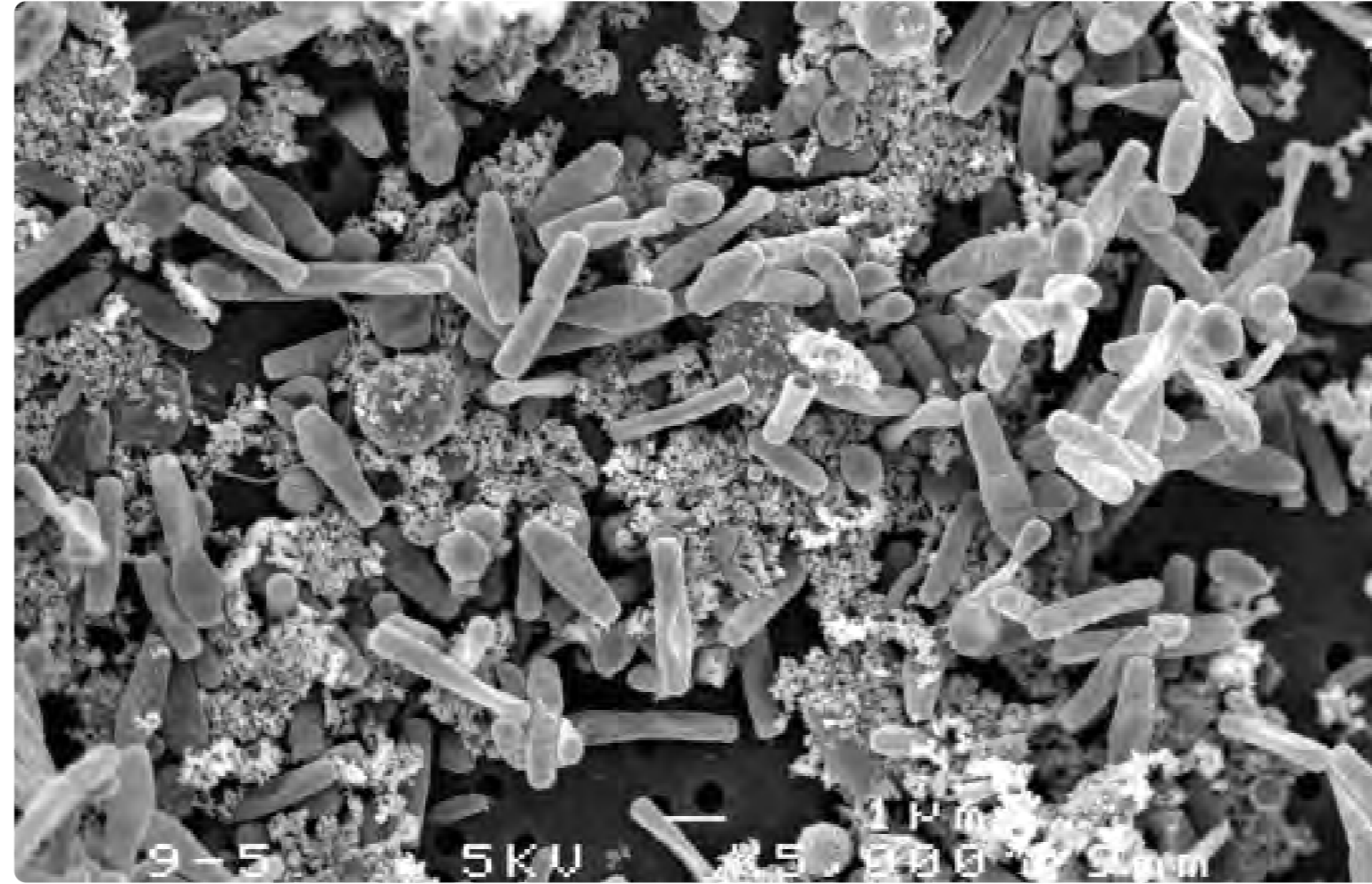
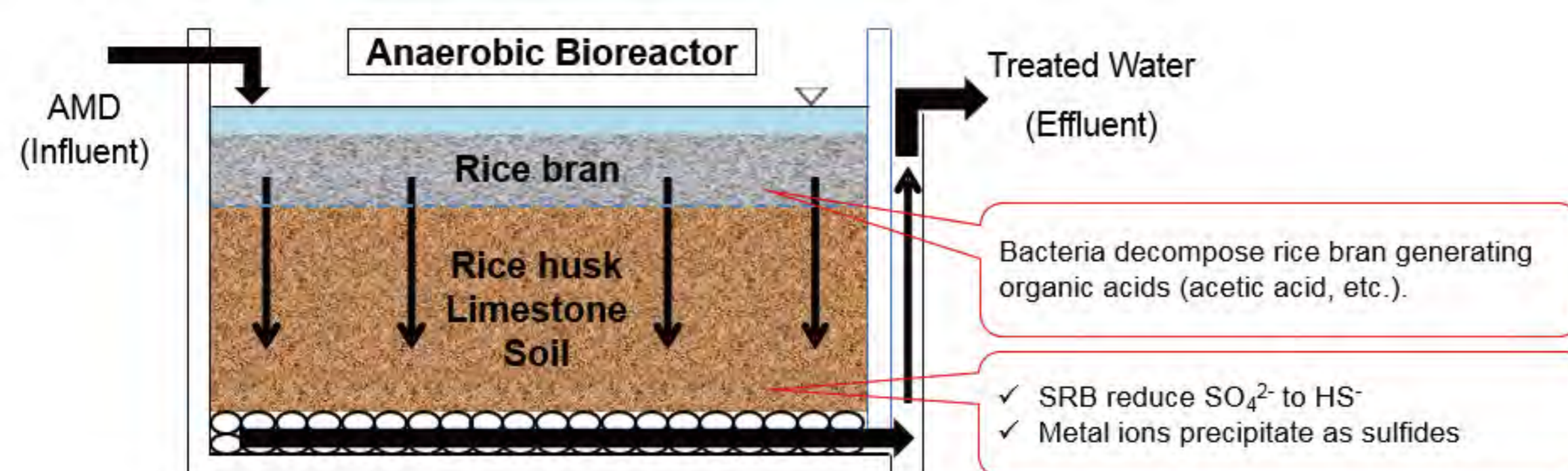


Research and development of passive mine water treatment technology



Research and development

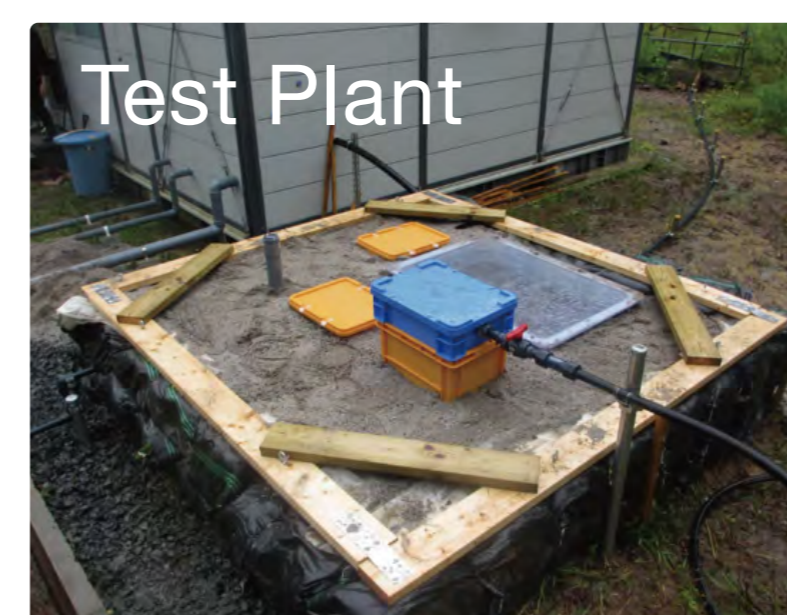
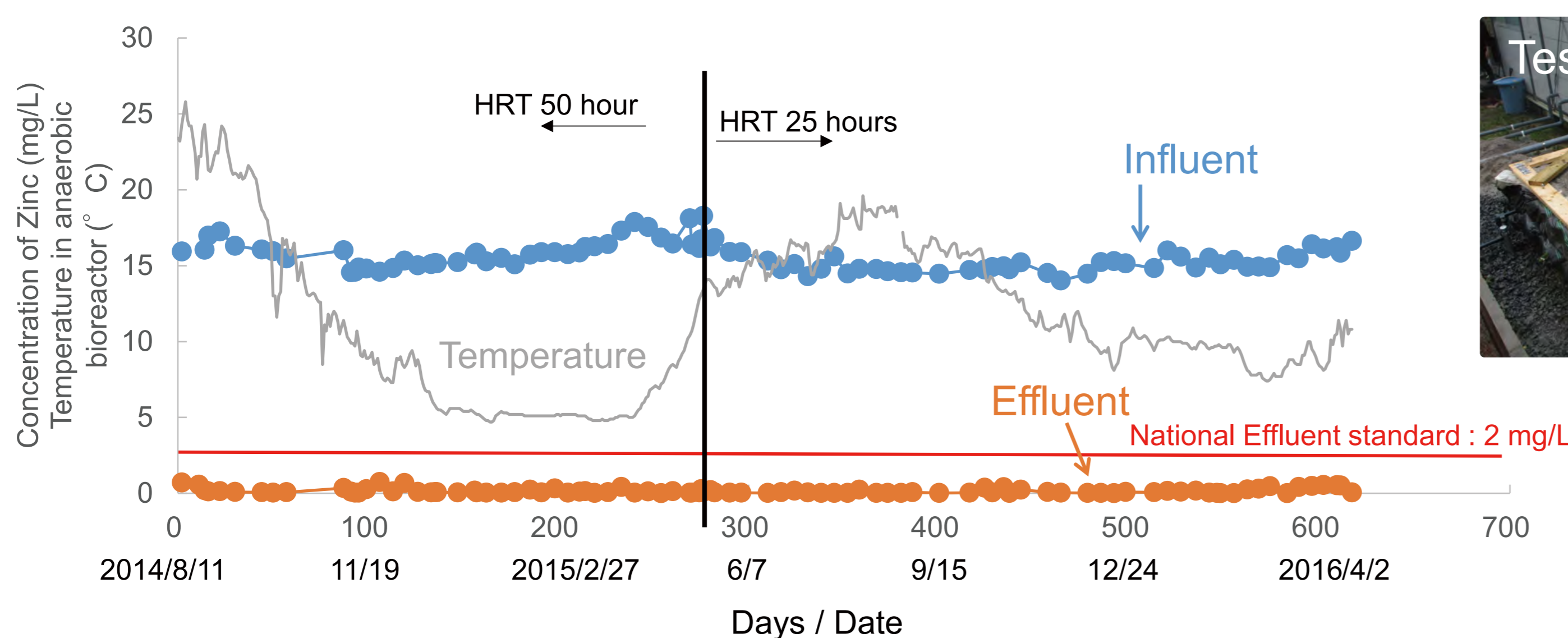
From the point of view of cost reduction for mine water treatment, JOGMEC has taken various research and development such as “**passive treatment**” technology, which utilizes natural purification capacity by the activity of microorganisms or others.



JOGMEC Process

Vertical flow anaerobic sulfate-reducing process which utilizing SRB (Sulfate Reducing Bacteria) is called “JOGMEC Process.” The process consists mainly of rice bran and rice husk that supply organic resources and habitation for bacteria respectively.

SRB oxidize organic materials consuming sulfate ion in mine water, resulting in generation of hydrogen sulfide ion that form metals sulfide precipitation.



Zn concentration in effluent is very low and stably below Japanese national standard (2 mg/L) through test term, and mean rate of Zn removal is 99 % (n=96).

Other metals (Cu, Cd, Fe) are also removed below national standard in the anaerobic bioreactor.

Conclusions

- During the bench scale test, for 2 years, **iron has been removed by the iron oxidation precipitation bioreactor** (Pre-treatment process for iron contained AMD) and other **metal ions have also been stably removed by the anaerobic bioreactor** despite of short HRT (Hydraulic Retention Time) of 25 hours and low temperature in winter.
- In anaerobic bioreactor, 15.5 mg/L (= 0.24 mmol/L) Zn, 0.16 mmol/L Cu, and 0.18 mmol/L Fe have been removed, and 150.9 mg/L (= 1.57 mmol/L) sulfate ions have been reduced on average.
- Metal removal have continued successfully **without frequent maintenance such as replacement of content materials.**
- It is assumed that Zn, Cu and other metal ions were stably immobilized as sulfide by sufficient generation of hydrogen sulfide ion in the anaerobic bioreactor.

Ongoing subject

- Improvement of treatment process in order to shorten HRT
- Handling of residual hydrogen sulfide ion and high concentration of BOD / COD in treated water (effective re-utilization)
- Prevention of shortcut phenomena of water might be caused by low permeability of rice bran
- Preparation of pilot-scale test (flow rate 5 L/min)



Second bench scale test has been conducted since Sep 2015.