete sleepers are mainly applied in Asia, Europe and Australia, but have less market share in the United States.

Concrete Sleepers

40-50 years
SERVICE LIFE



Advantages

- **Longer use life compared to wooden sleeper (40-50 years).**
- **Greater stability because of its heavier properties.**
- **Cost-effective in the long run.**
- **Need less maintenance.**

Disadvantages

- **So heavy that they are difficult to handle.**
- **Limited in application - cannot be used in bridges and crossings.**
- **Cannot mix concrete and wood sleepers.**
- **Ballast beds for concrete sleepers have to be more substantial and can therefore prove to be more costly.**



Steel Sleepers

Steel railway sleepers are formed from pressed steel and with a trough-shaped section. The housing for the rail fastening system is welded to the upper of steel sleeper.

Because they are **stronger than wood** and **cheaper than concrete**, steel railway sleepers are usually considered as middle way between wooden sleepers and concrete sleepers.

Steel railway sleepers are applied in secondary lines in the UK far less than other types of rail sleeper.

Steel Sleepers
50 years
SERVICE LIFE 



Advantages

- **Steel sleepers are easy to install on existing ballast beds, giving low cost.**
- **Steel sleepers are easy to stack because of light weight and shape.**
- **Steel sleepers have a long service life (more than 50 years).**
- **Steel sleepers are recyclable.**

Disadvantages

- **Chemical corrosion of steel sleepers.**
- **Higher maintenance costs.**
- **Steel sleepers can only be used in some special end uses because of insulation problems.**

Plastic and Composite Sleepers

Plastic railway sleepers, also called composite sleepers, are manufactured from a plastic composite.

Plastic composite is a modern material for making rail sleepers. It is a mixture of plastic and used or waste rubber.

Plastic sleepers combine the **pliability** of wood and **durability** of concrete.

Advantages

- **Like wood, plastic sleepers can reduce vibration.**
- **Composite sleepers are cuttable and light – easy to install and can be applied in any rail section.**
- **Recyclable - can be reused into new sleepers.**

Disadvantages

- **Expensive - restricts the possibility of being applied in large scale projects.**
- **Insulation problems.**



If wood is your choice...

Wood Preservative Systems

Wood preservatives are typically either oil-based (treatment where the carrier of the preservative is oil) or water-based.

The most widely used oil-based preservative is creosote.

New Products to replace creosote are being developed and starting to be marketed in Europe.



Oil Based

The main oil-based solution approved under the BPR, apart from creosote, is expected to be Tanasote, which will be described in more detail later. It shares many of creosote's desirable properties, as shown opposite.

Comparison of Oil vs Water based

Oil Based systems are will be used in existing creosote plants keeping investment lower.

They will have a longer service life – typically 40 years but will be more expensive than waterbased systems due to the carrier being oil.



Oil-based preservatives

- **No swelling, shrinking and cracking** during treatment and re-drying due to the absence of water.
- **Low corrosivity to metal**; this is applicable to the materials used in the treatment vessels and also the fittings on the treated timber.
- **No surface hardening** of timber; this is important for poles since they have to be climbed during service.
- **Favourable hydrophobicity properties**; especially important for sleepers as these have the tendency to split.
- **Low mass uptake** during treatment with water-based treatments, the sapwood can absorb 600kg/m³ whereas with Tanasote the target is 100kg/m³. The mass of water-based treated poles and sleepers can easily exceed 50% of its untreated mass and this limits transportation.

Water based preservatives

- Water-based preservatives **contain biocidal metal compounds** (in Europe currently only copper) solubilised in varying ways and organic biocides.
- Typically, water-based preservative are applied in a similar manner to creosote, but at **ambient temperatures**.
- They are used in both above-ground and in-ground situations including **construction, fencing, landscaping and engineering** applications.

- Products can **diffuse within the timber**; should the timbers split in service, this migration property has the benefit of being able to “heal” the split and prevent internal attack from decay fungi.
- Attractive **green colour** that weathers to a light brown.
- **Long lasting properties**; all wood preservatives, if applied correctly, can provide long service lives to timber products. High performance systems that use oil as a carrier will have a longer service life - typically 40 years.
- **Minimal loss of strength** due to the absence of water and no need for re-drying.
- **Ease of treatment** compared with water-based preservatives; **deep penetration** of sapwood and some penetration of heartwood



- **Tanalith E** and other **water based copper based wood preservatives** are being used for treatment of utility poles across the EU and have already reached **service lives of around 20 years**. Tanalith E is also being used for treatment of some railway sleepers.

How does a life cycle assessment compare?

In order to assess the impacts on health and the environment, a Life Cycle Assessment (LCA) for Tanasote treated wood, used as poles or as sleepers, has been undertaken.

In these LCAs many environmental and health impact categories were taken into consideration to enable decision makers to avoid a scenario where a decision to replace Creosote by another product leads to a replacement of one health or environmental problem with another.

These LCAs have been independently audited by three LCA practitioners.

The results in the following graphs are presented in units known as **Normalised Impacts per European person emission equivalent** which is equal to the impacts in Europe in one year weighted by the population.



The LCAs cover:

- the production of raw materials
- transport
- manufacturing (taking into account the consumption of energy and the production of waste)
- the use emissions over the whole lifetime and the end of life management



health
environment

Normalised impact data

The lower the normalised impact, the better for the environment and for health.

Utility Poles

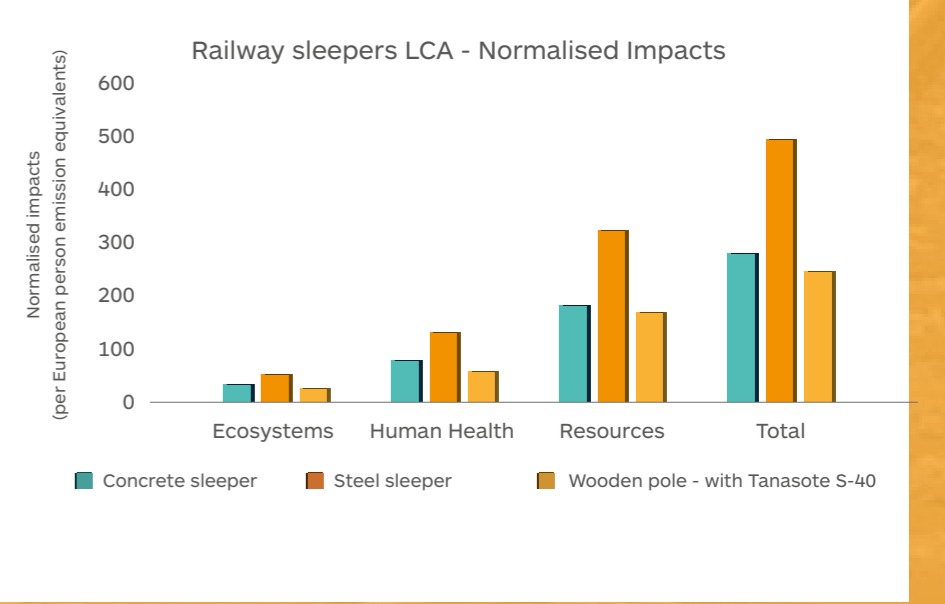
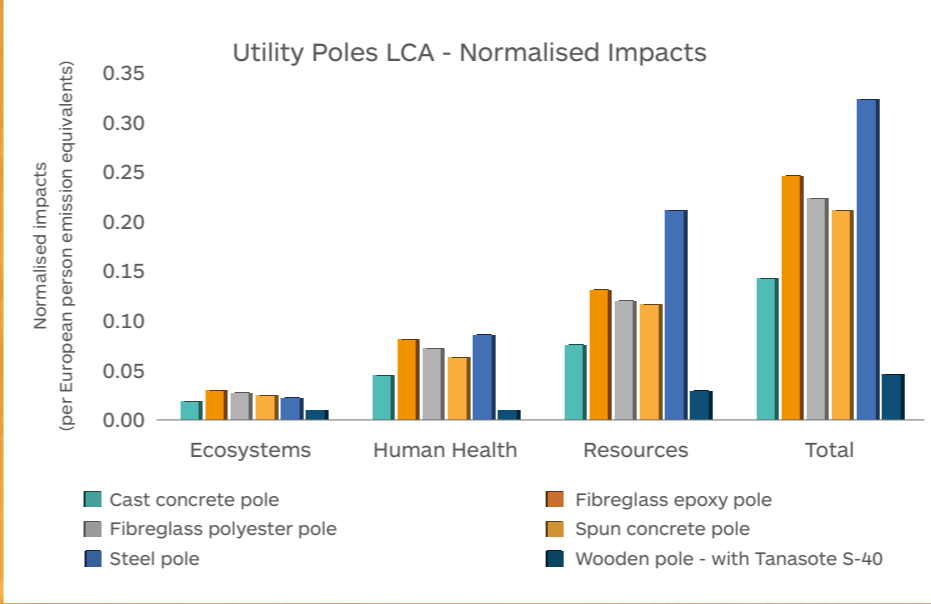
The results show that **Tanasote treated wooden poles** have the **lowest impact overall** followed by the cast concrete pole.

The impact of each pole material is also presented relative to the Tanasote treated wooden pole system.

Sleepers

Tanasote still has the **lowest overall normalised impact**. However, the total difference is not as large as for utility poles.

The unit assessed in this case is one kilometre of railway track and includes sleepers and the relevant ancillary materials for each material type.



Can we trust the performance of new oil based alternatives?



Testing of Wood Preservatives

Testing wood preservatives is a well documented procedure. It requires compulsory laboratory testing to determine performance, coupled with long term field test experience and knowledge.

When new products are developed there has to be a range of data bridges to determine performance. Otherwise products have to be developed 40 years before they can be sold, which is not commercially feasible.

At Lonza we are always pushing beyond that which is compulsory.

Laboratory Testing

We conduct the following Laboratory testing as standard:

- Formal EN studies including EN599-1 (Performance of wood preservatives which covers testing by Use Class durability, ageing test, biological analysis etc)
- Fungi and Insect testing
- BPR conformance and approval

GOING THE EXTRA MILE

“We also conduct laboratory testing on aggressive copper tolerant fungi.”

Testing of Wood Preservatives

Field Testing

We conduct the following field testing as standard:

- **Standard field tests in multiple countries EN252 (determining effectiveness of a wood preservative in ground contact)**

GOING THE EXTRA MILE

Accelerated field tests in aggressive environments such as Florida.

Fungal cellar tests (UK & Germany)

Multiple Pole & Sleeper field test studies for case study purposes

Bridging from long-term field test data for Tanasote

We also use data gained from our **extensive long term field studies** around the world that demonstrate that **3kg/m³ of copper in Tanalith® E preservative** matches the performance of Creosote in **20 year field test studies**. **Tanasote is based on 3kg/m³ of copper.**

The development of Tanasote has taken this into consideration and it is developed as a **higher performing product** than existing water based copper organic preservative products.



Fungal cellar test being conducted by Freedom on behalf of the UK Distribution Network Operators (DNOs).



CREOSOTE TREATED TIMBER - WHAT YOU NEED TO KNOW

Characteristics of oil based treatments

The choice of oil is a very important consideration.

Petroleum vs Bio based Oil

Petroleum based oils have already proven properties in wood preservation. They offer **significant water repellent properties** and work well with the wooden substrate. They do not have any odours or any affect on the surface of the wood by hardening or encouraging the growth of wood destroying fungi that causes the staining which can **occur with bio based oils** such as **Talloil**, a derivative from the pulp industry.

Petroleum based oils are also better from an operational point of view being more **consistent** in penetration and less likely to sludge in the storage tank.

From an environmental point of view Life Cycle Assessment (LCA) studies have shown negligible difference in both these types of oils.

Several species of brown rot fungi exhibit extremely high levels of tolerance for copper when exposed to some early copper-based preservatives.

How will wooden poles treated with Tanasote combat against these fungal strains?

This was a key consideration when developing Tanasote.

Lonza has data showing excellent performance against aggressive strains of copper tolerant fungi, these being more aggressive than the compulsory fungi called up in EN test standards.

What is the conductive nature of new oil based treatments?

Conductivity is largely a function of water uptake. **Being oil-based Tanasote is an excellent water repellent with low levels of conductivity.**

The oil is similar to oils being used in the USA for the treatment of poles today and has an excellent commercial track record

What is the corrosive nature of new oil based treatments?

There is excellent data to show that **Tanasote is non-corrosive to the treatment vessel** and to metal fittings traditionally in use in the various markets.



What is the Disposal Process for end of life?

Creosote

The re-use of Creosote treated wood is **strictly controlled**.

EU regulation 552/2009 **prohibits** the placing on the market of **any Creosote treated wood for re-use** where treatment was applied after 31 December 2002.

Wood treated before 31 December 2002 can still be placed on the market but with **close restrictions** on the end-use.

The wood **must need no prior treatment** (unsound areas cut out etc) before being placed on the market.



CREOSOTE TREATED TIMBER

**NO
RE-USE**

EU REG 552/2009

Energy Recovery

Both Creosote and Tanasote treated wood **can be incinerated**.

Incineration with energy recovery, preferably in combined heat and power plants, is the environmentally preferred route.



Tanasote

There are currently **no similar regulations** applying to Tanasote treated wood.

In the UK, Tanasote treated end of life wood is covered by Waste Exemption U8 irrespective of the treatment date. This **allows the placing on the market of re-used wood** as long as it does not need treating in any way (e.g. unsound areas cut-out etc) before being sold.

End of life Tanasote treated sleepers, for example, could be placed on the market for certain end-uses prescribed in Waste Exemption U8. These end uses include construction of **buildings, fencing, barriers, containment** or similar above ground construction.

Tanasote™

A Modern Twist on an Old Classic

When, why and how should we move to Creosote alternatives?



Transitioning from Creosote

The transition from a well respected preservative such as Creosote to an emerging alternative is never an easy decision.

The **main strategic factors** that require consideration are:



Market Considerations

- What are my current & future market drivers?
- How do I want to be seen in the market place - am I market leader or follower?
- What product will best continue to service my customers effectively?
- Am I engaging with this issue enough?



Supply Considerations

- What product fits my current operation best?
- Am I clear on what my customers want from me when Creosote is restricted or banned?
- Do I have a trusted relationship with recognised suppliers?
- Am I engaging enough with trusted suppliers?



Transition Considerations

- Does my supplier have the resources to give me a seamless transition?
- Can my supplier help me communicate and educate my customers?
- Will my supplier support me technically to ensure that we use the new products effectively?
- Does my supplier have a long term pipeline to ensure future proofed supply?

Lonza

Wood Protection

REAL WORLD THINKING.
REAL WORLD PERFORMANCE.

At Lonza we believe that we have the **technologies** and the **resources** that can assist you to have a strategy in place to effect a **successful transition** away from Creosote.

Lonza Wood Protection has some of the most recognised and respected product brands in the world of timber protection.

We are passionate about timber. We love its warmth, its beauty, its strength, its versatility.

“Our mission is to help you make the most of this sustainable and adaptable material with tried, tested and trusted wood protection products and services that will give you and your customers real world performance.”

For **over 80 years** we have been pioneering and developing customer and market focused industrially applied **preservatives for timber**.

Brands such as TANALITH, VACSOL and ANTIBLU have built an **international level of recognition** and use by architects, specifiers, builders, contractors, merchants, as well as the general public.

We are proud of our dedicated and talented employees who provide **focused** and **responsive support services** that will ensure that the total experience of transitioning away from creosote will be as seamless as possible for all stakeholders.



Lonza - the Trusted Name in Wood Preservation

ACCOUNT MANAGEMENT

Every one of our customers has a dedicated account manager. They are working for you every day, focused on timber industry dynamics that relate to your business.



SUPPLY TEAM and CUSTOMER SUPPORT

Our supply team personnel are ready to take and process your product orders and arrange appropriate deliveries.

Our customer support team can help to answer any day to day questions from you or your customers on our products and treatments.



RESEARCH and REGULATORY TEAMS

Our research and development teams based at Castleford are continually liaising with our colleagues worldwide in developing innovative yet tried and tested protection products and technologies to help meet your future business and markets requirements.

Lonza - the Trusted Name in Wood Preservation

PRODUCT MANUFACTURE and SUPPLY

Our supply team personnel ensure product orders are supplied to meet your delivery and timing requirements through professional chemical industry bulk delivery transport or in UN approved containers.

All products have appropriate regulatory and safety labelling in place.



TECHNICAL SUPPORT SERVICES

With a continual investment in the very latest technology and equipment, the technical services team at our UK technical centre is able to analyse and report back the quality of customers' treatment solutions and treated timbers to help make sure you are producing high performance products for your markets.

Our field technical support team can also work directly with individual customers.



PLANT and ENGINEERING SERVICES

Our experienced head office based engineering services manager can quickly resolve many operational issues over the phone.

We also have dedicated field engineers to help with any on-site plant problems or to deliver regular professional plant maintenance services to help keep your operation working to its full capacity.



MARKETING SERVICES

Our in-house marketing and design team has a wealth of experience in the effective and creative promotion of treated timber products.

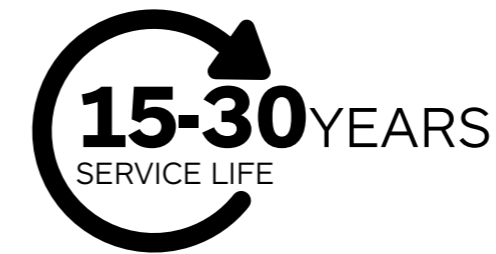


Lonza Technologies for Poles, Sleepers, Agricultural Fencing, Equestrian, Highway Fencing and Industrial Landscaping/Revetment Markets

Lonza offer the following wood protection technologies to help you deliver assured treated timbers to your markets.



TANALITH - Water Based Copper Organic Preservative - 15-30 years Service Life (species dependant) - designed for residential and industrial markets.



TANASOTE - Oil Based Heavy Duty Preservative - 40 years Service Life in Pine - designed as a direct replacement for Creosote for all markets.



BARRIER Systems – Highly durable coatings for ground line and below. Designed to further enhance treated timbers in ground contact applications.



**If you need
further help
and advice
please get in
touch...**

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Wood Protection