

## TECHNICAL BULLETIN

# PVC vs. DUCTILE IRON – COST DIFFERENCES

PVC pipes have gained recognition for their cost-effectiveness, demonstrating excellence in installation, labor, and operational efficiencies. This concise analysis highlights the economic merits inherent in PVC when compared to ductile iron, emphasizing its appeal as a fiscally prudent choice that does not compromise on performance.

### Cost Breakdown

#### PVC Pipe Has Lower Installation Costs

PVC pipes offer a cost effective alternative, ranging from \$0.5 to \$5 per linear foot, significantly undercutting the \$2 to \$10 per linear foot cost of ductile iron pipes (4). PVC fittings often present a compelling advantage, costing up to 50% less compared to their iron counterparts.<sup>5</sup>

Beyond cost, the lightweight nature of PVC contributes to substantial savings in transportation, unloading, and installation efforts, providing an efficient and economical choice when compared to the heavier and more cumbersome ductile iron products.

#### PVC Pipe Requires Less Labor

The national average wage for a pipeline laborer stands at \$17 per hour, a common factor regardless of the type of pipe involved (6). However, the installation time varies significantly depending on the pipe material. The lightweight nature of PVC makes for a faster installation than ductile iron pipe. In addition, fewer workers are needed for PVC installation. PVC is light enough for one to two workers to carry it on a job site where ductile iron requires machinery to move the pipe.

Notably, the difference between PVC and DI lies in the machinery requirements, with DI's heavier nature necessitating equipment capable of lifting the pipe (5). This disparity in machinery adds a nuanced dimension to the overall installation costs and considerations for each pipe material.

PVC installation requires fewer steps than ductile iron pipe. Iron pipes require corrosion protection, while PVC does not need any additional protection. This added step in the process increases the labor costs for ductile iron pipe installation because of the added hours needed.

#### Operational Cost – Friction from Pipe Surface

The Hazen Williams equation relates pipe material and flow to determine pressure drop due to friction from the pipe surface. The "C" value is specific to the pipe material, and is known as the roughness coefficient. The higher the Hazen-Williams "C" value, the more efficient the water flow is through the pipe.

**PVC:** Over time, the Hazen-Williams "C" value may decrease from 155-165 to 150 over a 100-year lifespan<sup>2</sup>

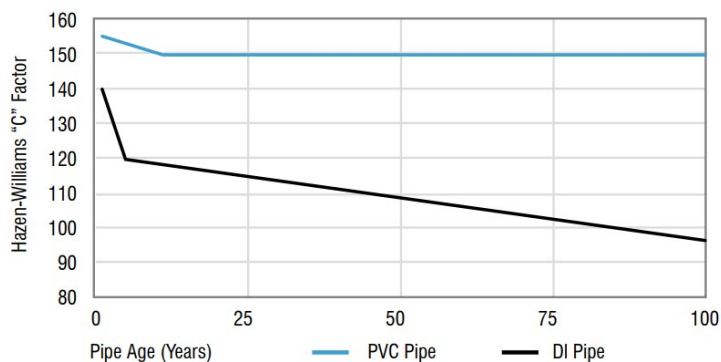
**Ductile Iron:** Starting point may be around 140 and will decrease to 95 over a 100 year lifespan<sup>2</sup>

Pumping costs through pipelines over time are computed each year using the annual head loss. Since PVC does not tuberculate, the head loss in the pipe remains relatively stable over time. Conversely, DI pipes witness an increasing head loss each year, influenced by the diminishing Hazen-Williams "C" value of the pipe material<sup>2</sup>. This distinction highlights a key longevity advantage for PVC, contributing to sustained efficiency in water flow and lower operational costs over the course of a century.

#### Operational Cost – Scanning Electron Microscope Images

While the Hazen-Williams equation determines the headloss through a pipe based on the roughness. The "C" value is based on the pipe surface that the water passes over. The smoothness of the materials can be seen in the scanning electron microscope (SEM) images below. These images are on the micrometer scale - the surface roughness not necessarily seen by the naked eye. The smoother the material, the better the flow through the

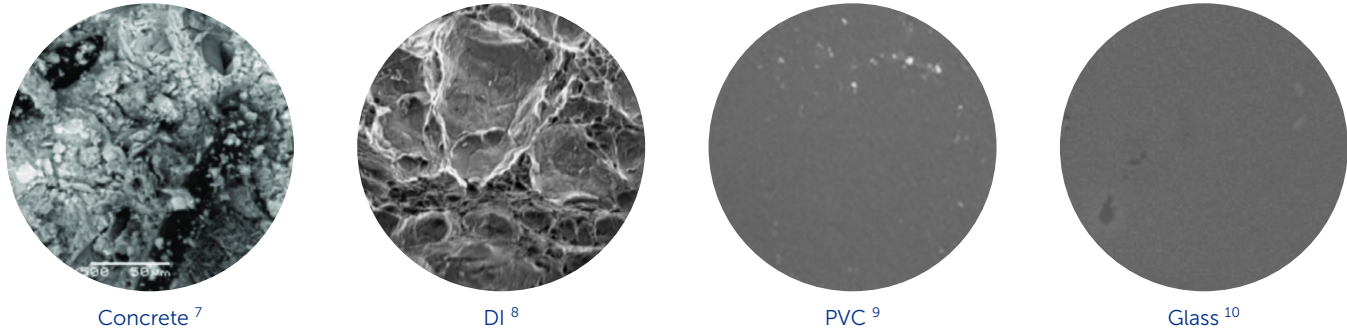
FIGURE 1



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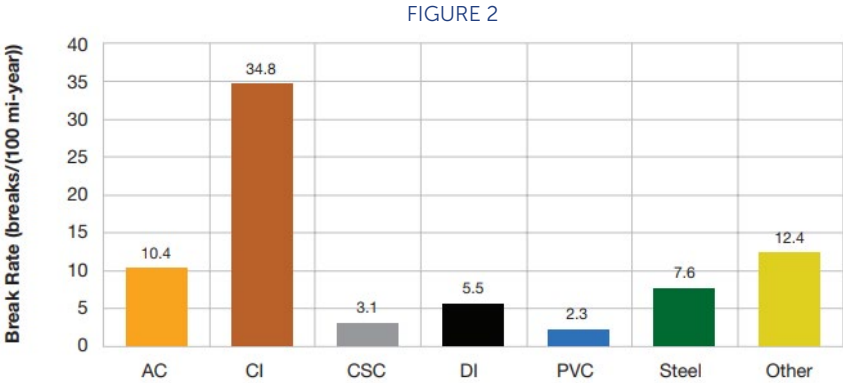
pipe, the higher the Hazen-Williams “C” value. The surface roughness seen in Figure 2 is a tangible example of the Hazen-Williams “C” Value. The rougher surfaces of concrete and ductile iron can be seen here, proving that there is a difference in the surface roughness.



**Operational Cost – Water Main Break**

Studies show that PVC has the lowest water main break rate of the most commonly used pipe materials. The break rate is defined as the number of breaks per 100 miles of pipe per year<sup>1</sup>. Ductile iron pipe breaks at a rate of nearly 3 times as much as PVC.

For additional information, visit the Uni-Bell Lifecycle Analysis<sup>3</sup>



**References**

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