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H O T W A T E R S Y S T E M S

## There Is Nothing Hotter than Copper

### 3 Major Reasons Why You Should Use Copper Cylinders

Copper has been used for thousands of years and so it's maybe a little ironic that the modern technologies and approaches used in renewable energy are so compatible with such a traditional raw material.

The changing market demands and the increase in energy costs have meant that the role of the hot water system is becoming a key feature in determining the energy efficiency of a building.

Throw in the fact that health and safety has never been more scrutinised, not only in the build process, but throughout the lifetime of the building and it is vital that architects, specifiers and installers consider the impact their material choices may have.

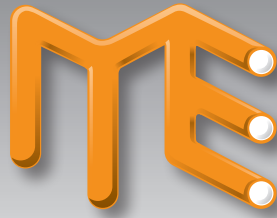
So, why is **Copper So Hot** right now?

1. **Copper's superior heat transfer properties means less time to heat water and so improves energy efficiency**
2. **Copper Offers Increased Protection Against the Threat of E.coli and Legionella**
3. **Copper is 100% recyclable**

We will look at each area in more detail to see exactly why there really is nothing hotter than copper.

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### 1. Copper's superior heat transfer properties means less time to heat water

The speed at which a hot water systems heats up is dependent on two key factors. Firstly how quickly the coil itself heats up - determined by its thermal conductivity. And secondly, the amount of surface area in the coil to transfer the heat to the water.

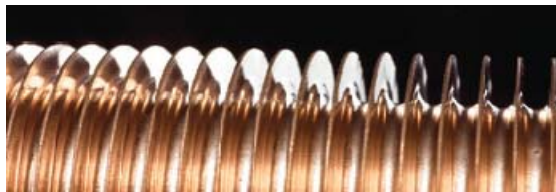
When you compare the two main materials used in coils, copper and stainless steel, we can see that **copper's thermal conductivity is almost 30 times greater than that of stainless steel**. This means that it will take significantly longer for the stainless steel coil to raise its temperature to the required the level and so use more energy.

When it comes to transferring the heat to the water, the key factor in determining speed is the physical surface area of the coil which can cause a reaction with the water. The more surface area, the more heat that can be transferred, the quicker the heat recovery process.

So how do you maximise the amount of surface area of the coil?

Obviously the more coil you have in the tank, the more surface area you offer. As copper is a much more flexible material than stainless steel, **you can squeeze more copper coil into a cylinder than you can with a stainless steel coil**. For example, many copper cylinder manufacturers suggest approximately 0.3 m<sup>2</sup> coil per 1m<sup>2</sup> of solar panel - a ratio stainless steel cylinders do not achieve.

**Copper coils can also be available with a finned profile which drastically increases the surface area of the coil, once again improving the time the heat transfer process required.**



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The combination of up to 30 times improvement in thermal conductivity, the ability to fit more copper coil into a cylinder than a stainless steel coil and the ability to incorporate a finned coil to further increase the surface area, means that copper is a dramatically more efficient material to be used for hot water cylinders.

**One leading heat pump manufacturer reckoned using a copper cylinder could save up to £180 per year on running costs.**

And when it comes to solar thermal systems the benefits are equally as attractive. One leading manufacturer of solar thermal panels estimated that **a system incorporating a copper cylinder is 17% more efficient than when using stainless steel.**

**That's 17% more energy from the same solar panels year after year by using copper.**

### 2. Copper Offers Increased Protection Against the Threat of E.coli and Legionella

Hot water systems can be a thriving breeding ground for bacteria such as E.coli and Legionella and the choice of material will play a vital factor in the threat level.

Tests showed that after **7 days of immersion in water, 80% of stainless steel and 90% of plastics were coated in a biofilm.** These biofilms are harbingers of E.coli 0157 and other microbiological bugs that can pose a significant threat to human health and indeed could be life threatening.

The concentration of E. coli when tested **after the 7 days was 100 times lower on the copper** than the stainless steel or plastic.

In tests, it **took 34 days for E. coli 0157 to die on stainless steel**, 4 days on brass and just **4 hours on copper.**

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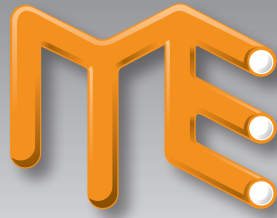
The temperature of the water will also affect the growth of bacteria and research shows that *Legionella pneumophila* will multiply in water at temperatures between 25-45°C. It is only when the temperature reaches 55°C that the bacteria will be killed off.

This becomes a **key issue in renewable energy and in particular solar energy**, where the **water temperatures achieved can be less** than traditional fuel sources and may be the reason why many heat pump manufacturers are recommending copper cylinders be used with their systems.

So using **copper cylinders can significantly reduce the threat of bacteria growth** in your water system.

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### 3. Recyclable – Copper is 100% recyclable

Going green and improving the country's sustainability is high up on the government's agenda and a core driver for the increasing use of renewable energy and multiple fuels sources.

The WEEE Directive is also a clear sign that a greater focus will be placed on the costs of disposing products at the end of their lifespan and so recyclable products become increasingly attractive in the build process.

**Copper is one of the few building materials that is 100% recyclable** meaning that environmental impact of copper cylinders are minimal.

Copper as a material has been used for good reason over the years and continues to be far superior to other alternatives on the market.

To find out more about the full range of products and services available from McDonald Engineers contact us on 01592 611123 or visit [www.mcdonald-engineers.com](http://www.mcdonald-engineers.com)

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