

Piping Perspective

Piping technology has driven the development of joining methods.

BY MARK EVANS



› Oldest archeological record of any piping product was excavated at the site of the Temple of Bel at Nippur, Babylonia. Made of baked clay, it was accompanied by a fitting system consisting of Knee and Tee joints.

› The earliest recorded use of cast iron pipe was for construction of a fountain in Langensalza, Germany. 1664 - The first recorded full-scale production of cast iron pipe for water distribution was in Versailles, France. It remained in service for over 300 years. 1801 - The City of Philadelphia sought to promote the production and use of cast iron, an effort that was not successful until the establishment of charcoal furnace plants capable of commercializing pipe commenced production in 1819.

› The first furnace designed to manufacture steel (wrought iron) pipe enters production in Pennsylvania. 1855 - The Bessemer process and later the open-hearth process (1861) made it possible to produce stronger, more ductile pipe by cold forming sheets to roundness and riveting the seams. The earlier discovery (1742) of galvanizing by the French chemist Paul Jacques Malouin is applied to the production of galvanized pipe in the 1890s as a means of extending its life and improving water quality. The development of the Lock Seam production method concurrent with the implementation of electric resistance welding of these lock seams (invented by Professor Elihu Thomson in 1885) spelled the end of riveted seamed pipe in 1905.

4000 BC - CLAY PIPE

AD 75 - LEAD PIPE

› The Romans appropriated the baths built by the Celts at Bath, England and re-constructed them. They used folded, seamed lead pipes to supply hot water to the baths. Some of these remain in service today (which makes the baths unfit for use). 1790 - The first recorded patent for a process for making lead pipe was granted to the great iron master John Wilkinson. Lead pipe was used in water supply piping for both interior piping and exterior water service until the 1920s. Many Canadian cities such as Hamilton, Ottawa and Edmonton have conversion programs to facilitate the replacement of water service piping that may be buried on the private water side of some homes (connecting the curb stop to the house).



1562 - CAST IRON PIPE

1652 - WOODEN PIPE

› Boston became the first city in North America to install wooden piping to supply water for firefighting and domestic use. The term "fire plug" refers to the act of a fireman cutting a hole in a wooden pipe to tap for water, and then subsequently using a special "plug" to stem the flow. That "plug" location would be noted for future use and was the first crude form of fire hydrant. Wooden pipes were initially hollowed out logs. This style was later replaced by sectional or stave pipes that used wire hoops to maintain their structure.

1831 - STEEL PIPE

1842 - CONCRETE PIPE

› The earliest recorded use of concrete pipe in the U.S. is a sewer installation at Mohawk, NY. Other New England cities followed suit and installed concrete pipelines in the second half of the nineteenth century. Many of these concrete pipelines are still in use today. Milestones in concrete pipe development include: the production of the first reinforced concrete pipe in 1905, the invention of pre-stressed concrete pipe in the 1930s, and the manufacture of the first steel-cylinder pre-stressed concrete pipe in 1942. In 2007 the American Concrete Pipe Association celebrated its 100th anniversary.





› While PVC as a material had been discovered (and recorded) accidentally on two previous occasions, first in 1835 by Henri Victor Regnault and then again in 1872 by Eugen Baumann, it was not until 1926 that Waldo Semon (and BF Goodrich) developed a method of plasticizing PVC, making it commercially viable for extrusion. The first large scale production was in Germany from 1938 onward, primarily after the war as a post-war (and assumed short-term) replacement for cast iron piping. 1952 - PVC is introduced to the U.S., but its use does not become significant until the late 1960s when it becomes Code approved for DWV use in the U.S. in 1968.

1926 - PVC PIPE

1933 - COPPER PIPING

› The first production of copper tubing is thought to have been in about 1900, however the advent of soldered fitting connections is what made copper a viable piping product. With the evolution of uniform building codes in the post-WWII period, copper became the most prevalent domestic water piping product in use. Today, over 80 per cent of the domestic water piping installed in new construction is copper. Across Canada, the average single-family house with a copper plumbing system has about 130 pounds of copper plumbing tube, fittings and valves.



› Originally developed in the early 1950s for use in oil fields and the chemical industry, ABS pipe entered the market as a replacement for cast iron drainage pipe. First used in mobile home construction, it gained Code approvals for conventional housing and by 1967, had been installed in more than four million homes. However, today in the U.S., 20 times more PVC DWV piping is used in residential than ABS pipe.

1957 - ABS PIPE

1966 - POLYBUTYLENE PIPE

› First synthesized in 1953, polybutylene (PB) was introduced to the European market for pressure piping applications in mid-1966. The suitability of PB for use in plumbing is controversial. PB plumbing was used in six to 10 million homes built in the U.S. from 1970 to the mid-1990s.



› The first PEX material was prepared in the 1930s by irradiating it with an electron beam, however this method was not made feasible until the 1970s. In 1965 the Engel method of cross-linking was patented with the first patent licenses granted in 1967 and 1968. When production using this method commenced in Europe in 1971 PEX became a commercially viable piping product. In 1968, the Sioplas process using silane was patented, followed by another silane-based process, Monosil, in 1974. A process using vinylsilane followed in 1986. These later methods are more popular in North America and largely prompted PB to be replaced as a piping material due to the relatively simple changeover in production from PB to PEX.

1971 - PEX PIPE

1973 - POLYPROPYLENE PIPE

› Relatively new to North America at that time, polypropylene was commercialized as a piping product initially for radiant floor heating in Germany. It is currently also used for domestic water service piping. First polymerized by Dr. Karl Rehn at Hoechst AG in Germany in 1951, polypropylene was then rediscovered on March 11, 1954 by Giulio Natta. Natta won a Nobel Prize in 1963 for his work with Karl Ziegler on high polymers. While it is not unusual for similar inventions to occur in different locals in a common timeframe, polypropylene was a patent attorney's cash cow. It was separately invented about nine times and litigation was not resolved until 1989. At the end of the legal process American chemists Paul Hogan and Robert Banks were credited as the "official" inventors of polypropylene.



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