

Main Category	Asset Management and Facility Renewal
Sub Category	Facility Development
<p>Japan's first pressurized water supply system started its operation in Yokohama City in 1887, with its major objective being to ensure public health by preventing waterborne diseases and to protect wooden houses from fires. Later, as the population increased and urbanization progressed, the demand for water rapidly rose, facilitating the expansion of water supply facilities nationwide. New water facilities were constructed and existing facilities reinforced, in particular during the rapid economic growth period from 1954 to 1970 and into the latter half of the 1980s.</p> <p>Japan is now in the middle of a facility renewal period, however, especially for the renewal of distribution mains buried from the 1950s to 1980s. A look at the population change over the last 140 years shows the country's population has tripled from approximately 40 million in 1887 - when the modern water supply system first began in Yokohama - to 126.8 million at the end of the 20th century. During the facility expansion period, the facility renewal mostly consisted of enlarging existing mains diameter and increasing existing treatment plants' capacity to address rising water demand. Later, water utilities also began seismic reinforcement of facilities and development of emergency water supply facilities and/or equipment because of the country's high propensity to earthquakes. Japan's population had still been increasing at the beginning of the 21st century but it began to decline in 2008, and the declining trend is expected to continue into the future, which means the facility renewal from now on will have to include the downsizing of facilities, such as reduction in mains diameter and treatment capacity, as well as consolidation of existing water treatment and distribution plants, while still promoting seismic reinforcement.</p> <p>In terms of operational cost, municipalities (water utilities) have been supplying sufficient amount of clean affordable water in a financially self-reliant manner, meaning the water supply has to be operated from the revenues of water rates alone, as stipulated by the Local Public Enterprise Act. For this reason, utilities have made constant efforts to secure financial resources and minimize facilities' initial/running costs both during the facility expansion period and the current renewal period. In such an effort, for instance, aiming at cost reduction as well as environmental protection, utilities have implemented PFI schemes and installed solar and/or small hydroelectric power generators at water treatment plants. Also, some utilities in urban areas have managed to renew their facilities via specialized construction methods, such as relocating facilities to a new location as they are without partial deconstruction, or expanding a plant's treatment capacity by relocating a chain of treatment processes and their equipment on multiple floors of a building on the plant's premises. These measures were taken because of limited available sites around some water treatment plants situated in the middle of residential districts.</p> <p>As for the renewal of distribution mains (whose statutory depreciation period is 40 years), utilities estimate their degradation using specialized software programs fed by various data including pipe's installation year, material, and soil conditions. In terms of pipe material, ductile iron pipes and high-density polyethylene pipes with high seismic resistance have come to be widely used in Japan, and their manufacturers advocate a long service life of 100 years for both</p>	

types of pipes. This means that in future it might be possible to extend those pipes' renewal cycle, depending on their physical inspection and software simulation results. In terms of mains construction methods, there are various kinds available depending on the existing mains' conditions and their surrounding environment as well as the long-term capital improvement programs adopted by utilities. These construction methods include the open-cut method, propulsion method, joint trench construction method, the shield method (primarily used for trunk mains construction), and the pipe-in-pipe method for downsizing and renewal.