Comparison of PB, PPR, CPVC and PE-RT

Introduction

A plumbing system is a long-term investment
The piping system for hot & cold water supply inside buildings is definitively a very important part of every building. In fact it is, after the building structure, the second (2) most important part of the building because the pipes are hidden behind walls, floors, false ceilings etc. and have therefore a very difficult access in case of leakages. It is also well known that pipe leakages can damaged very much the building itself giving a lot of troubles to inhabitants and building owner.

On the other side, many people are not aware about the effective material cost of the pipes and fittings; → which is less than 0,5%* of the total building costs!

*) 0,5% is only the pipes and fittings (no valves, pumps, claims, insulation, filters, heaters, tec.)

However, we are the opinion that especially for the piping system, consultants and owners, shall choose best quality because it is a small cost unit but at the meantime extreme important.

Objective
This comparison is concentrating only on the material properties itself. It is self-evident that all piping systems with all its different materials and assembly technologies have its “right to exist”. Some manufactures have a good price others have a strong local relationship, other are using just a clever assembly technology, etc. etc. Therefore it is always the market who decides.

We believe that it is important to recognise our piping systems as it is;
→ As a “high end” piping system for prestigious buildings.
The low price market is not our focus.

With this document we would like to demonstrate that PB has a clear difference to other materials used in the piping system industry and has much better properties for that propose.

A High-End piping system manufacturer has to fulfil these (basic) four steps to achieve its objectives:
1. Choose best raw materials for its propose
2. Have own R&D which can develop and design best assembly technologies
3. Have a strong quality control process during the fabrication
4. Assuring best practice on the worksite during the installation work but also offering training and site monitoring

Only when all these points are successfully achieved the building owner can “forget” the piping installation for the whole lifetime, and that is in fact what he wants.
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Characteristics</th>
<th>Unit Criteria</th>
<th>PB (TERRAIN SDP)</th>
<th>PP-R</th>
<th>PE-RT</th>
<th>C-PVC</th>
<th>Copper</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Possibility to use one single system for the hole project</td>
<td>Product range</td>
<td>16 – 125mm</td>
<td>20 – 125mm</td>
<td>20 – 63mm</td>
<td>16 – 110mm</td>
<td>10 – 108mm</td>
<td>Very important in big projects (\rightarrow) no mix of materials and same supplier!</td>
</tr>
<tr>
<td>2</td>
<td>Jointing technique:</td>
<td>-</td>
<td>Socketfusion</td>
<td>Socketfusion</td>
<td>Glue</td>
<td>Solder</td>
<td>Solder</td>
<td>Solder unions need a lot of working time (labour costs). Glue unions are delicate in the work site...</td>
</tr>
<tr>
<td>3</td>
<td>Flexibility of the pipe</td>
<td>-</td>
<td>Extreme flexible</td>
<td>medium</td>
<td>medium</td>
<td>hart</td>
<td>Very hard</td>
<td>PB is perfect for risers in high buildings. No need of expansion loops!</td>
</tr>
<tr>
<td>4</td>
<td>Less pressure drop in Pipes</td>
<td>mbar</td>
<td>Low</td>
<td>High (due their thick wall thickness)</td>
<td>Middle</td>
<td>Middle</td>
<td>Middle</td>
<td>PB is better because of its thin wall thickness</td>
</tr>
<tr>
<td>5</td>
<td>Corrosion free</td>
<td>Yes/No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>NO</td>
<td>Plastic cannot corrode but copper it does</td>
</tr>
<tr>
<td>6</td>
<td>Scale build up</td>
<td>CaCO3</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>YES</td>
<td>Plastics are much better than metals</td>
</tr>
<tr>
<td>7</td>
<td>Possibility for “pipe in pipe” installation (\text{PB trough corrugated pipe})</td>
<td>Flexibility (very flexible)</td>
<td>NO (too rigid)</td>
<td>NO (too rigid)</td>
<td>NO (too rigid)</td>
<td>NO (too rigid)</td>
<td>NO</td>
<td>Due the PB pipe is extreme flexible it is very easy to “put in” or “take off” the inner pipe.</td>
</tr>
<tr>
<td>8</td>
<td>Heat expansion</td>
<td>mm/mK</td>
<td>0,13</td>
<td>0,18</td>
<td>0,18</td>
<td>0,08</td>
<td>0,018</td>
<td>PB is the only one which offers the possibility to install by “Rigidly Fixing”</td>
</tr>
<tr>
<td>9</td>
<td>Thermal conductivity</td>
<td>W/mK</td>
<td>0,22</td>
<td>0,24</td>
<td>0,40</td>
<td>0,14</td>
<td>372</td>
<td>Copper is very high</td>
</tr>
<tr>
<td>10</td>
<td>Density</td>
<td>g/cm3</td>
<td>0,93</td>
<td>0,90</td>
<td>0,94</td>
<td>1,55</td>
<td>8,89</td>
<td>Plastics are much lighter than metals</td>
</tr>
<tr>
<td>11</td>
<td>Market position in Europe in the life cycle diagram</td>
<td>1. Introduction</td>
<td>Growth (fast)</td>
<td>Not used in pluming. Only in heating.</td>
<td>Not used anymore in Europe</td>
<td>Still big market share but Decrease/Death</td>
<td>In Central and Western Europe, PP-R and Copper loses fast on market</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Sound velocity in material</td>
<td>m/s</td>
<td>620</td>
<td>1200</td>
<td>870</td>
<td>2350</td>
<td>3900</td>
<td>PB is best (rubber is 320, quite the same as PB!)</td>
</tr>
<tr>
<td>13</td>
<td>Flexibility (modulus of elasticity)</td>
<td>N/mm2</td>
<td>450</td>
<td>800</td>
<td>650</td>
<td>3500</td>
<td>120000</td>
<td>PB is best (ideal for pipe through sleeve)</td>
</tr>
</tbody>
</table>
Leader in PB piping systems

Overview of our systems

WE OFFER 2 THERMOPLASTICS

<table>
<thead>
<tr>
<th>Polybutylene (PB) Distribution of cold &amp; hot water and Radiator Heating</th>
<th>PVC / PP Wastewater, Rainwater, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PushFit - System</td>
<td>• Rain water system</td>
</tr>
<tr>
<td>Socket fusion - System</td>
<td>• Soil and Waste water system</td>
</tr>
<tr>
<td>Butt/Electro fusion - System</td>
<td>• Valves &amp; Siphons (PP)</td>
</tr>
<tr>
<td></td>
<td>• Floor drains</td>
</tr>
<tr>
<td></td>
<td>Soundproof system in PVC</td>
</tr>
</tbody>
</table>
### Brief overview about our systems

<table>
<thead>
<tr>
<th>POLYBUTEN (PB)</th>
<th>Mechanical</th>
<th>Thermo Fusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>PushFit</td>
<td>Socket Fusion</td>
<td>Electro Fusion</td>
</tr>
<tr>
<td>d16 – 50mm</td>
<td>d16 – 63mm</td>
<td>d63 - 110mm</td>
</tr>
</tbody>
</table>

*Tool Less!!!*

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### Current situation in big parts of Europe

**Lifecycle of different polymers used in plumbing installations for cold & hot water**

**Systems for small diameters up to d25mm:**  
- PB and ML are changing depending on the country.  
  E.g. in Spain, UK, Switzerland  
  PB is in the position of ML and ML behind PB.

- Multilayer  
- PEX

**Introduction**  
**Growth**  
**Saturation**  
**Regression**

**Remark:**  
PE-RT is not used in Europe for plumbing
What is Polybuten (PB)?

It has been manufactured specifically to transport hot potable water at high pressure.

Therefore it is the strongest polymer of all and that is the reason why PB pipes have the skinniest wall thickness of all plastic pipes... but still offering a very long lifetime (minimum 50 years) at 70°C and 10bars! (CLASS 2)

PB is very flexible and it adapts to any shape in your project.

Resistant to low temperatures. It don’t breaks when water is freezing inside the pipe! It is perfect for cooling systems too.

PB is best choice when big diameters are needed and the best solution when a long life span is required, specially for Hotels, deluxe Malls, Hospitals, High Riser Buildings, etc.

It is resistant to all kind of vibrations and/or water hammering effects.

Comparison of Standards
70°C Reference Lines of Polyolefin


Comparison of reference lines @ 70°C

Even after 50 years lifetime, PB is still stronger.

The PB resin is stronger than the leading competitive products offering more than 35% higher strength at 70°C whilst maintaining the advantage of pipe flexibility.

Source: BASELL
PB → the strongest resin!
Comparison of pipes with the same wall thickness

Pressures Comparison
SDR11 / Series 5 pipe

Class 2 (70°C / 50 years)
Service Class according EN ISO 15876

Which material is stronger?

Comparison of different materials (PB – PP-R)

6 bar working pressure at 95°C continuous temperature with 1.5 SF

Question: how long does PB, PP-R resist?

PB S5  PP-R S3,2  PE-RT S4  CPVC S4

5 Years  1 Year  1 Year  1 Year

Remark:
PB has even with the thinnest wall thickness (Pipe Series 5 / SDR11) the longest lifetime.
PB is the better alternative to PP-R, PE-RT or CPVC because:

- PB is the strongest resin
- PB has the thinness pipe wall thickness…
  …and therefore PB has the biggest flow rate
  …respectively the lowest pressure drop
- Can use always 1 diameter smaller than PP-R!!!
- PB offers the longest lifetime even with water hammering effects in the installation
- PB is perfect to compete Legionella because it offers big reserves at high temperature (important because pressure rating e.g. water hammering)
- PB is best for big Projects due its big product range → one material – one system!
- Lowest noise emissions
- PB is the most flexible polymer
- Expansion: smallest Flexible Legs, Loops and Expansion Force
- Flexibility allows for easier installation and different methods (e.g. Spider or PiP)
- Safety for the customer since controlled raw material source

In a few words; → more benefits with a very reasonable price!