

New closed biobed with recirculation and evaporation for use under colder climates

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Regulation in Denmark from April 2010:

Only filling and cleaning of sprayers

on paved surface with collection of waste water in manure- or other tight tank 50 m from water drilling 50 m from surface water

in the treated field – new place each time 300 m from water drilling 50 m from surface water.

Biobeds with permeable bottom **not** allowed.



Advantages for establishing a biobed with evaporation compared to a closed tank:

You don't have to get rid of the waste water

You don't have to make considerations about pesticide content in the waste water

Disadvantages :

You should maintain the biomix (but you don't have to)

The circulation system has to be maintained.

Covering the biobed at heavy rainfall and in the winter time.



The biobed construction:



Closed system with recirculation and evaporation







Submersible pump:







Level controller;







The new Danish study:

A new construction is tested with circulation of waste water through the biobed and evaporation on the top.

Four different biobeds:

A research biobed with controlled applications

An estate with massive use.

A farm with agriculture and orchard

Mixed use with generel cleaning of equipment.





The research biobed:

Application of 21 different pesticides as formulated products spring and autumn 2010 and spring 2011.

5 g of each pesticide in 100 L water simulating sprayer wash. Sampling and analysis of percolate in tank and biomix.





The three other biobeds:

Analysis of tank water and biomix spring and autumn 2010 and 2011.

| Active ingredient | Туре | Product | Company | |
|--|------|---------------------|-------------------|--|
| Bentazone, 480 gL ⁻¹ | Н | Fighter 480 | BASF | |
| Bromoxynil, 200 gL ⁻¹ | н | Oxitril CM | Bayer CropScience | |
| loxynil, 200gL ⁻¹ | | | | |
| Aclonifen, 600 gL ⁻¹ | н | Fenix | Bayer CropScience | |
| Fluazifop-P-butyl 250 gL ⁻¹ | н | Fusilade X-tra | Syngenta AG | |
| Diflufenican, 500 gL ⁻¹ | н | DFF | Bayer CropScience | |
| lodosulfuron methyl, natrium, 50 gkg ⁻¹ | н | Hussar | Bayer CropScience | |
| Mefenpyr-diethyl, 150 gkg ⁻¹ | | | | |
| MCPA, 750 gL ⁻¹ | н | M-750 | Klarsø & Co. | |
| Metamitron, 700 gkg ⁻¹ | н | Goltix WG | Makhteshim | |
| Pendimethalin, 400 gL ⁻¹ | н | Stomp | BASF | |
| Propyzamide, 500 gL ⁻¹ | н | Kerb 500 SC | Dow | |
| Prosulfocarb, 800 gL ⁻¹ | н | Boxer EC | Syngenta | |
| Terbuthylazine, 500 gL ⁻¹ | н | Inter-Terbuthylazin | Inter Trade | |
| Azoxystrobin, 250 gL ⁻¹ | F | Amistar | Syngenta | |
| Kresoxim-methyl, 500 gkg ⁻¹ | F | Candit | BASF | |
| Prothioconazole, 250 gL ⁻¹ | F | Proline EC 250 | Bayer CropScience | |
| Epoxiconazole, 125 gL ⁻¹ | F | Opus | BASF | |
| Fenpropidin, 750 gL ⁻¹ | F | Tern | Makhteshim | |
| Dimethoate, 500 gL ⁻¹ | I | Danadim Progress | Cheminova | |
| Pirimicarb, 500 gkg ⁻¹ | I | Pirimor G | Syngenta | |



Results:

- 11. May 2010. Application of 21 pesticides.
- 18. May 2010: 1. sampling.
- 31. May 2010: 2. second sampling.

6. June 2010: Biobed flooded after heavy rainfall. Tank level controller not installed and tank overflowed with loss of water from the system.



Some few results - research biobed tank content (µg/L):

| Date: | Tank content | Azoxy strobin | Dimetho ate | Kresoxim- methyl | Meta mitron | Pirimicarb | Propyz amide |
|-----------------------------------|-----------------|------------------|----------------|---------------------|----------------|------------|-----------------|
| 11 May Application 5 g each | 750 L | <1 | <1 | <1 | <1 | <1 | <1 |
| 18 May | 1691 L | 45 | 326 | 1.2 | 111 | 45 | 68 |
| 31 May | 2875 L | 12 | 139 | <1 | 29 | 24 | 25 |



| Date: | Terbuthyl azine | Prosulfo carb | Pendi methalin | Diflu fenican | Mefenpyr- diethyl | Fenpro pidine | Epoxy conazole |
|--|--------------------|---------------------------|-----------------------------|-------------------------------------|----------------------|---------------------------------|-------------------------------------|
| 11 May Application 5 g each | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 18 May | 35 | 31 | <1 | 13 | 22 | 7.7 | 17 |
| 31 May | 16 | 40 | <1 | 2 | <1 | <1 | 3 |
| | | | | | | | |
| Date: | MCPA | Benta zone | Brom oxynil | Fluazifop free acid | loxynil | Prothio conazole | Iodosulfuro n methyl |
| Date: 11 May Application 5 g each | MCPA 2 | Benta zone 1 | Brom oxynil <1 | Fluazifop free acid <1 | loxynil <1 | Prothio conazole <1 | Iodosulfuro n methyl <1 |
| Date: 11 May Application 5 g each 18 May | MCPA 2 599 | Benta zone 1 516 | Brom oxynil <1 204 | Fluazifop free acid <1 477 | Ioxynil <1 39 | Prothio conazole <1 <1 | Iodosulfuro n methyl <1 21 |

Some results from the two other biobeds:

No accumulation of water in the systems

Farm with agriculture and orchardTank water 11 May 2010:Pirimicarb2.4 µg/LTerbuthylazine1Prosulfocarb1.8Epoxyconazole18Bentazone42

Mixed use with general cleaning of equipment:Tank water 20 April 2009:Dimethoate1.7 μg/LTank water 20 November 2010:No detections.



Future work:

Problems with inflow of water to the research biobed MUST be solved.

New pesticide applications autumn and spring

More analyses of water and biomix.

Monitoring water balance in the tanks.

