March 5, 2020

JS Registers Three New Technologies on its New Tech Implementation Program

—Two new aeration control technologies by ammonia meter achieving the reduction of aeration volume by more than 10 % —Downsized belt press dewatering device maintaining dewaterability

Japan Sewage Works Agency (JS) has been running the JS New Tech Implementation Program* since 2011. The program aims to encourage the development of new technologies meeting various needs of municipal wastewater business and facilitate the new technology adoption for our entrusted projects.

JS newly registers the following three technologies on its New Tech Implementation Program.

Feedforward Aeration Control by Ammonia Meter

Developers: JS, Nissin Electric Co., Ltd., Nissin Systems Co., Ltd.

Summary and Features: In the feedforward aeration control technology, a reactor has two ammonia meters inside, which automatically adjust the supply air volume depending on the inflow nitrogen load and nitrification status. The new technology targeting to activated sludge process that accelerates nitrification aims energy-saving by the reduction of supply air volume. At the same time, it also aims to stabilize the quality of treated water such as NH_4-N concentration.

Aeration Control Device Consisting of Ammonia Meter and Control Panel

Developers: JS, Kobelco eco-solutions Co., Ltd.

Summary and Features: In this system, an ammonia meter and a DO meter inside a reactor automatically adjust target DO concentration depending on the nitrification status for aeration control. The system aims to reconcile energy-saving and stabilization of the treated water quality such as NH_4-N for various kinds of activated sludge process accelerating nitrification.

Downsized Belt-press Dewatering Device

Developers: JS, Tsukishima Kikai Co., Ltd.

Summary and Features: The new belt-press dewatering device is a combination of a thickening part and a dewatering part including a high concentration-adaptive feeding device. This unique mechanism to maintain dewaterability not only improves the filtration rate by 1.5 times but has achieved downsizing

while it has the equivalent treatment performance to the conventional highly efficient belt-press dewatering device.
Besides, the new machine is adaptable to a poly ferric sulfate injection system. This option enables reducing sludge's water content rate and LCC.

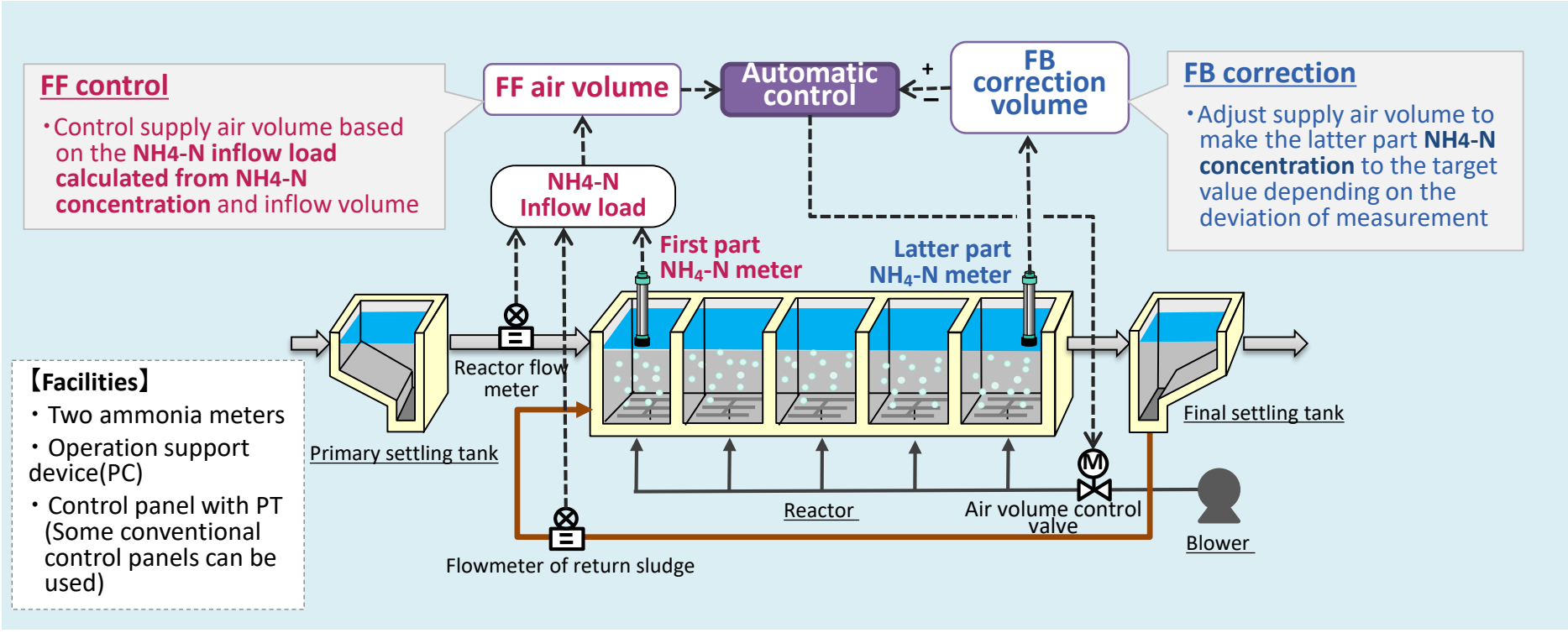
* Note that JS New Tech Implementation Program verifies registered technologies for their applicability **only** at JS' entrusted projects.

* The validity of the JS New Tech Implementation Program is five years from the date of registration. If the registration is modified, validity starts on the date of the modification. Validity can be extended until a maximum of ten years if developers apply.

Feedforward Aeration Control by Ammonia Meter

● Reactor has two ammonia (NH_4-N) meters in each of the first and latter part.
● The combination of the feedforward (FF) control by the first NH_4-N concentration and the feedback (FB) correction by the latter NH_4-N concentration automatically controls supply air volume

✓ FF control taking NH_4-N inflow load as a parameter ⇒ **Real-time following to the inflow load fluctuation**
✓ FB correction based on the deviation from the target NH_4-N ⇒ **Fix NH_4-N of treated water to the target value**



[Scope of application]

- Wastewater treatment process: **Activated sludge process making accelerated nitrification except for OD process** (ex. CAS process (accelerated nitrification), anaerobic-aerobic activated sludge process (accelerated nitrification), Ludzack-Ettinger process, Anaerobic –anoxic-aerobic process, Step-feed multistage nitrification/denitrification process)
- Treatment capacity: **Facility with treatment capacity of about 10,000 m^3/day per control unit** ※ A control unit is a set of control facilities including two ammonia meters and a controller
- Benefits of adoption: Facilities that **FS proves the benefits of adoption such as adoption cost recovery by energy saving.**

[Benefits of adoption]

◆ **Energy-saving by the reduction of supplying air volume**

✓ Reduce supplying air volume by more than 10% compared to DO control process, the conventional technology

◆ **Stabilize NH_4-N concentration of treated water**

✓ Fix the latter NH_4-N concentration to near the target value ⇒ Stabilize NH_4-N of treated water at low concentration.

[Adoption example]

✓ New construction, extension, retrofit of reactor facilities

✓ Newly installation/retrofit of electric device

⇒ The improvement of the cost merit by optimized construction costs and energy savings

Aeration Control Device Consisting of Ammonia Meter and Control Panel

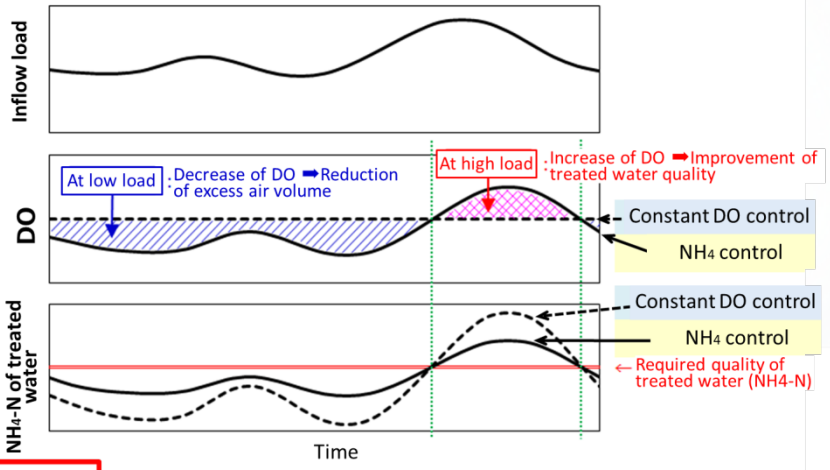
The device automatically controls the opening of the aeration valve for aeration control to a reactor based on the measurement value of ammonia nitrogen concentration (NH_4 meter) inside a reactor.

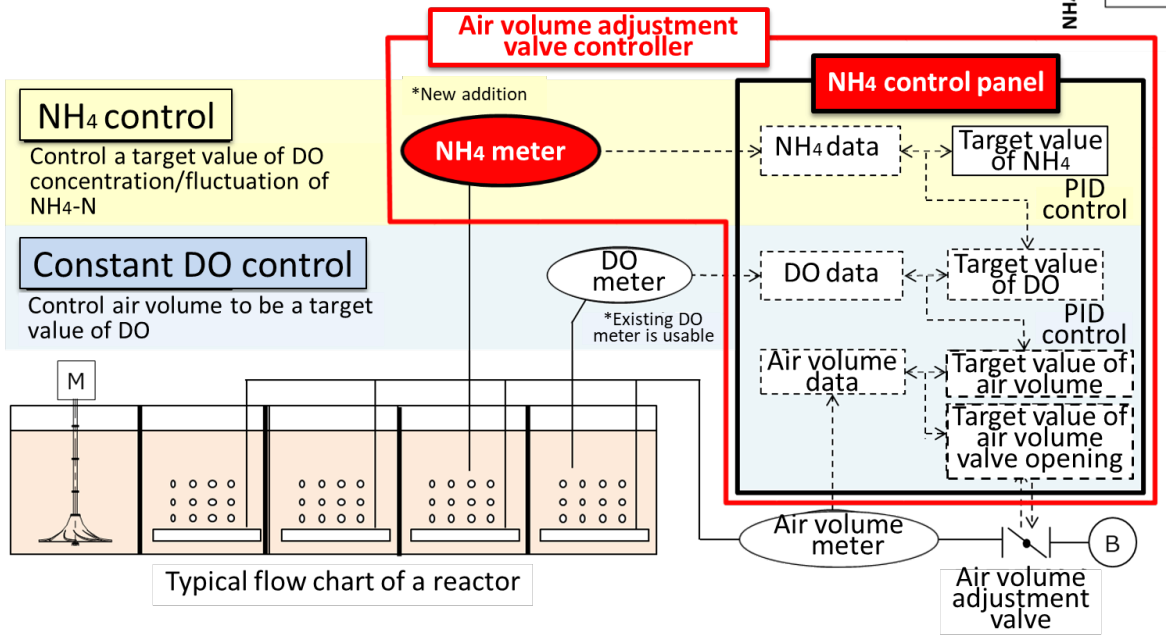
■Control manner

Variable DO control (NH_4-DO control) that automatically adjusts target value of DO concentration for DO control based on NH_4-N data at the downstream of reactors.

■Installed facilities

One NH4 meter(downstream of aerobic tanks) , One NH4 control panel, *Existing DO meters, air flow meters and air flow control valves are usable for the new system.





▶ Principle

Secure the required air volume against the constant DO control while controlling excess air volume

⇒ Energy-saving of a blower and stabilize NH_4-N of treated water

Scope of Application

■ Activated sludge facilities accelerating nitrification except for OD process
■ Facilities that can be expected adoption effects verified by FS, including the recovery of initial costs

【Applicable treatment process】

CAS process (Acceleration of nitrification), Anaerobic/aerobic activated sludge process(Acceleration of nitrification), Ludzack-Ettinger process, Anaerobic-anoxic-aerobic process, Step-feed multistage nitrification/denitrification

【Facility scale that can be expected economic effects 】

Medium to large scale WWTPs with a treatment capacity of **10,000 m^3/day and over**

Benefits

■ Reducible rate of air volume：10% and over (against constant DO control)
■ NH_4-N of treated water： controllable at the target value of nitrification acceleration

【Cases that enjoy benefits】

■ **At the retrofit of reactor facilities**
➡ Reducing further air volume at the renewal of diffusers or blowers

■ **At the change of the existing treatment process from CAS to nutrients removal that is nitrification acceleration**
➡ Preventing the increase of air volume

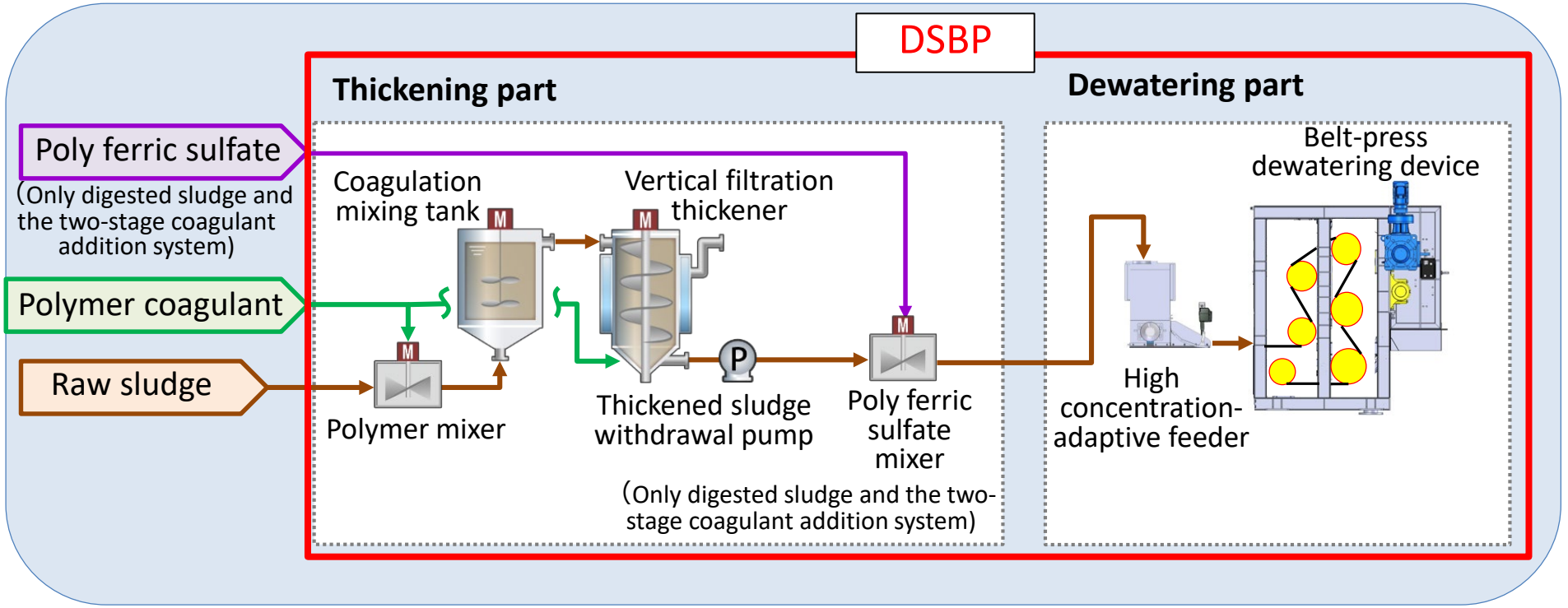
■ **Expansion or new construction of reactor train**
➡ Enable effective introduction from the stage of planning

Downsized Belt-press Dewatering Device

Summary

■ Downsized belt-press dewatering device, DSBP, has a thickening part combined with a high concentration-adaptive feeder. The mechanism that optimizes both thickening and dehydration improves the filtration rate by 1.5 times while keeping dewaterability.

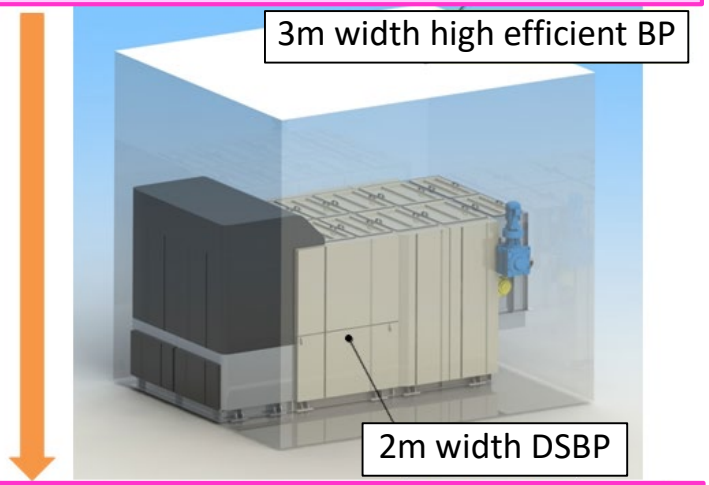
■ DSBP is applicable to the two-stage coagulant addition system. The system that later injects poly ferric sulfate into thickened sludge can minimize the runoff of poly ferric sulfate into the water and work effectively. So the system enables reducing the water content rate of dewatered sludge with less consumption of poly ferric sulfate.



Benefits

- Can substitute 2m width DSBP for 3m width high efficient belt press
- The downsized machine reduces footprint and dynamic load

2m width DSBP has the equivalent treatment capability with 3m width high efficient BP



Adoption of 2m width DSBP instead of 3m width BP can reduce capacity by 50% and area by 25%

Conditions enjoying benefits

- Having limitations for footprint and dynamic load
- The existing dewatering device is a belt press with a good treatment condition
- Sludge to be treated has a hard-to-dewatered property with high VTS

Scope of application and standard performance of DSBP

Treatment process				CAS		CAS	
Kind of sludge				Anaerobic digested sludge		Mixed raw sludge	
Sludge property	Ignition loss (VTS)		(%)	81-77		88 - 85	
	TS	mechanical	(%)	About 1.3		About 3.1	
	SS rate of raw and excess sludge		(－)			1: 0.6 - 0.8	
	Fibrous material (100mesh)		(%)	5	10	10	20
One coagulant	Water content rate of dewatered sludge		(%)	—	84	—	79
	Filtration rate[kg-DS/m･h]			—	90	—	210
	SS Recovery rate		(%)	—	90 and over	—	93 and over
	Chemical dosing rate (TS : polymer)		(%)	—	2.2 or less	—	0.8 or less
Two-coagulant addition	Water content rate of dewatered sludge		(%)	—	81	Reference: JS standard specification: examples: dewatering capability of high efficient BP ■ Anaerobic digestion sludge (one coagulant) Water content rate of dewatered sludge:83% Filtration rate： 60 [kg-DS/m･h] ■ Mixed raw sludge (one coagulant) Water content rate of dewatered sludge :79% Filtration rate: 140 [kg-DS/m･h]	
	Filtration rate[kg-DS/m･h]			—	90		
	SS Recovery rate		(%)	—	95 and over		
	Chemical dosing rate (TS : inorganic)		(%)	—	20 or less		
			(%)	—	2.2 or less		