Valorización integral de lodos y concentrados, mediante secado-FQ

Proceso ALXIMIX, sin consumo de energía térmica, CO_2 neutro, sin residuos ni efluentes, con precaución biológica

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HERA

Hilo Conductor

PROBLEMAS, DEPENDENCIAS, RETOS	PRINCIPIOS, CRITERIOS	LEYES, POLÍTICAS	OPCIONES, CONSECUENCIAS
ENERGÍA, EFICIENCIA-VALORIZACIÓN DEL CICLO	CO_2 eq DEL CICLO	PRECAUCIÓN BIOLÓGICA	RESIDUOS, EMISIONES, EXPLOSIONES
JUST IN SITU, JUST IN TIME, MÚLTIPLES SALIDAS "EJ"	MINIMIZACIÓN COSTE Y VOLATILIDAD, PRIMAS	VALOR PARA LA SOCIEDAD. CLUSTER DE RESIDUOS	REFLEXIONES. CONCLUSIONES

Problemas, Dependencias, Retos. Criterios. Prioridades

LODOS EDAR Y CONCENTRADOS: UN PROBLEMA AMBIENTAL Y ECONÓMICO

- ✓***El gran volumen y caracterización de los lodos*** generados por la sociedad actual no permite que sean asimilados por el medio.
- ✓***Prohibición de vertido de lodos orgánicos*** al mar, a cauce público y depósito controlado
- ✓***Dificultades de valorización agrícola*** por contaminación biológica y difusa. Regulación respecto a la higienización total (virus, bacterias, parásitos, etc)
- ✓***Dificultades de manejo y transporte*** de lodos húmedos y secos
- ✓***Consumos energéticos elevados*** en los secados térmicos con combustibles fósiles. Generación de Emisiones de NOx y partículas
- ✓***Coste elevado*** de inversión y operación y destino final. Necesidad de abaratamiento y reducción de la volatilidad de los costes (energía, CO2, vertedero, incineración)
- ✓***Oposición social y laboral y normas CEN*** a la conversión de los residuos en combustibles secundarios
- ✓***Objetivo de residuo cero,*** o valorización total

Leyes y políticas lodos

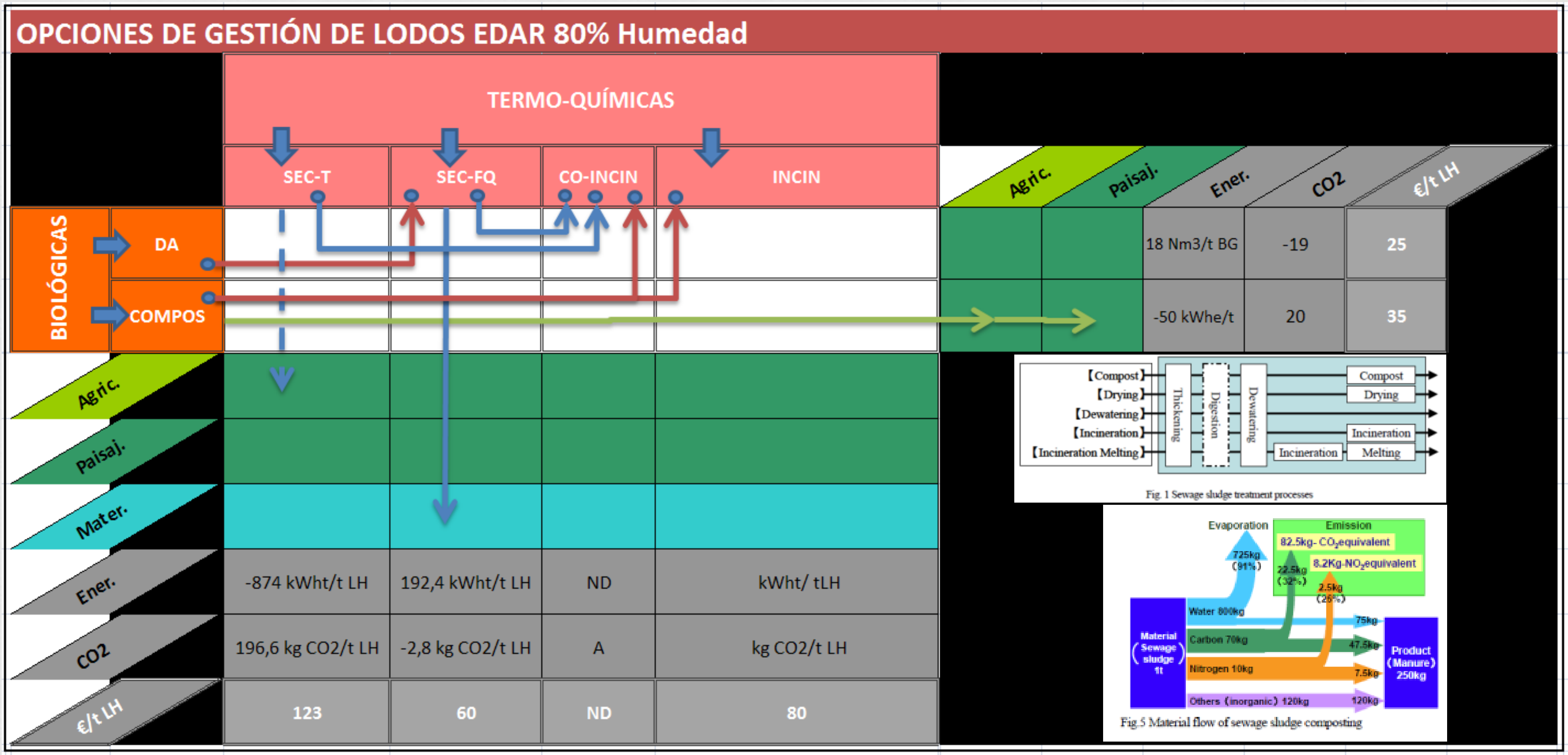
GESTIÓN DE RESIDUOS: NUEVAS POLÍTICAS DE GESTIÓN DE LODOS

El crecimiento en la preparación y tratamiento de aguas, ya sean urbanas o de proceso y la depuración de las aguas residuales, urbanas e industriales, conlleva ***dar solución a la problemática que supone la creciente generación de los lodos y establecer nuevas exigencias :***

- ✓ ***Resolver o reducir las incertidumbres*** respecto al precio del gas, emisiones de CO_2, límites uso agrícola y prevención de riesgos por contaminación
- ✓ ***Minimizar la generación de lodos*** Según datos del Registro Nacional de Lodos la producción de lodos se ha incrementado en un 55% (1997-2006).
- ✓ Precisar los ***tratamientos realmente necesarios para optimizar la valorización de los LD*** mejorando la eficacia de los tratamientos con mejor gestión, y el abaratamiento es uno de los objetivos del II PNLD.

Opciones de gestión. Balance de energía y de CO2eq de los ciclos de gestión

Matriz de opciones gestión lodos



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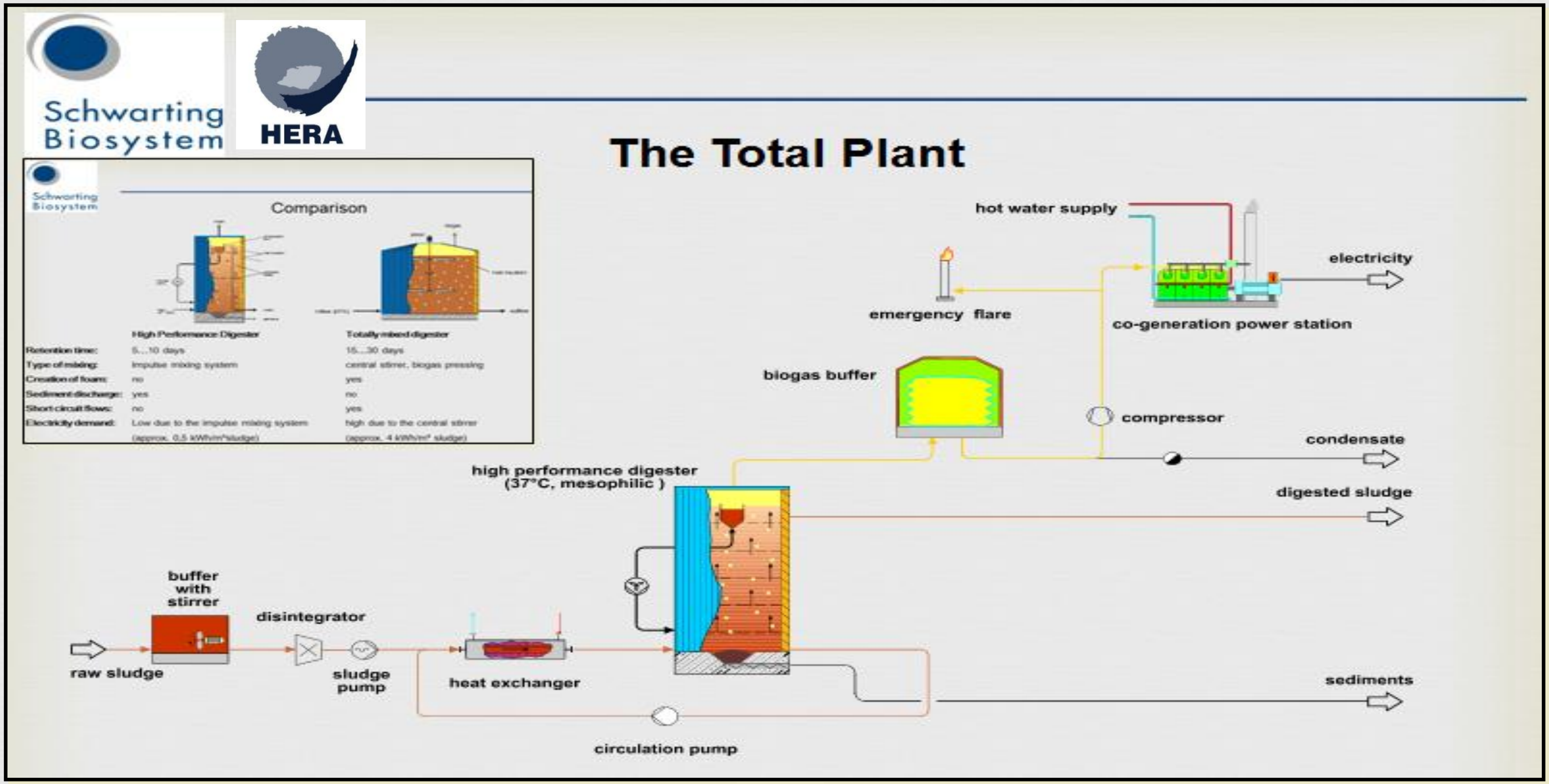
Digestión avanzada de lodos: flujo pistón y mezcla completa



Energía incineración lodos

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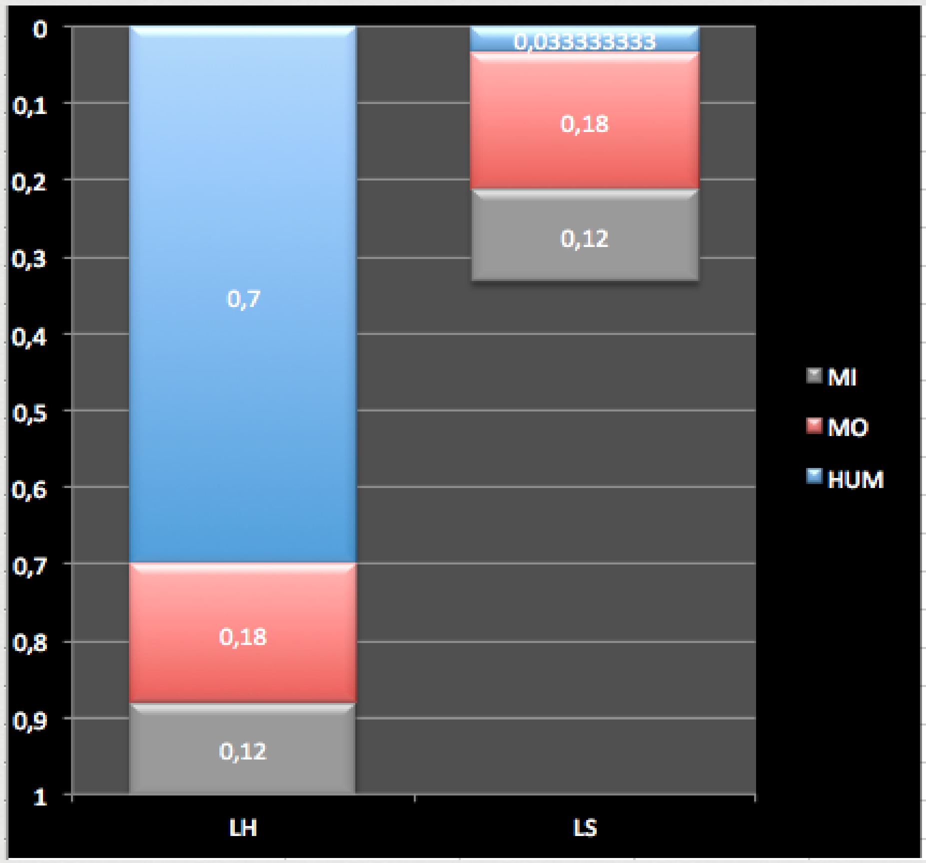
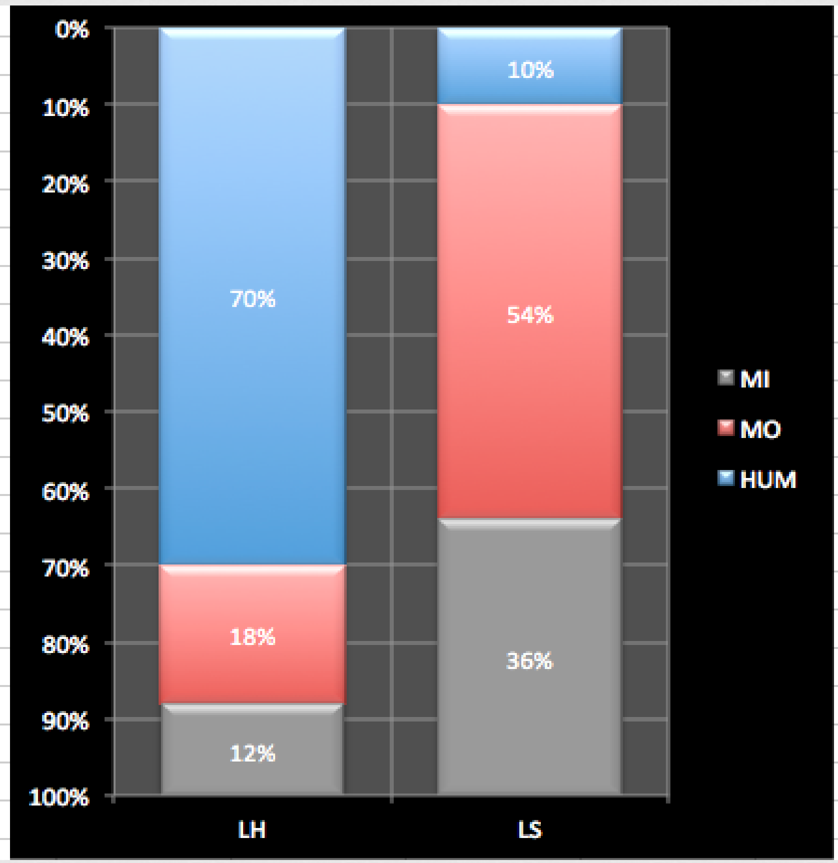
Holcim
JUNTA DE ANDALUCIA
EMACSA

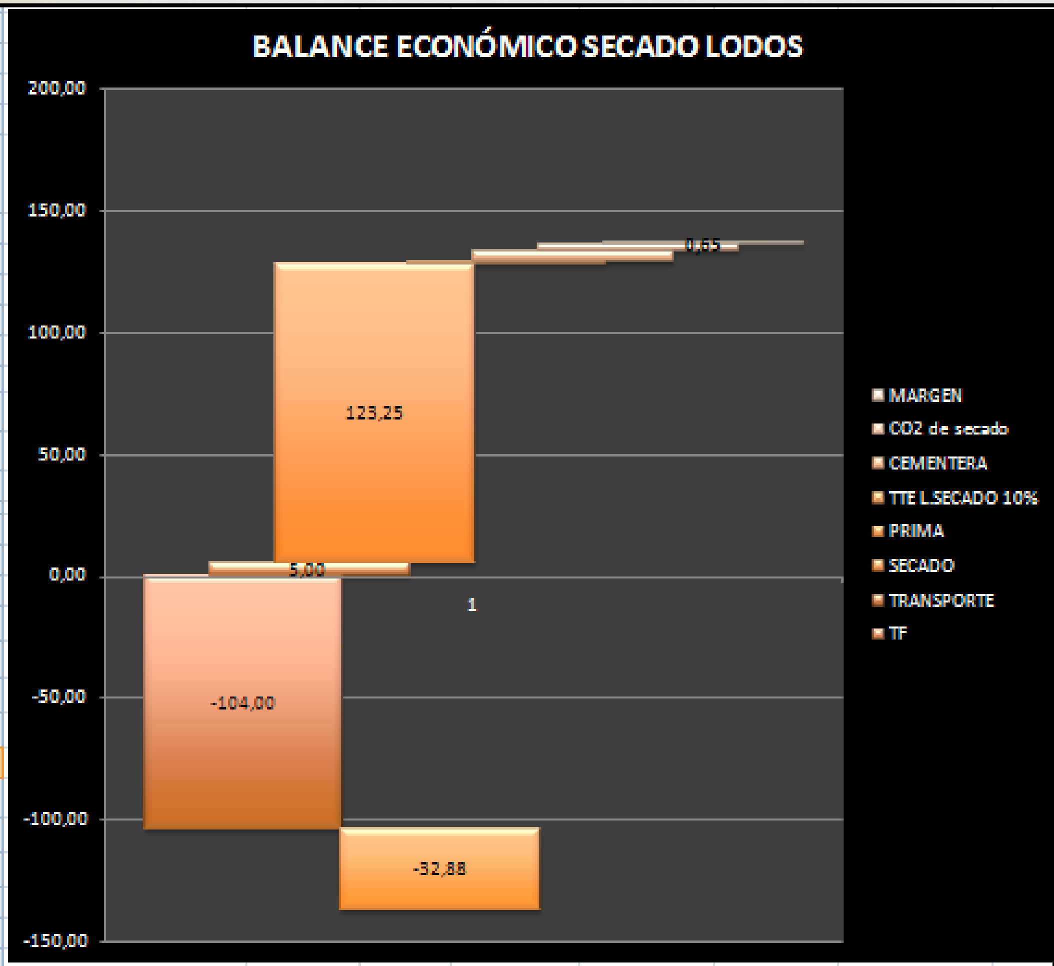
BALANCE ENERGÉTICO DE LA INCINERACIÓN DE LODOS DE EDAR					
Para 1 Kg. De lodo incinerado con 70% de exceso de aire y recuperación energética					
Porcentaje de MS en el lodo	%	23	33	23	42
Porcentaje en MO sobre MS	%	67	67	55	55
Poder calorífico MO	Kcal/kg.	5.500	5.500	5.500	5.500
Poder Calorífico de la MS	Kcal/kg.	3.685	3.685	3.025	3.025
Energia sobrante	Kcal/kg.	(1.154)	0	(1.507)	0

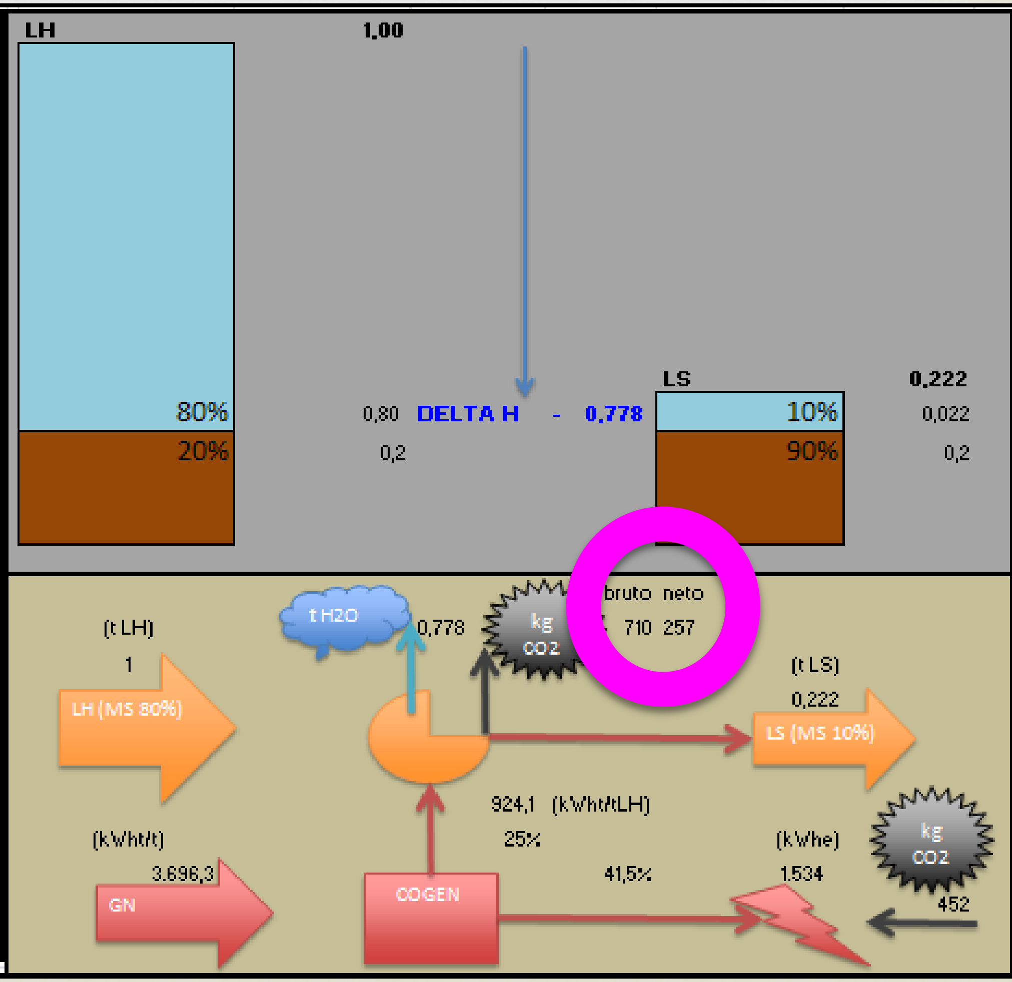
Secado-Térmico:
Del lodo húmedo al lodo secado





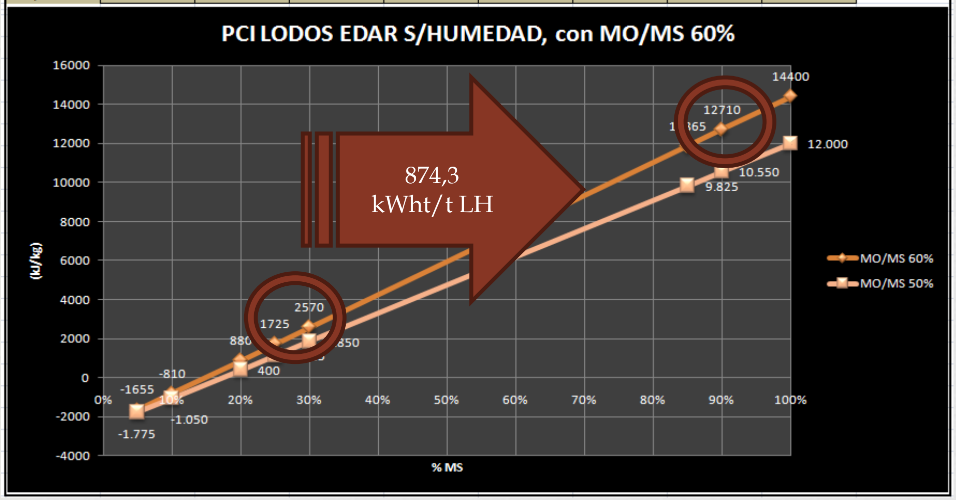
Balance secado térmico lodos

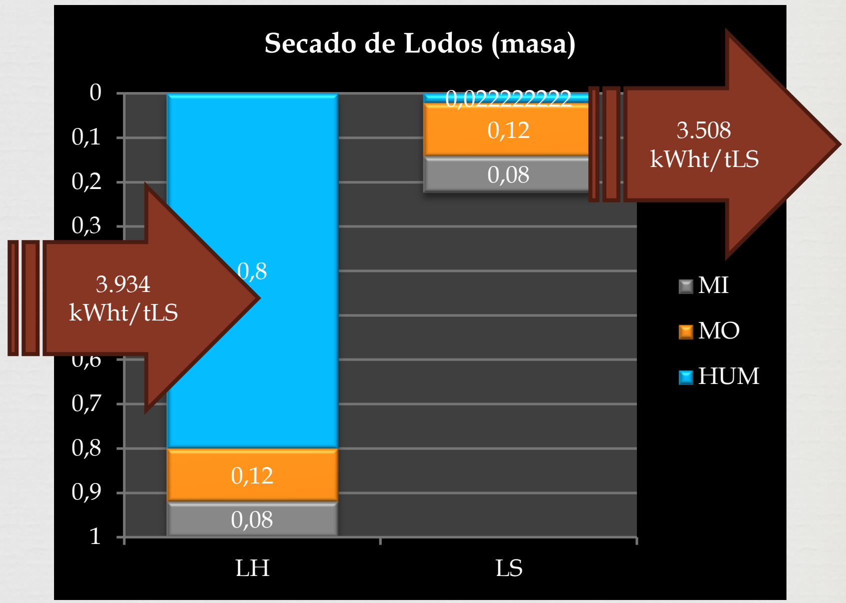




Consumo Secado-Term vs VE LSeco

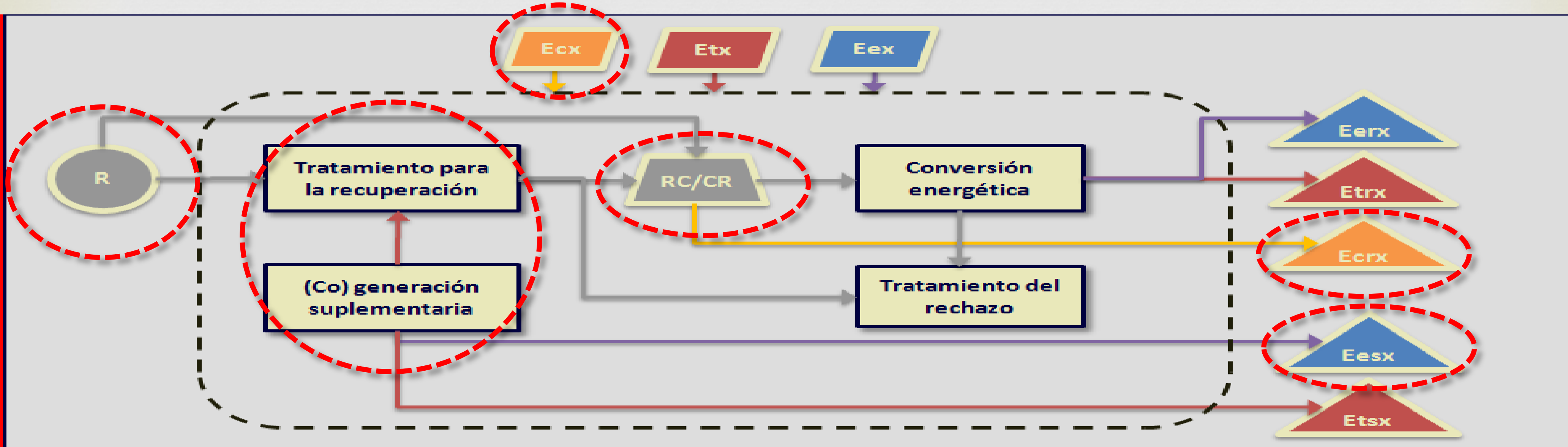
PCI LODOS SECADOS (kJ/kg)								
	%MS							
MO/MS	100%	90%	85%	30%	25%	20%	10%	5%
MO/MS 40%	9.600	8.390	7.785	1.130	525	- 80	- 1.290	- 1.895
MO/MS 50%	12.000	10.550	9.825	1.850	1.125	400	- 1.050	- 1.775
MO/MS 60%	14.400	12.710	11.865	2.570	1.725	880	- 810	- 1.655





	LH	LS (90%MS)	PCI (MO/MS 60%) (kJ/kg LS)	(kcal/kg LS)	(kWht/t LS)
Masa (t)	1	0,222	12.710	3.050	3.508
Consumo S-Term	874,3				3.934
	(kWht/t LH)			-	**426**

R1 (Dva. Marco Residuos) adaptada al ciclo completo de secado y VE de lodos



VALORIZACIÓN ENERGÉTICA DE LODOS SECADOS

$$\eta = [(Eerx-Eex) / 0,39 + Eesx / \eta s + (Etrx+Etsx-Etx) / 0,9 + Ecrx-Ecx] / E_{RC/CR}$$

$E_{RC/CR}$	Ecx	Eerx	Eesx	ηs	Eex	Etrx	Etsx	Etx	Ecrx	η
(tert/t lod 20%MS)	(ter/t)	(kWhe/t)	(kWhe/t)	(kWhF/kWhP)	(kWhe/t)	(kWhe/t)	(kWhe/t)	(kWhe/t)	(kWhe/t)	(%)
778	3.080		1.505	60%	0	0	0	0	894,44	-15,5%

(kWht/t)	(kWht/t)	Efi Inc	Efi CC
894	3.542	0,0%	42,5%
(tert/t lod 90%MS)	Efi t Cog GN	Efi el Cog GN	
3.500	25%	42,5%	
	Ener Ev. T H2O		
	1.100		

(Eerx-Eex) / 0,39	
Eesx / ηs	2.508,92
(Etrx+Etsx-Etx) / 0,9	-
Ecrx-Ecx	- 2.647,56
ΣNumerador	- 138,64
ERC/CR	894

- R: residuo original, tal como se genera inicialmente; por tanto, se incluye todo el ciclo de vida del residuo
- E: energía

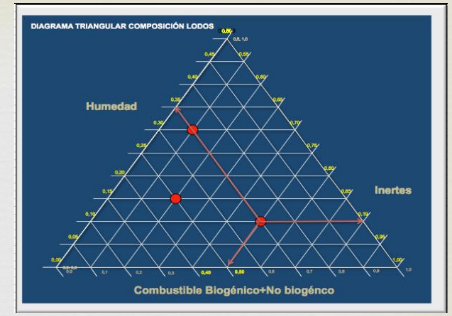
  c: combustible
  e: eléctrica
  t: térmica
  x: externa al sistema
  r: del residuo
  s: suplementaria

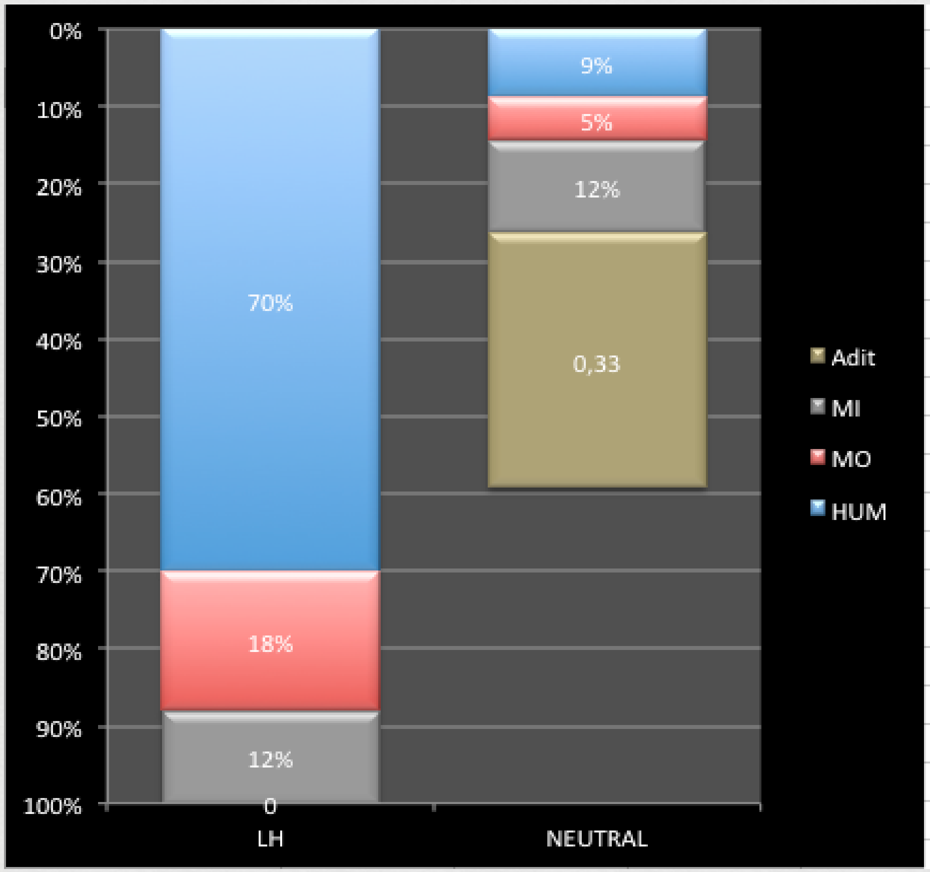
- CR: combustible recuperado que cumple las especificaciones para el tipo de conversión
- RC: residuo combustible no sometido a especificaciones, pero apto para la conversión
- ηs: eficiencia eléctrica de una planta de generación convencional (no asociada a la valorización energética del residuo) alimentada con el mismo combustible que la (co)generación suplementaria.

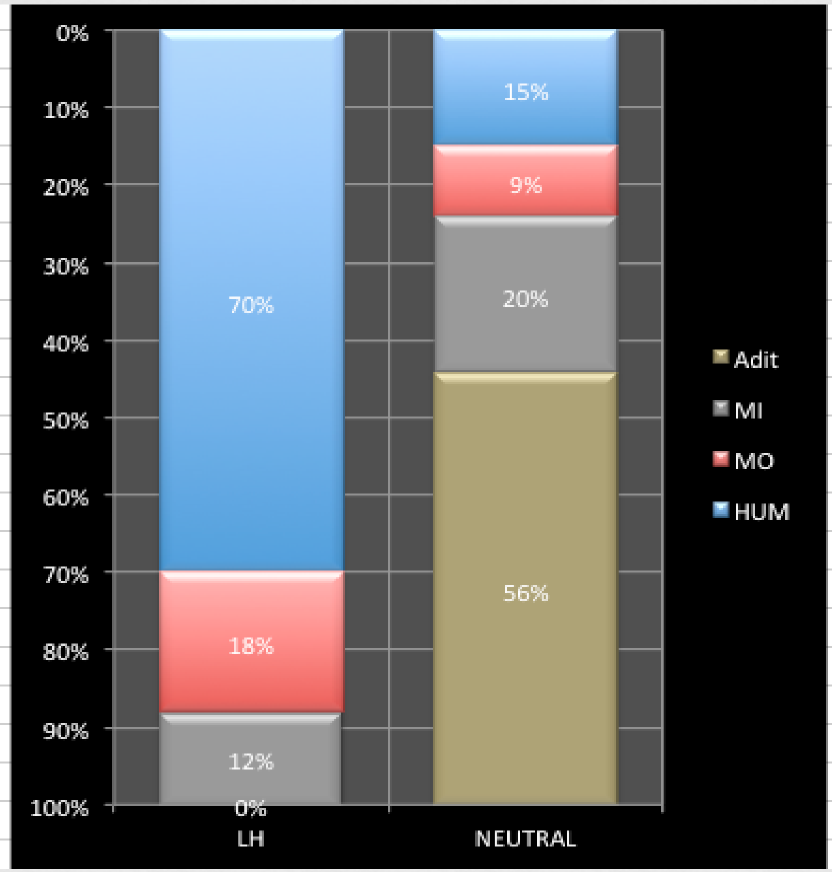
Disadvantages of Thermal-Drying

- Safety concerns of thermal drying include the explosive potential of the dust and the potential for product overheating and fires. Current design measures significantly reduce the above safety hazards.
- The complexity of thermal drying equipment requires a qualified operating staff. Maintenance requirements are typically high.
- Air emissions are produced at any thermal drying facility. Air permitting and air pollution control will be required.
- Capital and O&M costs of a thermal drying facility are relatively high, typically higher than other solids processing alternatives (land application of digested biosolids, alkaline stabilization, etc.).
- Marketability of the dried material is sensitive to regional conditions. An evaluation of the market for the dried product should be conducted to determine optimum uses and value of the product.
- Drying of certain types of solids (undigested primary) can result in a more odorous product that can negatively affect its marketability.

Secado-FQ Alximix:
Del lodo húmedo al Neutral

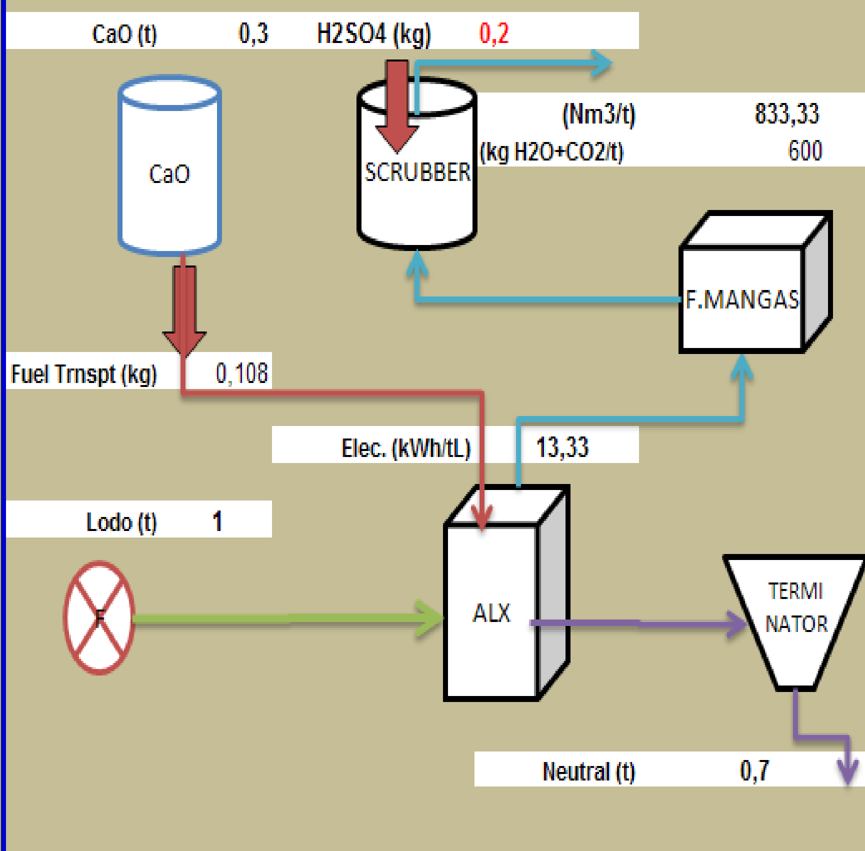






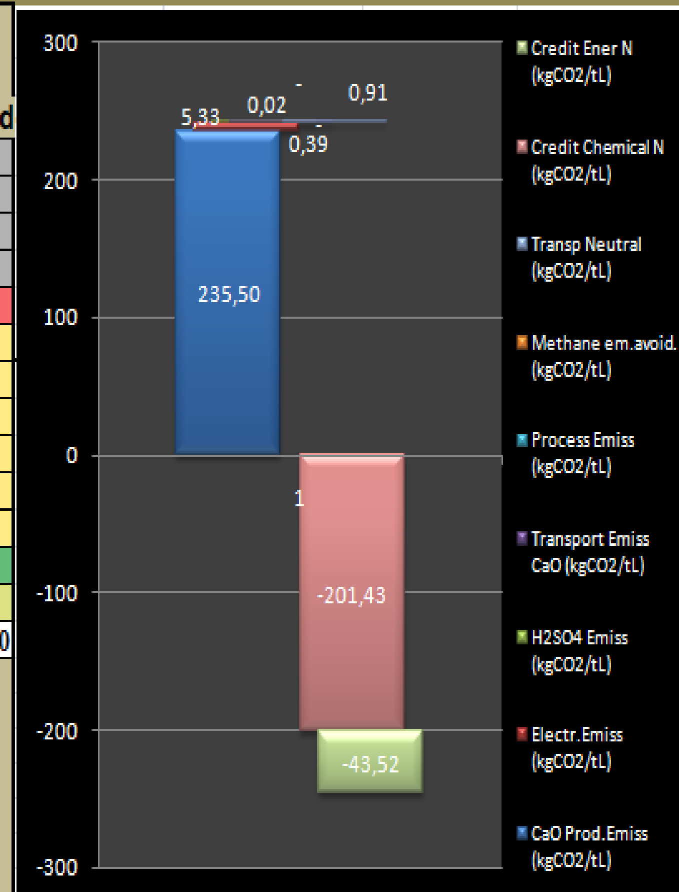
Balance de Energía y CO_2 Secado-FQ

3. SECADO-FQ ALXIMIX



Mochilas y emisiones de CO2 por t de lod

Mochila cal	(kg CO2/t CaO)	785,00
Mochila electricidad	(kgCO2/kWhe)	0,40
Mochila sulfúrico	(kgCO2/kg H2SO4)	0,10
Mochila gasoleo	(kg CO2/l)	3,60
CaO Prod.Emiss	(kgCO2/tL)	235,50
Electr.Emiss	(kgCO2/tL)	5,33
H2SO4 Emiss	(kgCO2/tL)	0,02
Transport Emiss CaO	(kgCO2/tL)	0,39
Process Emiss	(kgCO2/tL)	-
Methane em.avoid.	(kgCO2/tL)	-
Transp Neutral	(kgCO2/tL)	0,91
Credit Chemical N	(kgCO2/tL)	- 201,43
Credit Ener N	(kgCO2/tL)	- 43,52
TOTAL (NET)	(kgCO2/tL)	-2,80



Prevención Biológica

Sin Prevención Biológica: los primeros Brotes Amarillos

"Don't look, can't tell"

INSTITUTE FOR AGRICULTURE AND TRADE POLICY ■ FOOD AND HEALTH PROGRAM

Smart Guide
On Sludge Use and Food Production

How can contaminants from sludge end up in our food?

Animal ingestion
Livestock and dairy animals ingest large quantities of soil when grazing and consequently, sludge contaminants, which can ultimately end up in the food produced from these animals.[16,17,18] Many consider this the primary way that sludge contaminants can enter the food chain.[19] Food animals may also ingest contaminated soil attached to harvested animal feed crops. Many chemical contaminants (including dioxins, PCBs, pesticides and some flame retardants), and a few heavy metals (such as cadmium) found in sludge tend to bio-accumulate in fat tissue and milk fat.[20,21,22,23]

Direct uptake
Food crops grown on sludge-applied lands can absorb some heavy metals present in sludge-treated soil. Heavy metals persist in soils. Plants can continue to take up heavy metals for decades, if not centuries, after sludge is applied.[24,25] Cadmium is of particular concern since it is readily taken up from sludge-amended soils by various food crops, including carrots, potatoes, lettuce, spinach and grains.[26,27] Lead is also taken up by some of the same crops, but to a lesser degree.[28,29]

Some synthetic chemicals found in sludge may also persist in the environment and build up in the food chain. However, plant uptake of these synthetic chemicals is less studied than that of metals. Evidence suggests they are especially likely to be absorbed from soil onto surfaces of root vegetables and tubers, and sometimes into the flesh, depending on the nature of the contaminant.[30]

Various food crops absorb dioxin and dioxin-like compounds from contaminated soil, although cucumbers and related vegetables (e.g. zucchini, pumpkin) take up more dioxins than other plants, and the uptake is related to the level of contamination.[31,32] Carrots can also take up into the interior (and/or the peel) some solvents (chlorobenzenes),[33] chemicals from perfumes and scented products (polycyclic musks),[34] and polycyclic aromatic hydrocarbons (PAHs),[35] a class of chemicals found in dyes and plastics, among other places. Plants can also take up at least one antibiotic from animal manure, a substance similar to sludge.[36]

Air blown
Some synthetic chemicals,[37] arsenic,[38] mercury,[39] and surviving disease-causing microbes and their breakdown products (endotoxins)[40] may also be blown onto plants or vaporize and settle on food crops.

What's the concern?

Human exposure to the types of microbes and other contaminants found in sludge is implicated in an array of chronic and acute diseases:

Acute infections
Acute food poisoning accounts for an estimated 76 million illnesses and 5,000 deaths annually in the U.S.; cases of food poisoning are routinely not detected or reported.[41] Scientists are concerned that potentially deadly pathogens surviving in sludge-treated soil may lead to infections, although as yet there is no scientific documentation of cases where this has occurred.[42] The presence in sludge of human antibiotics[43] and heavy metals may also increase the ecological pressures in selecting for bacteria that are antibiotic-resistant.[44] Resistant bacteria can be transferred from sludge-contaminated soil and plants to grazing animals—and then to humans—if meat is not thoroughly cooked or handled properly.[45]

Chronic disease
Dietary exposure to arsenic, cadmium, lead and mercury heightens the risk of cancer.[46,47,48,49] Long-term dietary exposure to arsenic may result in lower IQ scores in children, early death in young adults, reproductive problems in women and hormone-disruption.[50,51] Long-term exposure to cadmium is linked to intestinal and kidney damage in both children and adults.[52] For fetuses and young children, there is no "safe" level of exposure to environmental lead[53] or mercury.[54]

More than 330 of the synthetic chemical contaminants detected in sludge to date have been found to contribute to chronic diseases.[55] Some of these chemicals, such as dioxin and PCBs, are part of a group of contaminants referred to as persistent, bioaccumulative toxins (PBTs) because they do not break down easily in the environment, build up in the food chain and can negatively impact human health. Some PBTs and other chemical sludge contaminants are also known or suspected endocrine disrupting chemicals (EDCs). EDCs, even at low levels, may disrupt growth, brain and reproductive development, cause cancer and more.[56] A chart containing some of the known or suspected PBTs and EDCs found in sludge, along with other potential heath effects, can be found at www.healthobservatory.org.

Chronic diseases including cancer, learning disabilities, neurologic and reproductive problems, are typically caused by multiple, mutually interacting factors. These include not only exposure to toxic chemicals, but also genetics, diet, stress, poverty and other influences. Thus, it is impossible to predict whether any individual eating food from sludge-amended soil will definitively suffer health impacts.

For more on other health impacts related to agricultural use of sludge, see the Cornell Waste Management Institute Web site at http://cwmi.css.cornell.edu/sewagesludge.htm.

Prevención Biológica: en usos y tratamientos

- Prohibición-limitación de uso (Suiza, Länders Alem., Holanda, UK)
- Exclusión o declaración para empresas alimentarias: Del Monte, G.Mills, Heinz
- Restricción de cultivos y pastoreos
- Restricción períodos y fases cosechas

- Higienización
- Tratamientos avanzados
- Control y análisis
- Trazabilidad

PATÓGENOS:
- Bacterias
- Virus
- Priones
- Hongos
- Parásitos

Low-Cost, High Risk:
- Direct contact
- Raising crops
- Grazing animals

Sources and routes:
Pathogens in the environment

INSTITUTE FOR AGRICULTURE AND TRADE POLICY (IATP)
"Smart Guide on Sludge Use and Food Production"

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Sewage sludge

Farmers who use conventional agricultural methods may use sewage sludge (sometimes referred to as "biosolids") because sewage treatment plants give it away or sell it as a cheap fertilizer/soil amendment. They are generally unaware that the sludge can contain toxic chemicals from industries, as well as hazardous materials from residential use of toxic products, prescription drugs and personal care products that sewage treatment plants have not been designed to handle. Thus, sewage sludge can be contaminated with radioactive material and thousands of toxic chemicals (e.g. dioxins, plasticizers, flame retardants, mercury, cadmium, lead) with potentially severe health effects. For instance, the sewage treatment plant that services Minneapolis and St. Paul receives discharge from more than 600 industrial facilities. Bacteria, viruses and other pathogens that can cause disease may also survive the sludge treatment process.

What Can I Do? (Yo Gobierno) Algunas deficiencias clave

- Protección inadecuada frente a patógenos:
- - En caso de aplicación directa: No se exige test de campo.
- - En caso de tratamientos térmicos, no se exige comprobar la resistencia de los patógenos.
- No existe restricción de la aplicación del lodo basándose en el contenido de agentes químicos sintéticos presentes en el mismo.
- Límites permisivos en cuanto a metales pesados.
- No se considera la exposición múltiple (sinergias) entre los contaminantes contenidos en los lodos.
- No se requiere etiquetado (=sin control) para los productos destinados a consumo humano que han tenido contacto con lodos EDAR.

- **No restriction of use based on synthetic chemical content.** Despite the routine presence of these chemicals in sludge, their ability to persist in soils, and their potential health impacts alone or in combination (even at low levels of exposure), federal sludge standards do not require testing for the presence of, or restrict use of, sludge based on synthetic chemical content.
- **Weak limits on heavy metals.** The standards make it acceptable to contaminate farms (and other lands) up to a certain point with heavy metals, and have the weakest restrictions of any industrialized country on agricultural use of heavy metal contaminated sludge.[58] Dietary exposure to cadmium was not considered by the EPA when setting the cadmium sludge pollutant limits.[59] For some contaminants, e.g. lead,[60] presumed "safe" thresholds have dropped significantly over time. For others, such as chromium, the EPA chose not to establish a pollutant limit.
- **Inadequate pathogen protections.** Sludge end products are divided into two categories based predominantly on pathogen content: Class B and Class A/EQ.

- **Exposures from multiple pathways, contaminant mixtures, not considered.** Neither exposure from multiple routes[69] nor the potential for toxic synergies between sludge contaminants were considered by regulators when setting "safe" levels or practices.
- **No labeling requirement.** Food produced on land treated with sewage sludge does not have to be labeled as such.

Some localities have banned agricultural use of sludge.[70] Also, many states have adopted more protective heavy metal standards (16) and/or management practices (37), and a few are testing sludge for one or more synthetic chemicals—primarily PCBs.[71] However, this patchwork of regulation lacks uniformity and falls short of what is needed to assure safety of sludge use in agriculture. Also, 26 states allow sewage sludge/biosolid generators to pass legal liability over to the landowner.[72]

INSTITUTE FOR AGRICULTURE AND TRADE POLICY ■ FOOD AND HEALTH PROGRAM

Smart Guide
On Sludge Use and Food Production

What Can I Do?
(Yo Consumidor)

- ACTUAR AGUAS ARRIBA. Minimizando productos químicos en el efluente en lo cotidiano.
- Comprar sólo productos que GARANTICEN el no-contacto con material biológico, especialmente verduras y tubérculos (Alemania).
- Apoyo a los agricultores implementando buenas prácticas (NO-utilización de lodos en agricultura).
- (+) Buenas prácticas: lavar y pelar.
- Apoyo a las políticas que eviten el uso de lodos EDAR en agricultura

What can I do?

1. Think upstream. Keep chemicals out of sludge by choosing safer household and personal care products. Learn more at www.healthylegacy.org/consumerpower.cfm.
2. Buy "certified organic" when possible—especially meat and dairy—and vegetables known to take up sludge contaminants, including roots and tubers such as potatoes, sweet potatoes and carrots, and leafy vegetables such as lettuce and spinach. Federal organic standards prohibit sewage sludge application to crop- or pastureland for a minimum period of three years immediately preceding harvest.
3. Support local growers who don't use sludge. Absent labeling requirements, check with the farmer about their practices.
4. Wash and peel produce to help reduce (but not eliminate) exposure to disease-causing organisms and chemicals.
5. Avoid home use of sludge-based fertilizers. Some products are made entirely from sludge. Others are a blend of sludge with materials such as leaves, sawdust and food waste. Most sludge products are only marketed locally or regionally. Others, such as Milorganite®, are sold in home and garden stores nationwide. Find the names of known sludge-based fertilizer products at www.healthobservatory.org.
6. Choose landscapers wisely. Screen landscape/lawn care companies before hiring to make sure they will not use sludge-based fertilizer products on your lawn or garden.
7. Encourage elected officials to ban use of sewage sludge on agricultural land and home gardens; in the absence of a ban, require labeling of food produced from sludge-amended soil and promote policies that incentivize manufacturers to create safer products using clean, innovative technologies that do not put toxic chemicals into the waste stream.

INSTITUTE FOR AGRICULTURE AND TRADE POLICY ■ FOOD AND HEALTH PROGRAM

Smart Guide
On Sludge Use and Food Production

Secado-FQ Alximix:
Just in situ, Just in time, Just with lime

Espacio-Tiempo-Energía
(y Conciencia)

JUST IN SITU

- Muy compacta
- Sin stocks
- Sin residuos, efluentes ni olores

JUST IN TIME

- Tratamiento en tiempo real
- Expedición de MP a procesos productivos

JUST WITH LIME

- Sin energía térmica
- Sin patógenos
- Sin GEI –CO2 neutra-

PROCESO ALXIMIX: VALORIZACIÓN INTEGRAL DE LODOS

- La ***tecnología Alximix se basa en la recuperación de recursos de los residuos húmedos,*** como lodos, fangos y concentrados, en materias primas de calidad homologada para sustituir materiales, “Commodities”, empleados en sistemas productivos o de consumo.

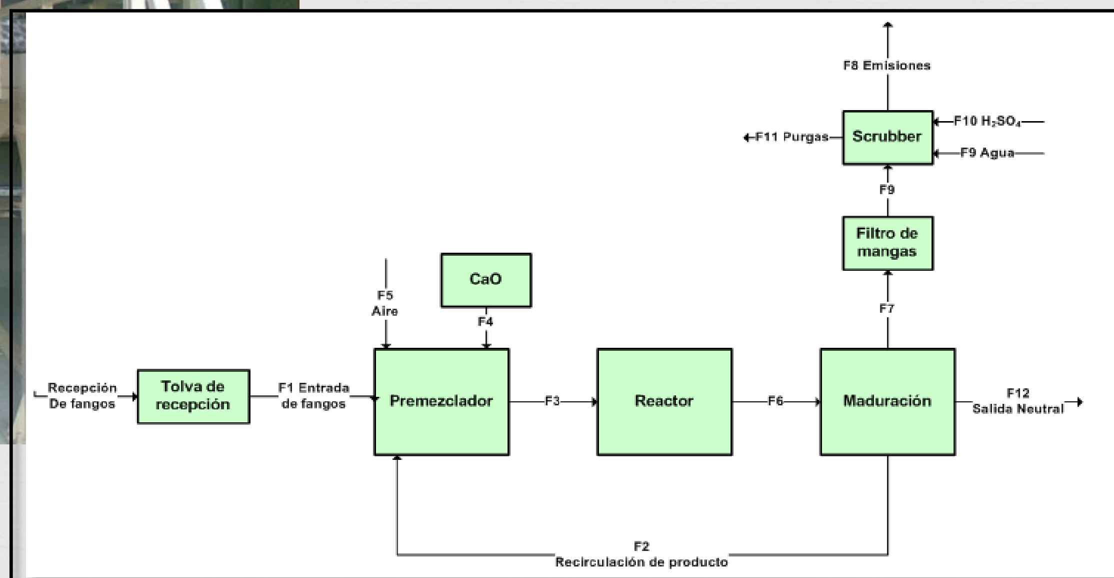
- El proceso de tratamiento de lodos ALXIMIX es, esencialmente, un **tratamiento de secado termo-mecánico e inertización físico-químico,** mediante la adición de óxido cálcico en dos reactores. La reacción oxida la materia orgánica, libera la mayor cantidad de agua y se disocian y encapsulan los metales y otras substancias tóxicas. Se produce una reducción de masa del lodo, del 50%

- Como resultado de la reacción y evaporación se obtiene el **NEUTRAL, producto micronizado y seco**

- Según la Orden MAM/304/2002, de 8 de febrero, por la que se publican las operaciones de valorización y eliminación de residuos y la lista europea de residuos, la ***tecnología ALXIMIX es un sistema de tratamiento físico-químico***. No obstante, ***también es posible su consideración como instalación de valorización de residuos.***

- Las mejoras que supone este sistema, las potencialidades que abre en relación al tratamiento de otros tipos de lodos y la reducción de costes económicos en relación a otros sistemas de tratamiento, hace prever su implantación y utilización para la gestión y tratamiento de varias tipologías de lodos.

Diagrama del proceso de Secado-FQ ALXIMIX



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Planta de Secado-FQ de lodos y concentrados Alximix de 12 t/h

ALXIMIX RESPONDE A LAS PROBLEMÁTICAS AMBIENTALES DE LOS TRATAMIENOS DE LODOS Y CONCENTRADOS

En el contexto del aumento de generación de lodos y concentrados, la tecnología ALXIMIX ofrece la ***conversión ecoeficiente, in situ, de lodos y concentrados*** en una nueva materia prima descarbonatada el ***Neutral***, idónea para la fabricación de clinker de cemento, sustitución de arena en hormigoneras y estabilización de suelos.

✓Sin ***necesidad de primas*** económicas insostenibles e incompatibles con la política de abaratamiento de gestión y control del déficit tarifario

✓Sin ***consumos energéticos*** adicionales ni consumos de combustibles, sin dependencias

✓Sin ***emisiones de GEI y emisiones de NH3***, partículas y olores

✓Sin ***residuos secundarios ni efluentes***, excepto el agua del sccruber de tratamiento de gases, sulfato amónico reciclable como fertilizante con amonio natural

✓***Tratamiento en origen***. Optimización de la logística de manejo y transporte, sin mover agua. Producto homologado multidestino

✓***Ciclo neutro en CO2***

✓Permite **reducir en un 30% el coste unitario** de tratamiento de lodos

HERA

ALXIMIX:
Proceso de Valorización Integral de Lodos

Sin consumo de energía térmica

Costes de Energía	Just in time, in situ, compacta	CO_2

Sin residuos ni efluentes

Sin residuos y emisiones	Nuevas políticas y leyes de gestión de lodos	Salidas múltiples económicamente justificadas

Con prevención biológica

Sin riesgos para la salud ("brotes amarillos")	Independencia de gas, diluciones, vertederos

Minimización de los costes y su volatilidad

Comparación de plantas secado termoquímico de lodos

	35.000 t/a (70-80%Hum)		90.000 t/a	
	S-Term+Cem	S-FQ+Cem	S-Term+Cem	S-FQ+Cem
Capital (M€)	14,8	5,0	35,0	9,5
Superficie (m2)	8.800	400	12.000	700
coste total un. (€/t)	126	65	123	60
prima cogen (€/t)	-33	0	-33	0
CT (M€/a)	4,41 (1,8 O&M)	2,27	11,07	5,40
Prima (M€/a)	-1,15	0	-2,97	0

Valor para la Sociedad. Clúster de residuos

PROCESO ALXIMIX: VALORIZACIÓN INTEGRAL DE LODOS

- **La flexibilidad del proceso ALXIMIX permite tratar**:
  - ✓Concentrados de lixiviados de vertedero y ecoparque
  - ✓Lodos de papelera y de calera
  - ✓Lodos primarios y secundarios de EDAR y de depuradoras industriales
  - ✓Residuos oleosos y lodos de taladrinas, marpoles y refinerías
  - ✓Cenizas volantes de térmica, humos de acería, etc.
- **Esta nueva tecnología supone:**
  1. Una vía de tratamiento para los lodos y concentrados de depuración, con ***bajo coste ambiental y económico,*** sin volatilidades, que abre vías a nuevas formas de gestión de lodos. Adaptado y probado para lodos floculados y concentrados de evaporación y de osmosis.
  2. Cierra el ciclo de gestión de los lodos ya que permite su valorización y posibilita reintroducir el ***producto resultante (NEUTRAL)*** en la cadena económica, ya sea para la utilización en construcción o en la fabricación de cemento (la viabilidad técnica y económica probada mediante el programa CENIT).

PROCESO ALXIMIX : SIN CONSUMO DE ENERGÍA TÉRMICA Y CO2 NEUTRO, SIN RIESGOS AMBIENTALES, SANITARIOS NI ATEX, COMPETITIVO A NIVEL INTERNACIONAL,

- Se ***minimiza el consumo de energía*** procedente de fuentes no renovables en el ciclo completo de valorización.
- ***Mínimos impactos ambientales*****:** emisiones, consumo de recursos, eliminación de los riesgos sanitarios y de contaminación de suelos y agua.
- ***Riesgo cero de explosión e incendio.*** Proyecto en Francia de sustitución de planta de Secado-T que explotó y lodo seco se incendió en cementera
- ***Reducción de costes totales,*** contando las primas. Garantiza la viabilidad económica del tratamiento con independencia de subvenciones (Dva. Cogeneración y Eficiencia Dva. Marco Residuos) y de la evolución de los precios de la energía y el CO2
- ***Reducción en origen y optimización logística***, favoreciendo los tratamientos de lodos in situ.

Residuos y emisiones. Otros riesgos

Producto final: Neutral

- ✓ Como resultado de las reacciones químicas del proceso y de la liberación de la mayor parte del agua, se obtiene el **Neutral**, un producto en forma de polvo, con un reducción de masa, en relación al fango de origen, del 50%
- ✓ El «Neutral» es el producto final, **uniforme, seco y micronizado**, apto para transporte y dosificación con sistemas neumáticos, que puede ser utilizado como sustituto de la materia prima en cementeras, sustitución de arena en hormigoneras, y usos en estabilización de suelos.

Valorización del Neutral como materia prima alternativa en cementeras

- El clinker (mezcla de silicatos de calcio con aluminato y ferrito) es el componente principal del cemento Portland. Su elaboración condiciona la configuración, consumos y emisiones de las plantas cementeras.

Formación del Clinker Portland

12 CaO + 2 SiO2 + 2 Al2O3 + Fe2O3 → 3 CaO·SiO2 + 2 CaO·SiO2 + 3 CaO·Al2O3 + 4 CaO·Al2O3·Fe2O3

Como se observa, el óxido de calcio es básico para la formación del clinker.

$$Ca(OH)_2 + calor \rightarrow CaO + H_2O \uparrow$$

- El Neutral, estando básicamente constituido por Hidróxido de Calcio puede ser deshidroxilado en el horno pasando a óxido y realizar la aportación necesaria en la producción de clinker en la proporción deseada.

REFLEXIONES
"De aquellos barros, estos lodos"

- Experiencia de lo que aprendimos con la catástrofe ecológica de los lodos de Doñana: más vale Prevenir que verter. La gestión "low cost" es arriesgada, pues lo posible acaba pasando –como en Fukujima-, y la negligencia, se acaba pagando!
- El «brote alemán» (E.Coli) ha ofrecido una triste demostración de irresponsabilidad en gestión política y de salud pública. Como lo fue el caso del aceite de colza
- Seamos cautos e higiénicos con la política ambiental española, especialmente en relación a los alimentos y la contaminación, sobretodo a nivel de percepción internacional. En particular, los lodos van a ser una cuestión sensible, con posible incidencia en las exportaciones alimentarias y el turismo. De muestra, un botón!
- Es conocido a nivel internacional lo que hacemos con nuestros lodos y purines (secado "útil" económicamente justificado con primas). Y ya está dañando la imagen española de los sectores ambiental, energético y político. Algunas soluciones son insostenibles a nivel ambiental y económico, y además sin mercado exterior para el sector –como solución de gestión-.

Conclusiones

PROCESO DE SECADO-FQ ALXIMIX: CONCLUSIONES GENERALES

- ***Aximix es una tecnología española*** de Secado Físico-Químico de lodos y concentrados, con proyectos en diversos países y sectores, integrado a medida de cada necesidad
- La tecnología ALXIMIX ofrece la posibilidad de tratar "**IN SITU", "JUST IN TIME"** y **"JUST WITH LIME"** lodos de EDAR y concentrados de aguas residuales
- Convierte lo que era un problema ambiental en un ***nuevo producto, el neutral,*** que puede usarse como suministro alternativo ya descarbonatado en cementeras y otros fines
- El proceso tiene un ***balance competitivo*** en consumo energético, emisiones de CO2, riesgos sanitarios-ambientales, logística y coste económico, respecto a las demás opciones de gestión
- Esta tecnología ha llegado a la etapa final del ***proyecto CENIT,*** dedicado al ciclo integral del agua, ***liderado por AGBAR y CEMENTOS MOLINS,*** auditada por el CSIC y el Instituto Químico de Sarriá, *que avalan los resultados obtenidos en las pruebas realizadas dentro del programa CENIT en la planta cementera de Cementos Molins*, sustituyendo SIN RESTRICCIONES un porcentaje variable de la materia prima empleada en la fabricación de cemento, por Neutral

Gracias por su atención

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Aplicación en agricultura después de tratamientos como deshidratación y digestión anaerobia, seguido de un compostaje o de un secado térmico

- En Europa aumenta la tendencia legislativa a desviar las practicas de recuperación de lodos vía agricultura hacia la recuperación energética como alternativa.

En Europa la opción agrícola se ha reducido drásticamente en los últimos 10 años.

- La gestión de lodos de depuradora está regulada por la directiva 86/278/CEE que establece una serie de restricciones adicionales por motivos ambientales y sanitarios:

  - ✓Prohibición de utilizar estos lodos sin haberlos tratado previamente
  - ✓Prohibición de su uso en la mayoría de los cultivos
  - ✓Exige el control de la cantidad de metales pesados que puedan contener antes de su uso agrícola
  - ✓El II PNLD establece se hace necesario mejorar el control de estas aplicaciones agrícolas. Sólo el uso agrícola de los LD de mejor calidad, y el resto destinado a otras formas de valorización.
  - ✓Real Decreto 824/2005, sobre productos fertilizantes, en el que se establecen varias clases de compost, según su calidad (a,b,c) introduce criterios de calidad ecológica en las normas agronómicas de fertilización.

Balance CO2 y Energía secado térmico lodos y cementera

BALANCE ENERGÉTICO DEL SECADO TÉRMICO DE LODOS EDAR

	t			
	1	(t)		
	L.EDAR	**L.SECADO**	**L.SECADO**	
Humedad	80%	0,010526	5%	
MS	20%	0,2	95%	
Total	100%	0,210526	100%	
	Agua evaporada (t/t lodo)	0,79	3,75	(t/t lodo secado)
	Calor vaporización (MJ/kg agua)	2260	542,4	(termias/t agua)
	MJ/t lodo	1.784	428	(termias/t lodo)
	efi transfer calor	45%		
	consumo ter/t lodo	952	1.094	(kWht/t LO)
	kcal/mol CH4	213		
	gr/mol CH4	16		
	consumo kg CH4/t lodo	71,5		
	F.emis.CO2 (t/t CH4 combust.)	2,75		
	(kgCO2/t lodo)	196,6		
	(kgCO2/t L.secado)	**933,7**		
	cons. (ter/t L.Secado)	2.034	2.339	(kWht/tLO.Secado)
	Ener.Electr.Recuperable		1000	(kWhe/tLO.Secado)
	Coke substituible (t/t secada)	0,27		
	Coke substituible (t/t lodo)	0,057		

Sewage sludge is the product of municipal wastewater treatment. Often thought to consist of only "human waste," sewage sludge in fact contains organic, inorganic, and biological pollutants from commercial, industrial, and household wastes, and compounds added to and formed during treatment processes.

Millions of dry tons of sludge go on land every year. Why? Because it is the cheapest and most politically manageable disposal option since Congress banned ocean dumping of the material in 1991.

When ocean dumping was ruled out, the EPA adopted land disposal as its official sludge policy. To garner public acceptance for the practice, the agency coined the word "biosolids" for sewage sludge that has been treated to meet its regulatory requirements for land application. It was the linguistic detoxification of a hazardous waste. The agency has gone to extraordinary effort to propagate the euphemism.

But EPA and industry propaganda is being challenged by an alarming number of reports from people who say they or their friends or families were made sick by exposure to sewage sludge. What is making them sick? Synthetic organic chemicals? Pathogens? Dioxins? Or some combinations of the thousands of chemicals that end up in the sludge? No one knows for sure. The agency looked at 411 pollutants in sludge before deciding on regulations that govern 9 metals and nothing more. Call it the "Don't look, can't tell" policy. EPA has spent millions to tell us how safe sludge is, while not funding a single epidemiological study or a dime on tracking complaints about sludge-related illnesses.

from Natural Life Magazine, November/December 1997 **The Real Dirt on Sewage Sludge** *by Wendy Priesnitz*

Hold your nose! Waste from households and industries treated at a sewage plant may be spread on a farmer's field near you. Unfortunately, it may contain heavy metals and other nasty surprises that could end up on your dinner plate.

The safe disposal of hazardous waste has been a challenge for both industry and governments for decades. Under increasing assault by environmental groups for dumping waste into landfills, oceans, rivers and lakes, or burning it in incinerators, corporations and governments seem to have agreed upon a new solution.

They rename the waste as fertilizer or dust suppressant and spread it on farmers' fields and country roads. The code word for this practice is "beneficial use". While it may be an environmentally sound example of recycling, in many cases it's merely relocating pathogens rather than disposing of them.

Although many different industries are "recycling" their toxic waste in this manner, one of the most controversial substances is sewage sludge, which is widely used as a soil amendment by farmers in both the United States and Canada.

Sludge is the mud-like material that remains after treatment of the wastes that flow into local sewage treatment plants. If human wastes were the only thing entering the sewage treatment plants, then sewage sludge would be a relatively safe, nutrient-rich fertilizer that could be safely returned to the land. However, sewage treatment plants also inevitably receive industrial and household toxic wastes.

In a November, 1990 edition of the United States *Federal Register*, the Environmental Protection Agency (EPA) had this to say of sewage sludge: "Typically, these constituents may include volatiles, organic solids, nutrients, disease-causing pathogenic organisms (bacteria, viruses, etc.), heavy metals and inorganic ions, and toxic organic chemicals from industrial wastes, household chemicals and pesticides."

In fact, there are thousands of substances that can be found in typical sewage sludge, including any of the 100,000 or so chemicals produced and used in industrialized nations, many of which illegally end up in the sewers. Anything that is dumped into a sewer – and that is removed from water by the treatment process – becomes sludge.

This sludge is being legally marketed to farmers who plough it into soil as fertilizer. Although the practice has been around for more than 30 years, there has been a dramatic increase since 1990, according to Agriculture and Agri-Food Canada. This has prompted governments to put in place standards to regulate the levels of toxics in the final product.

Some Canadian provinces have their own regulations, as does the federal government. Agriculture and Agri-Food Canada's Food Production and Inspection Branch has set maximum acceptable metal concentrations for processed sewage and sewage-based products which are sold as fertilizers or supplements.

Ontario's guidelines require that each field on which sludge fertilizer is to be spread must be approved and monitored to ensure the mandated nitrogen to heavy metal ratio is not exceeded. The Ontario Ministry of the Environment and Energy maintains the practice is very safe and will not contaminate groundwater, since the fertilizer only penetrates the soil for four or five inches, just like liquid manure.

In the United States, the Clean Water Act contains specifications for metals concentrations, pathogen reduction and disease-carrying animals such as rodents and vermin. These standards are permissive compared with those of other countries, including Canada.

Nevertheless, there is growing controversy about the safety of sludge-based fertilizer. In the U.S., the National Food Processors' Association says it "does not endorse the use of sewage sludge on crop land". And some of its members also shun the process. Heinz and Del Monte both say none of their products are grown with sludge.

One of the reasons for the concern is confusion about the presence of heavy metals. Maximum allowable levels of metals vary widely around the world. Take cadmium, for instance. Denmark limits this metal to less than one part per million in sludge fertilizer. Germany allows ten parts per million, the state of New York allows 25 and the EPA allows 39 parts per million.

In Canada, the practice is to adopt metal concentration standards as a result of long-term (40 year) effects of heavy metals in soils. The American standards were apparently set using different criteria. After 1992, when a U.S. government ban on ocean dumping of sewage sludge went into effect, the one economical disposal option still available was land application. So with the blessing of the Environmental Protection Agency (EPA), the municipal waste industry hired the public relations firm Powell Tate, which rechristened sludge as "beneficial biosolids". Then, with the sweep of a pen, the EPA reclassified sludge from "hazardous material" to "compost".

PR Campaign

This amazing process is documented by authors John Stauber and Sheldon Rampton, in their book about the public relations industry, *Toxic Sludge is Good for You*. They write, "Our investigation into the PR campaign for 'beneficial use' of sewage sludge revealed a murky tangle of corporate and government bureaucracies, conflicts of interest, and a cover-up of massive hazards to the environment and human health."

According to Abby Rockefeller, a Boston philanthropist and advocate of waste treatment reform, the move to land application of toxic sludge in the United States was sanctioned by some of the country's most respectable environmental organizations, like the Environmental Defense Fund and the National Resources Defense Council.

Nevertheless, Rockefeller states, "...the menace of toxic and otherwise non-life-compatible substances that can be found in sludge so greatly outweigh the potential nutrient benefit as to make that potential benefit an irrelevance...The sheer number of dangers associated with treating sludge as if it were a fertilizer is so great, so various, and so serious that it would be the life work of thousands of professionals to divide up and respond to the categories of problems that will arise from this practice."

The body of literature on sewage sludge is large, but much of it consists of articles intended to break down public resistance to the use of the product on farm land. There is, however, a core of serious scientific research that has tried to discover what the long-term consequences will be from using sewage sludge as fertilizer. Peter Montague in a recent edition of *Rachel's Environment & Health Weekly*, summarized this literature.

Negative Research

Sewage sludge is mutagenic (it causes inheritable genetic changes in organisms), but no one seems sure what this means for human or animal health. Regulations for the use of sewage sludge ignore this information.

Two-thirds of sewage sludge contains asbestos. Because sludge is often applied to the land dry, asbestos may be a real health danger to farmers, neighbours and their children. Again

Planta de secado de lodos de Castellón

La adjudicación de las obras de construcción y explotación de la planta de secado térmico de lodos procedentes de las estaciones depuradoras de aguas residuales (EDAR) de la provincia de Castellón acumula más de 14 meses de retraso. Pese a que el Boletín Oficial del Estado (BOE) publicó el anuncio de la licitación de los trabajos en marzo de 2008 y fijó el 8 de mayo del pasado año como fecha límite para que las empresas presentaran sus ofertas, los trabajos siguen sin adjudicarse.

Sin embargo, la Conselleria de Medio Ambiente, Agua, Urbanismo y Vivienda volvió a 'vender' ayer en un comunicado las instalaciones incluidas en el II Plan Director de Saneamiento sin mayores novedades que las ya comunicadas cuando, hace más de año y medio, se licitaron los trabajos. La infraestructura, que se construirá por concesión, cuenta con un presupuesto de inversión estimado de 14.800.405,45 euros, a los que se sumaron otros 1,8 millones como coste previsto de funcionamiento y 296.008,11 euros como garantía provisional. Respecto a los plazos de ejecución, se estimaron 16 meses para

DEPURADORA. Imagen de la planta depuradora Burriana. /PAU BELLIDO

..EL BOE HA PUBLICADO LA ADJUDICACIÓN DE LA PLANTA POR 35 MILLONES..

La UTE encargada de la planta para lodos ya redacta el proyecto

La planta aprovechará el fango de depuradoras para usos agrícolas..

20/04/2010 R. OLIVARES

comentarios enviar imprimir valorar añade a tu blog

La sociedad Secado Térmico de Castellón SA, formada por la unión temporal de empresas (UTE) de Sufi (filial de medio ambiente del grupo Sacyr) y Cyes, ya trabaja en la redacción del proyecto que ha de servir para construir la planta de aprovechamiento de lodos que se ubicará en el polígono del Serrallo. Esta planta acogerá los fangos que generan las depuradoras de Castellón, Burriana, Onda/Betxí/Vila-real, Vila-real, Benicàssim y Orpesa.

EDICIÓN IMPRESA EN PDF

Esta noticia pertenece a la edición en papel.
Ver archivo (pdf)

Fuentes de la Conselleria de Medio Ambiente confirmaron ayer que ya se está trabajando en este proyecto, justo un año después de su adjudicación. Casualmente, el sábado el Boletín Oficial del Estado publicó este trámite. Preguntadas sobre el retraso de un año en este paso, las fuentes de la Conselleria afirmaron que esto no ha sido obstáculo para iniciar la redacción del proyecto.

El objetivo del mismo es la construcción y explotación de esta planta de secado de lodos, mediante la cogeneración, para facilitar el transporte y uso del fango para usos agrícolas.

El coste de la construcción de la planta es de 14,8 millones de euros, y su coste estimado de funcionamiento por año es de 1,8 millones. Para optar a ello, la UTE adjudicataria hará frente a un canon de adjudicación de 35, 2 millones de euros, según apareció el pasado sábado en el BOE. H

The agricultural utilization of sludge is presently reg- ulated at the European level by the Directive 86/278 that is currently to be amended. The new Directive will revis the previous one almost completely and the limi- tations imposed, if confirmed, will make it more and more difficult to use sludge in agriculture, and consid-12

erable investments will be needed to fullfill the new re- quirements.

As far as landfilling is concerned, main negative as- pects are that organic matter deposited in a landfill is not available for plant growth and that biogas produced, if no captured, contributes considerably to the green- house effect.

Because of this, strong restrictions intended to limit the use of landfills in future have been introduced by the European Directive 99/31, that imposes the reduction of biodegradable municipal waste to be landfilled to 75% of total biodegradable municipal waste produced in 1995 by 2006, to 50% by 2009, and to 35% by 2016.

Although the EU landfill Directive does not prohibit landfilling of sludge, it is clear that environmental European politics are pushing towards recycling, but not fully justified restrictions are imposed on landfilling, so the impact of the Directive over the next few years will make this practice more expensive and less attractive.

Stringent limits are also imposed on other manage- ment options, with the consequence that the costs asso- ciated with sludge use/disposal are, in all cases, rapidly increasing.

Finally, to properly perform sludge and biowaste management, and to correctly fulfill the legal require- ments, the definition of standardized characterization methods and procedures is necessary. To this end, a broad activity at the European level has been under- taken by CEN, under the program of TC308 whose work will be very useful in amending the EU Directive on the utilization of sludge in agriculture and in other Directives dealing, directly or indirectly, with sludge.

APPENDIX 1 From Biowaste Directive (2nd Draft) (In Relation to Anaerobic Digestion)

∑ If released into surface water, the liquid digestate from an anaerobic digestion plant shall be suitably treated to comply with the requirements of Directive 91/271/EEC.

∑ The anaerobic digestion process shall be carried out in such a way that a minimum temperature of 55°C is maintained over an uninterrupted period of 24 h, with a minimum hydraulic residence time in the reactor of 20 days.

∑ In the case of lower operating temperatures or shorter period of exposure, the biowaste should be
pre-treated, or the digestate post-treated, at 70°C for 1
h, or the digestate composted. ∑ The management of biogas is also subjected to spe-
cific requirements, including emission limits and concentration of total halogenated hydrocarbons (AOX) below 150 mg/m3.

APPENDIX 2 From Working Document on Sludge Use (3rd Draft)

Advanced treatments include:

∑ thermal drying ensuring that the temperature of the sludge particles is higher than 80°C with a reduction of water content to less than 10%;
∑ thermophilicaerobicstabilization,asabatch,at55°C for 20 hours;
∑ thermophilic anaerobic digestion as a batch at 53°C for 20 hours;
∑ pasteurization of liquid sludge at 70°C for 30 min- utes, followed by mesophilic anaerobic digestion at 35°C for 12 days;
∑ chemicalstabilizationwithlimeatpHequalorabove 12, maintaining the temperature at 55°C for 2 hours; ∑ chemicalstabilizationwithlimeatpHequalorabove 12 for 3 months.

The treated sludge shall not contain Salmonella spp in 50 g (wet weight), and achieve at least a 6 Log10 re- duction in Escherichia Coli to less than 5 ¥ 102 CFU/g.

Conventional treatments include:

∑ thermophilic aerobic stabilization at a temperature of at least 55°C with a mean retention time of 20 days;
∑ thermophilic anaerobic digestion at a temperature of at least 53°C with a mean retention time of 20 days;
∑ mesophilic anaerobic digestion at a temperature of 35°C for 15 days;
∑ chemical stabilization with lime at pH equal or above12 for 24 hours;
∑ extended aeration at ambient temperature, as a batch (time length to be defined locally depending on cli- mate conditions);
∑ simultaneous aerobic stabilization at ambient tem- perature (time length to be defined locally depending on climate conditions);
∑ storage in liquid form at ambient temperature, as a

Nutrient recycling via direct application of sewage sludge on cropland aggravates the above mentioned runoff problem in areas with high livestock population. On top of that, the risk of some of the numerous chemicals that accumulate in sludge being taken up by crops and getting into the food chain cannot be excluded. As a consequence, some European countries have forbidden or strictly limited the direct application of sewage sludge as a fertilizer.

Thermal valorisation of sewage sludge by its combustion in fluidized bed incinerators is the royal road, particularly since effective air pollution control systems prevent toxic emissions from getting into the environment. This is why sludge incineration is becoming much more popular in highly industrialized societies, even if the energy yield is limited by the moisture content of the sludge.

As long as phosphorus could not be effectively recovered from the ash, policy makers had to decide between the bad and the evil. Nutrient recovery entailed the risk of contaminating the food chain and increasing eutrophication. Energy recovery entailed an irrecoverable loss of the finite element phosphorus.

Aux USA, l'épandage de boues liquide a été pratiqué durant plus de 30 ans, mais a été suspecté d'être à l'origine de certaines pollutions ou zoonoses, voire d'avoir été à l'origine de la maladie à prion (CWD, chronic wasting disease) qui touche les cervidés dans une dizaine d'états

- la future réglementation européenne sur le recyclage du phosphore devrait imposer la mono-incinération des boues (leur incinération avec d'autres matériaux sera interdite
- Le compostage ne peut éliminer les métaux lourds (une partie du mercure peut s'évaporer) ni les polluants organiques ou organométalliques faiblement biodégradables (dioxines, PCB, certains pesticides, etc.). Ils persistent dans le compost si ce dernier est réalisé à partir de matières polluées ou souillées. Le risque est a priori plus élevé là où des rejets médicaux, artisanaux et industriels dont rejetés sans contrôle dans les réseaux d'assainissement collectif et là où le risque d'accident industriel est plus élevé (des bassins-tampon, recueillant par exemple les eaux d'extinction d'incendie limitent le risque, mais des rejets pirates sont aujourd'hui difficiles à prévenir). Par exemple en France, la seule collecte des amalgames dentaires a beaucoup fait diminuer le taux de mercure dans les boues urbaines 10.
- Les travailleurs mal protégés peuvent être exposés (inhalation, contact, via blessures…) à certains spores de champignons microscopiques (moisissures) et actinomycètes allergènes ou à des pathogènes (parasites ou leurs œufs, bactéries, prions, virus) ou toxines (exemple : Aflatoxines, endotoxines) et allergènes libérés par ces organismes11.
- France nature environnement, dans le cadre du PEFC notamment a estimé que l'épandage en forêt comporte trop de risque et qu'il est à proscrire.

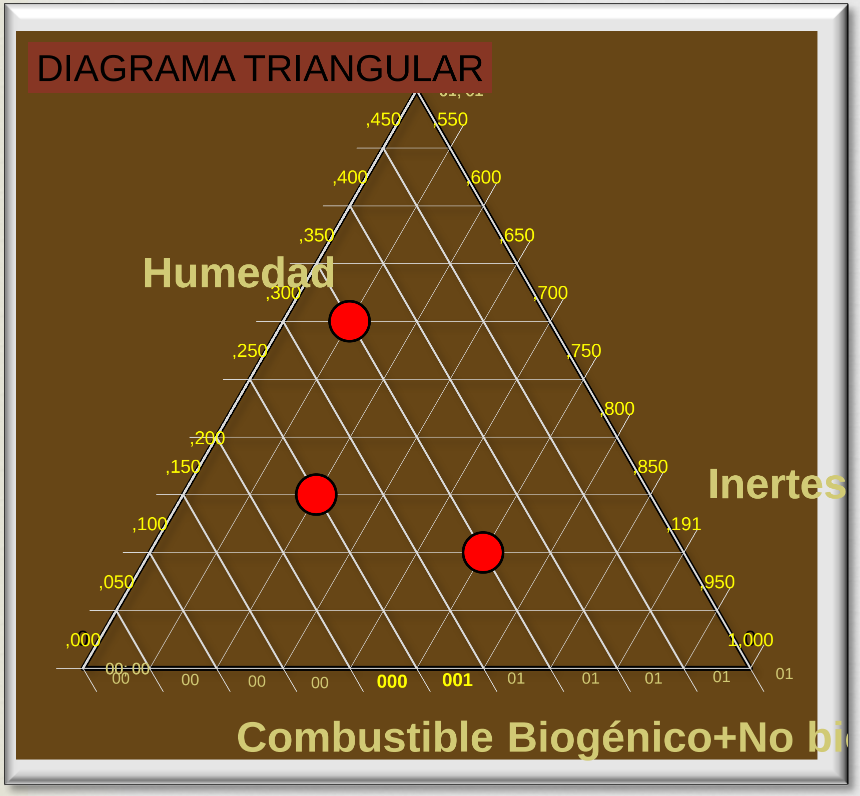
DIAGRAMA TRIANGULAR
Humedad
Inertes
Combustible Biogénico+No bi

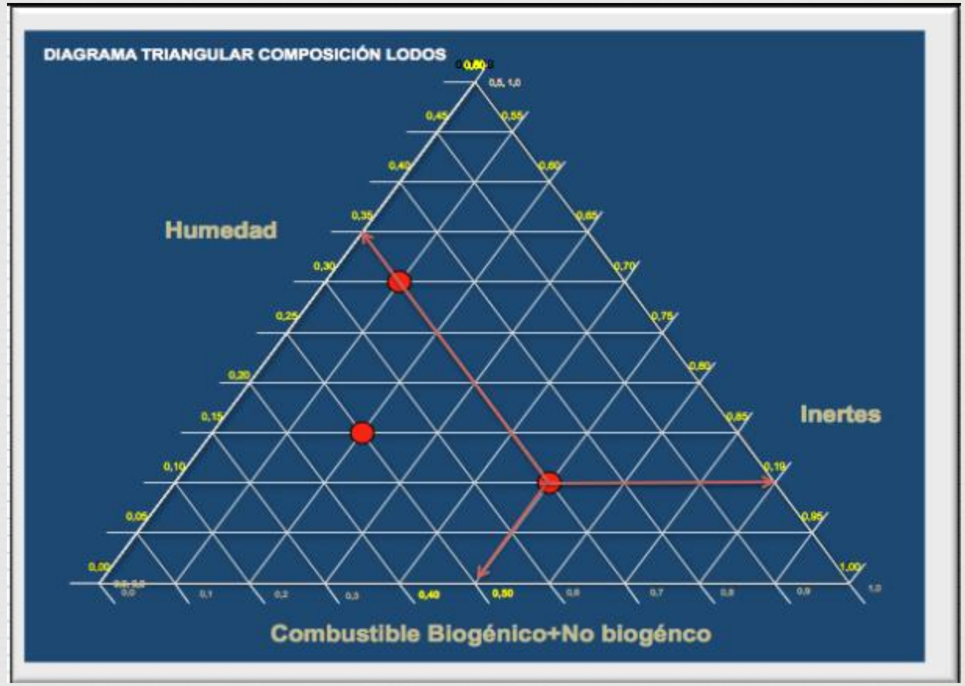
DIAGRAMA TRIANGULAR COMPOSICIÓN LODOS
Humedad
Inertes
Combustible Biogénico+No biogénco

Tipically Spanish

BREAKING: DEADLY SPANISH CUCUMBERS KILLS 5, 600 IN HOSPITAL IN GERMANY DUE TO E.COLI INFECTION Suggest Pin Quote [+]

No tomatoes, lettuces nor cucumber to be eaten in Germany. Vegetable virus has killed 5 people and over 600 in the hospitals.

Typically Spanish - Spain News : National

2 tweets retweet

German E. coli outbreak traced to Spanish cucumbers

larger | smaller

By m.p./h.b. - May 26, 2011 - 7:43 PM

Three people have died and more than 200 were taken ill after eating cucumbers allgedly from Málaga and Almería

Germany announced on Thursday that a deadly infection there which has killed three people and left more than two hundred ill has been traced to Spanish cucumbers.

The outbreak, which began in northern Germany and has now spread to the south, is a particularly aggressive strain of E.coli and is resistant to many antibiotics.

Hamburg's health senator, Cornelia Pruefer-Storcks, said the city's Hygiene Institute have discovered the bacteria on three cucumbers from Spain, and investigations latest established that the origin of the outbreak was organic cucumbers from Almería and Málaga. One of the cooperatives which has been accused said that the consignment 'was altered' in Hamburg.

The German authorities were investigating 'other potential sources'. As well has Germany, Sweden has announced ten cases, Denmark four, the UK three and Holland one.

There are no reported cases in Spain; the companies accused only export their crops and do not operate in the domestic market.

Europa Press reports that the bacteria were identified on a fourth cucumber whose country of origin is not yet known.

The Senator however noted that the analyses have only been carried out on produce in Hamburg, adding that other produce may have been the source of the infection elsewhere in the country.

The German public, particularly those in the north of the country, were advised this week to not eat any vegetables, especially lettuce, tomatoes and cucumber, without cooking.

APPENDIX 3
From Working Document on Sludge Use (3rd Draft)

Limit values of heavy metals in sludge for use on land

	Limit Values (mg/kg-dry matter)		Limit Values (mg/kg P)
Metal	Directive 86/278	Proposed New	Proposed
Cd	20–40	10	250
Cr	—	1,000	25,000
Cu	1,000–1,750	1,000	25,000
Hg	16–25	10	250
Ni	300–400	300	7,500
Pb	750–1,200	750	18,750
Zn	2,500–4,000	2,500	62,500

Note: The sludge producer may choose to observe either the dry matter related or the phosphorus related limit values

Limit values of organic compounds and dioxins

Compound	Limit values (mg/kg-dry matter)
AOX (sum of halogenated organic compounds)	500
LAS (linear alkylbenzene sulphonates)	2,600
DEHP (di(2-ethylhexyl)phthalate)	100
NPE (nonylphenol and nonylphenolethoxylates with 1 or 2 ethoxy groups)	50
PAH (sum of various polycyclic aromatic hydrocarbons)	6
PCB (sum of some polychlorinated byphenils)	0.8
	(ng-TE/kg-dry matter)
PCDD/F (polychlorinated dibenzodiox./dibenzofur.)	100