Bayer Phytobac

Phytobac Manual Part One

An introduction to Phytobac & Biobed systems

Phytobac®
Bayer CropScience

Contents

Legal Disclaimer

Phytobac® is a natural waste recovery and degradation system for non-hazardous pesticide washings designed to work by evaporation. The use of the Phytobac Manuals and results provided by the Bayer Phytobac Calculator is under the user's sole responsibility. The user is solely responsible for making the decision to install the system, sourcing materials for the system, and for its installation. Bayer CropScience Ltd expressly disclaims any liability, and gives no guarantees or warranties and makes no representations express or implied in relation to Phytobac®, except that liability for death or personal injury resulting from the negligence or breach of any contract by Bayer CropScience is not excluded by this provision.

Background

Throughout Western Europe, including the UK, there has been considerable investigation into the amount of pesticides entering waterways and courses. Studies starting from the late 1990's have shown that between 40-70% of the total amount of pesticides in water have come from the sprayer filling area and it is this contamination which is often referred to as 'point source pollution'.
Reducing pollution from these sources is essential and can be achieved by following best practice and adopting the following procedures;

Reduce volume of contaminated liquid by limiting:

- the amount of pesticides used
- pesticide waste created though poor handling procedures
- water entering sprayer filling area by bunding and/or roofing the area
- water leaving sprayer filling area by bunding and containment

Responsibly manage the contaminated liquid by:

- application to land via an Environmental Permit
- removal to suitable waste treatment centre
- treatment by a carbon filtration process
- treatment via a bioremediation process, e.g. biobed, biofilter, Phytobac (roofed biobed)

First Actions

Limiting pesticide use is a first consideration in minimising pollution. The case must be made for application and use must follow a rational and justifiable protocol. If pest or disease thresholds indicate no need to treat then not using a pesticide is a first step in contributing to lower pesticides in waters.

Pesticide Handling

Chemicals are stored in a dedicated store according to best practice. Guidance on chemical storage is given in the HSE leaflet AIS16. Sprayer operators are well trained, and they take all reasonable steps to avoid spillage or accidents. However, operators should routinely review their working practices to minimise splashes and spillages from container handling, emptying, and washing.

The condition of sprayers has improved through the adoption of the National Sprayer Testing Scheme (NSTS). However, small leaks and drips can occasionally occur. These are known as 'hot spots'. Ensuring that the sprayer is kept well maintained will reduce these leaks and subsequent contamination from these 'hot spots' (the Voluntary Initiative supply a sprayer checklist). Early diagnosis of leaks and faults, through regular inspection of the sprayer followed by prompt remedial action will pay dividends.

Reducing Total Contaminated Water Volume

Most sprayer filling areas are located in a fairly open area close to a water supply. This can result in the area being liable to rainwater runoff or being close to drains which can act as pathways for contaminated waters. In addition, the filling area may be subject to other yard traffic which could spread contamination. This makes good practice essential to reduce and manage the potential pollution of spraying operations.

Poor sprayer fill site. Cracked sloping concrete, no control of liquids spilt

Good sprayer fill site. Good control by bunding and separate drainage to a biobed

Where possible, sprayer filling areas should be bunded to limit yard water entry and be sited to prevent contamination from entering drains and watercourses. Ideally, this will be accompanied by roofing the pesticide preparation and handling areas. Roofing and bunding can be integrated to provide a fully dedicated area for sprayer and chemical storage, as well as protected sprayer filling and wash-down area. A sprayer fill area may easily be 7 x 5m and a year's rainfall may thus result in 21m^3 of water falling on this area so the benefits from roofing or covering are clear.

Sprayer equipment wash-down will also produce contaminated waters. The amount may be linked to pressure washer outputs and frequency of the work. Currently this wash-down procedure is recommended in a part of the field previously sprayed at a lower rate, but bioremediation developments and exemptions under the Agricultural Waste Regulations do permit equipment wash-down at a bunded fill site where the output is directed to a bioremediation facility such as a biobed, biofilter or Phytobac.

Containment of Contaminated Waters

Roofed fill area, controlling rainwater inputs, well bunded containment of inadvertent spills and drips

Containment is an essential part of the management of contaminated waters.
The simplest form of this is a raised bund around the fill area. A concrete hump approximately 100mm high, 300mm wide provides a useful barrier to yard flash floods in most situations. This bund is an acceptable compromise between water protection and vehicle access.

Some areas may allow a sunken fill area to be constructed which can provide the same effect as a manufactured bund, particularly where a roof is adopted. Such layouts can also provide significant holding capacity which can accommodate the emergency containment that matches the capacity of the sprayer tank.

A slope of 1:100 should be incorporated into the fill area and the water directed via a silt trap to an optional buffer or storage tank. To comply with government regulations (RP27 – Sprayer or applicator load and washdown area) a buffer tank can have a maximum capacity of 1,500 litres. Combined with a bunded fill area a significant holding capacity can be formed which can accommodate the emergency containment that matches the capacity of the sprayer tank.

To estimate the volume of contaminated water that is produced from washing down your sprayer equipment consider the pressure washer flowrate and the time spent washing down along with frequency.

Dealing with contaminated waters

Permitted Disposal Area

Under landfill regulations the direct disposal of “washings” to soil or grassed areas is illegal. Disposal can only be to areas identified in an Environmental Permit issued by the Environment Agency. This replaces the old ‘Groundwater Authorisation’. Under an Environmental Permit, an area of land will be assessed and designated as suitable for receiving pesticide washings. There may be limits to the quantities and types of spray wastes that are allowed. There will also be an annual fee to maintain the permit.

Waste Collection

Liquids contained from the fill area may be collected by a licensed waste carrier. Such action will be subject to a fee and relevant waste transfer notice. Minimisation of liquid volume produced help manage costs.

Carbon Filtration

For many years it has been possible to install a carbon filtration system (such as the Sentinel) to receive waste spray liquids and reduce their potential to pollute. This system can treat up to 8,000 litres over any 24 hours. It can be operated under a T29 exemption which must be registered with the Environment Agency. The treated output can be disposed to land but this will require an Environmental Permit from the Environment Agency. In addition, the carbon filter and separated ‘sludge’ will need to be removed by a licensed waste carrier and will require a waste transfer note and will involve a fee.

Bioremediation

Currently (2015) there are three approaches offering remediation which are included in the Environment Agency T32 Exemption from the Agricultural Waste Regulations: biobed, biofilter and Phytobac.

All three include the use of natural materials to reduce the polluting potential of waste spray liquids. All have been developed from early work in Sweden where a mixture of straw, soil and compost was shown to lower the pesticide content in waters by between 10,000 and 100,000 times.

You can store or treat up to 15,000 litres of dilute pesticide washings in a 12-month period.

Biobed

A well-constructed lined biobed

This will deal with large volumes of spray waste, up to 15,000 litres per annum plus any rainfall falling on the spray fill area and biobed. Essentially it is a lined, below ground pit, containing a mixture (biomix) by volume of 50% straw, 25% friable soil, 25% compost. Liquids entering the biobed from the fill area and from rainfall pass into the biobed and through the biomix. They are then pumped from a sump within the liner to a neighbouring vegetated area as minor irrigation.
The bioremediation takes place within the biomix. Extensive field trials and use have shown reliable reductions in pesticide levels in the water discharged.

Biofilter

Stacked biofilter from a covered sprayer fill area

Where smaller volumes have to be dealt with a biofilter may be appropriate. This typically consists of 3 x 1,000 litre capacity Intermediate Bulk Containers (IBCs) stacked one above the other with a connection made between the two. Each IBC contains the biomix as used in a biobed. Liquid directed from the filling area is pumped to the highest unit and then drains through the biomix to pass to the next unit below and thus to the lowest unit. This vertical stack has also been shown capable of similar degradation as a biobed and the liquid passing from the lowest IBC is drained or pumped to a vegetative area as minor irrigation.

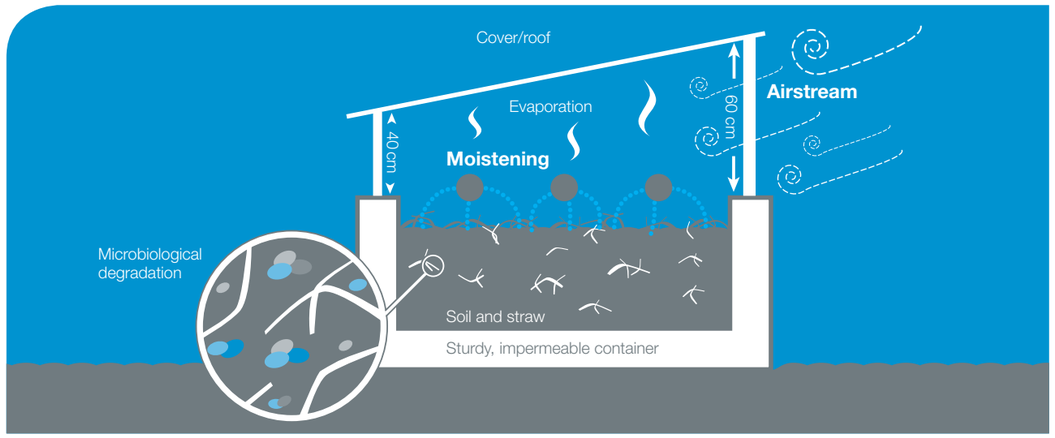
Phytobac

This development has been supported by **Bayer CropScience**. It is essentially similar to a biobed, but is designed as a closed system to ensure that no liquid is discharged from the unit at the end of bioremediation. This is achieved by enhancing evaporation from the unit.

The Phytobac contains a biomix (70% top soil and 30% straw by volume) normally within a concrete chamber, either above or below ground, which has a roof to prevent rainfall entry and enhance evaporation. The roof is mounted to promote good ventilation through the air space above the biomix.

All liquids collected from the bunded fill area are directed via gravity or a pumped system to the Phytobac.

The bioremediation takes place within the biomix. Extensive field trials and use have shown reliable reductions in pesticide levels.



Further Information

- Sprayer checklist, biobeds, biofilters and best practice advice can be found through the Voluntary Initiative http://www.voluntaryinitiative.org.uk
- Government Regulations can be found at www.gov.uk
- To find out more on Catchment Sensitive Farming and find your local officer visit https://www.gov.uk/catchment-sensitive-farming-reduce-agricultural-water-pollution
- Information on the safe storage of pesticides can be found in the Health and Safety Executives Agriculture Information Sheet AIS16
- Information on how to construct a phytobac:
  Phytobac Manual: Part Two, Phytobac Construction and Operation
  is found through www.bayercropscience.co.uk

Glossary

Agricultural Waste Regulations: Waste exemption: T32 treatment of waste in a biobed or biofilter. GOV.UK: Part of Business, Waste environment, Environmental regulations. This exemption allows you to treat non-hazardous pesticide washings in a biobed or biofilter. The treated washings can be re-used and the biobed material (biomix) can then be spread on land (under an exemption) for agricultural or ecological benefit.

Anaerobic: An environment without air, reducing or stopping the rate at which contaminants are metabolised or broken down.

Biomix: An organic mixture (by volume) of 70% topsoil and 30% straw in a Phytobac and 50% straw, 25% friable soil and 25% compost in a biobed.

Bioremediation: The breakdown of contaminants through microbial activity.

Carbon Filtration: A method to remove contaminants and impurities by filtering through a bed of activated carbon which traps the pollutant molecules.

Enhanced Evaporation: Reducing the amount of liquid in the biomix by exploiting the air flow and heat transfer created by the Phytobac roof.

Environmental Permit: Authorisation by the Environment Agency for businesses that produce waste emissions that pollute the air, water or land. GOV.UK: Part of Environment and countryside, Recycling and waste management.

Hot spots: areas on and around a sprayer and pesticide handling area where there is a high chance of leaks, drips or spills which could result in the release of contaminants.

Point Source Pollution: Pollution arising from an identifiable and localised area, structure or facility, such as discharge pipe, landfill or foil from a pesticide container.

Washings: contaminated water created from cleaning a sprayer after use.

Waste exemption: U10 spreading waste to benefit agricultural land. GOV.UK: Part of Business, Waste environment, Environmental regulations. This exemption allows you to spread specific waste on agricultural land to replace manufactured fertilisers or virgin materials such as agricultural lime used to improve or maintain soil.

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Bayer CropScience and **sustainable agriculture**

With a rapidly growing global population, crop protection and seeds have an increasing role to play in helping our farmers produce more food.
We are currently reinvesting more than 10% of our sales into developing new plant protection products, seeds and traits, keeping **Bayer CropScience** at the forefront of sustainable agriculture. This is combined with our extensive stewardship activities and a growing number of AgriServices such as pest forecasting systems and agronomy apps for smartphones and tablets.

The Phytobac system is one example of how **Bayer CropScience** looks to promote the very best in environmental stewardship and sustainable agriculture.
For more information visit our website or call Bayer Assist.

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