

Development of Night Soil Treatment Technology in Japan

To meet the social needs or to take preemptive measures, various night soil treatment technologies have been developed and put into practical use in Japan.

In 1950s, anaerobic digestion treatment was the major process in night soil treatment facilities. From then, more compact with higher treatment performance facilities were constructed. The facilities became capable of treating not only night soil and johkasou sludge but also organic wastes with high concentrations, and shifted from waste treatment facilities to recycling facilities by manufacturing biomass, compost fertilizer and other useful products.

The following shows outlines of night soil treatment technologies developed in Japan

Anaerobic digestion treatment :	Anaerobic digestion tanks combined with trickling filter process or activated sludge process; it has advantages of biomass production, production of high fertilizer effect digested sludge with low moisture content
Chemical treatment :	Solid-liquid separation process using flocculant such as metallic salt and hydrated lime, combined with trickling filter process or activated sludge process
Aerobic digestion treatment :	Instead of anaerobic digestion tanks, aerobic digestion tanks are adopted to decrease the odors and make the plant more compact
Standard denitrification treatment :	A biochemical denitrification process for treating night soil diluted by five to ten times with water
High-load denitrification treatment :	Night soil without dilution is treated by high-load denitrification devices, solid-liquid separation devices and flocculation separation devices
Membrane separation high-load denitrification treatment :	Night soil is treated by the high-load denitrification process, membrane separation devices are adopted for solid-liquid separation instead of traditional sedimentation tanks or mechanical devices

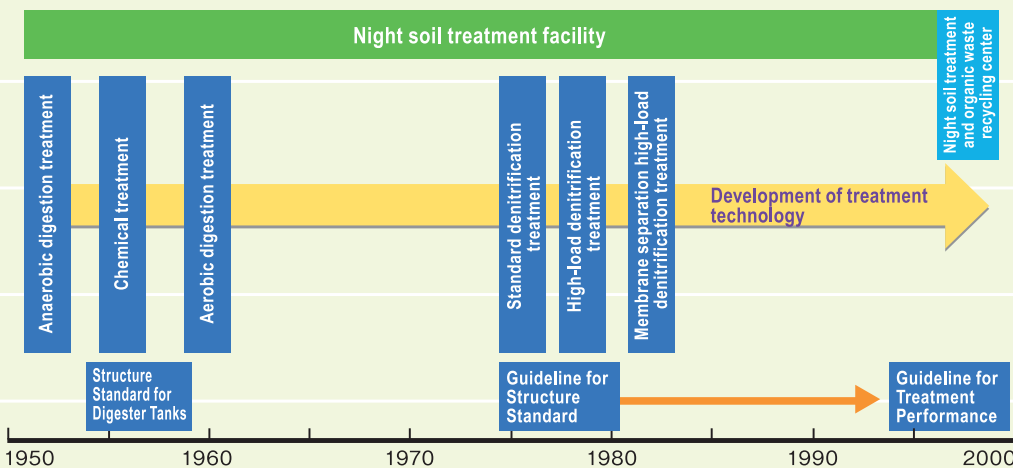


Figure 20 Historical development of night soil treatment technology in Japan



Picture 1 The first large scale night soil treatment plant (Sunamachi plant, capacity 3,600kℓ/day,1954)⁽⁶⁾

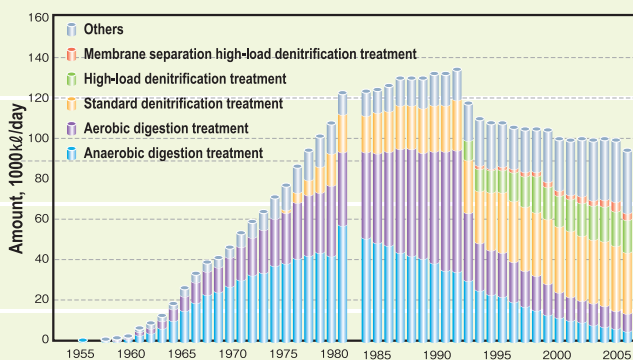


Figure 21 The treated amount of night soil by treatment processes⁽³⁾

Table 6 Historical transition of night soil treatment systems

Year	Event
1953	Start of subsidy program for night soil treatment facilities
1956	Notice of structure standard for anaerobic digester tanks
1966	Guidance for maintenance and management of night soil treatment facilities
1977	Guideline for structure of night soil treatment facilities
1979	Revision of guidelines for structure of night soil treatment facilities (two step activated sludge process and flocculation separation process were added)
1981	Revision of guideline for structure of night soil treatment facilities (johkasou sludge treatment processes were systemized)
1988	Revision of guideline for structure of night soil treatment facilities (high-load denitrification treatment process and advanced treatment processes were added)
1993	Revision of guideline for structure of night soil treatment facilities (effluent BOD concentration was revised to be less than 20mg/ℓ)
1997	Start of subsidy program for night soil treatment and organic wastes recycling center Revision of guideline for structure of night soil treatment facilities (methane manufacturing devices were added)

Sources: (1) From the left side, Paintings of Edo Kakusho; Paintings of Customs of Edo and Meiji eras; Thinking about 'Toilet situation and sanitation culture', Bungeishunshusha; Wakanshenyoshyu, Vol.5 (2) S. Watanabe, Toilets in Edo, Shinchoshenshyo (3)Yuzo Inoue, History and technology of night soil treatment in Japan, J. of Monthly Johkasou (4) Ministry of the Environment, Waste Management in Japan (5) Literature offered by Ministry of Land, Infrastructure, Transport and Tourism (6) Literature offered by Environment Bureau of Tokyo Metropolitan