NAGAOKA INTERNATIONAL CORP.

Energy-saving, low-cost Groundwater Treatment Technology

Features

・Low-cost, energy-saving and easy maintenance water purification system (Fig.1) utilizing groundwater for small scale waterworks and developing countries.
・Combination technology of
① High efficiency groundwater-intake well
② Chemiles (No chemical injection; High Concentration Fe, Mn, NH_3-N removal device with high velocity)
③ Membrane filtration or UV disinfection device (for high quality water) as required

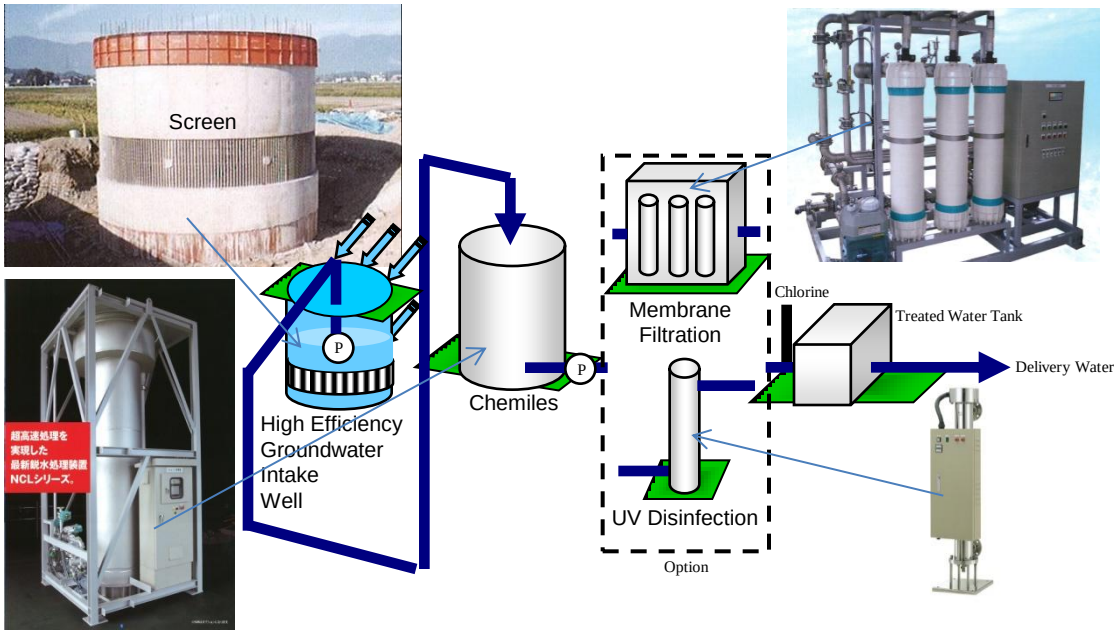
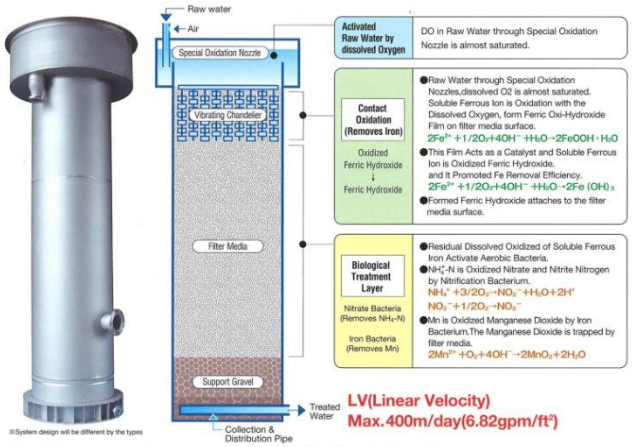


Fig.1 Energy saving and low cost groundwater treatment technology

Overview (Technical principles, actions, etc.)

① **High efficiency groundwater-intake well**: Perforated casing well, a traditional Japanese groundwater-intake technology, often presents a clogging problem. This is because there is only a 3-5% open area ratio of the perforated wall (gross pore area/gross perforated wall area), causing an accumulation of fine sand carried by groundwater, which flows fast in or near open areas or in aquifer. Recently, however, a newly developed groundwater-intake well with a 30-50% open area ratio, causing less clogging and featuring long life and high efficiency, has often been used. The water intake part (screen) of this well consists of a stainless steel or iron rod with a triangular coiled wire made of the same material. Since the inner side of the opening area is wider than the outer side, fine sand flowing in can easily pass through the open area to the inside, resulting in less clogging.
② **Chemiles**: Groundwater often contains high concentration Fe, Mn and NH_3-N. Generally, a large amount of chlorine is used to remove these substances, causing problems such as high cost, high energy use, difficulty in maintenance management, a large amount of sludge generation, and chlorine vice-generative production. Meanwhile, the Chemiles (Fig. 2) removes Fe, Mn and NH_3-N by biological treatment and contact oxidation using oxygen in the atmosphere, resulting in no chlorine-related problems. The Chemiles can be used groundwater containing extremely high concentration Fe, Mn and NH_3-N, which are usually abandoned (verified research data of Fig. 2) as water source. The filtration velocity of the Chemiles is several times of that of general treatment methods (max. 400 m/day). Thus, the area needed to install the Chemiles can be small. In addition, because the Chemiles can be installed outdoors, no building is required to cover it.
③ **Membrane filtration and UV disinfection device**: When using membranes for high-efficiency removal of suspended substances and UV disinfection devices for chlorine-resistant protozoa, in order to produce high-quality water, are combined with ① and ②. Nagaoka International Corp. products are low-cost, energy-saving devices, because waste is eliminated thoroughly while high performance is maintained.



The NCL Series reduces total construction costs dramatically.

The NCL Series is a compact design built for outdoor use that does not require a protective shed or other structure.These features minimize footprint and construction costs.

Verification Test Data

Site	LV (m/d)	LV(gpm/ft²)	Raw Water Quality(mg/l)	Treated Water Quality(mg/l)
Water Source A	500	8.52	Fe 40.1 Mn 1.1 NH_3-N 1.1	Fe 0.05 Mn <0.05 NH_3-N<0.05
Water Source B	400	6.82	Fe 0.95 Mn 0.3 NH_3-N 2.0	Fe 0.08 Mn <0.05 NH_3-N<0.05

NCL (Outdoor Column) Standard Specification

Type	Capacity(LV=400m/d =6.82gpm/ft²)				Column Dimension※		No.of Column	Weight				Electric Consumption(KW)		Washing Water Volume			
								Body		at Operation				m³/Time/Column		Gallon/Time/Column	
	m³/d	m³/hr	MG/d	Gallon/hr	mm	ft-inch		Kg	USTon	Kg	USTon	Operation	Back Washing	P-Wash	W-Wash	P-Wash	W-Wash
NCL-3045	5,600	233	1.47	61,500	φ3,000x4,500H	φ9'-10"x14'-9"H	2	14,000	15.4	130,000	143.3	4.4	30.0	12.7	25.4	3,350	6,700
NCL-3045	2,800	117			φ3,000x4,500H	φ9'-10"x14'-9"H	1	7,000	7.7	65,000	71.7	2.2	30.0	12.7	25.4	3,350	6,700
NCL-3035	2,800	117	0.74	30,900	φ3,000x3,500H	φ9'-10"x11'-6H	1	6,600	7.3	51,000	56.2	2.2	30.0	12.7	25.4	3,350	6,700
NCL-3025	2,800	117			φ3,000x2,500H	φ9'-10"x8'-2"H	1	6,200	6.8	37,000	40.8	2.2	30.0	12.7	25.4	3,350	6,700
NCL-2035	1,250	52	0.33	13,700	φ2,000x3,500H	φ6'-7"x11'-6"H	1	3,800	4.2	23,600	26.0	1.5	11.0	5.7	11.3	1,500	3,000
NCL-2025	1,250	52			φ2,000x2,500H	φ6'-7"x8'-2"H	1	3,500	3.9	17,200	19.0	1.5	11.0	5.7	11.3	1,500	3,000
NCL-1025	300	13	0.08	3,400	φ1,000x2,500H	φ3'-3"x8'-2"H	1	1,400	1.5	5,600	6.2	0.4	3.7	1.4	2.8	370	740
NCL-1015	300	13			φ1,000x1,500H	φ3'-3"x4'-11"H	1	1,200	1.3	4,000	4.4	0.4	3.7	1.4	2.8	370	740

※Installation space will be different by site condition

Fig.2 Chemiles

Fig.3 Rehabilitation of Groundwater Well /Completion Ceremony

Fig.4 IWA-PIA Global Honor Awards

Performance

① The intake water quantity of a well in a rural village in a city of Liaoning Province was reduced to 2,000 m^3/day, half the planned intake water quantity of 4,000 m^3/day, because of clogging of well and a lower groundwater level in the dry season. However, after rehabilitation the well to the high-efficiency water intake well, the intake water quantity increased to over the planned intake water quantity. The chairperson of the China urban water association confirmed the effects of this high-efficiency water intake well, acclaiming this effect and strongly recommending the adoption of this well for waterworks in rural areas of China (Fig. 3).

② The purification plant in a town of Kyoto Prefecture, Japan uses a groundwater source with a high concentration Fe (19.2 mg/L) and variable NH_3-N concentrations over short time periods. Thus, the plant had to rely on treatment using a large amount of chloride, facing problems such as the high cost of chlorine and the difficulty of controlling chlorine injection. However, after introducing the Chemiles, which does not use chemicals for water purification, the plant has not suffered such problems, producing quality water at a higher level than the standard water quality level of Japan (Fe: 0.3 mg/L) at the same velocity as that of rapid filtration. The Chemiles was highly valued by this purification plant.

The above two introduction examples were highly rated as innovative technologies by the International Water Association (IWA), receiving winner prize in East Asia Region and Global Grand Honor Award of the IWA Project Innovation Awards (PIA) small project category in the year of 2010 and 2012 consecutively (Fig. 4).

IWA-PIA HP : *http://www.iwa-pia.org/pia_winners_2010.html*
http://www.iwa-pia.org/pia_award_global.html

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