Ductile Iron Pipe Creation Forges Durability and Sustainability

By Jon Runge

Ductile iron demonstrates qualities of durability, sustainability, and cost-effectiveness. Used in tandem with advanced coating and encasement technologies, this pipe material is strong and tough for reliable water service.

In Roman myth, Vulcan ruled the forge, producing ironworks of legendary strength and durability. Pity the ancient god, for he never knew the power of ductile iron. Today, the US ductile iron pipe industry recycles annually the equivalent of more than 2 million junked vehicles into durable water and wastewater infrastructure.

Ductile iron pipe production builds on long-established value and reliability by adding the inoculant magnesium to molten iron in the manufacturing process to help reconstruct and distribute graphite in spheroidal or nodular form. Cement-mortar lining of ductile iron pipe makes a pipe highly resistant to internal corrosion, while encasing it in polyethylene inhibits potential external corrosion.

PRODUCTION DETAILS

Composed of up to 95 percent recycled scrap steel and iron, ductile iron is an environmentally sustainable pipe, remaking refuse into resilient infrastructure. Hauled up by the ton into the foundry's cupola, the scrap metal becomes molten soon after passing the 2,500 °F mark. Impurities burn away, and once magnesium is introduced into the molten mix, the catalytic power of magnesium changes the graphite molecules in the iron, a molecular transmutation that gives ductile iron its strength.

The transformed molten mix is poured into spinning molds and emerges glowing hot. Soon, pipe segments are brought into annealing ovens for a controlled cool-down that releases stress, reinforces the metal’s durable ferritic character, and provides ductile iron pipe with a protective layer of annealing oxides for a natural resistance to corrosion. Throughout the process, molten metals are sampled, and the final product is tested to ensure the pipe meets the rigorous standards that govern its manufacture. Every batch of pipe is hydrostatically tested—filled with water and pressurized to 500 lb/in.².

After the hydrostatic testing, the inside of the ductile iron pipe is given a protective cement-mortar lining that allows water’s smooth passage throughout the pipe’s service life. Flow tests on cement-mortar-lined pipelines of all ages have proven the pipe’s reliability. After a shopcoat is applied, the pipe is shipped to utilities.

RESOURCES

- AWWA Standard C104/A21.4-13, Cement–Mortar Lining for Ductile Iron Pipe and Fittings (catalog No. 43104)
- AWWA Standard C105/A21.5-10, Polyethylene Encasement for Ductile Iron Pipe Systems (catalog No. 43105)
- AWWA Standard C150/A21.50-14, Thickness Design of Ductile Iron Pipe (catalog No. 43150)
- AWWA Standard C151/A21.51-09, Ductile Iron Pipe, Centrifugally Cast (catalog No. 43151)