Pit Recharge
Manure Management System

A pit recharge system is a manure management system in which a pit is periodically drained by gravity to a lagoon, and then recharged with a new liquid, usually recycled lagoon water. The theory behind recharging is that the addition of water to the pit on a regular basis will keep most manure solids in suspension, making them more easily removed the next time the pit is drained.

A major benefit of using the pit recharge system is to provide better air quality inside livestock buildings for operators and animals, and to minimize deterioration of equipment. The pit recharge system offers the same advantages as does pit flushing; however, it is less expensive and easier to adapt to existing deep pit systems under confinement buildings than a flushing system.

Installation
Figure 1 shows a recommended layout for plumbing in the recharge and drain lines. A lateral pipe to supply liquids is installed in each pit wall, preferably opposite the drain outlet. The lateral pipe can either be stubbed from an underground main directly into the pit wall with a conveniently located and protected butterfly valve, or it can enter the building wall near the ceiling level and drop down into the pit. In Iowa, where freezing conditions can be a problem, the lateral pipe should enter the building from underground. Do not reduce the diameter of the lateral pipe between the main line and the outlet.

The discharge point of the lateral pipe should be located between the slotted floor and the maximum liquid level of the pit, as shown in Figure 2. Many older buildings were constructed with a...
An example

Suppose that you wanted to know the pump capacity needed to recharge a pit that is 16 feet wide and 160 feet long under a swine finishing building. You would need to know the surface area of the pit to determine the volume of liquid needed for recharging. Then you could determine the size of pump needed to pump that volume within 4 hours.

1. Determine surface area of the pit.
   Pit surface area (ft$^2$) = Width (feet) × Length (feet)
   \[ = 16 \text{ feet} \times 160 \text{ feet} \]
   \[ = 2,560 \text{ ft}^2 \]

2. Determine the liquid volume needed to recharge the pit, a depth of 1 foot.
   (Assume that one gallon is 7.5 cubic feet.)
   Liquid volume = Pit surface area (ft$^2$) × Desired depth (feet) × 7.5 gallons/ft$^3$
   \[ = 2,560 \text{ ft}^2 \times 1 \text{ foot} \times 7.5 \text{ gallons/ft}^3 \]
   \[ = 19,200 \text{ gallons} \]

3. Determine the size of the pump (usually rated at gallons per minute, or gpm) that can pump this volume within 4 hours.
   Pump capacity = Liquid volume/4 hours/60 minutes/hour (to get gpm rate)
   \[ = 19,200 \text{ gallons}/4 \text{ hours}/60 \]
   \[ = 80 \text{ gpm} \]

Therefore, to effectively recharge a 16 × 160-foot underfloor pit, you would need an 80 gpm pump to handle the amount of water needed for recharging within a 4-hour period.
Lagoons must be sized and managed properly to use lagoon water in pit recharge systems. More information about lagoon sizing and operation can be found in another publication in the LIFE series, Design and Management of Anaerobic Lagoons in Iowa for Animal Manure Storage and Treatment, Pm-1590. This publication is available at any Iowa State University Extension office.

References


Recharge frequency
Pits drained and recharged frequently will have more manure solids removed than less frequently drained and recharged pits. This reduces the potential for generation of manure gases, which can be both a nuisance and safety hazard. Studies have shown that manure must be removed from the livestock building at least every 5-7 days to minimize odor and gas levels.

Recharge liquid quality
Although fresh water can be used to recharge a pit, recycled water from anaerobic lagoons for livestock manure management is more practical. Lagoons must be large enough to produce an adequate amount of high quality water needed to recharge a pit. The use of inadequately treated lagoon water to recharge a pit can threaten air quality in livestock buildings rather than improve it by contributing to the generation of manure gases.

Concrete Specifications for Agriculture, Pm-1589
Design and Management of Anaerobic Lagoons in Iowa for Animal Manure Storage and Treatment, Pm-1590
Vented Plumbing for Livestock Manure Handling Systems, Pm-1600
Watering Systems for Grazing Livestock, Pm-1604
Tunnel Ventilation to Alleviate Animal Heat Stress, Pm-1606
You Can't Afford Not to Haul Manure, Pm-1609
Freestall Housing for Livestock, Pm-1610

Additional resources
Other publications in the LIFE series, available from any Iowa State University Extension office, include:

Environmental Guidelines for Confinement Swine Housing, Pm-1586
Choosing Fans for Livestock and Poultry Ventilation, Pm-1587
Health Hazards in Swine Confinement Housing: How Bad Is Bad? Pm-1588

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