User Application Report

Product:
penergetic g

User:
Bernhard Tafelmeier-Marin
LWG – Leben Wachsen Gedeihen
Mautern
AUSTRIA

Consultant:
Christof Weber
Penergetic Österreich

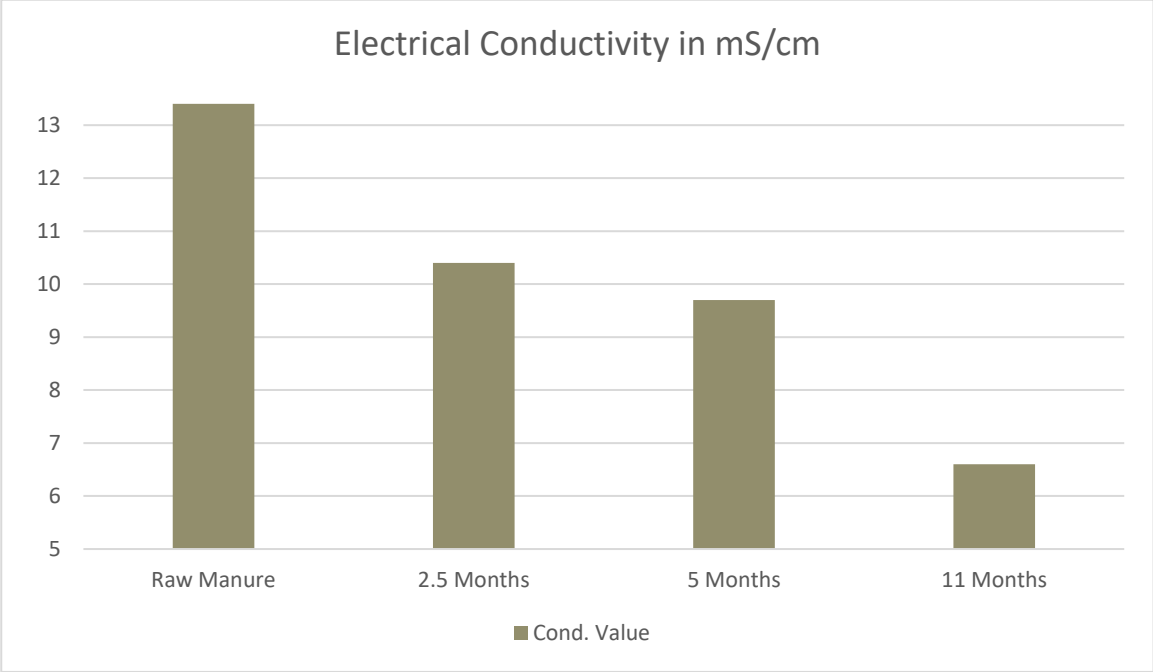
Date:
2021/2022

Processing of Pig Slurry with penergetic g

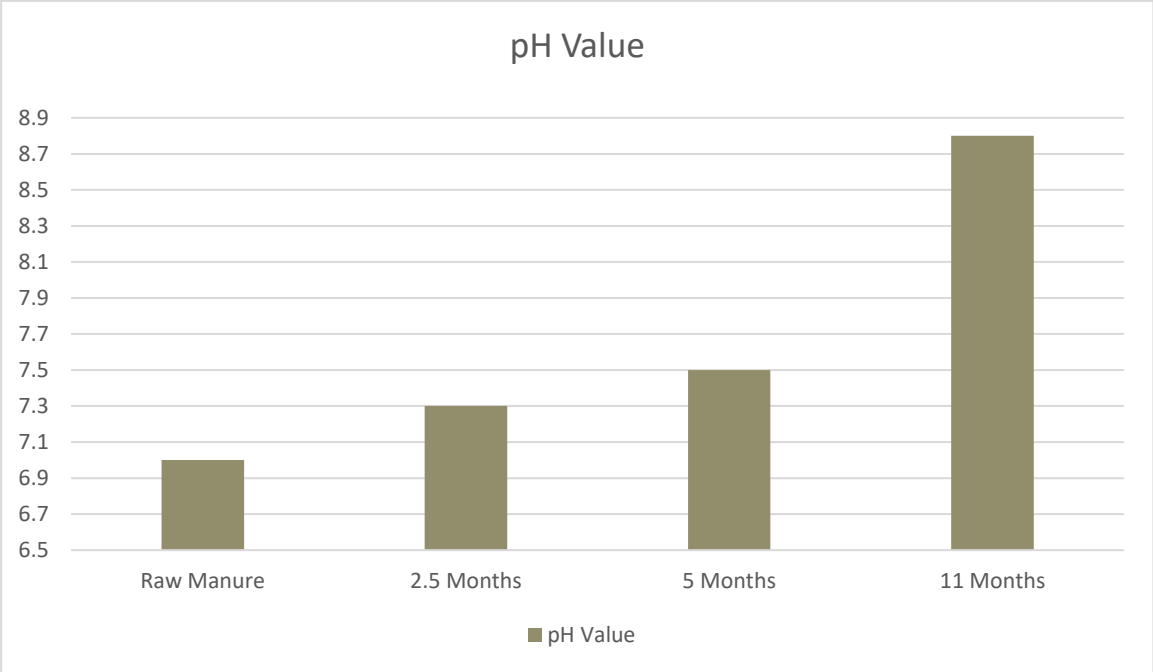
Decomposed slurry has the ability to deliver nutrients to plants and simultaneously supports the soil microbiome through its treatment. Soil-inhibiting toxins no longer have to be converted by soil organisms, which accelerates soil producing processes. The resultant higher fertilizer performance through nutrient breakdown increases efficiency.

Bernhard Tafelmeier-Marin of LWG has compiled a summary of his results with decomposed pig slurry which had been treated with penergetic g below:

Conductivity Value – Measurement



pH Value – Measurement



Liquid Cold Decomposition

penergetic g – decomposed slurry

The principle of aerobic liquid cold decomposition is based on nature's biological reductive oxygen cycles. Oxygen is generated within biological processes by awakening the aerobic microbiology in the slurry. The breakdown of carbon compounds into carbon and oxygen releases O_2, which stimulates biological aerobic microorganisms and their environment. The slurry is thus gradually converted from an anaerobic to an aerobic environment. The slurry's increasing pH value reflects the cold decomposition process that is in progress.
The conductivity value of the slurry shows the electrical conductivity. The higher the value in mS/cm, the higher the salt compounds present. In composting processes for nutrient processing, the pH value increases, whereas the electrical conductivity decreases.

Decomposed slurry has the ability to deliver nutrients to plants and simultaneously supports the soil microbiome through its treatment. Soil-inhibiting toxins no longer have to be converted by soil organisms, which accelerates soil producing processes. The resultant higher fertilizer performance through nutrient breakdown increases efficiency.
Valuable volatile ammonia is biochemically converted into plant-available ammonium.
Micronutrients contained in the slurry become available.
In future, the area of application of aerobically processed slurry can be extended to several areas within agriculture.
Professional management of slurry can lead to the closure of operational cycles and reduce and/or replace external operating materials. Only biologically treated slurry efficiently promotes plant growth and soil revitalisation.

Decomposition Analysis

Generation of a ‘false’ floating layer through heating slurry.

In order to ascertain the degree of decomposition of the solids in the slurry, the slurry was warmed. The resulting temperature difference and physical properties allows solids to come to the surface of the slurry. Penergetic g decomposes these floating layers and homogenises slurry. Producing a false floating layer through warming allows suspended solids to rise upwards. This comes about due to the changing surface tension of the water molecules in the slurry.

After the floating layer is produced, part of the floating layer can be removed with a spoon and placed on a piece of card, without stirring.

The progress of the treatment process can be checked through the means of decomposition analysis. The reduced effort required for stirring becomes apparent.

Figure 1: Slurry Treated with penergetic g for 12 Months, High Homogenity

Figure 2: Slurry Treated with penergetic g for 6 Months, Good Homogenity

Figure 3: Slurry Treated with penergetic g for 3 Months, Beginning Decomposition

Cress Test

For this purpose, a precisely defined, neutral germination substrate was created, consisting of filter sand of the same 0.4-0.8 mm grain size. The slurry samples were pre-mixed with water in a mixing process that required 1 part slurry to 2 parts water. For the germ samples, 60 ml of the mixed solution was applied to the sand surface. The coarse parts of the slurry remain on the filter sand surface, whereas the rest of the slurry-water solution seeped through. Prior to the cress being sown, the filter sand was covered with 2 mm of liquid. The cress seeds swam in the diluted slurry at a room temperature of 22 °C.

Figure 1: 7 Days after Sowing

Figure 2: 10 Days after Sowing

From left to right: Slurry treated with penergetic g for 11 months, slurry handled with penergetic g for 5 months, slurry treated with penergetic g for 2.5 months, untreated slurry.

The control germination with water germinated more quickly in the beginning, however, after 7 days it was caught up by the treated decomposed slurry.

Figures 3 and 4 each show a comparison between the treated slurry and the control with germination with water after 14 days. Due to a lack of nutrients, the control germination gave rise to a fungal and/or mould growth, whereas the cress that had received treatment with penergetic g showed no signs of damage.

Figures 3+4: Comparison with Slurry Treated with penergetic g and a Control with Water Germination after 14 Days

Shake Test/Slurry Foaming

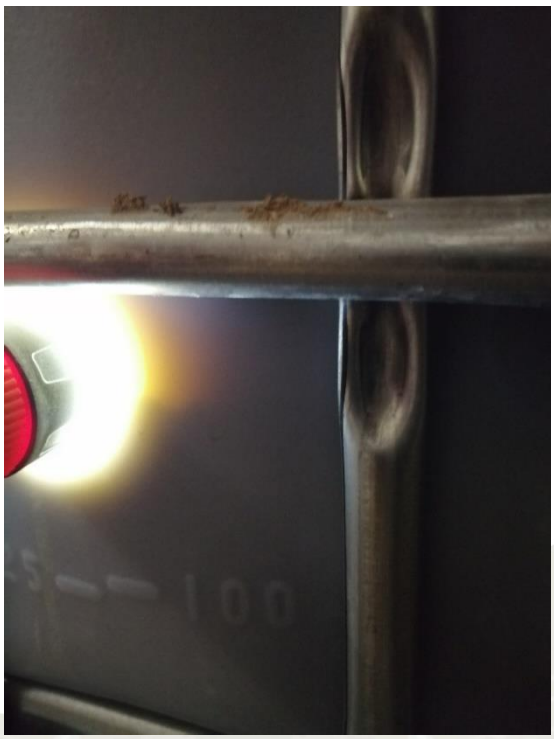
The plastic bottles were filled with samples of slurry and were tightly closed. Vigorous shaking of the bottles led to foam formation on the surface. The colouration allows conclusions to be drawn about the amount of decomposition. Grey foam occurs with the raw, toxic pig slurry. White foam indicates the fermentation stage of decomposition. Brown foam occurs with the final decomposition and/or when the slurry has decomposed throughout.
The odour between the decomposition phases can be differentiated:

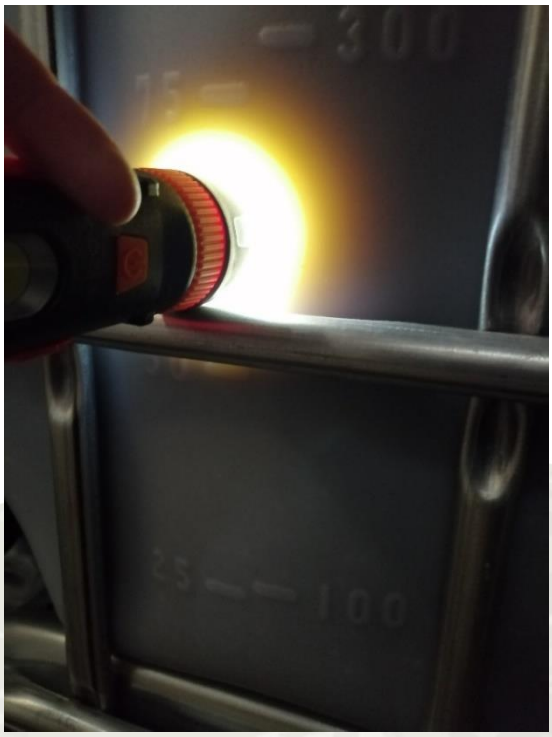
- Grey foam: raw slurry with a pungent, toxic, putrid odour (putrefying gases)
- White foam: semi-decomposed slurry with a slightly fermented, herb-like odour
- Brown foam: fully decomposed slurry with a slightly humic, deep, slightly stale smell

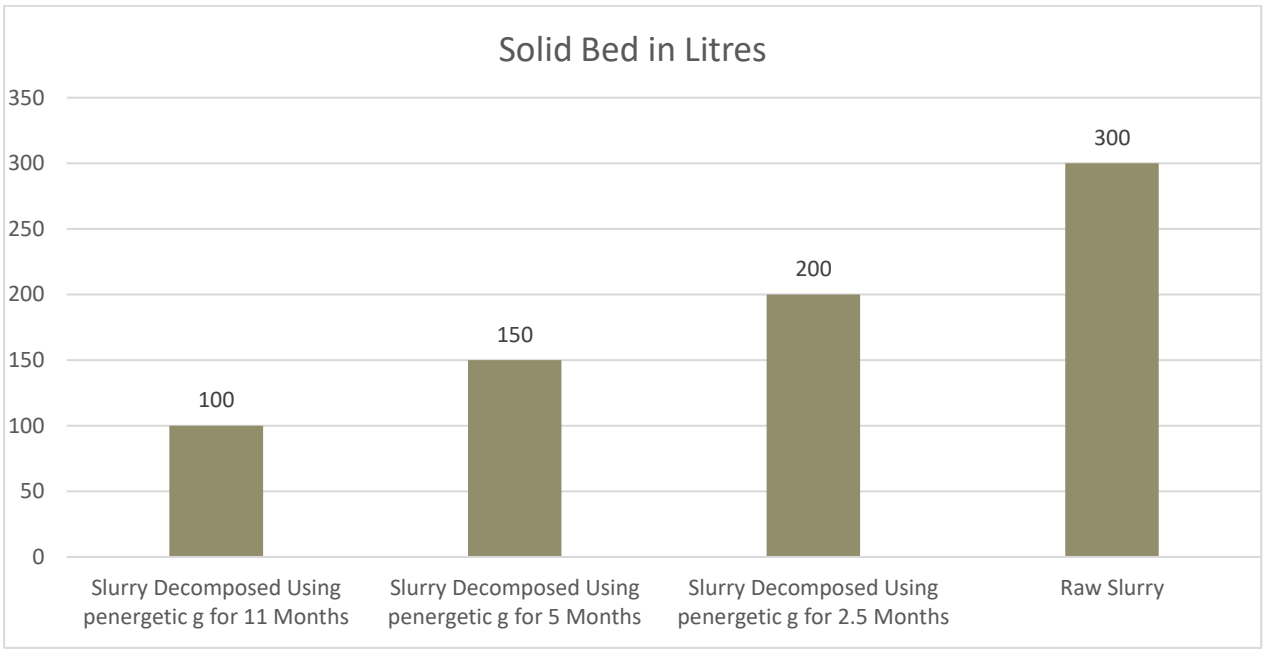
From left to right: Slurry treated with penergetic g for 11 months, slurry treated with penergetic g for 5 months, slurry treated with penergetic g for 2.5 months, 2nd sample slurry treated with penergetic g for 2.5 months, untreated slurry.

Settling of Solids on the Bottom

The settled solids were observed. When the 1,000 L container was filled, a solid deposit of 300 L was seen after the slurry had settled. The decomposition, which started organically over time, changed the ratio of the solid bed volume to liquid volume to favour liquids. Here, it could be determined that for slurry treated with penergetic g for 11 months, only 100 L solids remained, for slurry treated with penergetic g for 5 months, 150 L solids remained, for slurry treated with penergetic g for 2.5 months, 200 L solids remained. Raw slurry remained unchanged at 300 L solid content. The decomposition process liquefies the solids.






Solid Bed in Litres
350
300
250
200
150
100
50
0
100
150
200
300
Slurry Decomposed Using penergetic g for 11 Months
Slurry Decomposed Using penergetic g for 5 Months
Slurry Decomposed Using penergetic g for 2.5 Months
Raw Slurry

Floating Layer

The change in the accumulation of solids on the surface (floating layer) could be observed in the decomposing slurry tanks. With the raw slurry, a floating layer of approx. 2 cm remained throughout. A continuous formation of bubbles with slight foaming on the surface was visible. Light particles were occasionally present at the beginning. Every four weeks, the slurry was stirred in the tanks. The slurry that had been treated using penergetic g showed a different picture: there was no floating layer formed. A slight odour had developed. The existing solids demonstrated different stages of decomposition.

Figure 1: Fine Foam Bubbles, Beginning Decomposition, Little Odour, Fermenting, Herbs

Figure 2: Slight Floating Layer, Little Odour, Fermenting, Herbs

Figure 3: Coarse Foam Bubbles, Final Decomposition, Little Odour, Humic, Swampy

Figure 4: Foaming Decomposing Solids, Pleasant Fermenting Odour

Figure 5: Creamy Decomposing Solids, Final Decomposition, Humic Pleasant Odour

Implosion Test

The slurry sample was poured into a plastic bottle, in which the slurry sample filled only 3/4 of the bottle. The bottle was then made airtight with the screw cap. At room temperature, the sample bottle was then stored statically for 4 weeks. Should the bottle contract, the oxygen in the upper quarter of the bottle has been metabolised by the decomposing microorganisms in the slurry and has been converted from the gaseous to the liquid and solid aggregate states. The gases implode and the bottle deforms. When the bottle cap is opened, air is sucked in, which returned the bottle to its original state. Should the bottle expand outwards, this means that gases from the slurry have expanded and the order of the aggregate states is reversed. The slurry was not being broken down by an active decomposition process and remains toxic. On opening the screw cap, unpleasant-smelling slurry gases escape.

Figure: From Left to Right

Left: Final slurry decomposition (treated with penergetic g for 11 months) still slight implosion

Middle: Half rotten slurry (treated with penergetic g for 5 months) high implosion

Right: Raw slurry bottle puffed out by expansion

Penergetic ORC Test

Measurement of biological activity through reaction analysis

Penergetic's ORC (oxidation-reduction potentials in chemical elements) test shows the biological activity of the slurry. The degree of revitalisation can be read out using a specific colour spectrum. Dark blue colouration shows insufficient revitalisation (toxic). The lighter the blue colouration, the more biologically active the tested medium is. Green colour spectra indicate high biological activity. The pictures below show slurry treated with penergetic g in different rotting stages.

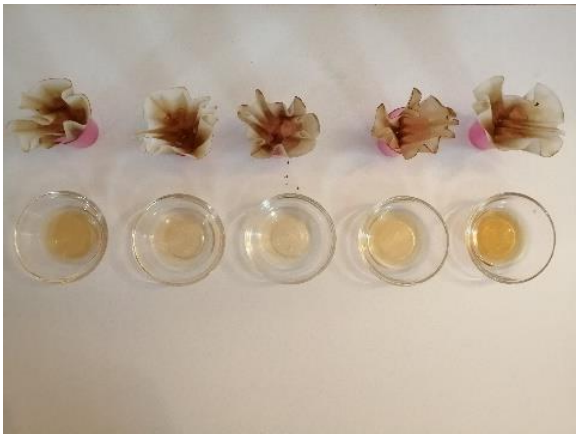


Figure 1: Filtered Slurry Samples Treated with Reagent 1

Figure 2: Initiation of the Reaction with Reagents 2 and 3 Allowing Biological Activity to be Visualised

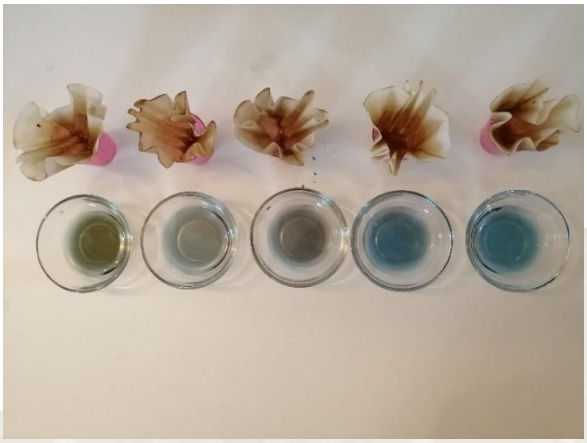


Figure 3: Slurry Samples after Reacting in a Colour Spectrum

Figure 4: Analytical Reagents

Germination Test

For practical application, a mixture of field soil and filter sand was composed, in which grain (winter wheat), is used as a germination sample. This is followed by inoculation with the different decomposition stages: with penergetic, raw slurry and the control. The germination test is intended to illustrate the tolerance and growth with regard to released available organic nutrients. The time taken for the slurry to decompose confirms that the toxicity has decreased and that more nutrients have been released. As a control, a sample with water was germinated for comparison.
The germination test should be carried out at a favourable growth temperature (approx. 20 °C).

Figure 1: From Left to Right

Slurry treated with penergetic for 11 months, slurry treated with penergetic 5 months, raw slurry, control

Figure 2: From Left to Right

Slurry treated with penergetic for 11 months, water control