



## Food for thought or time for change?

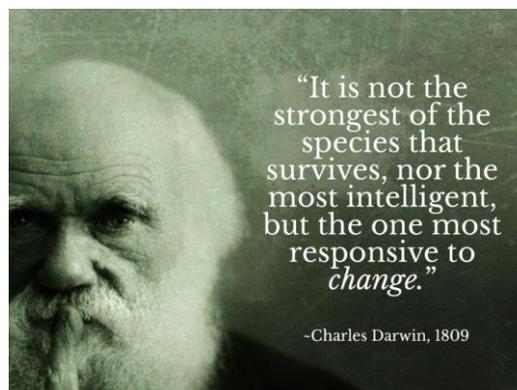


We are living in a *competitive* and fast *changing* world.

As we all know we are living in a competitive and fast changing world. **New innovations** are taking over **old technologies** more rapidly than they did in the past. Did it take us thousands of years to invent iron, bronze, fire, book print, steam engines, electricity or computers, nowadays it only takes a few years or even months for a new technology or product to be invented and launched into the market. In the past we could hold on to old technologies for decades or at least years but in today's society and competitive market, we have to keep up with the latest technology or are simply left behind.



We sometimes ask ourselves how we functioned in the past, without our current technology and latest products. Why are we people **innovating** and **changing** all the time? Could it be because we are not happy with the way we are doing things today, think we can do things better or do we have a problem today that has to be solved tomorrow?



## Or is it simply a matter of survival...?



# TECH NEWS



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On the other hand, why do some people sometimes still want to hold on to **old technologies** and even justify the limitations or failures of these **old technologies**?  
Is it simply because these people don't like to change and are happy in their comfort zone?

**"Because we've always done it this way."**

**The 7 most dangerous words in the English language.**

**We at aquatherm believe we are Innovative and "different"!**

This was confirmed when we heard about our excellent position as the number one in the "most innovative companies of Germany's small and mid-sized enterprises ("Mittelstand")" ranking from the Munich Strategy Group at the end of 2011.



Nr.	Branche	Unternehmen
1	Bauwirtschaft	aquatherm GmbH Kunststoff - Extrusions- & Spritzgießtechnik
2	Maschinen- und Anlagebau	Mecklenburger Metallguss GmbH
3	Maschinen- und Anlagebau	LEWA GmbH
4	Technologie	Becker Marine Systems GmbH & Co. KG
5	Maschinen- und Anlagebau	Gebrüder Lödige Maschinenbau GmbH
6	Bauwirtschaft	Albany Door Systems
7	Maschinen- und Anlagebau	Multivac Sepp Haggenmüller GmbH & Co. KG
8	Technologie	Otto Bock
9	Dienstleistungen & Handel	Ravensburger AG
10	Technologie	d & b audioteknik GmbH
11	Technologie	W.O.M. World of Medicine AG
12	Bauwirtschaft	HEWI
13	Maschinen- und Anlagebau	kocher-plastik Maschinenbau GmbH
14	Bauwirtschaft	TECE GmbH
15	Dienstleistungen & Handel	Galileo Lebensmittel GmbH & Co. KG
16	Technologie	IBAK Helmut Hunger
17	Maschinen- und Anlagebau	MAJA-Maschinenfabrik Hermann Schill GmbH & Co. KG
18	Maschinen- und Anlagebau	Jöst GmbH & Co. KG
19	Technologie	Telegärtnner Karl Gärtner GmbH
20	Maschinen- und Anlagebau	Sear GmbH

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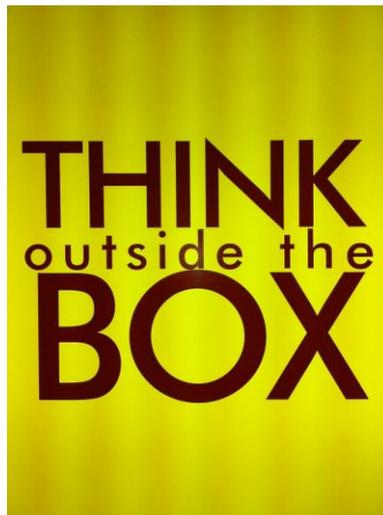
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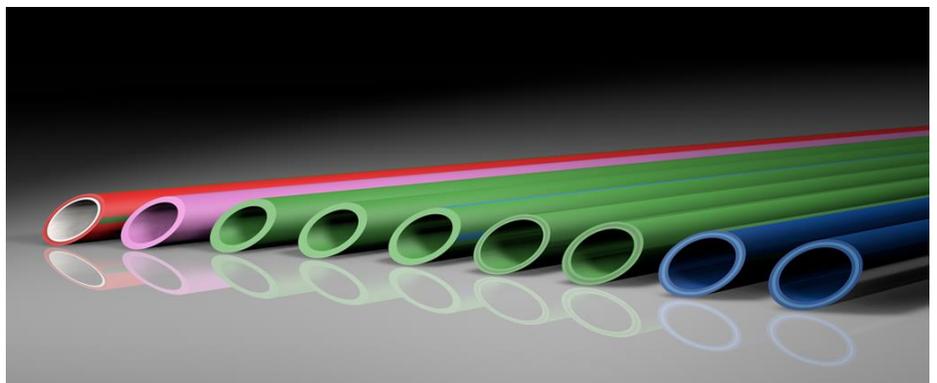


We at aquatherm believe it is good to constantly question ourselves about the things we are doing and why we are doing things a certain way.  
Can we do things better or differently?



Shouldn't that also count for the way we are choosing our pipework?

Let's compare Australian's default pipe material of choice (i.e. *Copper*) to aquatherm PP-R pipe systems.





## Copper pipe

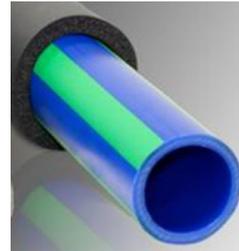
- Thermal Conductivity: **305-355 W/m.K** (= Conductor of heat).  
Copper pipes hardly have any R-value. Why choose (the best) conductor of heat for conveying chilled or heated water over long distances? Good heat exchanger!



- Not an acoustic insulator. (Flow/velocity restrictions).
- Not an electric insulator.  
Electrical Resistivity:  
 **$1.9-2.3 \times 10^{-8} \Omega m$  at 20°C**  
(Earth the copper pipe system).
- High density:  **$8.94 \times 10^3 \text{ kg/m}^3$**
- Modulus of Elasticity: **117 GPa**
- Yield Stress (Annealed Copper): **70 MPa**  
Yield Stress (Bendable Copper): **220 MPa**
- Copper pipes can corrode. (Inside and Outside).
- Copper pipes can be susceptible to type 1 & 2 pitting, cavitation erosion, erosion-corrosion, flux induced corrosion and blue water.  
[IPA Copper temperature & velocity report](#)  
[Erosion corrosion in Copper HWRS pipes](#)
- Limited chemical resistance.
- Linear expansion coefficient:  
**0.0177 mm/m.K**
- Rigid pipe (larger provisions for expansion; bending side / expansion loop)
- For in ground, in combination with roll groove couplings, thrust blocks required.
- Some maintenance required during service life.

## aquatherm PP-R pipe

- Thermal Conductivity: **0.15 W/m.K** (= Insulator). PP-R pipes have an R-value. This can reduce the insulation thickness.



- Acoustic insulator. (Less flow/velocity restrictions).
- Electric insulator.  
Electrical Resistivity:  **$> 10^{15} \Omega m$  at 20°C**  
(Don't have to earth the PP-R pipe system).
- Low density:  **$0.9-1.2 \times 10^3 \text{ kg/m}^3$**
- Modulus of Elasticity: **0.9-1.2 GPa**  
(S pipe: 0.9 GPa / MF pipe: 1.2 GPa)
- Yield Stress: **25-30 MPa**  
(S pipe: 25 MPa / MF pipe: 30 MPa)
- PP-R pipes do not corrode.
- Can be susceptible to oxidative stress cracking.  
[Degradation of Polyolefin pipes in HWRS](#)
- Very good chemical resistance.
- Linear expansion coefficient:  
**0.03 / 0.035 / 0.15 mm/m.K**  
(MS pipe / MF pipe / S pipe)
- Flexible pipe (smaller provisions for expansion; bending side / expansion loop)
- For in ground no thrust blocks required.
- Maintenance free.



## Copper pipe

- Pipe roughness:  
C factor = 130 Hazen-Williams formula.  
(C factor becomes lower when copper pipe corrodes/erodes internally).
- Lower permissible working pressure for larger copper pipe sizes.
- Thin pipe wall;  
larger hydraulic bore (d<sub>i</sub>).
- Not abrasion resistant.
- Not resistant to scaling.
- Can react with other materials/metals and can cause other materials to fail.  
(i.e. electrolytic/galvanic corrosion).
- UV resistant.
- Heavy metal.  
Copper toxicity (copper poisoning).  
[US Lead and Copper Rule](#)  
(United States EPA)
- Are not used in high purity RO water, rainwater & swimming pool applications.
- Low tolerance to freezing.
- Higher permissible working temperatures.
- Volatile pricing.  
(Can be double digit price fluctuations, depending on global commodity prices).
- Joining by brazing, soldering, compression, roll groove (rubber gaskets) or press-connect (O-rings).
- Recyclable material.
- Prone to stealing.
- Larger impact on Environment  
(Mining, Energy, Transport, Chemicals).

## aquatherm PP-R pipe

- Permanent smooth bore  
(pipe roughness 0.007)  
C factor = 150 Hazen-Williams formula.
  - Higher permissible working pressure for larger aquatherm PP-R MF pipe sizes.
  - Larger wall thicknesses;  
smaller hydraulic bore (d<sub>i</sub>).
  - Longer lasting in combination with abrasive media (i.e. sand, cement, slurry).
  - Scaling resistant.
  - Will not react with other materials.
  - Limited UV resistant.
  - No heavy metals. No VOC's. Zero impact on smell and taste. Food grade material.
- 
- Suitable for RO water, rainwater and swimming pool applications.
  - Better tolerance to freezing.
- 
- Limited maximum working temperatures.
  - Stable pricing.  
(Single digit price fluctuations).
  - Joining by socket fusion, butt welding and electrofusion (no foreign materials).  
No open flames or toxic materials.
  - Recyclable material.
  - Environmentally friendly material.  
[EPD \(Environmental Product Declaration\)](#)  
[Environment Impact Comparison \(teppfa\)](#)
  - Slightly shorter support intervals (MF pipe)



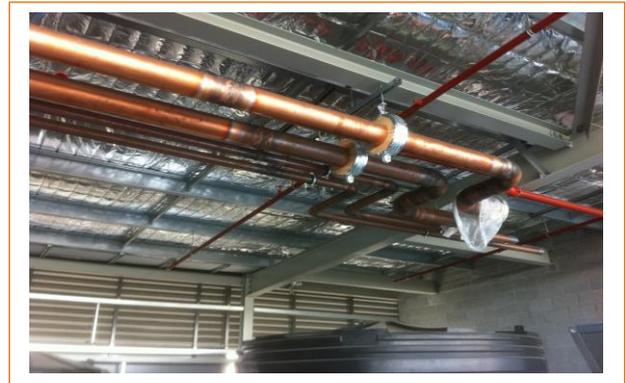
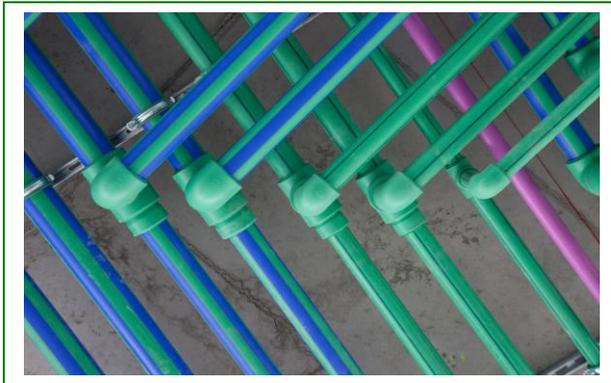
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