



Benefits of slurry separators for dairy farms using green bedding

Managing slurry to optimise the use of nutrients for crop and grass production, and at the same time protecting the environment from air and water pollution, is becoming an increasingly important focus for all livestock farms. It may also help farmers comply with regulations for storing, covering stores and applying slurry proposed in Defra's Clean Air Strategy.

Separation of slurry can simplify its storage and application by removing a large proportion of the solid matter, leaving a free-flowing liquid and a stackable solid. This leads to the potential for savings in ammonia emissions from the farm through better options for slurry handling and storage.



Charles Goadby with his EYS slurry separator Manor Farm, Warwickshire

The removal of the solid material reduces the tendency for solids to settle out therefore leaving less sludge in the base of the store and effectively increases the storage period capability of the store. 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 separated solid fraction can itself be used as a bedding material, known as

Green Bedding or Recycled Manure Solids (RMS). Green Bedding systems require a high dry matter solid material achieved by removing as much moisture from the slurry as possible.

The liquid fraction can be easily applied to land with ammonia reducing techniques e.g. band-spreaders, saving costs and improving crop utilisation of the slurry nutrients, whereas the solid produced from separation, if not used as bedding, provides a valuable source of plant nutrients, breaking down quickly when spread onto grassland or when ploughed-in for reseeding grass, arable cropping or for maize production.

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 requirements and better tolerance of abrasive materials.

Separators for Green Bedding - key points

- Green Bedding is the fibre produced from separated slurry which is used for bedding cubicles, saving the cost of bought-in bedding.
- Separation and no additional bedding reduces the volume of slurry produced, enabling effective long term management of lagoons, particularly when covers are fitted.
- Slurry separation simplifies storage and spreading and enables a reduction in air and water pollution.

D Goadby and Sons, Ansley, Warwickshire

- 1,400-acre mixed farm.
- 350 Holstein cows + followers and beef. Milkers housed 365 days a year.
- 10,000 litres per cow, 2 x a day milking, all-year-round calving.
- Somatic Cell Count (SCC) average 150-175,000/ml.
- Mastitis: 15-20 cases per 100 cows.

The slurry system at Manor farm has been in operation for almost 7 years:

- Only enough slurry to produce the required Green Bedding is separated. The remaining slurry is scraped directly to a lagoon.
- Slurry for separation is scraped to a reception pit and mixed with clean water (approx. 0.3m³/hour of running time) before being pumped to the separator which runs 3 times a week, 8 hours at a time, to produce enough Green Bedding for all cubicles.
- Separated solid is used on the day of separation for cubicle bedding, before the fibre starts to heat-up.
- Half of the cubicles have mats with bedding spread thinly on top and the other half have a concrete base with a half-round timber attached to the heel stone to retain the bedding, which are bedded with a deeper layer i.e. 50mm.
- Fibre is spread into cubicles with a 'FLINK bedder'. This is a twin auger machine which prevents 'bridging' of the fibre in the machine.
- Lime is applied to cubicles after bedding-up.
- Cubicle dung is removed and bedding raked back by hand at each milking.



Slurry pump to supply the separator. Water is added to the slurry at this point to aid the separation process (approximately 36m³/month of added water).



Slurry separator mounted on farm-constructed housing to save costs / provide covered storage area for separated solids.



The hard working EYS separator has been in operation for almost 7 years and only had one replacement screen in that time



Twin auger 'FLINK bedder' which prevents 'bridging' of the fibre in the machine

Reasons for system change

The farm changed from loose housing to cubicles to save bedding costs and to improve cow udder health. Changing, initially to sawdust bedding, saw SCCs and mastitis rates fall and they improved further when a change to Green Bedding was made to save the cost of sawdust and make the slurry system more manageable.

The approximate current cost of the system:

- Replacement separator cost £25-30k.
- Gantry £5-8k depending on construction.
- Reception pit and pumps £10-15k.
- Total costs £40 - 53k.



Separated solid is stored undercover and used on the day of separation.

System performance

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

Separator performance	%
Slurry reception pit dry matter (DM)	11.5
Reception pit (DM)* DM is reduced by adding water to the slurry before pumping to the separator, to aid the efficiency of fibre separation	10.5
Dry matter content of liquid from separator, after fibre removal	4.8
Dry matter of separated fibre	35
Overall reduction in volume of slurry entering the lagoon	19

***Note: No parlour washings are added to the separator reception pit to reduce the potential for the spread of bacteria that could cause mastitis**

System running costs

- Separator maintenance and equipment depreciation cost is estimated to be £6-8k per year.
- Electricity cost to run the system is currently £1.5k/year.

Less savings:

- Bedding cost saving £20k/year.
- Reduced manure spreading costs due to no additional bedding, easily handled manure and less slurry volume.
- Reduced fertiliser costs from improved manure nutrient utilisation.

Benefits of the Green Bedding system at Manor Farm

- Saving the cost of bedding purchase which was previously £400/week before changing to Green Bedding.
- Cow comfort is considered superior to other options, including sand.
- Improved cow health from longer lying times and reduced hock abrasions.
- Reduced slurry volume from no bought-in bedding i.e. saving approximately 600m³ per year of slurry storage requirement and spreading cost.
- The slurry not separated is easily spreadable through umbilical/injector and dribble bar due to the low fibre content due to the absence of any additional bedding material. This also reduces the potential sludge left in the lagoon and results in minimal surface crusting on the lagoon surface.
- Handling, storage and application of manures can be undertaken using ammonia reduction techniques, improving opportunity to utilise manure nutrients for crop growth and reduce the impact on air and water quality.

Charles Goadby is a strong advocate for the system and is committed to any future investment required to maintain and improve the system to meet current and future environmental requirements for manure handling.

Health requirements for using Green Bedding

The following points should also be considered before installing a Green Bedding system:

- Regulations for using Green Bedding are set out in the Animal By-Products legislation and farmers using it must notify APHA, see the following link: <https://www.gov.uk/government/publications/use-recycled-manure-solids-as-cattle-bedding>
- Discuss with your milk buyer, any relevant assurance scheme, and your vet before installing the system to see if they have any objections to its use.
- Defra considers that if Green Bedding is used in accordance with certain conditions (see link above) there will be no unacceptable risks to the public or animal health. Research has also indicated that no consistent correlations could be found between the bedding, bacterial counts and udder health, see: [https://projectblue.blob.core.windows.net/media/Default/Research%20Papers/Dairy/411137branded executive summary.pdf](https://projectblue.blob.core.windows.net/media/Default/Research%20Papers/Dairy/411137branded%20executive%20summary.pdf)

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 improve the efficiency of

slurry handling and reduce storage requirements, although controlling viscosity to enable efficient separation and pumping is crucial.



Green Bedding at Manor Farm.

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 this investment should be seen in terms of reduced storage requirements and handling costs, improved manure nutrient utilisation and enhanced opportunities for regulatory compliance with current and future environmental legislation. Other information on separators can be found here:

<https://www.fwi.co.uk/livestock/slurry-and-manure-management/slurry-separation-options-compared>

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

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