

Tiroler Röhren und Metallwerke AG-Cast iron pipes



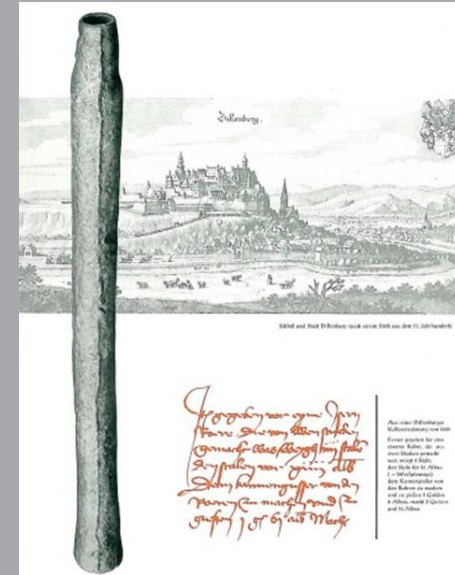
- 1947 start of pipe and fitting production with grey cast iron at TRM in Hall in Tirol
- 250 employees in 3 - shift - operation
- Plant ground 83.000 m²
- Output 40.000 tons ductile iron per year
- Stock 10.000 tons pipes and 25.000 tons fittings
- Sales ca.100 Mio. EUR
- 1971 change from grey cast iron to ductile iron



Cast iron-Key milestones



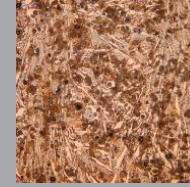
- 12th Century – Discovery of grey cast iron
- 15th Century – First application for water transport (Dillenburg Castle 1455)
- 1930 – Introduction of centrifugal casting machines
- 1950 Internal cement lining introduced
- 1960 Ductile iron with flexible joint
- 1971 Change from grey cast iron to ductile iron
- 1990 Anti-pull-out joint developed
- 2000 Zinc-aluminium coating applied
- 2015 Enhanced external coatings introduced



Cast Iron: Fully Reusable Without Loss of Properties. Cast iron can be indefinitely recycled without any degradation in its mechanical or chemical properties. It is 100% reused as a raw material in conventional metallurgical melting processes, including: Blast furnaces and Cupola furnaces.

Production

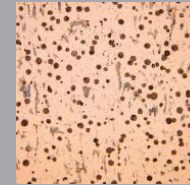
Magnesium Treatment – Georg-Fischer-Converter



Grey cast iron



Microstructure
change



Ductile iron

Liquid iron is alloyed with magnesium → ductile iron

Carbon / graphite has a globular structure instead of lamellar

Treatment weight 2.2 tons

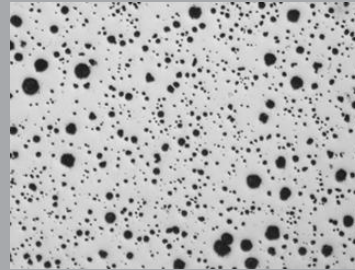
Material evolution can be observed microscopically



Cast iron with lamellar graphite breaks more easily and is less tough



In spheroidal graphite cast iron, the typical crack propagation pathways are eliminated, resulting in significantly improved fracture resistance and mechanical toughness



Liquid iron forms an alloy with magnesium → ductile spheroidal graphite cast iron. Carbon/graphite arranges itself in a spherical form instead of lamellar (more than 3,5% carbon)

Material Properties



- **Mechanical properties**

- High tensile strength and elongation: Ductile iron has mechanical properties comparable to those of steel.
- Good elongation: It is able to deform under load before breaking.
- High elasticity and flexural strength: The material is very flexible and elastic, making it resistant to dynamic stresses.
- High impact resistance: It is extremely robust and withstands impacts well.



- **Other important properties**

- Durability: The mechanical properties do not change over time, and it has a long service life of over 100 years.
- Diffusion tightness: This prevents pollutants from the soil from entering the drinking water, making it suitable for water pipes.
- Good machinability: Although it is hard, it can be easily machined, e.g., by drilling or turning,