

**DISADVANTAGES OF DUCTILE IRON PIPE
(ADVANTAGES OF POLYETHYLENE)**

S.No.	DI Pipes	HDPE Pipes
01	<p>Handling</p> <p>Ductile Iron (DI) pipes are strong but heavy. They need more handling equipment and craneage than most other material even for small diameters. Lengths are restricted to 5.0 or 5.5 metres even for the small diameters.</p>	<p>HPDE has a much lower density and the pipes are therefore easier to handle even at large diameters.</p>
02	<p>Interchanging Manufacturers</p> <p>The spigot and socket jointed pipes supplied by different manufacturers are not necessarily interchangeable.</p>	<p>All PE pipes are specified in outside diameters and as such are mutually compatible. Even different grades of resin may be welded with full confidence in the resulting joint.</p>
03	<p>Anchor Blocks</p> <p>Bends and tees require restraint (concrete anchor blocks) which can sometimes be very large. They are also awkward to provide in distribution systems because of the adjacent other services.</p>	<p>Welded pipe systems such as PE do not need anchor blocks.</p>
04	<p>House Connections</p> <p>Tappings with ferrules should not exceed 1/16th of the diameter of the pipe. Otherwise saddles or tees should be used.</p>	<p>There is a huge range of options for making service connections from electro fusion to common tappings. All are completely leak proof.</p>
05	<p>Corrosion</p> <p>The pipes need protecting against internal and external corrosion.</p>	<p>All polyethylene pipes are completely resistant to corrosion. It should be noted that PE is used to protect the DI pipes.</p>

<p>06</p>	<p>Complex Protection</p> <p>The standard protection is a complex combination.</p> <p>Internal – cement mortar (plus seal coat for low alkalinity water especially desalinated water and distribution pipework)</p> <p>External – 20 microns of zinc 70 microns of bitumen</p> <p>Wrap - site or factory applied polyethylene sleeve</p>	<p>No protection required</p>
<p>07</p>	<p>Fittings Protection</p> <p>Fittings require an additional bitumen (70 microns) coat inside the bell.</p>	<p>No extra protection is required for PE fittings</p>
<p>08</p>	<p>Vulnerable Protection</p> <p>The pipes are robust and not easily broken but the protective layers are much more vulnerable.</p>	<p>PE is extremely durable and will perform adequately even after considerable surface damage - up to 10% of the wall thickness may be scored out without any loss in pressure capability.</p>
<p>09</p>	<p>Tears in Wrap</p> <p>The PE wrap is very vulnerable to tearing during installation, so areas of the pipe may come into contact with the soil which is undesirable.</p>	<p>Wrappings are never necessary to protect PE</p>
<p>10</p>	<p>Design Life</p> <p>The design life of DI pipes is nominally 50 years (sometimes quoted also as 35 years) but there is no way of predicting this either empirically or statistically in any particular conditions.</p>	<p>All PE pipes must give at least 50 years of service life and will almost always give far more. Proven methods are available to calculate service life in a variety of environments.</p>

<p>11</p>	<p>Limited Deflection</p> <p>Angular deflection is limited to 3° or 5°.</p>	<p>PE pipes are flexible and can be bent into quite tight bends with radius from 20 to 35 times the diameter of the pipe depending on the resin and the temperature. This is a special boon in service connections and avoiding other congested existing utilities.</p>
<p>12</p>	<p>Special Tape Protection</p> <p>At service connections the protective coating and wrapping should be over-wrapped with special tape to avoid leaving unprotected metal surfaces</p>	<p>Tape wrapping is never used with PE</p>
<p>13</p>	<p>Anchor Blocks for Testing</p> <p>For pressure testing anchor blocks must develop full strength prior to the start of the test therefore adding considerably to installation times.</p>	<p>Testing is easily carried out even above the trench and a minimum of support is necessary. No concrete blocks are needed.</p>
<p>14</p>	<p>Lining Leaching</p> <p>Unsealed cement mortar lining can give rise to pH pick up and leaching (some failures in pipes carrying desalinated water are known to have occurred in the region)</p>	<p>There is no lining in a PE pipe and no chemical leaching is possible.</p>
<p>15</p>	<p>Low Resistivity Soils</p> <p>In aggressive ground conditions (resistivity less than 2000ohm.cm) wrapping must be done with extra care.</p>	<p>PE is fully resistant to almost all known chemicals so no wrapping or extra protection is necessary</p>

<p>16</p>	<p>Special Circumstances</p> <p>The recommended external protection system (zinc/bitumen/PE sleeving) may not be adequate in some circumstances.</p> <ul style="list-style-type: none"> (a) Natural soils with resistivity less than 1000 ohm.cm (b) Soils with large sharp lumps. (c) Contaminated soils. (d) Anywhere there is a risk of stray current - transformers at large buildings, district sub-stations etc. 	<p>There only very few chemicals that will affect PE and we can advise on special circumstances.</p>
<p>17</p>	<p>Quality of Sleeving</p> <p>Where the quality or consistency of site applied sleeving cannot be guaranteed the corrosion protection system may be at risk.</p> <ul style="list-style-type: none"> (a) Highly acid ($\text{pH} \leq 5$) or highly alkaline ($\text{pH} \geq 9$) soils. (b) Where the water table is above the crown of the pipe especially if resistivity is less than 1000 ohm.cm and/or the ground water chloride content is over 300 mg/litre. © Any situation where water can drain along the trench. <p>In any of the above circumstances it would be wise to specify tape wrapping or extruded PE protection. If there is a risk of the wrapping being torn then cathodic protection should also be considered.</p>	<p>There are no worries about resistivity or integrity of lining when PE is used</p>
<p>18</p>	<p>Joint Tolerances</p> <p>The DI flexible joint tolerance to BS EN 545 maintains wall thickness tolerance on only the first two thirds of the barrel from the spigot. Where pipes are to be cut on site a special order has to be made to ensure compatibility along the whole length.</p>	<p>PE pipes are consistent in their wall thickness. Care is taken to measure this throughout the length of every pipe.</p>

<p>19</p>	<p>Excessive Pressure Rating</p> <p>Where DI is used for distribution the maximum pressures are normally less than 4 bars whereas the pipes are capable of withstanding over 35 bars if necessary. This is clearly well in excess of the system requirement and a waste of budget.</p>	<p>PE pipes are designed to cater for operational pressures. For example, we advise using 10 bar pipes for distribution but we would produce 8 bar or 6 bar pipes on request.</p>
<p>20</p>	<p>Leakage</p> <p>Leaks from push fit joints are the main reason for physical losses in distribution.</p>	<p>PE pipes are welded and the joints do not leak. Western utility providers use PE specifically because it minimizes losses.</p>

SUMMARY

The vulnerability of Ductile Iron to damage from a corrosive environment makes the prediction of useful service life very difficult, if not impossible. It is this uncertainty that often makes DI a less desirable material than those more resistant to corrosion. More practical issues such as site cutting, weight and provision of anchors make it a poor choice for distribution.

Polyethylene is simply not vulnerable to corrosion and therefore requires less maintenance and will not allow losses through pin holes and other damaged areas. Neither will the joints leak. The potential saving in deferred capital investment should alone recommend PE as the only sensible engineering option.

Pipe grade polyethylene is now available from the Borouge factory in Ruwais. The ethane feedstock is bought from Gas Co. The final conversion into pipes is done at the Union Pipes factory in Mussafah. The full manufacturing cycle is carried out within Abu Dhabi's borders. The reverse is true of Ductile Iron which is brought in from various countries outside the region. There is an unnecessary net loss of foreign exchange to bring in a product for which a far superior substitute is available locally.

We will be pleased to expand further on any of the points we have listed above.