

EM for Wastewater Treatment at Miyata Hog Farm

A summary prepared by EMRO Tokyo Office

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We like to express our thanks to Mr. Miyata Hiroshi who showed us around the farm and explained how EM is used at the farm.

Note: There is no foul odor throughout the farm, excepting a little around inflow tank.

① Hog house



Hogs are housed either in individual cage with wooden lattice floor or in a group cage with a water pool. Activated EM is added to sludge from sedimentation tank and circulated in the pits under the wooden lattice floor of individual cages. Activated EM is added to supernatant liquid from sedimentation tank and circulated in the water pools.

About 5,500 hogs are housed. $5,500 \text{ hogs} \times 8 \text{ liters of feces and urine per hog per day} = 44,000 \text{ liters per day}$. However, a total amounts to approximately 220 tons because of water circulated in hog houses. Approximately 4 tons of activated EM per week is applied.

② Screening facilities



Wastewater goes through two rows of screens on the ground to separate out large solids and fine mesh screens (right picture).

③ Solids are processed into manure



Separated solids are hog hair and undigested corn. White spawn is often observed near the surface of accumulated solids left for drying (right picture). Excreta of piglets are added to manure to increase nitrogen content.

After being dried in a compost maker (left below picture) for one week, manure is given away to about 50 neighboring farmers. Storage space is often empty (right below picture), and manure before drying is sometimes given away.

④ Processing liquid portion

After going through screens (see step 2), liquid portion is gathered in inflow tank (picture not shown) situated under the fine mesh screens. After adding activated EM, liquid portion is forwarded to the first aeration tank.

⑤ The first aeration tank



A 600-ton round tank is used for aeration. Liquid portion of hog excreta (wastewater) registers BOD approximately 4,500 ppm.

About 500 tons of wastewater (= 200 tons inflow from hog houses + 144 tons supernatant liquid returned from sedimentation tank + 144 tons sludge returned from sedimentation tank) flows into the tank daily. MLSS is maintained at 6,000 in summer and 8,000 in winter by adjusting the volume of sludge returned from sedimentation tank.

⑥ Aeration sequence: aeration - intermittent aeration - aeration



After the first aeration tank, wastewater goes through 6 full-time aeration tanks, 2 intermittent aeration tanks, and a full-time aeration tank to facilitate flock formation.

A total volume of aeration tanks including the first and the final aeration tanks is 1,937 tons. Intermittent aeration is alternation of 1.25 hours anaerobic condition and 1.75 hours aerobic condition repeated 8 times a day.

In order to double the anaerobic time, it is planned to return the outflow of the second intermittent aeration tank back to the inflow of the first intermittent aeration tank.

Measurements of relative acidity and alkalinity (pH) and DO are made in the final aeration tank. The volume of sludge removed from sedimentation tank is adjusted to maintain the level of pH 6.9 to 7.1.

⑦ Sedimentation tank



A part of supernatant liquid of sedimentation tank (left picture) is returned to the first aeration tank (see step 4), and other part is forwarded to 100-ton storage tank (right picture) where activated EM is added and returned back to water pools in hog houses.



A part of sludge (above picture) is returned to the first aeration tank (see step 4) and to the pits under wooden lattice floor of hog houses.

Water Quality of Storage Tank (March 2004)

Indices	p H	B O D	C O D	S S	Nitrogen by Kjeldahl	Ammoniac nitrogen	Nitrous acid	Nitric acid	Total phosphorus
Value	7.2	34 mg/L	210 mg/L	56 mg/L	41 mg/L	20 mg/L	39 mg/L	16 m/L	71 mg/L

Special attention is paid to maintain the levels of nitrous acid and nitric acid low so that hog health is not affected when hogs drink from the water pools.

A reported case of nitric acid toxication was caused by high level of nitric acid as high as 200-500 mg/L. The level at Miyata Hog Farm is comfortably low.

A total level of nitrogen in 2003 when Mr. Yamamoto started advising Miyata Hog Farm was 101 mg/L. It increased to 116 mg/L in 2004 as shown in the above chart. But a comparative examination of 2003 and 2004 data indicated that the amount of ammoniac nitrogen and organic nitrogen (=nitrogen measured by Kjeldahl method minus ammoniac nitrogen) were lower in 2004, which means that nitrification is more active in 2004.

⑧ Environmental improvement by discharged wastewater



EM treated wastewater is discharged to a lagoon (above left picture) that leads to an opening to irrigation channel (above right). The upper stream of the irrigation channel beyond the opening (left below picture) is covered with sludge, and individual stones on the channel bed cannot be distinguished. However the lower stream of the channel below the opening (right below picture) shows less sludge, and individual stones are identifiable.

Reference: “Flowchart of Wastewater Treatment at Miyata Hog Farm” shown in a booklet published by EM Research Laboratory in February 2004.

図1 宮田ブリーディング豚糞尿処理システム (H16.1月)

