Catchment Sensitive Farming
Working together for a healthy environment

Benefits of slurry separators for dairy farms using sand bedding

Managing slurry is becoming an increasingly important focus for all livestock farms to optimise the use of nutrients for crop and grass production, protect the environment from air and water pollution, and assist farmer compliance with regulations for storing, covering stores and applying slurry as proposed in Defra's Clean Air Strategy.

Separation of slurry into free-flowing liquid and stackable solid components can lead to potential savings in ammonia emissions from the farm through provision of better options for slurry handling and storage.

The Sperrin Optiflow slurry separator at Portway Farm is a key component in the new slurry handling system, managing slurry from 310 high-yielding Holstein cows housed on sand bedded cubicles.

Removal of the solid material leaves less sludge in the base of the store and increases storage period capability. This helps to maintain storage capacity from year to year and reduces potential problems associated with mixing and emptying stores fitted with floating covers.

The liquid fraction can be easily applied to land with low ammonia emissions techniques e.g. band-spreaders, saving costs and improving crop utilisation of the slurry nutrients, whereas the solid component provides a valuable source of plant nutrients that will break down quickly when spread onto grassland or when ploughed-in for reseeding grass, arable cropping or for maize production.

Separators for sand bedding - key points

- Separating slurry and removing sand reduces slurry volume.
- Slurry separation simplifies storage and spreading, enabling reduction in air and water pollution.
- Separation is key for long term management and capacity of lagoons, particularly when covers are fitted.
- Removing sand from the slurry requires an extra step in the process before the separated liquid flows into a lagoon.
- Separated solid can be stacked and spread on the land when conditions are suitable and nutrients required by crops.

All slurry-based systems can use a separator regardless of bedding type, although the approach to a separation system will depend on the type of bedding used. Screw press separators use an auger to squeeze the liquid fraction of the slurry through a perforated sleeve and can produce relatively high dry matter solids, whereas roller press separators operate less aggressively, potentially have lower power requirements and better tolerance of abrasive materials.

Sand-based cubicle systems are popular due to well documented cow health and comfort benefits. However, removing sand from the slurry is likely to require further treatment other than just a conventional separator either before or after separation of the fibre.

Mark and Charlie Wood. Portway Farm, Twyford, Bucks

- 1,000 acre mixed farm.
- 310 Holstein cows + followers and beef.
- 12,500 litres per cow, 3 x a day milking, AYR calving. High yielders housed whilst low yielders go out to grass in the summer.
- Somatic Cell Count (SCC) annual average 120,000/ml.
- Mastitis: 8 cases per 100 cows.

A new slurry handling system has recently been installed at Portway Farm:

- Sand bedded cubicles bedded 3 times a week using 4 tonnes of sand per cow per year.
- Passageways are tractor scraped to a collection channel and then slurry is moved by chain driven conveyor to the slurry reception pit.
- Here it is mixed with parlour washings and then pumped with a heavy duty piston pump, designed to handle thick sand-laden manure, to the separator.
- The roller-press separator currently runs approximately 2 hours per day, removing solid material and a small proportion of the sand in the slurry.
- The liquid fraction then flows to a U-shaped sand sedimentation channel, where the majority of the sand settles out before the remaining liquid flows to the lagoon.

Approximate cost of installing the system:

- Separator, pumps, mixers, controls - approximately £60k.
- Concrete channels, panels, floors + labour - at least £60k. System cost will depend on specific requirements and existing infrastructure.

Reasons for system change

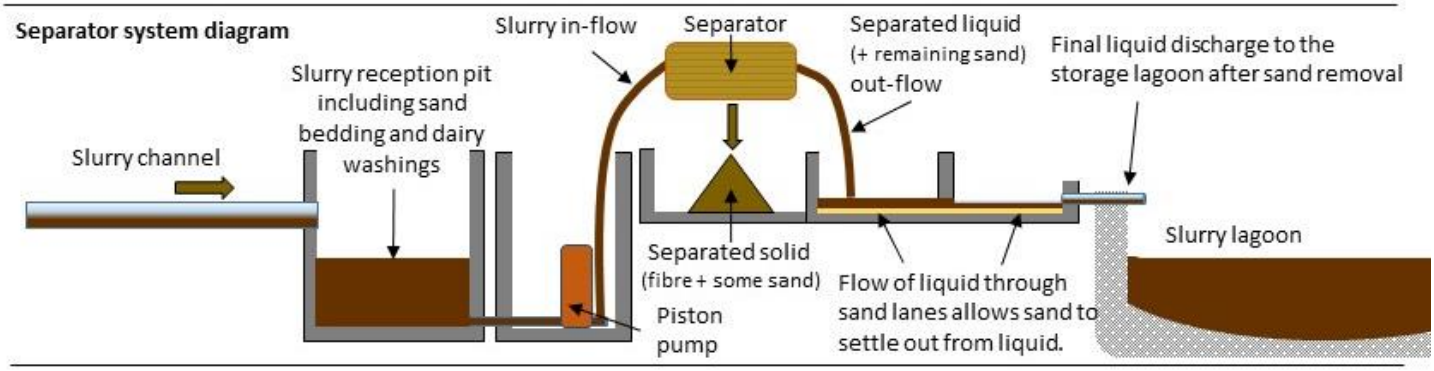
- Loss of grazing land and separation from the rest of the farm as a result of compulsory purchase for a government infrastructure project has reduced access for cow grazing.

Channel constructed alongside existing lagoon to transfer slurry to reception pit.

Reception pit with chain driven channel conveyor.

Piston pump delivers slurry to separator.

- The resultant increased levels of slurry to be stored and spread prompted the need for the new separator system to reduce the volume of slurry in the lagoon and reduce the transport time and cost of moving liquid slurry.
- More liquid slurry can now be used closer to home on rotational grass leys, and the solid can be stacked ready to be ploughed in as land is prepared for cropping.



Separator system performance at Portway Farm

Dry matter % of separator inputs and outputs and % volume reductions, based on a single day's analysis;

Separator performance	%
Slurry dry matter (DM) – including sand bedding	18
Reception pit DM including parlour washings	13
Liquid discharge from separator DM. This includes a large proportion of the bedding sand	9.5
Fibre from separator DM - a quite high DM due to the sand content of the fibre	31
Liquid flowing into the lagoon after sand removed, DM	5
Reduction in volume from separator	19
Reduction in volume of slurry entering the lagoon after separator and sand lane separation	32

Benefits of the separator system at Portway Farm

- Reduced slurry volume storage required, i.e. of the 880m^3 of slurry produced per month 280m^3 has been removed as separated solid and sand, reducing lagoon storage requirement by 1,680m^3 for a six-month winter.
- Much lower levels of sludge in the lagoon are expected due to prior removal of most of the sand. This will be a crucial benefit once the lagoon is covered to comply with future ammonia reduction legislation, due to the reduced need to regularly remove the cover to empty the lagoon.
- Handling, storage and application of manures can be undertaken using ammonia reduction techniques e.g. umbilical / injector and dribble bar when they will be best utilised by the growing crop to reduce impact on air and water quality.
- Management of the solid enables manure nutrients to be transported more efficiently to where they can be used for cropping, while the liquid slurry can be efficiently applied close to the dairy unit through an umbilical system.

Separated fibre is transferred to nearby concrete-walled storage area.

Sand sedimentation lanes flowing through 250mm pipe to lagoon in the background.

- This separator has saved the cost of increasing lagoon capacity to accommodate all-year-round housing.

System running costs

- Electricity cost to run the system is estimated to be £2-3k/year.
- Separator maintenance and equipment depreciation and finance cost is estimated to be £7-10k per year.

Less savings:

- Reduced manure handling cost.
- Reduced fertiliser costs from improved manure nutrient utilisation.

Slurry separator choice

Selecting a separator will depend on the aim of separation, i.e. use of the dry fibre and current bedding system. For sand bedded systems, selecting a separator more able to cope with the abrasive nature of sand will reduce equipment maintenance and replacement costs.

If the main intention is to reduce liquid slurry volume to be stored then using a separator that produces a high dry matter fibre is not necessary, as more liquid will be produced for storage. Keeping rainwater out of slurry stores through roofing or lagoon covers will also improve the efficiency of slurry handling and reduce storage requirements. However, controlling slurry viscosity to enable efficient separation and pumping is crucial.

Separator costs

The cost of a separator and associated equipment is a substantial investment and will be at least £30-£40k. Additional costs of changes to the existing infrastructure will also need to be considered.

Return on investment should be measured in terms of reduced storage requirements, lower handling costs, improved nutrient utilisation and enhanced opportunities for regulatory compliance with current and future environmental legislation.

Further information

More information on types of separator can be found here: https://www.fwi.co.uk/livestock/slurry-and-manure-management/slurry-separation-options-compared

Reducing ammonia emissions from agriculture

Reducing ammonia (NH3) emissions will be a requirement in future legislation as set out in Defra's Clean Air Strategy: https://www.gov.uk/government/publications/clean-air-strategy-2019

Installing a separator could be part of a solution to help reduce ammonia emissions on your farm. The Table below shows some other changes that can be made on farm to reduce ammonia emissions;

Action	**Reduction in NH_3 losses to air, %**
Lagoon covering	Up to 60
Trailing hose/trailing shoe	30/60
Injection shallow/deep	Up to 70
Washing collecting yards twice a day	70
Grooved flooring for rapid urine draining	35

Get in touch with your local Catchment Sensitive Farming Officer at gov.uk/catchment-sensitive-farming

Thanks to Mark and Charlie Wood for assisting with the compilation of this document. This guidance note has been produced by ADAS for Catchment Sensitive Farming. No liability can be accepted for its use.