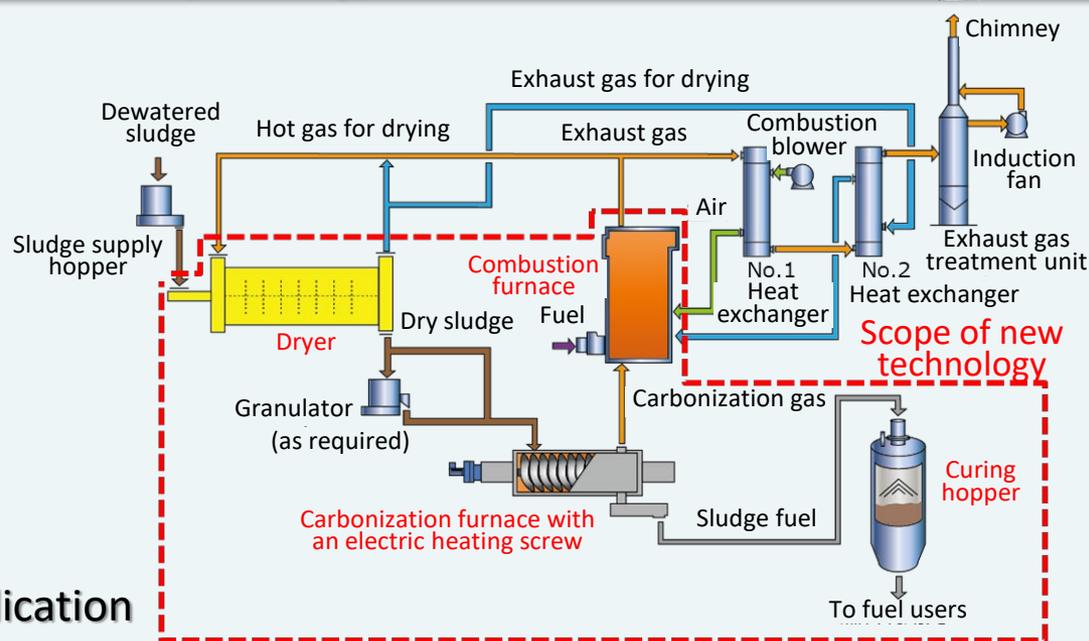


Sewage sludge fuelization technology using carbonization furnace with an electric heating screw

● Technology overview

This technology produces sludge fuel by heating dewatered sludge in a reduced state using electricity as a heat source after drying. The compact carbonization furnace adopts an electric heating screw, and a simple treatment flow requires no hot air generating furnace. These two features contribute to reduce heat radiation and enable less input energy than the conventional external heat kiln carbonization furnaces.



Flow diagram example of sewage sludge fuelization with a direct heating hot air dryer

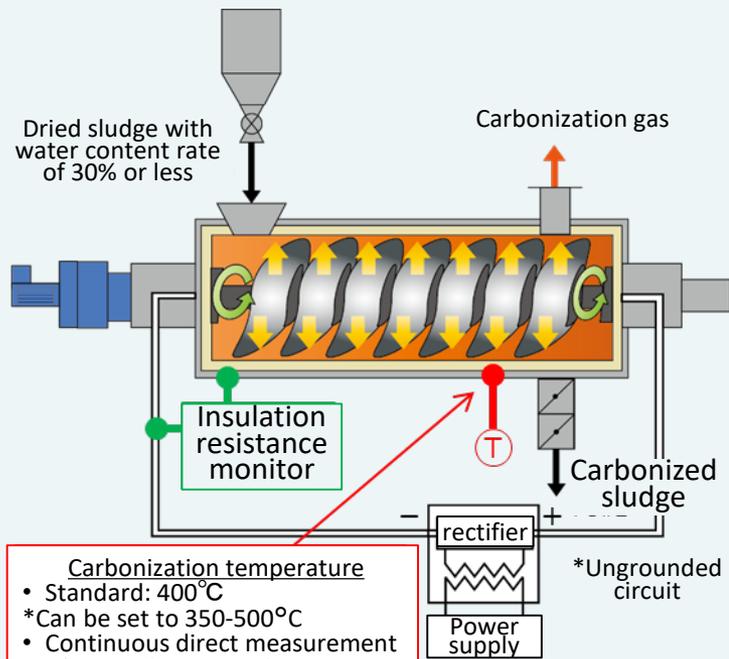
● Scope of application

- **Facility scale:** Input amount of dewatered sludge: More than 10t-wet/day and less than 200t-wet/day
- **Applicable sludge:** Mixed raw sludge or anaerobic digested sludge
- **Property of input dewatered sludge:** Water content rate of 70-85% and combustile content rate of 60-92%
- **Carbide properties:** No odor conditions by fuel user

*.When the input sludge or carbides' properties are out of scope, conduct tests using the testing equipment to confirm the expected properties of the carbides, such as calorific value, inflammability, and odor intensity.

● Technology features

Carbonization furnace with an electric heating screw



➤ Producing sludge fuel with a stable calorific value

- Measuring the carbonized material temperature directly in the furnace ⇒ Easy adjustment of carbonization temperature and high responsiveness
- Conveying by screw ⇒ Constant carbonization time despite fluctuations in sludge properties
- The screw of the heating element directly contacts the sludge to ensure even heating
- The system satisfies BSF-15 (JIS standard for sewage sludge solid fuel, 15MJ/kg or more) when the dewatered sludge has a higher heating value of 18MJ/kg-dry or more, and BSF (JIS standard for sewage sludge solid fuel, 8MJ/kg or more) when the dewatered sludge has a higher heating value of 16MJ/kg-dry or more under standard conditions of 400°C for 15 minutes.

➤ Substantial energy saving

- Reducing heat radiation by simple flow using electric heat screw: Electric heat source makes the furnace compact and does not require a hot air generator for carbonization. ⇒ Require less input energy than the conventional external heat kiln carbonization furnaces.

* Ungrounded circuit : A circuit in which the secondary side of the power supply is not grounded. Even if people contact the equipment when the insulation deteriorates, the circuit insulated from the earth does not form a circuit in which current flows and protects people from electric shock.

● Recommended operating conditions

◆ WWTP treating sludge with various properties (ex. intensive or wide-area WWTPs)

- ✓ It applies to fluctuations within a specific range in the water content and combustible content of dewatered sludge by intensive treatment.

◆ WWTPs that can use digestion gas as auxiliary fuel (ex. WWTPs which have or will have digestion facilities)

- ✓ Reduction of greenhouse gas emissions because digestion gas can be used as fuel for combustion furnaces. (Total digestion that can provide most of the fuel with digestion gas is favorable)

★ Presuppose that there are destinations that will take sludge fuel as an alternative fuel to coal.