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The FAN Press Screw Separator PSS

- The FAN PSS can handle thick (20% solids) as well as thin slurries (down to 0.1% solids)
- Dryness of the separated solids can be adjusted between 25% and 55% TS (depending on application and model)
- High capacity and production of very dry solids
- Minimal maintenance, no special training required
- Very low power consumption
- The FAN PSS is optionally equipped with an oscillator unit (patented) for improved performance and higher capacity
- Main components are constructed out of stainless steel
- Auger of the PSS is hard coated for longer life
- Body available in cast iron, stainless steel or cast stainless steel
- Screen will be cleaned continuously by the auger because of very tight tolerances
- The FAN PSS is optionally equipped with a flushing device inside the body

The PSS is fed by pump or gravity from a holding tank. It is also possible to feed the PSS by hopper. The optimal feeding method depends on the raw material consistency and the site conditions.

Inside of the inlet section, an oscillator unit (patented) inducts oscillating pressure into the liquid. This leads to an improved performance and a higher capacity, especially with viscous liquids.

In the slotted screen, the fibrous solids are screened out from the liquid. The fibres build up a layer which also acts as a filter to separate finer particles from the liquid. The auger flights convey this layer to the solids outlet. The screen surface is cleaned and a new filter layer is formed.

The design of the screens is not conducive to plugging. The pressure in the first part of the screen is low but increases with the solid consistency to the solid output. The friction of the solid plug in the cylindrical mouthpiece and the double flap of the output regulator provide counter pressure for further dewatering of the solids.

The dryness of the solid cake can be adjusted by the number and position of the weights (patented output regulator).

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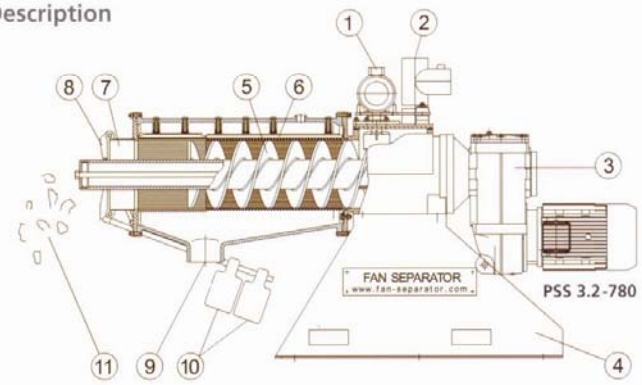
PSS 1.2-520

PSS 3.2-780

PSS 3.2-1040

PSS 5.2-1040

Description



1 Oscillator	5 Auger	9 Exit for separated liquid, 5"
2 Inlet, 4"	6 Screen	10 Counterweight
3 Gearmotor	7 Mouthpiece	11 Separated solids
4 Stand	8 Output regulator	

Major patent rights

Separation principles (Patent EP 0 367 037 / USA Patent No. 5, 009, 795) consisting of:

- relationship between of screen diameter and auger pipe diameter is designed that a hollow cylindrical solid plug is produced
- transfer of tangential force from the screen via guide rails
- screen construction, made of screen bars
- output regulation with flaps and weights for regulating dryness of cake

Oscillator system (Patent EP 0 443 385 / USA Patent No. 5, 118, 427):

- transmits vibrations into the liquid to increase the viscosity

Technical Data

Separator Model	Power kW	Power HP	Max. capacity m³/h*	Max. capacity USgpm*	Max. capacity bd t/d*
PSS 3.2 / 4.2 / 5.2 - 520	4.0 – 5.5	5.5 – 7.5	50	220	8
PSS 3.2 / 4.2 / 5.2 - 780	5.5 – 7.5	7.5 – 10.0	80	352	10
PSS 3.2 / 4.2 / 5.2 - 1040	7.5 – 11.0	10.0 – 15.0	100	440	12
PSS 8 - 800	18.5	25.0	150	660	30
PSS 8 - 1200	18.5 – 30.0	25.0 – 40.0	250	1100	40
PSS 8 - 1600	30.0	40.0	350	1540	50

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Innovative solutions for solid/liquid separation

- Squeezes water out of liquid manure
- Separates solids into piles of dry solids
- The only separator that works with thick slurries and dilute waste waters
- Cleaning every 3-4 months only
- Meets environmental effluent standards
- Reduces solids content of manure
- Reduces size of new pits and lagoons
- Reduces pollutant nutrient content
- Re-use solids for bedding
- Re-use liquids for flushing
- Recycle solids for refeeding
- Prolongs life of existing lagoons
- Minimizes costs of hauling water
- Improves biological treatment
- Minimizes odour
- Reduces field spreading acreage
- Solids moisture content 60-70%
- Easy and very safe to use

General description of the FAN Separator system

Slurry is collected, mixed and pumped to the separator, with any excess returning to the collection pit. As slurry floods into the auger chamber the vibrator energizes the fluid for increased dewatering capacity in the screen section of the press screw separator.

Dewatering takes place initially by gravity as the free water passes through the screens and exits through the effluent nozzle in the separator body. Bonded water that is attached to the solids is squeezed out by the compressing action that occurs within the last two turns of the auger flights. The last flight turns are reinforced and heat treated to withstand the high pressures of the compression process.

Desired solids moistures is regulated by weights that control the exit door pressure. Dewatered manure solids fall freely from the auger into the receiving pile ready for composting for other use. Effluent liquid goes into storage for recycling.

The PSS separates solids out of a liquid or slurry waste. By separating the solids and liquids - two distinct products are created. This creates many advantages in dealing with effluent as the liquids are much easier to disperse direct into irrigators, ponds etc and solids will compost down quickly creating great fertiliser.

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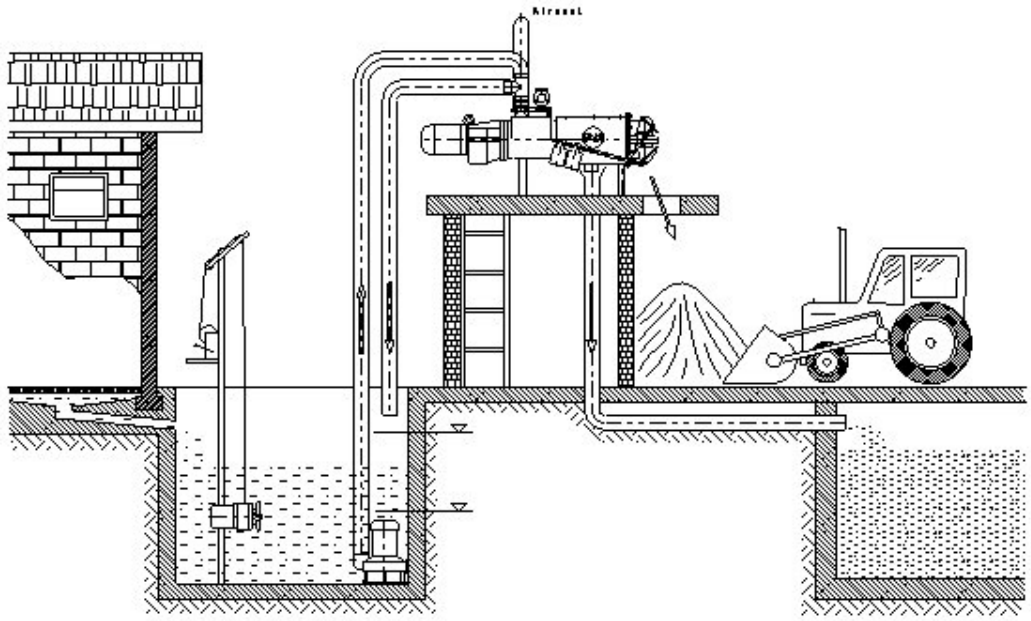
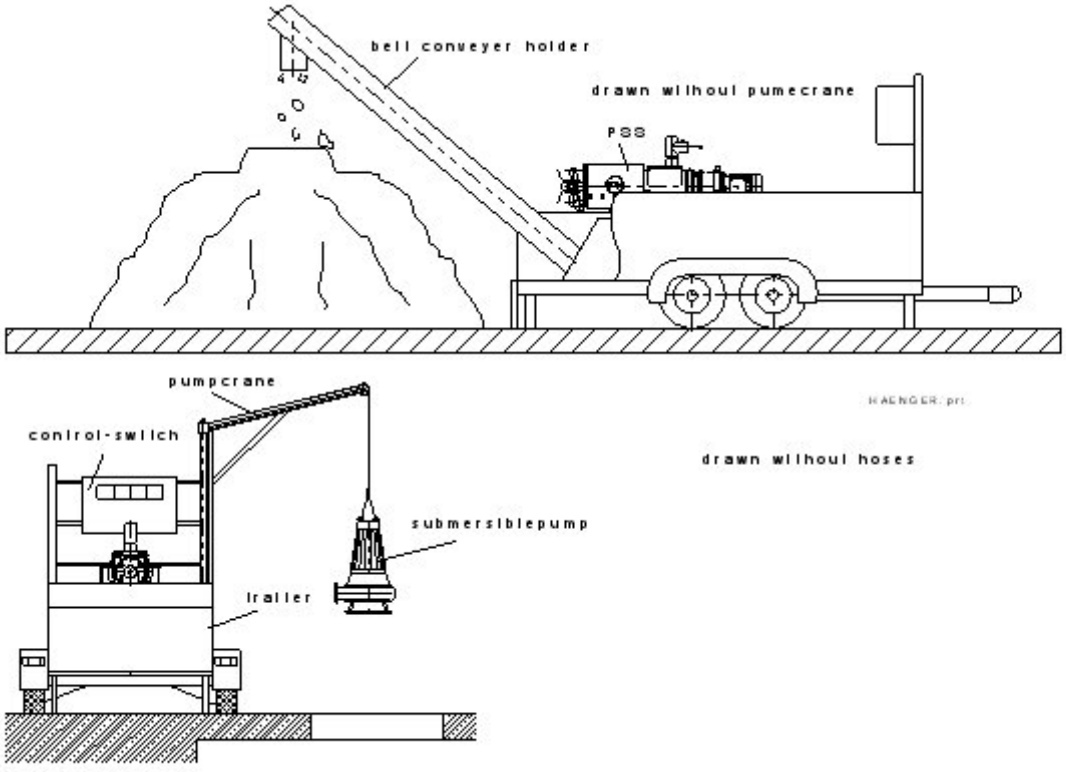


The FAN PSS Separator can also be used as a mobile separation system mounted on a trailer.

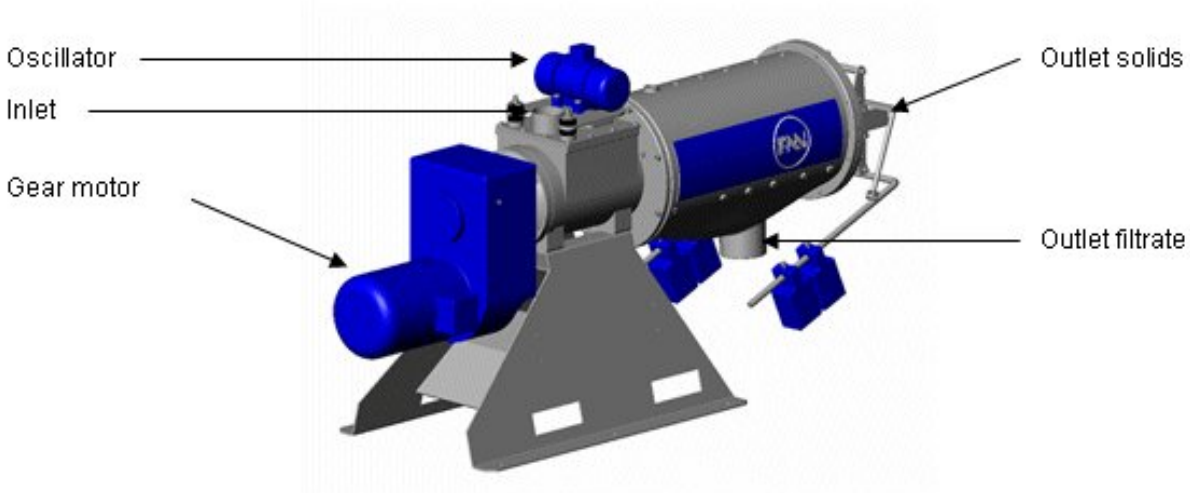


The FAN Press screw separator PSS – Facts

- The FAN PSS can handle thick (20 % TS) as well as thin slurries (less than 1 % solids).
- The FAN PSS is self-cleaning.
- The dryness of the separated solids can be adjusted between 20 and 50 % TS.
- The FAN PSS has a high capacity and produces dry solids.
- The FAN PSS produces solids at moisture that is optimum for composting.
- The maintenance of the PSS is minimal and requires no special training.
- The FAN PSS comes with control panel.
- The FAN PSS shuts off automatically if the sump is empty.
- A full automatic control is possible.
- The power consumption of the FAN PSS is very small - only 4 to 5.5 kW installed electrical power.
- The FAN PSS is equipped with an oscillator unit for improved performance and higher capacity.
- The body of the FAN PSS comes in cast iron and has a long life.
- The most important parts like screen and auger are made of stainless steel.
- The auger of the PSS is coated for longer life against abrasive material like sand.
- The auger of the FAN PSS can be refurbished after use.

The FAN Press Screw Separator PSS - Operation

The PSS is fed by pump or gravity from a holding tank. It is also possible to feed the PSS by hopper. The optimal inlet possibility depends on the slurry consistency and the site conditions. Inside of the inlet section a vibration unit inducts oscillating pressure into the liquid. This leads to an improved performance and a higher capacity especially in viscous liquids. In the slot screen the fibrous solids are screened out from the liquid. The fibres build up a filter layer which filters also finer particles from the liquid. The auger flights convey the layer with each rotation two times to the solid outlet. The screen surface is cleaned and a new filter layer is formed. The design of the screen slots do not allow a plugging.



The pressure in the first part of the screen is low but raises with the solid consistency to the solid output. The friction of the solid plug in the cylindrical mouthpiece and the double flap of the output regulator gives the counter pressure. The solid consistency of the solid cake can be adjusted by the number and position of the weights very easy.

Solids

- Usually de-watered to about 70% moisture content.
- This low moisture content ensures the solids will compost.
- The solids are easy to handle and this means spreading them back onto the farm is very straight forward (and cost effective).
- A cost effective, high nutrient value fertiliser.

Liquid

- Can be irrigated onto paddocks without a build up of sludge on the grass.

- Irrigator nozzles will not block up and a smaller nozzle can be used, extending the coverage of the irrigator and reducing the chance of leaching.
- Liquid can be added directly into Central Pivot irrigators with irrigation water therefore no need for a separate effluent line added onto the central pivot for the effluent.
- Greatly reduced solid build up in effluent ponds, no more crusting.
- Can be recycled for wash-down water for feed pads, yards etc. This means when your land is saturated you can greatly reduce the amount of liquid you have to irrigated or store in ponds.
- Fresh water will have to be added daily to replace moisture that has been separated with the solids and also if the liquids become to thick with suspended solids.
- Liquids stored in ponds also allow Nitrates to be absorbed into the atmosphere – hence reducing nitrates entering soil and water ways if this is an issue.

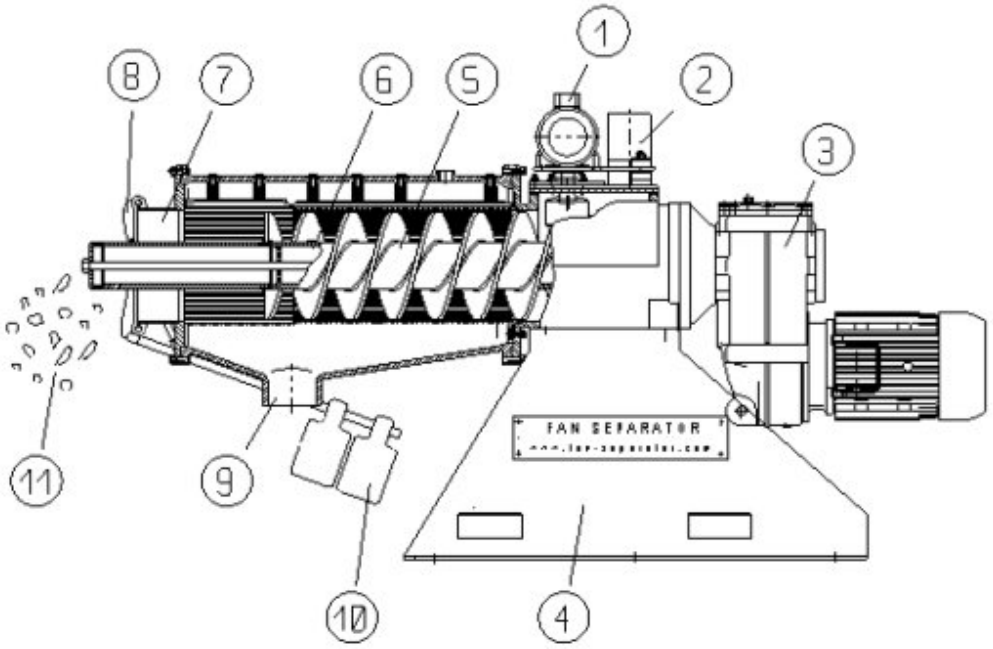
The Separation process

- The PSS is cylindrical in shape and lies horizontally.
- The slurry enters through the top of the PSS.
- The slurry falls onto an auger chamber which is turning slowly, pushing the slurry toward the outlet end of the machine.
- Surrounding the auger is a screen with 0.50 mm apertures. Some of the liquid will begin to pass through these apertures as the slurry is pushed along by the auger.
- The solids and remaining liquid is then gradually squeezed by the turning action of the auger as they are forced toward the exit.
- The exit point is restricted by weighted plates. These plates ensure that the slurry is squeezed very hard. This squeezing action forces the liquid out of the slurry and through the surrounding screen, and traps the solids.
- The solids then falls out of the PSS into a pile or trailer etc.
- The liquid is piped to an effluent pond or to an irrigator etc.

Other points

- A pump must deliver the effluent to the PSS or a gravity system can be employed with a trap to catch large stones or lost farm equipment.
- It is said that whatever a pump can deliver in the way of foreign materials such as stones etc the PSS can handle.
- The auger is run by a direct drive with a gearbox connected to a 4.0 kW three phase motor.
- Grease nipples should be greased once per day, however an automatic greasing unit may be added to remove this job.
- Every three to four months it is recommended that the screen be removed for checking. This is a 10 minute job.
- The system can be set up to turn on either automatically or manually – this is an option.

The FAN Press screw separator PSS - Parts



1	**Oscillator**	**7**	**Mouthpiece**
2	Inlet	8	Outputregulator
3	Gearmotor	9	Exit for separated liquid
4	Stand	10	Counterweight
5	Auger	11	Separated solids
6	Screen		

The FAN Press screw separator PSS - Capacity

Cattle manure

Manure dry matter (%)	Screen slot size 0.25 mm	Screen slot size 0.50 mm	Screen slot size 0.75 mm	Screen slot size 1.00 mm
1 – 3	7 - 15 m³/h	13 – 28 m³/h	X	X
4 – 6	5 - 14 m³/h	9 – 19 m³/h	12 – 25 m³/h	X
7 – 9	2 – 5 m³/h	7 – 10 m³/h	6 – 15 m³/h	8 – 15 m³/h
10 – 12	1 – 3 m³/h	3 – 8 m³/h	6 – 15 m³/h	9 – 18 m³/h
13 – 15	X	1 – 5 m³/h	5 -10 m³/h	7 – 11 m³/h

Pig manure

Manure dry matter (%)	Screen slot size 0.25 mm	Screen slot size 0.50 mm	Screen slot size 0.75 mm	Screen slot size 1.00 mm
1 – 3	12 – 25 m³/h	16 – 35 m³/h	X	X
4 – 6	9 – 20 m³/h	15 – 30 m³/h	X	X
7 – 9	5 – 15 m³/h	10 – 25 m³/h	15 – 25 m³/h	18 – 30 m³/h
10 – 12	1 – 12 m³/h	8 – 15 m³/h	10 – 18 m³/h	12 – 21 m³/h
13 – 15	X	2 – 6 m³/h	4 – 10 m³/h	6 – 13 m³/h

Poultry manure

Manure dry matter (%)	Screen slot size 0.25 mm	Screen slot size 0.50 mm	Screen slot size 0.75 mm	Screen slot size 1.00 mm
1 – 3	7 – 13 m³/h	8 - 15 m³/h	X	X
4 – 6	6 – 12 m³/h	9 – 19 m³/h	X	X
7 – 9	4 – 11 m³/h	7 – 13 m³/h	8 – 15 m³/h	9 – 17 m³/h
10 – 12	2 – 9 m³/h	3 – 11 m³/h	6 – 15 m³/h	9 – 18 m³/h
13 – 15	X	1 – 5 m³/h	5 – 10 m³/h	7 – 11 m³/h

The above mention data is the result of a great number of measurements in practice. The figures are not guarantees since the capacity of the separator depends on different factors, such as dry matter, quality of the manure and feeding.

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The FAN Press screw separator – typical installation






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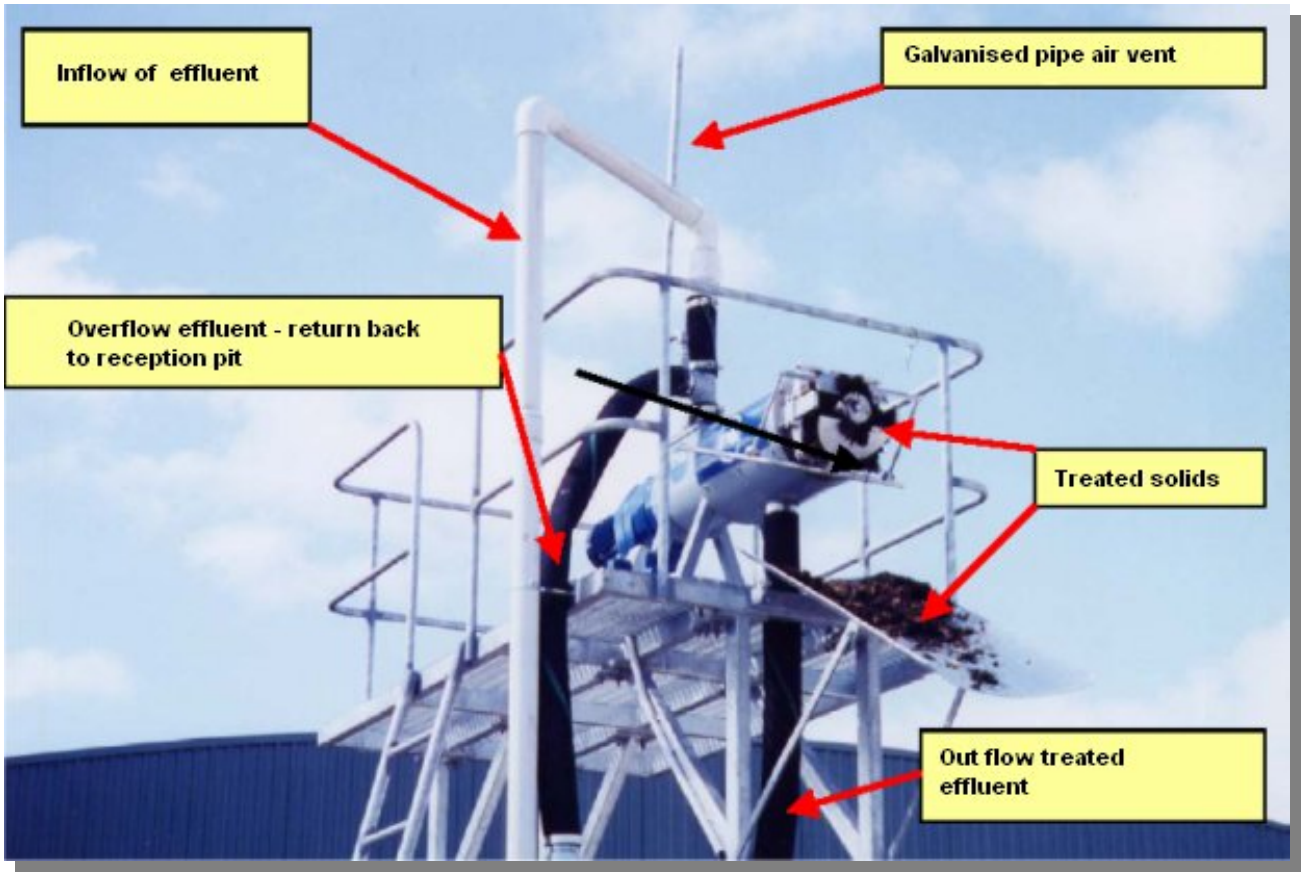

Stone trap - Run-off from feed pad before entering pumping and reception pit

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Stand - allows for a pile to be built in front of the separator assisting handling and composting

Solids outlet - easy adjustment allows for solids to be drier or wetter depending on preference.

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FAN Separator – Separation of manure for bedding

Introduction

Cows digest feed to produce milk and recyclable biomass. The value of milk is the focus of the industry, but the economics of recycled biomass is just being explored. Maximum economic benefit depends upon full utilization of all the available products. Organic fertilizer is the oldest and best known way to recycle manure, but on the modern dairy a second use can be made of this valuable biomass. That is to use dewatered manure solids for bedding. Remarkably this new use does not detract from total fertilizer value. Feed recycled to bedding and then once again to fertilizer results in a triple value from one resource!

Freestall bedding is not a new use for dewatered manure solids. It has been used, on a limited scale, for 20 years and more. Early machines, such as the Surge “True Machine”, proved unsatisfactory, but many of its owners judged the bedding it produced to be superior to other products in several years.

Bedding Products

To be usable as bedding, a product needs first to be cow compatible for comfort and health. Secondly, it must be environment friendly and thirdly to be economical to buy, handle and dispose after use. Traditional bedding materials are: straw, wood shavings, sawdust, rubber mats, sand, and dry manure solids.

Barns and stalls are substitutes for the original animal environment which is outdoors in the pasture and forest. Barns provide protection from the elements; however, confinement presents challenges to sanitation and creature comfort. Freestalls allow proper cleaning, but providing cow compatible bedding has proved difficult. Traditional straw, sawdust and wood shavings all have problems, are labour intensive and costly to buy. Rubber mats and mattresses attempt to reduce labour and improve comfort, but are expensive to buy and maintain. Some dairies cause sand bedding as a means to optimize sanitation, but sand is very expensive in terns of equipment wear and cost of handling.

Recycled Manure Solids As Bedding

Use of dry manure solids as bedding has been dependent upon developments in two areas. The first is udder health and then good equipment to dewater and process raw manure slurry.

Health

Mastitis is the scourge of the dairy industry. Fear of mastitis infection accompanies any change on process, such as the type of bedding material. Manure as bedding naturally raises the question of how it can be sanitized so that herd health is not affected. However, a survey of manure-for-bedding user has revealed an interesting fact. Sanitation concerns focus primarily on milk parlour hygiene rather than bedding used.

Udder sanitation, including pre and post teat dips, is an essential part of the milking process. Cell counts and mastitis infection are primarily controlled in the milking process. Operators say that this milk parlour practice is entirely compatible with using manure solids for bedding. All respondents claimed equal and most claimed lower cell counts when using manure solids for bedding. Note that the survey included only farms using the FAN Screw Press Separator for producing bedding.

Equipment / Process

Most of the equipment for dewatering manure slurry gas been disappointing in both the machines and the quality of material produced. Separators are predominantly gravity screen types that require extensive cleaning and produce wet cake unsuitable for bedding. Separators with roller press options add maintenance cost without much improvement in

product dryness. The FAN Separator Company's development is a screw press that uses pressure from an auger to squeeze out all the free water and most of the bound water. This is the only manure separator that consistently produces manure solids dry enough to be placed in the Freestalls. Some FAN press users compost partially and one research farm scientifically composts, but more and more the farms use the bedding immediately out of the FAN Separator, without further processing.

The only handling practice common to all manure solids-for-bedding users is to keep the produced solids dry. Fortunately there is always an abundance of solids so any that gets rained on can be diverted to fertilizer use. All of the following management practices are found on dairies using FAN Separators to produce bedding:

- Bedding with fresh cake from the FAN Separator
- Partial composting (Pile and turn once or twice in 3 - 4 weeks)
- Full scientific composting with temperature and air control
- Bedding in thin layers with careful bed levelling
- Bedding in thick piles with no bed levelling
- Bedding often - ranking beds only
- Bedding every 1 to 2 weeks - never ranking
- Beds high at the head - bed manually
- Level beds - bed with front end bucket loader
- Thin beds - bed with side throwing spreader
- Thick beds

The only consistence factors are to: keep the produced solids dry
practice good milk parlour hygiene

Environment

Manure solids are a natural element that has always cycled through the environment. Used as bedding, manure solids only add positively to the farm environment. And, it is one additional recycle of bio solids. However, there are additional environmental benefits from manure separation which include:

- more manageable nutrient plans
- no land impact from purchased bedding products
- lower odours and energy savings.

Finally, there is the general benefit of additional recycling of resources.

Economics

Manure solids for bedding. As produced by the FAN Press Screw Separator, provides an immediate economic benefit by saving the entire cost of buying bedding material. The cost of purchased bedding can be as high as $ 100 per cow each year. This savings alone often justifies the entire cost of a new efficient manure handling system. Al a bonus there is no loss of fertilizer value. After recycling to bedding, solids can be used on farm crops or it can become a crash product by selling to outside markets.

Other benefits that result from building a modern manure management system using the FAN Press Screw Separator include:

- Lower cost from:
- Automation of manure collection and separation systems
    - Cleaning out slurry storage vessels without mixing
    - Efficient hauling of dry solids to distant fields
    - Pump irrigating the water component (no hauling)
- Lower cost slurry storage (volume reduced by 20 – 30 %)
- No field impact by sand, wood or straw solids
- No major equipment wear from sand
- Flexibility of farm management

Less obvious benefits reported by users are:

- Higher milk production due to improved cow comfort and using beds higher at the head

Innovative solutions for solid/liquid separation

- Lower incidence of calving infections due to better cow drainage with high head beds
- Lower incidence of foot and udder injury from generous bedding amounts
- Cleaner cows and fewer flies

Summary
Dewatered manure solids, as produced by the FAN Screw Separator, are glowing in use and preference for Freestall bedding. Managers report that herd health improves, when combined with good milk parlour hygiene and keeping the bedding dry after production. Dewatered manure solids are becoming known as the ideal dairy bedding material.

Economic benefits of using manure solids from bedding are both immediate and long range by eliminating purchased bedding material and by providing added cow comfort and health. Additional benefits in manure handling and storage add to the economic, management and environmental advantages gained by using the FAN Screw Press Separator to produce dairy bedding material. Call it “FAN bedding”.

FAN Press screw separator PSS – Trials cattle manure

The separator was set up on Triple Ee Farm, Canada as illustrated in figure 1. The machine was placed on a tower 5m high. The slurry was fed bay a 2,5 hp chopper pump to the separator. The excess slurry flowed back into the slurry tank. Homogenisation of the raw slurry was achieved by the consistent stirring of an escalator. The separator liquid was directed to a storage lagoon and solids piled up under the tower and then were transferred to another site for composting. Screens with openings of 0,75 mm and 0,50 mm were tested.

Samples were taken from three locations, i.e., influent (raw slurry before separation), effluent (liquid after separation) and solids (separated from slurry). The separation efficiency was assessed by analysing total solids (TS), volatile solid (VS), total suspended solid (TSS.), volatile suspended solid (VSS.), Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), ammonium nitrogen (NH_3 - N), nitrate- nitrite nitrogen (NO_3 - NO_2- N), total Kjeldahl nitrogen (TKN), dissolved phosphate (Dissolved PO_4), total potassium (K) and salinity. Four sets of example were taken to each screen at different times. Replication was made during laboratory analysis. Separation rate was determined by measuring the volume of slurry being pumped to the separator within a period of time. Solids production was measured by collecting the solids a truck, and weighing the truck before and after the collection.

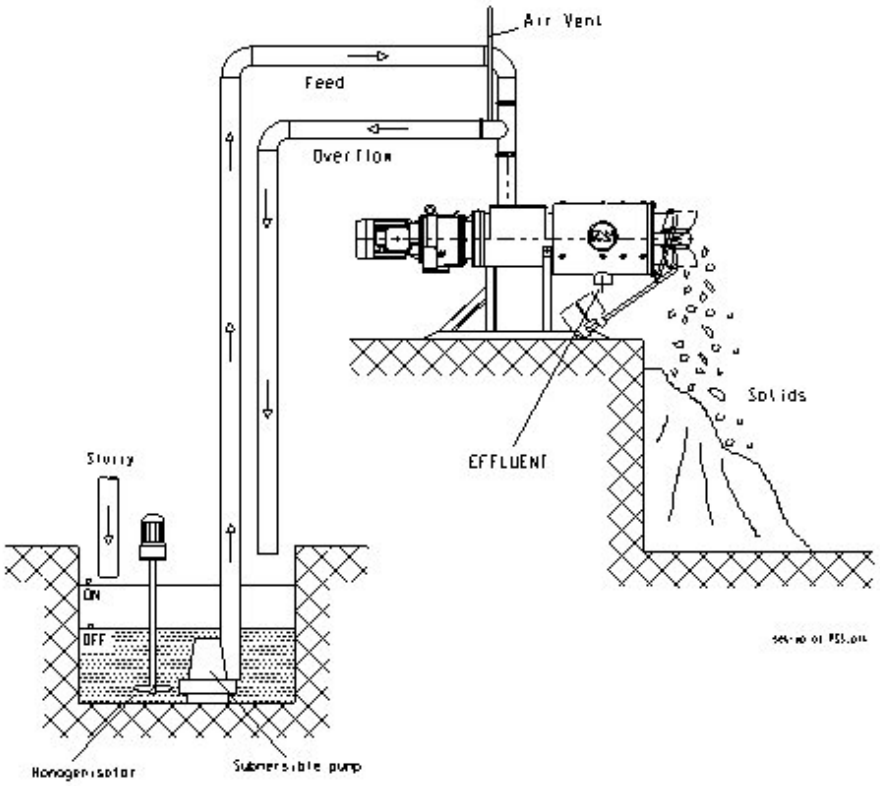

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Figure 1. Set-up Press Screw Separator

RESULTS

Solids Removal

Table 1 is a summary of the performance of the press screw separator in solids removal. The solids concentration of slurry from Triple Ee Farm was around 5% with only one exception of about 2%. After separation, the effluent had a fairly consistent solids concentration of 1.7% (with 15% variation) and 1.2% (with 30% variation), respectively, when using 0.75mm and 0.5mm screens. If a solids concentration of 5% was taken as normal, the average solids removal efficiency was 67% and 79% respectively from 0,75mm and 0,5mm screens. Table 1 indicates that the 0,5mm screen removed more solids from the raw slurry than the 0,75mm screen, and produced a liquid with lower solid concentration. When the influent contained less solid (e.g. 2%), the removal efficiency dropped to 23%. This phenomenon was due to the concentration of the slurry and the size of particles in the slurry. The reason to the low concentration of solids and small size of particles in the slurry can be attributed to:

- Solids settled onto the bottom of the tank, and not enough homogenisation was provided therefore the pump sent only the fraction of low solids content with small particles to the separator
- The slurry was mostly recycles flushing water, and there were not many large particles in it

The separator removed more VS, TSS, and VSS than TS. The 0,50 mm screen removed more solids than the 0,75mm screen.

Table 1 - Solids removal 0.50 mm screen

	Influent conc. % Range/Average	Removal efficiency % Rage/Average	Effluent solid conc. % Rage/Average
TS	5.4 – 5.8/5.5	73.7 – 85.7/79.1	0.8 – 1.4/1.2
VS	4.4 – 4.9/4.6	78.8 – 89.8/83.7	0.5 – 0.9/0.7
TSS	4.5 – 5.4/5	81.5 – 88.4/83.4	0.6 – 1.0/0.8
VSS	4.0 – 4.7/4.4	83.1 – 90.5/86.2	0.5 – 0.8/0.6

Table 1 - Solids removal 0.75 mm screen

	Influent conc. % Range/Average	Removal efficiency % Rage/Average	Effluent solid conc. % Rage/Average
TS	2.0 – 5.6/4.5	22.9 – 71.7/56.2	1.6 – 1.9/1.7
VS	1.4 – 4.6/3.5	21.9 – 76.6/59.3	1.1 – 1.2/1.2
TSS	1.5 – 5.2/3.6	31.1 – 76.9/60.7	1.1 – 1.2/1.2
VSS	1.3 – 4.2/3	34.3 – 78.1/63.1	0.8 – 0.9/0.9

Solid Quality

The quality of the separated solids is listed in Table 2. The separated solids had moisture content about 73%. The screen with smaller opening produced more consistent quality of solids. The solids were suitable for composting with or without bulking agent.

Table 2 - Quality of separated solid

Quality	0.50 mm screen Range/Average	0.75 mm screen Rage/Average
Moisture %	72.3 – 74.9/73.4	67.8 – 76.6/73.0

TKN %	1.5 – 1.9/1.7	2.0 – 2.6/2.2
K %	0.36 – 0.42/0.39	0.37 – 0.55/0.46
pH	7.7 – 8.1/7.9	7.8 – 8.1/8.0

Nutrient removal

Nutrient reduction by the press screw separator is summarized in Table 3. The removal of nutrients was not as efficient as solids removal. An average COD reduction of 57.6% was achieved when using the 0,50 mm screen. The reduction of COD was 19.6% with the 0,75 mm screen. It appears that the removal of COD is a function of the solids concentration in the raw slurry. Total Kjeldahl Nitrogen was reduced by about 21% and 17% respectively, when using the 0,75 mm and the 0,50 mm screens. The removal of other nutrients largely fell in the range of 0 to 10%, which was not significant.
Aside from the performance of the separator, the on-farm manure handling practices have an impact on the removal of nutrients, for example , the frequency of flushing, the quality and amount of water being used for flushing, Generally, frequent flushing will reduce the amount of dissolved nutrients in the slurry and result an a cleaner liquid.

Table 3 - Nutrient removal 0.50 mm screen

Analysis	Influent conc. mg/l	Removal efficiency % Rage/Average
COD	37706 – 40324	43.8 – 73.4/57.6
BOD5	3756 – 8738	0-6 – 22.4/9
NH_3 – N	1533.8 – 2147.5	0 – 6.7/1.9
NO_3 – NO_2 - NO	0.7 – 1.2	0 – 0/0
TKN	2337.7 – 2919.5	3.3 – 28.6/17.5
Dissolved PO_4	250.9 – 428.4	1.7 – 19.3/8.6
K	881 – 941	5.0 – 19.2/9.7
Salinity	10.1 – 13.2	1.9 – 17.5/7.7

Table 3 - Nutrient removal 0.75 mm screen

Analysis	Influent conc. mg/l	Removal efficiency % Rage/Average
COD	25407 – 43429	0.1 – 38.5/10.6
BOD5	1113 – 15363	0.2 – 18.1/11.9
NH_3 – N	2192.8 – 2837.6	0 – 14.5/6.7
NO_3 – NO_2 - NO	0.87 – 1.35	0 – 21.2/5.6
TKN	3148.4 – 5041.4	7.9 – 46.7/21
Dissolved PO_4	457.8 – 756.8	1.2 – 10.7/4.9
K	975 – 1315	0.5 – 8.1/3.4
Salinity	13.9 – 18.6	9.4 – 21.8/13.4

Separation Rate

Innovative solutions for solid/liquid separation

The rate of processing was a function of the solid concentration in the raw slurry and the screen being used. Table 4 is al list of the processing rate obtained from press screw separator. The slurry solids concentration was around 5%.

Table 4 - Separation rate

Separation	0.50 mm screen Range/Average	0.75 mm screen Rage/Average
Slurry m^3/h	22 – 41/32	41 – 49/54
Solid t/h	2.7 – 3.3/3	3.0 – 3.4/3.2

Operation and maintenance

Installation of the press screw separator was fairly simple. The operation was controlled by a panel and required minimum input of manpower. The maintenance involved was greasing the gear box in the separator on a daily basis. The hair contained in the slurry did not cause any operational problems, since the slurry was from finishers only.

Conclusion

The following conclusions may be drawn from the tests:

- The press screw separator can removal 67% and 79%, respectively, of solids in the raw hog slurry, with the 0,75 mm and the 0,50 mm screen.
- The reduction of COD was 58% for the 0,50 mm screen, and 20% form the 0,75 mm screen in the liquid portion. Total Kjeldahl Nitrogen was reduces by 21% and 17%, respectively for the 0,75 mm and the 0,50 mm screens. The removal of other nutrients was in the range of 0 to 10%.
- The separated had an average moisture content of 73%, which was suitable for composting. The separated solids contained approximately 2% nitrogen and 0.4% potassium (D.M. basis). The separated solids an average pH of 8.0.
- The Separation rate for the 0,75 mm screen was 45 m^3/hr of slurry and 3.2 ton/hr of solids, 32m^3/hr and 3 ton/hr with the 0.50 mm screen.
- The operation and maintenance of the separator was simple and easy, and required minimum input of man power.

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NZ Feed Pad Trail Data on Solids & Liquids using a FAN PSS1.2 with a 0.50 mm Screen

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Laboratory No: 340283
Date Registered: 22/04/2004
Date Completed: 12/05/2004
Page Number: 1 of 2

The results for the analyses you requested are as follows:

Sample Type: Environmental Solids, Soil

Sample Name	Lab No	Total Recoverable Potassium (mg/kg dry wt)	Total Nitrogen (g/100g dry wt)	Total Recoverable Phosphorus (mg/kg dry wt)	Total Sulphur* (g/100g dry wt)	Dry Matter (g/100g as rcvd)
Solid 21/04/04	340283/3	7070	1.53	3640	0.210	20.3

* This test is not accredited.

Sample Type: Water,

Sample Name		Water 21/04/04
Lab No		340283/1
Dissolved Potassium	(g.m-3)	1010
Total Nitrogen	(g.m-3)	1800
Total Kjeldahl Nitrogen (TKN)	(g.m-3)	1800
Nitrate-N + Nitrite-N (TON)	(g.m-3)	0.48
Total Phosphorus	(g.m-3)	504
Total Sulphur	(g.m-3)	119

Sample Containers

The following table shows the sample containers that were associated with this job.

Container Description	Container Size (mL)	Number of Containers
Unpreserved (250 mL)	250	1
Nitric Preserved (100 mL)	100	1
Sulphuric Preserved Pottle	100	1
Sulphuric Preserved (250 mL)	250	1
Plastic Jar (Soils)	400	2

Details of sample bottle preparation procedures are available upon request.

This Laboratory is accredited by International Accreditation New Zealand (previously known as TELARC). The tests reported herein have been performed in accordance with its terms of accreditation, with the exception of tests marked *, which are not accredited.
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NZ Feed Pad Trail Data on Solids & Liquids using a FAN PSS1.2 with a 0.50 mm Screen

Client:Dave Forsythe Laboratory No:340283 Page:2 of 2

Summary of Methods Used and Detection Limits

The following table(s) gives a brief description of the methods used to conduct the analyses for this job.
The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Substance Type: Environmental Solids

Parameter	Method Used	Detection Limit
Dry and sieve sample	Air dry (35°C), sieved to pass 2mm.	N/A
Total Recoverable digest	Nitric / hydrochloric acid digestion. US EPA 200.2	N/A
Total Recoverable Potassium	Nitric / hydrochloric acid digestion, ICP-MS. US EPA 200.2	100 mg/kg dry wt
Total Nitrogen	Catalytic Combustion (900°C, O_2), separation, Thermal Conductivity Detector (Elementar Analyser)	0.05 g/100g dry wt
Total Recoverable Phosphorus	Nitric / hydrochloric acid digestion, ICP-MS. US EPA 200.2	40 mg/kg dry wt
Total Sulphur*	LECO SC32 Sulphur Determinator, high temperature furnace, infra-red detector. Subcontracted to SGS, Waihi ASTM 4239	0.005 g/100g dry wt
Dry Matter	Dried at 103°C, gravimetric (removes 3-5% more water than air drying at 35°C)	0.1 g/100g as rcvd

* This test is not accredited.

Substance Type: Water

Parameter	Method Used	Detection Limit
Sample filtration for general testing	Sample filtration through 0.45µm membrane filter.	N/A
Sample filtration for metals analyses	Sample filtration through nitric washed 0.45µm membrane filter. APHA 3030 B 20th ed. 1998	N/A
Total (nitric acid) digest	Boiling nitric acid digestion.	N/A
Dissolved Potassium	Filtered sample, ICP-MS APHA 3125 B 20th ed. 1998	0.05 g.m-3
Total Nitrogen	Calculation: TKN + Nitrate-N + Nitrite-N	0.1 g.m-3
Total Kjeldahl digestion	Sulphuric acid digestion with copper sulphate catalyst. APHA 4500-N_{org} D. (modified) 20th ed. 1998	N/A
Total Kjeldahl Nitrogen (TKN)	Kjeldahl digestion, phenol/hypochlorite colorimetry (Flow Injection Analysis) APHA 4500-N_{org} D. (modified) 20th ed. 1998	0.1 g.m-3
Nitrate-N + Nitrite-N (TON)	Total oxidised nitrogen. Automated cadmium reduction, Flow injection analyser. APHA 4500-NO_3^- I (Proposed) 20th ed. 1998	0.002 g.m-3
Total Phosphorus	Acid persulphate digestion, molybdate colorimetry, Flow Injection Analyser (FIA). APHA 4500-P H. 20th ed. 1998	0.004 g.m-3
Total Sulphur	Nitric acid digestion, ICP-OES (method may not fully account for H_2S due to volatilisation during digestion) All forms of oxidised and organic sulphur will be determined by this method	0.1 g.m-3

* This test is not accredited.

Analyst's Comments:

These samples were collected by yourselves and analysed as received at the laboratory.
Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the submitter.
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