Effluent solids separation using a mechanical system (6-27)

Mechanical solid separation is the fastest way to remove solids from effluent.

Advantages for separating solids:
- Fewer blockages in irrigation equipment
- Reduced sludge build-up in storage pond
- Providing more liquid effluent which can be pumped over a greater distance
- Allows strategic use of effluent solids, e.g. for cropping land

Mechanical solid separators typically achieve high rates of solids removal. The effluent is usually pumped from a sump to the solids separator, which removes and stockpiles the solids product for later land application. The liquid is drained to a storage facility for application.

*Figure 1: Common placement of mechanical separator within an effluent system*
Types of mechanical solids separators

A number of different mechanical systems can be used to remove the solids from effluent. These have been generally classified below:

1. **Press separators** – the effluent is forced under pressure through one or more layers of fine mesh screens to separate the solids and liquids. Press separators are normally built on raised platforms over concrete pads so that solids (above 25% DM) can pile up below for easy removal.

2. **Rotary de-waterers** – effluent is pumped into a large rotating drum filter, liquid drains through the drum and solids fall out the end of the drum as it spins. Rotary de-waterers produce an effluent solid content around 10-20% DM.

3. **Fixed screen separators** - effluent is pumped over an engineered filter screen which allows liquids to drain through and away to storage while solids are caught and slide off the front of the screen and collected in a solids bunker below. Solids collected are often 10-15% DM.

**Rule of thumb – the drier the effluent solid the higher the energy input required.**

Each model and type of mechanical separator will operate differently, and every farm has different effluent characteristics. Understanding your farm’s effluent and how that relates to the model of separator is important for choosing which to install.

Factors to consider when choosing a mechanical separator include:

- Is the system suitable for the required flow rate?
- How dry will the effluent solids be? How can they be handled/spread?
- What particle sizes are/are not removed? (e.g. some separators struggle to remove silt)
- How much power is required to run the separator? Is power on site/available?
- What warranty/guarantee is available with the separator?
- What maintenance is required, when and at what cost?
- Can the system cope with seasonal variation of effluent dry matter?
- What will the contingency plan be if the separator breaks down or is in need of maintenance
When planning to add a mechanical solids separation system into the effluent system, consider the following:

- Sufficient storage facilities are still required for effluent prior to separation (including emergency storage for pump or separator breakdown).
- All handling equipment should be placed so that if any effluent is spilt it will flow back to the farm dairy sump.
- There should be plenty of storage for separated solids and liquid so that effluent is not applied to land when soil conditions are unsuitable.
- The separated solids should be covered to prevent rainwater infiltrating and creating liquid effluent again.
- Effluent storage area should meet all of the food safety minimum distances, as well as the district and regional council requirements, particularly around proximity to freshwater, water takes, neighbours and the surface sealing requirements to prevent leaching.
- Suitable machinery is required for land application of effluent solids.
- Solids must be applied to land in compliance with Regional Council rules.
- Mechanical separators have to be regularly inspected and maintained.
- Ensure there is a large enough power source to run the effluent pump and separator at the same time. (Can this be used at the same time as the milking machine?)

**Things to consider when including feed pad effluent into the effluent for separation**

- Some separators need specific calibration for the effluent consistency, feed pad effluent and feed residues will greatly alter effluent consistency.
- A feed pad will increase the volume of solids extracted, meaning more solids storage and spreading will be required.
- Liquid effluent storage capacity will need to increase, as there will be significant additional liquid contribution from the pad.

**Storage of solids**

The separated solids can be stored and applied to land as a fertiliser. The storage area must be sealed (pad or bunker), so there is no leaching of excess nutrients into ground water. Liquid draining from the effluent solids bunker must drain back into the effluent system. Ideally removed effluent solids will be stored in a covered area to ensure that it does not rehydrate and turn into an effluent slurry when it rains.