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# Trends in equipment for solid and liquid manure

*Different storage and removal systems have become established for the various types of farm animal manure. And equipment for its removal, processing and spreading is just as varied.*



Fig. 1: Fully automatic spreading of litter is carried out by the Triomatic-System from Trioliet. Company photograph

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## Keywords

Organic manure, storage, processing, application

In-house manure drying dominates presently in laying hen production with droppings air-dried directly on manure collection belts. A Big Dutchman system, for example, applies a new air canal layout in a way that reduces both energy costs and emissions in this respect. The belts transport the manure out of the poultry house and into a roofed store where it's kept until applied on farmland. Because of its concentrated soil nutritive value transport is more cost-efficient and dried poultry manure is increasingly trucked over large distances from livestock into crop growing regions. Field application is by dung spreaders usually with hydraulic floor scraper and broadcasting systems with the capability of very precise spreading at even small application rates.

## New litter materials

So far, straw has played the major role as livestock litter. But a change is on the way as far as broilers are concerned. For a good year now, maize silage has been tested as litter in quite a large number of broiler houses. First recordings and observations indicate advantages for hygiene and a reduction in ammonia emissions compared with straw litter, effects possibly due to the higher organic acid content and thus low pH of the ensiled maize.

When maize silage is used as broiler house litter, it should be chopped as fine as when used in biogas production and it is also important that it should be dried before application, perhaps using waste heat from biogas production or through spreading thinly in a preheated poultry house. The resultant maize silage/poultry manure mix is cleared-out by front loader and in future will be used more commonly as biogas aggregate, a role already being fulfilled increasingly by straw litter/poultry manure mix. Because of its high nutrient and energy content this is just as cost-efficient to transport as dried poultry manure on its own.

Reported to have the same advantages as maize silage for poultry litter is untreated fresh wood material called "Soft-Cell"

which can also be finally used as aggregate for biogas production.

## Proven equipment for solid manure systems

Solid manure systems remain very important in certain pig and cattle production sectors as well as for organic farms. Straw litter is especially valued for its advantages in maintaining good interior climate and animal comfort, particularly for sow, piglet and calf housing. But the higher labour input with solid manure and the climate and management system advances attained by the no-straw approach have led to the present situation where by far the largest proportion of cattle and pigs are housed in no-straw systems.

With solid manure removal systems there have been no meaningful innovations in pig and cattle enterprises. Still applied are the most widely used static systems featuring cable or hydraulically operated scrapers and tractor and frontloader as mobile variant. Such techniques have proved themselves over many years with hardly any need for improvement.

But there are certainly improvements needed in the spreading of solid manure. Following important betterment of application precision and distribution there still remains the practical need to reduce wind effect during spreading. Especially with light material, precision in such cases is not satisfactory. And even although knowledge of nutrient content of all manures is necessary for precise use in fertilising, a method for rapid estimation of solid manure nutrient content is still missing so far.

## Clean passages with liquid manure systems

Pipeline and sluice gate systems for moving liquid manure from housing to storage are firmly established. These systems are reliable and help quality of interior air by rapid removal of manure from housing. Roofing with canvas has proved to reduce odour and

contaminant emissions from the storage container. In some cases a more solid roofing material, or simply covering the slurry surface with chopped straw or other light materials, have proved to be interesting alternatives. Before being removed for spreading, the manure has to be stirred to mix scum and lower levels into a nutritionally homogenous liquid. Nowadays, mainly electric submersible motor agitators are used, or tractor pto driven pole or turn mixers. Here, a new development by the company Landia features electric agitators built into the manure container walls. These feature practical leakage-proof sealing techniques and a lubricating system that can be continually monitored.

Agitation of liquid manure via slurry pump has proved to work well with relatively small containers. And such pumps are necessary anyway to move liquid manure from initial collection areas into higher storage containers, for example. Well-suited for this work over short distances have proved submersible chopper and motor pumps and, over longer distances, rotary and eccentric-screw pumps. Pump reliability has been still further bettered by improved chopping systems including that from Euro-P-Kleindienst.

A still relatively new development has appeared in dairy cow liquid manure systems where, on solid-floor passages as well as

slatted ones, stationary or mobile scrapers are used to clean surfaces and thus reduce odour and contaminant emissions. These move the manure several times per day into cross canals or under-slat channels. Mobile scrapers are available as operator-standing or sitting models but in the last few years fully automatic models have come on the market guided, for example, by induction loops.

Presented by Westermann at EuroTier is added equipment for mobile slat scrapers that greatly improves the cleaning effect (Fig. 2) featuring high-pressure water jets following the scraper to blast clinging dirt away. This system also has the advantage of being capable of freeing blocked slat interstices. Whether the effect can be improved still further when the cleaning water has acid added or the slat surfaces blow-dried is the subject of intensive testing currently. Also available for reducing dirt and emissions from manure is new slatted flooring from Hölscher and Leuschner.

#### Higher standards for liquid manure spreading equipment

For a long time liquid manure spreading equipment represented the weak point in the whole process. This has changed now with application systems that are very precise,

even in side winds, and markedly reduce emissions depositing the manure in strips across the field or injecting it into topsoil. Technology is also available for precise application which leaves nothing to be wished for in terms of accuracy with the predetermined amount of manure keyed into an operator terminal and the selected amount per hectare accurately applied independently of tractor speed. What was missing up until a little over a year ago was an analyser on the manure tanker for continuous determining of nutrient content and calculation of application rate. Now there's an instrument on the market to tackle this and tests by the Schleswig-Holstein Chamber of Agriculture have proved its functionality.

Although all requirements have been met in the meantime for accurate and environmentally-friendly application of liquid manure there regularly surface new ideas for supplementing the manure with ingredients or for further improvements through extra processing. But so far both avenues have regularly failed to deliver their promises. If one wants to invest in such directions, only test results carried out by neutral institutions with specialist knowledge and experience in this area should be trusted. What could well pay in the future, however, is using liquid manure for biogas production.

In farms where more nutrients are present in the manure than required as fertiliser, separation of solids and liquid might offer a practical solution with the liquid part spread on the farm and the solids delivered as aggregate to biogas plants in other regions. Separation more than doubles the nutrient concentration in the solids and the energy content per tonne is around two-thirds of that normal in a tonne of maize silage. Through this high solids nutrient concentration and its application in energy production the material is markedly more cost-efficient where long distance transport is involved than direct transport of liquid manure. Separators suitable for this work are produced, for instance, by Bauer and Big Dutchman.



Fig. 2: With the Cleanmeleon 3 (gold medal winner) Westermann presents a modular slat cleaner which effectively cleans both surfaces and interstices. (Gold medal)