INNOQUA: Tratamiento sostenible de aguas servidas usando soluciones naturales

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 689817.

Nuestro compromiso

- **Desarrollar una solución descentralizada de tratamiento de aguas adaptado tanto al Norte como al Sur Globales**
- **Apto para áreas urbanas y rurales**
- **Un Proyecto de I+D colaborativa de 4 años**
- **20 socios de horizontes diversos en la cadena de valor**

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El equipo desde la perspectiva de la cadena de valor

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Definición de especificaciones

- Estudios de mercado
- Encuestas de aceptación social
- Requerimientos legales
- Necesidades del usuario final
- Evaluación de costos medioambientales y económicos
- Comunicación

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4 tecnologías de la idea al producto

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Sistema INNOQUA

4 Tecnologías modulares

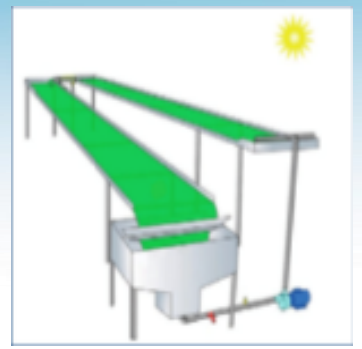
Lumbrifilter

- Primary and secondary treatment
- Aerobic system utilising earthworms and bacteria
- Removes BOD, suspended solids, ammonium

Daphniafilter

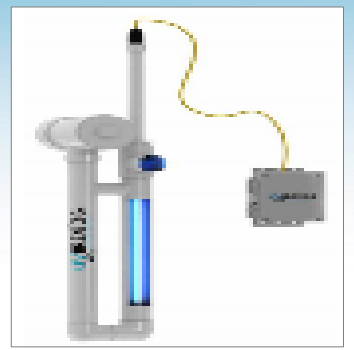
- Tertiary treatment
- Daphnia species consume very fine suspended solids, including bacteria
- Biofilm removes nutrients and other pollutants

Bio Solar Purification



- Tertiary treatment
- Biofilm removes nutrients and other pollutants

UV Disinfection



- Disinfection
- Optimised UV lamp configuration kills pathogens in treated wastewater

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Demostración global de las tecnologías INNOQUA

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Campaña de demostración global

Prototipo	Configuración
Irlanda	LBF+DF+UV
España	LBF+DF+BSP
Piloto	**Configuración**
Irlanda Ecuador	LBF
Italia	LBF+UV
Francia Rumania Escocia	LBF + DF
Tanzania Turquía	LBF + DF + UV
India Perú	LBF + DF + UV LBF + BSP
Francia	Lumbricomposting

11 sitios de demostración: Irlanda, Francia (2), Escocia, Italia, Rumania, Turquía, Tanzania, India, Perú, Ecuador

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Sitios piloto

Demo-Site	Responsible	Location	Wastewater origin	Wastewater type
1	NUIG	Cattle Farm Craughwell, County Galway	Cattle farming (dairy wastewater)	Industrial
2	LBT	La Canourgue, France	Inland aquaculture	Industrial
3	DE5	Vasto, Italy	Western single family	Domestic
4	NBK	Anglet, France	Tertiary/ commercial building	Domestic
5	SW	Littlemill, Scotland	Collective housing	Domestic
6	EKO	Sinop, Turkey	Collective housing	Domestic
7	RMC	Suceava county, Romania	Touristic Building	Domestic
8	UCU/GYA	Quito, Ecuador	Residential building	Domestic
9	BORDA	Mlalakuwa, Tanzania	Collective housing	Domestic
10	BORDA	Bangalore, India	Collective housing	Domestic
11	UCSM	Arequipa, Peru	University (labs, toilets, general use)	Domestic

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Lumbrifilter (Ireland) – municipal wastewater (primary settled)

Ireland – development pilot & demo-site

% Removal - average effluent value in ()					
COD	BOD_5	TN	TSS	NH_4-N	TP
78	93	40	80	88	29
(111)	(15)	(23)	(23)	(4)	(5)
Surface Removal Rate (g/m².day)					
192	115	10	30	13	1.1

- Top up woodchip (once a year)
- No other maintenance

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TESTS EN LABORATORIO DEL LOMBRIFILTRO EN LA UNIVERSIDAD DE GALWAY, IRLANDA

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Lumbrifilter (Ireland)

Ireland – agricultural demo-site

Up to 0.2 m^3/day

	COD (mg/L)	TSS (mg/L)	NH_4-N (mg/L)	TN (mg N/L)
Influent	8,148.3 ± 7342.3	5,484.3 ± 8,706.5	57.6 ± 19.5	251.9 ± 49.6
Effluent	1,875.9 ± 905.7	370.0 ± 195.8	16.3 ± 10.7	85.9 ± 34.4
% removal	62.6 ± 128.9	83.1 ± 14.5	71.9 ± 15.6	68.8 ± 16.1

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Lumbrifilter +UV system (Italy)

Italy demo-site

	Inlet lumbrifilter (mg/L) n = 24	Outlet lumbrifilter (mg/L) n = 24	Removal efficiency (%)	Local discharge Regulation (mg/L)
TSS	316	23	93	80
COD	998	143	86	160
BOD	391	16	96	40
NH4	88	10	87	15

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Lumbrifilter +DF (France, Romania, Scotland)

SEPTIC TANK LUMBRIFILTER DAPHNIAFILTER

	Inlet lumbrifilter (mg/L) n = 10	Outlet lumbrifilter (mg/L) n = 10	Global efficiency (%) n = 10	Discharge limit (mg/L)
TSS	609	40	**91**	25
COD	1313	216	**81**	
BOD	495	**21**	**85**	35
NH4	164	36	**78**	

French demo-site

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Lumbrifilter +DF +UV system
Lumbrifilter +BSP

} (India & Peru)

Demo-site India

Wastewater characteristics
TSS: 940-4030mg/L, aver. 2190mg/L
BOD: 600-2000mg/L, aver. 1165mg/L
COD: 1104-4190mg/L, aver. 2241mg/L
NH_4-N: 60-144mg/L, aver. 104mg/L
wastewater **temp.:** 20.8 up to 38.8°C

		TSS mg/L	BOD mg/L	COD mg/L	NH_4- N mg N/L
LFi_n	average; STD N	2190 +/- 951	1165 +/- 369	2242 +/-851	104 +/-23.7
	max	4030	2000	4190	144,0
	min	940	600	1104	60,1
LF_{eff}	average; STD N	271 +/- 186	90 +/- 76	371 +/- 217	15.2 +/- 8.5
	max	615	300	803	37,0
	min	36	14	86	2,7
efficiency [%]	average; STD N	88 +/-8	93 +/-6	83 +/-10	85 +/-10
	max	98	98	94	98
	min	62	75	60	54
Overall Performance					
DF+UV	average	98	99	96	94
BSP	average	87	97	90	97

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Algunas observaciones del equipo:

- En algunos sitios, se ha decidido rastrillar ocasionalmente la superficie superior del Lombrifiltro (una o dos veces al mes) durante las condiciones normales de funcionamiento.
- En el Lombrifiltro se ha requerido una recarga ocasional de virutas de madera, quizás 100 mm en 4 a 6 meses. No se ha requerido más mantenimiento.
- El Lombrifiltro es muy robusto y se recupera rápidamente incluso cuando los flujos de agua se han detenido durante varias semanas (confinamiento COVID19), siempre que la viruta permanezca húmeda y no se congele.
- En períodos prolongados en los que los volúmenes de aguas residuales son bajos, el sistema de dosificación del Lombrifiltro se puede ajustar para mantener una buena población de lombrices.

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Algunas observaciones del equipo:

- El filtro de dafnias requiere una atención detallada al inicio, ya que las dafnias son más sensibles;
- La coexistencia de macroalgas (ej. Lemna sp.) dentro del reactor mejora la absorción de nutrientes
- Los rendimientos del BSP (filtro de biopurificación solar) dependen del mantenimiento; el espesor de la biopelícula debe controlarse; el trasiego ocasional y la eliminación de la biomasa mejoran los rendimientos

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Muchas gracias por participar!

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