FERTILIZERS FROM ORGANIC SLUDGE OF CIVIL AND INDUSTRIAL WASTEWATER TREATMENT

Treatment of sewage sludge and conversion into commercial products for agronomic uses, mentioned "Gypsum of defecation" and "Calcium carbonate of defecation" pursuant to Italian Legislative Decree n.75/10

Agrosistemi Patent No. 00013640373 of 20/07/2009
The objective of the company is to obtain high quality fertilizer products, which allow the replacement of synthetic fertilizers with organic materials, more stable and lasting value, while recovering valuable resources that would otherwise be lost.

In 2005 the company has patented a system for treatment of sewage sludge to turn them in a corrective fertilizer for agricultural soils, according to the specifications of the Italian Legislative Decree n. 75 of 2010, commercially named **BIOSOLFATO**.
BIOSOLFATO is the trade name of a soil corrective, belonging to the kind of national “gypsum of defecation" fertilizer, defined by the Italian Law Legislative Decree n. 75/2010

It's produced by:
• treatment of biological sludge by hydrolysis of proteins with calcium oxide
• precipitation with sulfuric acid
• integration with additives
• possible removal pretreatment of metals or unwanted anions, through electrokinetic method
• possible pretreatment for organic pollutants reduction by Fenton process

It can be obtained by:
• fixed installations, authorized in accordance with Art. 208 paragraph 1 of Italian Legislative Decree 152/06
• mobile systems, authorized in accordance with Art. 208 paragraph 15 of Italian Legislative Decree 152/06

The administrative logic which underlies to transform a waste in a commercial product is enshrined in the Art. 184 ter of Italian Legislative Decree n. 152/2006 and confirmed by Italian Legislative Decree 3 December 2010, n ° 205, where are defined some essential conditions in the activity of recovery of wastes, to reach the cessation of waste status, that is, to obtain a product
BIO-SULFATE:

Dry matter > 40%; Organic matter > 30%; CaO > 20% on dry matter; SO3 > 15% on dry matter

Heavy metals mg/kg on dry matter:
Zn<500; Cd<1,5; Hg<1,5; Ni<100; Pb<100; Cu<230
Purification of the vapors from the treatment

**CHEMICAL**
- alkaline hydrolysis
- acid treatment

**CaO**

**H₂SO₄**

**BIOLISTIC SLUDGE**

supplements materials (calcium sulphate, calcium carbonate)

**BIOSOLFATO**
GYPSUM OF DEFECATION
Italian Legislative Decree n. 75/2010
EVENTUALE PRE-TRATTAMENTO PER L'ESTRAZIONE DI METALLI PESANTI

- Depurazione dei vapori prodotti dal trattamento.

  - FeCl₃ o altro elettrolita
  - Corrente elettrica continua

  - Condizionamento per rendere il fango conduttore di corrente elettrica

  - Fango contenente metalli pesanti in quantità rilevante.

  - Metalli e sostanze inquinanti estratte mediante elettrocinesi

  - Fango pre-trattato contenente metalli pesanti e/o contaminanti organici in quantità non rilevante (contenuti al 50% dei limiti previsti dalla D.G.R.E.R. 2773/2004)

  - Ingresso reattore chimico

EVENTUALE PRE-TRATTAMENTO PER L'ABBATTIMENTO DI LAS ED ALTRI INQUINANTI ORGANICI

- Depurazione dei vapori prodotti dal trattamento.

  - Eventuale fango contenente LAS ed altri contaminanti organici in quantità rilevante.

  - REATTORE CHIMICO trattamento Fenton like per abbattere LAS + altri contaminanti organici

  - H₂O₂ 130% Vol perossido di idrogeno
  - FeCl₃ catalizzatore

  - Terminata la reazione di Fenton si procede con il trattamento standard per la produzione di BIO-SOLFATO
ADVANTAGES

• Valorisation of a waste difficult to place by means of recovery, rather than disposal;

• Optional conditioning sludge reducing the negative elements by means of pre-treatment, before producing bio sulfate;

• Management no longer conditioned by the logic of "waste market";

• At the end of treatment, the product is governed by Legislative Decree 75/2010 (the regulation of fertilizers), and not by the waste legislation (Legislative Decree no. 152/2006);

• Production of a valuable commodity for the agriculture, able to correct and alkaline and saline soils, to provide for the basic fertilization and to counteract the deficiency of organic substance;

• Possibility of storage the product directly in users farms, not bound by the rules of waste
AN EXAMPLE OF REALIZATION
FACILITY IN CERVIA (RAVENNA, NORTH ITALY)

PATENTED TECHNOLOGY APPLIED SINCE DECEMBER 2006.

FACILITIES OPERATING IN PROVINCE OF:
RAVENNA (HERA S.p.A.)
PIACENZA (AGROSISTEMI s.r.l.)

QUANTITY OF BIOSOLFATO PRODUCED PER YEAR: > 100,000 TONS

AGROSISTEMI / HERA S.p.A. FACILITY IN CERVIA (RAVENNA) IS ADJACENT TO THE
MUNICIPAL WATER TREATMENT PLANT

TREATMENT CIVIL SLUDGE CER CODE 190805

AUTHORIZATION FOR ANNUAL QUANTITY OF SLUDGE TREATED EQUAL TO 80,000 TONS
Sludge and supplements receipt area
Input sludge area
Supplements area

Calcium carbonate

Calcium sulphate

Supplements area
Twin reactors

Power: 90 kWh el
Display digital scale
horizontal silo for calcium oxide powder
Aspiration manifold for ammonia
CaO screw
Scrubber
Discharge conveyor
Tank for $\text{H}_2\text{SO}_4$ 50%

Belt for loading Biosolfato storage
Biosolfato storage

Reversibile distributor
Reversibile distributor
BIO-SULFATE IS GIVEN BEFORE PLOWING OPERATIONS AND / OR IN PRE - SOWING OF CEREALS OR IN SPRING CROP OF OPEN FIELD (CORN, TOMATO, CHARD, SORGHUM, SUNFLOWER, SOYA, ETC.).

THE ESSENTIAL FUNCTIONS OF BIO-SULPHATE ARE:

- Basic nitrogenous fertilization
- Improver effect
- Organic matter supply
- It corrects the alkaline soils, lowering the high PH as it solubilizes the carbonates;
- It contrasts acid soils, increasing the low PH, as it replaces the H + ions with Ca ++ absorbed on clays.
- It flushes away sodium (harmful, when in excess) with an ion exchange mechanism.
- It brings back to balance soils which had become unbalanced because of the extended use of fertilizers
Bio-Sulfate: gypsum of defecation as an alternative to sewage sludge in agriculture
TRIALS ON FIELDS

Pilot farm V. Tadini in Gariga of Podenzano (PC)

Farm Repetti Bros. Quarto di Settima (PC)

Farm Monzardo Bros. Massenzatica Comune di Mesola (FE)

Farm Isolone Senna Lodigiana (LO)

2006 - MAIS

2007-2013 - MAIS

2011_12 - WHEAT

2012 - MAIS

2006 - MAIS