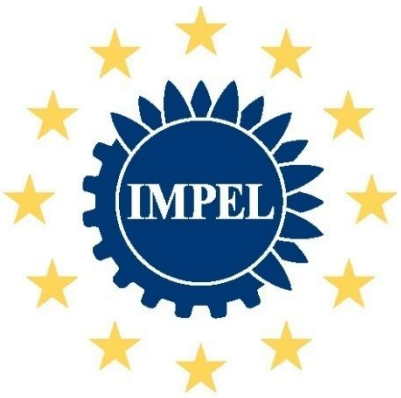
Inspection guidance book for intensive piggeries.

A practical book with guidance on activities on a pig farm.

Final report: March 13th 2013



European Union Network for
the Implementation and Enforcement
of Environmental Law

Introduction to IMPEL

The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an international non-profit association of the environmental authorities of the EU Member States, acceding and candidate countries of the European Union and EEA countries. The association is registered in Belgium and its legal seat is in Bruxelles, Belgium.

IMPEL was set up in 1992 as an informal Network of European regulators and authorities concerned with the implementation and enforcement of environmental law. The Network's objective is to create the necessary impetus in the European Community to make progress on ensuring a more effective application of environmental legislation. The core of the IMPEL activities concerns awareness raising, capacity building and exchange of information and experiences on implementation, enforcement and international enforcement collaboration as well as promoting and supporting the practicability and enforceability of European environmental legislation.

During the previous years IMPEL has developed into a considerable, widely known organisation, being mentioned in a number of EU legislative and policy documents, e.g. the 6th Environment Action Programme and the Recommendation on Minimum Criteria for Environmental Inspections.

The expertise and experience of the participants within IMPEL make the network uniquely qualified to work on both technical and regulatory aspects of EU environmental legislation.

Information on the IMPEL Network is also available through its website at:
www.impel.eu

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Executive summary:

This IMPEL project was a two year project. During these two years we have been building up a network of inspectors and permitters. We used IMPEL's internal project management system, 'Basecamp' for the exchange of information. During two years almost all member states participated in activities and the pig farm project is a well known project in the IMPEL network.

During workshops the exchange of 'in-the-field' experiences was very important. We used the form of case-studies and story-telling. After the workshop in 2011 we started to work on the first draft of the guidance. We started to work in a way that the guidance-document should be more standard for other IMPEL projects. Therefore consultant for pig farm-project and landfill-project contacted each other. The guidance document is a document in progress. A document that can be used by all inspectors and permitters, and also can be completed by all inspectors and permitters based on real life cases. It is an important recommendation to IMPEL to explore this opportunity.

This guidance document is a separate document. Also available at the IMPEL website is a report from this project.

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SUMMARY

The guidance book is the result of the collaboration of the countries represented in the IMPEL project “Improving permitting and inspection of IPPC pig farming installations”. The aim of the project is to develop practical tools for IPPC pig farm inspectors.

The structure of the book is based on activities on a pig farm. This fits the daily practice on a pig farm and a regular inspection on a pig farm.

Rearing of pigs has a great variety within Europe. The housing can consist of confined buildings for rapid standardised production to outdoor extensive production, as well as all other forms of organisation in between. But also, large pig farms have a lot of activities in common. The focus of the guidance is on these common activities.

Five main environmental issues are selected: manure storage, manure spreading on land, animal housing systems, air abatement techniques and odour assessment.

European legislation is applicable on large pig farms. Most important is the IED, which contains regulation for IPPC installations. The minimum amount of pigs in the IED is 2000 productions pigs or 750 sows. The IED contains requirements on environmental inspections. Also, de IED demands IPPC installations use the Best Available Techniques (BAT), which are in the Bref document “Intensive rearing of poultry and pigs”. For most pig farm activities a BAT can be defined and is given in this guidance. This helps inspectors to find their way in the complicated and elaborate Bref document.

Inspection preparation includes the collection of information and the study of the available drawings, maps and technical information. Inspectors also study connected legislation and guidelines (if they are available). The visit consists of two parts. One part will examine the documents, reviews and records in the installation office, the other part will take place during the check of the installation. Checklists and main questions for inspection from this guidance can be used for all inspection steps.

1. INTRODUCTION

1.1 Purpose and context

This guidance book is written for inspectors that are responsible for the inspection of IPPC pig farms. The guidance is intended for all inspectors in the European Union. The guidance is produced with great care and with attention to details and taking into account the different legislations of the European countries. The content of this guidance book is therefore not a complete overview of the legislation on a pig farm, but is intended as a helpful tool to understand the regulation on an European level (the IPPC-legislation) and in the context of the daily practice on a farm.

The guidance book is also helpful for inspectors with limited experience of inspecting pig farms (IPPC and not –IPPC). It gives a first understanding of the activities on a pig farm, their environmental impact and execution of the techniques.

1.2 Working method followed

The guidance book is the result of the collaboration of the countries represented in the IMPEL project “Improving permitting and inspection of IPPC pig farming installations”. The project team initiated the book by writing the different chapters and paragraphs in draft. Subsequently, a final workshop was organized. All cooperating impel members were invited to participate in this workshop. During this workshop, the guidance book has been edited and completed. This means that all the workshop members, from 12 EU member states[1] , worked on the content of this guidance book and gave their professional input.

1.3. Structure of the Guidance Book

The structure of the book is based on activities on a pig farm. This fits the daily practice on a pig farm and to a regular inspection of a pig farm. The content in the activity paragraphs focus on the environmental importance of the activity, what is written in the Bref on this activity (BAT), how the activity is executed (constructed and/or organised) and the main questions on inspection. The main questions form a general checklist on the specific activity. One paragraph, on general environmental performance, is about the whole farm and not one farm activity in particular.

The first three chapters are on the sector, key environmental issues and legislation. These chapters give a good understanding of the importance of the pig farming as a whole and in relation to the environment and its regulations.

The other chapters in the guidance book focus on the inspection itself. It is divided into inspection preparation, general tips for the actual inspection on the farm and duties after inspection.

[1] Estonia, Latvia, Lithuania, Poland, Netherlands, UK (England, Northern Ireland), France, Portugal, Italy, Cyprus, Romania, Slovenia

2. SECTOR DESCRIPTION

Pig farming is organised in a more or less sophisticated way, based on the production cycle.

Pig farming organisation is divided into two parts:
1. Farrowing sows for the production of weaned piglets and then
2. Their rearing, as future breeding animals or as pigs for slaughtering.

In a non-organised sector the genetic selection is managed within each herd, with the breeding animals being kept from the grown pigs (gilts) or purchased outside (boars) and used for natural service.

In a more sophisticated organisation the breeding animals are produced in specialised farms taking part in a thorough selection scheme (nucleus-multipliers-breeders). The sows are usually inseminated artificially and patch farrowed. Depending on the efficiency of the selection scheme, the pig fattening performance is improved. The functions of breeders, farrowers and fatteners can be combined and the fattening can be divided into growing and finishing. The housing of pigs may vary from confined buildings for rapid standardised production to outdoor extensive production, as well as all other forms of organisation in between. [source: Statistics in focus, Agriculture and fisheries Eurostat, 8/2010]

Pig production is commonly divided into breeding sows (dry or mating, pregnant or gestating and farrowing sows) and fattening pigs where post-weaning (from 4 – 6 weeks of age up to 20 –30 kg of live weight), growing (to around 60 kg) and finishing phases can be distinguished. One farm can have a closed system (from farrow to finish) or can be specialised in one part of the cycle.

Sows are group housed until farrowing when commonly they are individually penned: they can be equally kept on slatted or bedded floors, producing hence liquid or solid manure. Growing pigs are more often reared on slats in groups of 20 to 100, producing liquid manure. Buildings are increasingly modern and forced ventilation is used with dedicated heating for the very young piglets. [source: Bref IRPP 2003] , http://eippcb.jrc.ec.europa.eu/reference/BREF/irpp_bref_0703.pdf.

3. KEY ENVIRONMENTAL ISSUES

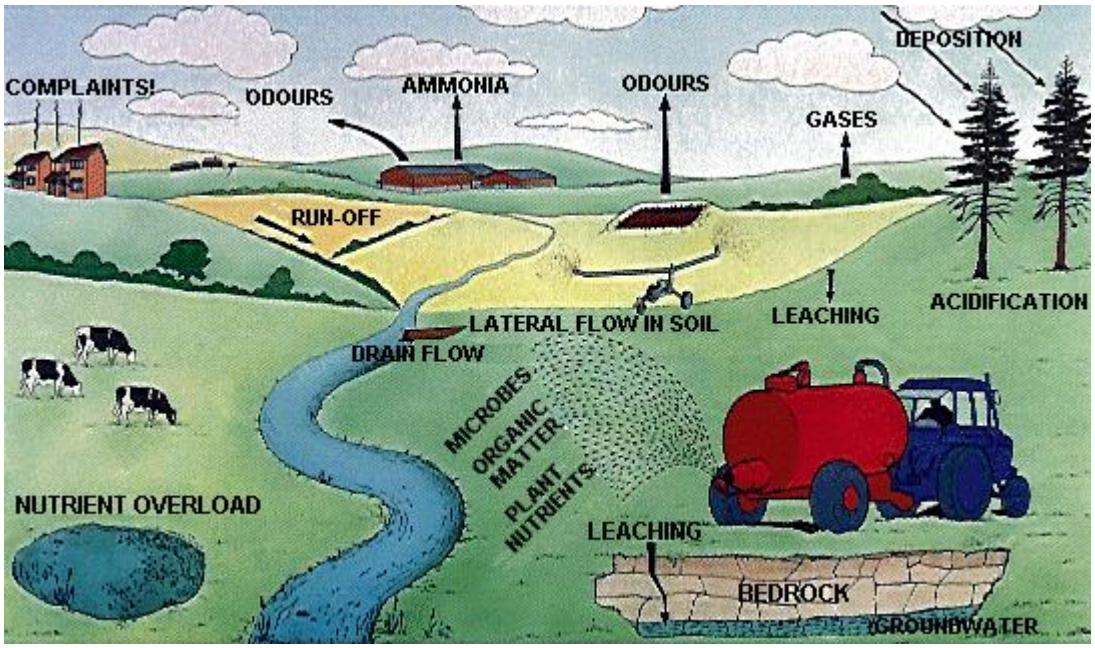


Figure 2: Illustration of environmental aspects related to intensive livestock farming
source: Bref IRPP 2003

In the IMPEL Project "Comparison Programme on Permitting and Inspection of IPPC Pig Farming Installations in IMPEL Member Countries," five key environmental issues were selected as most important:

- **Manure storage**: including issues of capacity, leakage, protection of water.
- **Manure spreading on land**: determining conditions for spreading, protection of surface and ground waters (interaction of IPPC with other regulations).
- **Animal housing systems**: impacts of different housing types on emissions, meeting requirements in the IPPC Best Available Techniques (BAT) Reference Document (BREF).
- **Air abatement techniques**: end of pipe techniques to control emissions, such as scrubbers and bio-filters.
- **Odour assessment**: including public interaction and measures to reduce odour (other than housing and abatement techniques).

These key environmental issues are important to keep in mind while making an inspection plan.

4. LEGISLATION

IED/IPPC

The IED is the successor of the IPPC Directive and in essence, it is about minimising pollution from various industrial sources throughout the European Union. The text of the Directive is available in all Member States languages.
See: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32010L0075:EN:NOT

The IED is based on several principles, namely (1) an integrated approach, (2) best available techniques, (3) flexibility, (4) inspections and (5) public participation.

The IED contains mandatory requirements on **environmental inspections**. (article 23) According to this article, Member States shall set up a system of environmental inspections and draw up inspection plans accordingly. The IED requires a routine site visit shall take place at least every 1 to 3 years, using risk-based criteria. Beside this, non-routine environmental inspections should be carried out in order to investigate as soon as possible serious complaints, accidents and occurrences of non-compliance. And where appropriate, before the granting, reconsideration or update of a permit.

Article 23 also contains requirements about the follow up of the inspection. An inspection report is obliged and should contain findings regarding compliance with the permit and conclusions whether any further action is necessary. The report shall be notified to the operator within 2 months of the site visit taking place. Within 4 months the report must be made publicly available[2]. Note that there is a difference between publicly available in a active way, like publish on the internet, or in a passive way, like an archive in a public hall.

And final in accordance with the IED the competent authority shall ensure that the operator takes all the necessary actions identified in the report within a reasonable period.

Thresholds

The primary regulatory focus of this guidance book are intensive farms with a capacity above IED (IPPC) thresholds.
These thresholds for pig farming can be found in Annex I of the IED Directive:

6.6. Intensive rearing of poultry or pigs: (a) with more than 40 000 places for poultry;(b) with more than 2 000 places for production pigs (over 30 kg), or (c) with more than 750 places for sows.

However, it is usually not possible to consider the Directive in isolation. This is for the following reasons:

- The IED Directive applies to pig farms above a specified capacity. However, some Member States also apply the same or similar approaches to pig farms below this capacity.

[2] in accordance with Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information OJ L 41, 14.2.2003, p. 26.

- Some aspects of pig farming, particularly, manure spreading, may be difficult to include within IED regulation and are addressed under other regulatory regimes.

While some Member States establish specific regulatory regimes for different issues (or to implement different EU Directives), others have adopted approaches to bring regulatory regimes together.

As stated above, IED applies to pig farms above a specific threshold (determined by animal numbers). However, a number of Member States do not limit their regulatory activity to these farms.
It is, therefore, important for the reader to take these comments on the regulatory framework into account through the rest of this guidance book which, while focused on IED, is not limited to this particular item of legislation. [source: impel report piggeries 1]

Installation

The IED Directive applies to industrial sites. To define what is part of the industrial site the Directive talks about "installations". The definition of a installation is:

> 'installation' means a stationary technical unit within which one or more activities listed in Annex I or in Part 1 of Annex VII are carried out, and any other directly associated activities on the same site which have a technical connection with the activities listed in those Annexes and which could have an effect on emissions and pollution;

For farms it is not always easy to define what is a part of the installation and what not. The housing system for pigs forms the major part of a pig farm installation. Outside the housing, manure storage, installations for manure treatment and storage for instance feed or fertilizer are in most cases also part of the installation. The fields where the manure from the pigs is spread are usually not considered as part of the installation. Despite this, the BREF intensive rearing of poultry and pigs includes some techniques that are not always applied on installations covered by the Directive, like land spreading techniques. The reason for considering land spreading in the Bref is to prevent the benefits of a measure applied by a farmer to reduce emissions in the beginning of a chain being cancelled out by later applying poor land spreading management or techniques at the end of the chain.

Relation to Habitat Directive

In some European regions with a large concentration of intensive animal husbandry the emissions of ammonia (NH3) to the atmosphere create severe risk to not realize the targets mentioned in the Habitats Directive (HD). Purpose of the HD is to protect certain with extinction endangered species and habitats, to protect biodiversity and to conserve a valuable area of nature in Europe.

In the southern and eastern parts of the Netherlands the concentration of ammonia en nitrogen oxides (NOx) is a serious problem for realising these purposes. The Habitats Directive is in the Netherlands translated in national legislation. In the concerning parts of the Netherlands this legislation is elaborated in provincial and regional rules. These rules require large reduction of ammonia emissions and result in very strict nature permits for intensive animal farming. Frequently larger reduction of ammonia emissions is required than could be asked on base of the IED. Mostly end of pipe solutions, like air-scrubbers, are used to reduce the emissions. In the concerning regions

a lot of effort on supervision and enforcement is invested to secure that these ammonia removing techniques operate well.

5. MAJOR ACTIVITIES

5.1 Pigs in housing

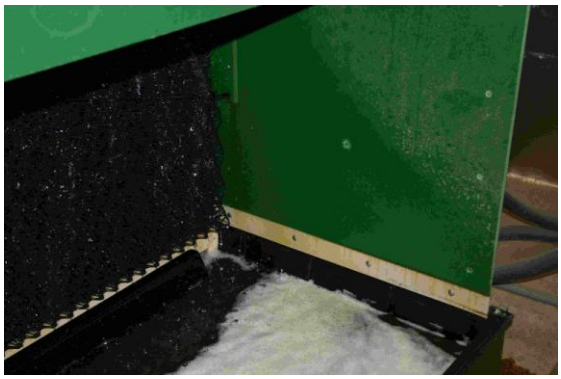
Environmental importance

The housing system for pigs determines the largest part of the ammonia and odour discharge from the pig farm. Housing is also a source of other emissions, like (fine) dust, nitrous oxide (N_2O) and methane (CH_4). Emissions are discharged from the ventilation output.

Relation to IED/Bref

The housing system is always part of the “installation”. The largest part of the Bref is about housing techniques. For sows, weaners and finishers there are several systems that are BAT.

Some systems are too expensive to become general BAT. Therefore these systems, like air scrubbers, are only BAT when the operator applies for the air scrubber himself. This can be the case when very high ammonia, odour or dust reductions are necessary for the protection of the local surroundings. For operators an air scrubber is then a relatively affordable way to obtain their permit. According to the Directive the authorities should take the specific local characteristics into account.



air scrubber

Execution

The execution of the housing system is different for sows, weaners and finishers. Housing systems mainly vary based on the proportions of fully-slatted (FSF), partly-slatted (PSF) or solid (concrete) floors (SCF) and on the use of straw or other litter. Slats can be made of concrete, metal (mostly iron) or plastic and have different shapes (e.g. triangular).

Plastic slats (source: AgriCONSTRUCT ilvo.vlaanderen.be)

Chapter 4 from the Bref intensive rearing of poultry and pigs (Bref IRPP) describes a variety of different kind of housing systems. Which type is most commonly used differs between countries. In the northern part of Europe it is common to use manure basements under a (partly) slatted floor. In the more southern part of Europe, manure is more often quickly removed from the housing system and stored in outside storage (with or without separation of the solid and liquid parts).

Ammonia reduction in BAT techniques is based on techniques. Those techniques are:

- nutritional measures to reduce the amount and the N content of manure
- control of the indoor housing climate
- optimisation of pig housing design

In housing design ammonia can be reduced by (a combination of) the floor system, manure collection and the manure removal system. The housing systems described in the Bref involve some or all of the following principles:

- reducing emitting manure surfaces;
- reducing the manure (slurry) permanence indoors and removing manure from the pit or channelling to an external storage;

Manure channel, with triangular metal slats (source: AgriCONSTRUCT ilvo.vlaanderen.be)

- applying an additional treatment, such as aeration, to obtain flushing liquid;
- cooling the manure surface;
- changing the chemical/physical properties of the manure, such as decreasing the pH;
- using surfaces which are smooth and easy to clean.

group housing on partly slatted floor

Usually pig farms use forced ventilation. Emissions are released from the ventilation outputs witch are usually equally scattered on the roof of a pig farm. By concentrating the ventilation output or raise the ventilation output speed, it is possible to disperse the waste gas more. This improves the air quality (odours and dust) at nearby houses.

Main questions for inspection

Which ammonia reduction technique is used? (feeding measures, climate control, housing design)
Which ammonia reduction principles in the housing design are used?
Are these reduction principles executed in the right way? (e.g. are channels present, are aeration nozzles installed etc?)
Are the reduction techniques used in the right way? (e.g. regularly cleaning or flushing, pH decreasing substance added, cooling principles used etc)
Are feed additives administrated?
If odour complaints occur: are possibilities present to optimize ventilation output?

5.2 Manure storage (slurry, outside the housing system)

Environmental importance

Slurry storage can be a source of ammonia and odour emissions, especially from the surface of the storage. Leakage of nutrients to the ground or surface water also needs attention.

Emissions of manure storage depend on a number of factors:

- chemical composition of manure/slurry/compost
- physical characteristics (DM %, pH, temperature)
- emitting surface (size, crusts, covers)
- climatic conditions (ambient temperature, rain)
- use of covers.

While initially storing slurry, some NH3 is emitted from the surface layer, but later, the impoverished surface layer blocks evaporation. Losses from slurry storage continues at a relatively steady pace throughout the storage period.
Stirring will raise the dry matter to the surface and increase the evaporation of NH3, thereby causing peaks in air emissions.

Relation to IED/Bref

Storage tanks

BAT on the storage of slurry in a concrete or steel tank comprises all of the following:

- a stable tank able to withstand likely mechanical, thermal and chemical influences
- the base and walls of the tank are impermeable and protected against corrosion
- the store is emptied regularly for inspection and maintenance, preferably every year
- double valves are used on any valved outlet from the store
- the slurry is stirred only just before emptying the tank for, e.g., application on land.

It is BAT to cover slurry tanks using one of the following options:

- a rigid lid, roof or tent structure, or
- a floating cover, such as chopped straw, natural crust, canvas, foil, peat, light expanded clay aggregate (LECA) or expanded polystyrene (EPS).

All of these types of covers are applied but have their technical and operational limitations. This means that the decision on what type of cover is preferred can only be taken on a case by case basis [source: Bref 2003 http://eippcb.jrc.ec.europa.eu/reference/BREF/irpp_bref_0703.pdf)


Storage lagoons

A lagoon used for storing slurry is equally as viable as a slurry tank, providing it has an impermeable base and walls (sufficient clay content or lined with plastic) in combination with leakage detection and provisions for a cover.

It is BAT to cover lagoons where slurry is stored using one of the following options:

- a plastic cover, or
- a floating cover, such as chopped straw, LECA or natural crust.

All these types of covers are applied but have their technical and operational limitations. This means that the decision on what type of cover is preferred can only be taken on a case by case basis. In some situations it might be very costly, or technically not even possible to install a cover to an existing lagoon. The cost for installing a cover can be high for very large lagoons or lagoons that have unusual shapes. It might technically be impossible to install a cover when, for example, embankment profiles are not suitable to attach the cover to. [source: bref 2003].

Manure bags

The Bref doesn't mention BAT for plastic storage bags. Compared to the BAT's for tanks and lagoons a good practice for manure bags is:

- The plastic is impermeable and can resist corrosive fluids.
- the bag is emptied regularly for inspection and maintenance, preferably every year
- double valves are used on any valved outlet from the store

Execution

Slurry consists of excreta produced by livestock in a yard or a building mixed with rainwater and wash water and, in some cases, with waste bedding and feed. Slurry may be pumped or discharged by gravity.

Slurry can be stored for long periods of time in a storage facility under the animal house, but in general, inside storage is temporary. Usually manure is regularly removed to an outside storage facility in the farmyard. Storage facilities are built to have a minimum capacity to guarantee sufficient storage until further manure handling is possible or allowed. This varies from 3 months in a Mediterranean climate up to 12 months in the Nordic countries. A commonly used storage capacity is 6 months. Large slurry tanks can easily contain 2000 m^3 or more.

Slurries are usually stored in tanks made of concrete or steel panels above or below ground. Also deep pit storage within the housing and external lagoons is still in common use. Only in some countries (e.g. NL, DK) the storage facilities are generally covered by tents or roofs. Open storage is still very widespread along with the use of natural or artificial crust forming.

The following types of manure storage systems are commonly applied:

Above ground or underground slurry tanks:

Concrete manure storage with cover

slurry bags:

manure bag (source: www.corvanderspek.nl)

Earth-banked stores or lagoons (waterproofed with a geomembrane):

Lagoon

Main questions for inspection

Is the storage covered?
In what condition is the storage?
Is the storage regularly inspected by an expert? If yes, is there a report?
Does regularly maintenance take place?

Is the manure in the storage regularly stirred or only before emptying?

5.3 Manure spreading on own land

Environmental importance

Manure spreading has impact on air, soil and water. Importance of impact depends on the parameters and the environment impacted. The emissions of ammonia to air caused by land spreading can be reduced through the selection of the right equipment.

One can summarise the main impacts as follows:

Polluting substances due to spreading

Environment	importance	parameter	observation
Air (direct introduction)	1	ammonia and other nitrogen compounds (oxides of nitrogen)	BAT Section 2.7.2.1 spreading equipment
	2	Volatile organic compounds (odour)	BAT Section 2.7.2.1 spreading equipment (associated element to ammonia)
Soil(indirect introduction)	1	Substances which contribute to eutrophication (in particular phosphates)	BAT Section 2.7.2.1 spreading equipment
Water (indirect introduction)	1	Substances which contribute to eutrophication (in particular, nitrates and phosphates)	BAT Section 2.7.2.1 spreading equipment

Relation to EU directives and the BREF document

The industrial emission directive in its sixteenth point provides that the spreading of manure contributes significantly to emissions of pollutants into air and water. In this directive (2010/75/EU), the Commission has therefore established the compulsory use of the best available techniques (BAT). The link between inspection and compliance to the BREF document is hence mandatory (directive article 11 b).

The BREF document indicates that the main environmental impacts relate to ammonia emissions to air, and nitrogen and phosphorus emissions to soil, to surface water and groundwater, and result from the manure from the animals.

Conditions in the permit regarding spreading

As there is no emission limit values in the BREF document for pig farming, they should be replaced by technical measures ensuring an equivalent level of environmental protection (directive article 14.2), that is to say the permit should contain appropriate requirements ensuring protection of the soil and groundwater and measures concerning the monitoring and management of waste generated by the installation (directive article 14.1.b).
The appropriate requirements are described below. In some countries, the manure is not spread near the farm and is not part of the installation (see chapter on Legislation). The requirements below should be regulated in another way. (For instance the "Manure Act" in the Netherlands).

Requirement in the BREF document

Spreading management:

- Plan the application of manure to land properly (Section 4.1.3).
- Keep records of field applications of inorganic fertiliser and manure

There are different stages in the process, from pre-production of the manure, to post-production and finally spreading on land, where emissions can be reduced and/or controlled. The different techniques that are BAT and that can be applied at the different stages in the process are listed below. However, the principle of BAT is based on doing all the following four actions:

- applying nutritional measures
- balancing the manure that is going to be spread with the available land and crop requirements and – if applied – with other fertilisers
- managing land spreading of manure, and only using the techniques that are BAT for the spreading of manure on land and – if applicable – finishing off.

BAT is to minimise emissions from manure to soil and groundwater by balancing the amount of manure with the foreseeable requirements of the crop (nitrogen and phosphorus, and the mineral supply to the crop from the soil and from fertilisation). Different tools are available to balance the total nutrient uptake by soil and vegetation against the total nutrient output of the manure, such as a soil nutrient balance or by rating the number of animals to the available land. BAT is to take into account the characteristics of the land concerned when applying manure; in particular soil conditions, soil type and slope, climatic conditions, rainfall and irrigation, land use and agricultural practices, including crop rotation systems.

BAT is to reduce pollution of water by doing in particular all of the following:

- not applying manure to land when the field is:
  - water-saturated
  - flooded
  - frozen
  - snow covered

- not applying manure to steeply sloping fields
- not applying manure adjacent to any watercourse (leaving an untreated strip of land), and spreading the manure as close as possible before maximum crop growth and nutrient uptake occurs.

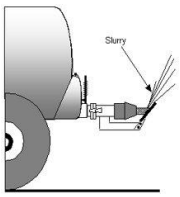
BAT is managing the land spreading of manure to reduce odour nuisance where neighbours are likely to be affected, by doing in particular all of the following:

- spreading during the day when people are less likely to be at home and avoiding weekends and public holidays, and
- paying attention to wind direction in relation to neighbouring houses.

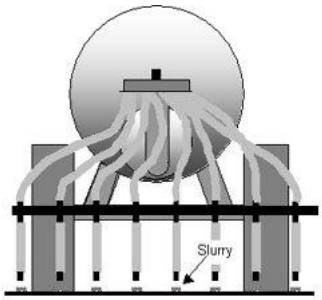
Manure can be treated to minimise odour emissions which can then allow more flexibility for identifying suitable sites and weather conditions for land application.
BAT concerning the equipment for land spreading pig manure and poultry manure is discussed in Sections 5.2.7 and 5.3.7 respectively.

Spreading equipment for pig manure:

The reference technique is a conventional broadcast spreader, not followed by fast incorporation.



. Generally, land spreading techniques that reduce ammonia emissions also reduce odour emissions.



Land use	BAT	Emission reduction	Type of manure	Applicability
grassland and land with crop height below 30 cm	trailing hose (bandspreading)	30 % this may be less if applied on grass height >10 cm	slurry	slope (<15 % for tankers; <25 % for umbilical systems); not for slurry that is viscous or has a high straw content, size and shape of the field are important
mainly grassland	trailing shoe (bandspreading)	40 %	slurry	slope (<20 % for tankers; <30 % for umbilical systems); not viscous slurry, size and shape of the field, grass less than 8 cm high
grassland	shallow injection (open slot)	60 %	slurry	slope <12 %, greater limitations for soil type and conditions, not viscous slurry
mainly grassland, arable land	deep injection (closed slot)	80 %	slurry	slope <12 %, greater limitations for soil type and conditions, not viscous slurry
arable land	bandspreading and incorporation within 4 hours (*)	80 %	slurry	incorporation is only applicable for land that can be easily cultivated, in other situations BAT is bandspreading without incorporation
arable land	incorporation as soon as possible, but at least within 12 hours	within: 4 hrs: 80 % 12 hrs: 60 – 70 %	solid pig manure	only for land that can be easily cultivated

Main questions for inspection

Is the operator using the best available techniques for spreading ?
If not, can they justify the use of alternative techniques providing the same level of environmental protection?
Is the manure spread at the right time/season?
Has the operator carried out the mandatory periodic monitoring at least once every 5 years for groundwater and 10 years for soil?
If not, has the operator based its monitoring on a systematic appraisal of the risk of contamination?

- Is a spreading map (showing areas where spreading is recommended/possible with caution/forbidden) available and updated?
- Has the farmer a spreading plan, containing:
    - the foreseeable requirements of the crop (nitrogen and phosphorus, and the mineral supply to the crop from the soil and from fertilisation).
    - The right nutriment amount balanced with the above requirement.

5.4 Transportation

Environmental importance

The main environmental issues in transportation are noise and air quality. Since the intensity of transportation for a farm is very low, the air quality risk is negligible. Feed delivery vehicles should be covered to minimise dust emissions. Noise can be a problem when transportation takes place during night time and houses are nearby. This could include activities such as delivery of animal feed materials, transportation of livestock, etc. In order to avoid complaints about noise the permit should have limiting values for night and daytime.

Noise can be minimised by locating feed bins or feed storage silos as far away as practical from houses and other sensitive properties, organising feed bin locations to reduce delivery vehicle movement on site and avoiding long conveyor distances, and minimising the number of bends on fixed pipes so that the maximum unloading rates can be achieved (to minimise noise duration).

Execution

The scale of transport operations on farms depends on farm size, farm layout and the location of fuel stores, feed stores and feed processing, livestock buildings, product processing, manure storage and fields for applying manures to land.

Feed is usually mechanically or pneumatically handled. Typically, tractors are used as the prime mover for manure transport and spreading, although on some pig units slurry irrigation using pumps and pipelines is practiced.

Many farmers use contractors who typically use larger equipment, especially for spreading manure.

Main questions for inspection

-Are houses or other noise sensitive receptors (besides the own farmhouse) nearby?

-Are there any complaints about noise from the farm?

-In case of noise complaints: Are possibilities present on the farm to reduce noise like change driving route, delivery times during day, use of less noisy vehicles; replace silo's, turn of engines?

-How many night transportations take place in a year? Is this more than described in the permit?

(It may be necessary to measure sound if there have been noise complaints.)

-Are feed delivery vehicles covered to minimize dust emissions?

5.5 Feed storage

Environmental importance

The environmental issues for feed storage are noise, odour, dust and water pollution. Noise is linked to transportation, but also contains the offloading of dry feed into silos. Dry matter storage can also cause dust problems. Odour problems are only related to wet feed. For more information on wet feed, see the paragraph on feed mixing. The storage of liquid feed materials has the potential to cause water pollution.

Execution

There are many different designs of silos and materials used. They can be flat at the bottom to stand on the ground or conical, resting on a supporting construction. Sizes and storage capacities are numerous. Nowadays, they are often made of polyester or similar material and the inside is made as smooth as possible to prevent residues from sticking to the wall. For liquid feed, materials (resins) are applied to resist low pH products or high temperatures.

Silos are usually equipped with a manhole for internal inspection and a device for air venting or relieving overpressure during filling.

Equipment is also applied for aeration and the stirring of the contents (especially soya) and to allow smooth transport of the feed out of the silo.
No particular techniques have been reported for a reduction of air emissions from feed storage.
In general, dry matter storage facilities might cause dust emissions, but regular inspection and maintenance of the silos and the transport facilities, such as valves and tubes, can prevent this.
Blowing dry feed into closed silos minimises dust problems.
Every few months a silo should be fully emptied to allow inspection and to prevent any biological activity in feed. This is particularly important in summer to prevent deterioration of feed quality and to prevent a development of odorous compounds.
Mixing of liquid feed materials can give rise to odours, for example yeast. It is therefore important that storage tanks are covered and frequency of mixing is limited in order to minimize odour emissions.
The storage of liquid feeds present a potential risk for pollution to water and therefore some degree of secondary containment and collision protection is recommended. For example, the installation of a leak collection system.

Main questions for inspection

Are houses nearby that are sensible for dust and noise?
If so, are dust problems visible like dirty pipes and surrounding?
Are feed storages regularly inspected by the operator, in particular for liquid feed storage?
Do liquid feed storage tanks have a leak collection system and are these impermeable/ leak proof.
Are liquid feed storage tanks/silos covered? Is the mixing of these tanks/silos minimised to reduce potential odours (rain and flies)?
Are measures taken to prevent flies at liquid feed storage?

Example of silos built close to the housing (UK) (source Bref Draft 1, 2011)

5.6 Feed mixing

Environmental importance

The composition and supply of pig feed is a key factor in the reduction of emissions to the environment from pig farming. Reducing the excretion of nutrients (N, P) in manure can reduce emissions. Diets that are not properly balanced can lead to a waste of excreted nutrients that turns into economic and environmental losses. The goal of nutritional techniques is to feed animals with an exact level of required nutrients (in particular N and P) to aim for the minimum excretion level that cannot be avoided due to the metabolic activity of the pig. [Source: Bref http://eippcb.jrc.ec.europa.eu/reference/BREF/irpp_bref_0703.pdf] .

Execution

Many on-farm activities involve the processing and storage of feed. Many farmers obtain feed from external producers. Large enterprises produce the majority part of the basic ingredients themselves and purchase some additives to produce the feed mixtures.

Processing of feedstuff consists of grinding or crushing and mixing. Mixing the feedstuff to obtain a liquid feed is often done shortly before feeding the animals, as this liquid cannot be stored for a long period of time. Grinding and crushing are time consuming and require a lot of energy. Other energy-consuming parts of the installation are the mixing equipment and the conveyor belts or air pressure generators used to transport the feed.

Feed processing and feed storage facilities are usually located as close as possible to the animal housing. Feed produced on the farm is usually stored in silos or sheds as dry cereals; gas emissions are then limited to the emission of carbon dioxide from respiration.

Industrial feed can be wet or dry. If dry it is often pelleted or granulated to allow for easier handling. Dry feed is transported in tanker lorries and unloaded straight into closed silos, therefore dust emissions are usually not a problem. Where dry feed is unloaded into open intake areas the use of equipment like feed ‘socks’ can reduce dust emissions.

Feeding of pigs is aimed at supplying the required amount of net energy, essential amino acids, minerals, trace elements and vitamins for growth, fattening or reproduction. Pig feed formulation is a complex matter, combining many different components in the most economicalway. Different factors influence the composition of a feed.

The inclusion of certain feed additives (for example Yucca Extract) claim to reduce the emissions of ammonia and odour.

Feeding systems can be linked with the feeding practice and feeding practice is normally linked with pig production type.
Feeding can vary from fully hand-operated to fully mechanized and automated systems.
The rationing of the mixture can be done automatically based on weighing the exact amounts or can be computer controlled, mixing according to the feeding plan and substituting feed when necessary. Liquid feeding can also be operated manually by weighing and mixing the required amounts.
BAT is to apply feeding measures in order to minimize emissions of ammonia, phosphorus and odour, etc..
As far as nitrogen and consequently nitrates and ammonia outputs are concerned, a basis for BAT is to feed animals with successive diets (phase-feeding) with lower crude protein contents.

Indicative crude protein levels in BAT-feeds for pigs

Species	**Phases**	**Crude protein content (% in feed)**
Weaner	<10 kg	19- 21
Piglet	<25 kg	17,5- 19,5
Fattening pig	25- 50 kg	15- 17
Finisher	50- 110 kg	14-15
Sow	Gestation	13-15
Sow	Lactation	16- 17

As far as phosphorus is concerned, a basis for BAT is to feed animals with successive diets (phase-feeding) with lower total phosphorus contents. In these diets, highly digestible inorganic feed phosphates and/or phytase must be used in order to guarantee a sufficient supply of digestible phosphorus.

Indicative total phosphorus content levels in BAT-feeds for pigs

Species	**Phases**	**Total phosphorus content (% in feed)**
Weaner	<10 kg	0.75- 0.85
Piglet	<25 kg	0.6- 0.7
Fattening pig	25- 50 kg	0.45- 0.55
Finisher	50- 110 kg	0.38- 0.49
Sow	Gestation	0.43- 0.51
Sow	Lactation	0.57- 0.65

Indicative total calcium content levels in BAT-feeds for pigs

Phases	Calcium (% in feed)
30- 75 kg	0.7- 0.9
55- 90 kg	0.65- 0.9
90- 140 kg	0.65- 0.9
Sow gestation	0.7- 0.9
Sow lactation	0.75- 1.0

Main questions for inspection

Is the feed mixing area adequately enclosed to prevent dust emissions?
What feed measures are used to reduce emissions?
If yes, is this based on phase-feeding (more phases) or feed additives/special feed?
With phase-feeding: can the farmer show with his administration how many phases he applies?
What are the total nitrate, phosphorus and calcium contents in the feed? Is this within the range? If not, what justification for using higher levels?
With feed additives: are bills/receipts available for the feed additives or special feed?
Is proper maintenance carried out to feed mixing equipment to minimise any potential noise emissions, for example repair of augers, bearings, etc.

5.7 Storage of hazardous substances

Environmental importance

Many dangerous substances are used in pig farms and one of the main purpose is to manage the storage in order to avoid leaks, spills, incidents or accidents, which may mainly pollute soil or water.

Relation to EU directives and the BREF document

The main storage of dangerous substances in pig farms are storage of fuel (persistent hydrocarbons), biocides (including insecticide, fungicides, medicines and disinfectants) and plant protection products (fertilizer) (directive annexe II).

Polluting substances due to storage of dangerous substances (directive 2000/60 CE)

Water (direct introduction)	Soil (direct introduction)
Alachlor (herbicide) Anthracene (fuel) Atrazine (herbicide) Benzene (fuel) cadmium (fertilizer) Chlorfenvinphos (insecticide) Chlorpyrifos (insecticide) Diuron (herbicide) Endosulfan (insecticide) Hexachlorobenzene (fungicide) Hexachlorocyclohexane (insecticide) Isoproturon (herbicide) Nickel and its compounds (fuel) Nonylphenol (biocide)	Alachlor (herbicide) Anthracene (fuel) Atrazine (herbicide) Benzene (fuel) cadmium (fertilizer) Chlorfenvinphos (insecticide) Chlorpyrifos (insecticide) Diuron (herbicide) Endosulfan (insecticide) Hexachlorobenzene (fungicide) Hexachlorocyclohexane (insecticide) Isoproturon (herbicide) Nickel and its compounds (fuel) Nonylphenol (biocide)

Conditions in the permit regarding storage of hazardous substances

Permit conditions include appropriate measures to prevent emissions to soil and groundwater and regular surveillance of those measures to avoid leaks, spills, incidents or accidents occurring during storage.
First of all, the operator should strictly respect his permit conditions.

In order to detect possible soil and groundwater pollution at an early stage and, therefore, to take appropriate corrective measures before the pollution spreads, the operator should have established a relevant monitoring of the storage of dangerous substances (Are they any holes in the storage ? Is the holding tank dirty?).

storage of pesticides

storage of cleaning products

Main questions for inspection

Prevention

Are the installations for fuel and hazardous substances in compliance with the application and the permit?

Is there a management plan including split of responsibilities, monitoring and incident/accident management (can be a part of the general management documentation)?

If not, is-it justify by small DS quantities?
Is there a regular monitoring / surveillance of the pollution?
Are the leaks, spills, incidents or accidents well prevented? Such as:

- leakage containers
- separate storage of substances that can react with one other.
- stored in special closets.

Is there any significant pollution caused by storage of dangerous substances?
(**directive 2000/60 CE**, article 11c)

In case of any incident or accident significantly affecting the environment,
(**directive 2000/60 CE,** article 11g)
Has the operator informed the competent authority immediately?
Has the operator immediately taken the measures to limit the environmental consequences and to prevent further possible incidents or accidents?

5.8 Waste water treatment

Environmental importance

Waste water emissions can contaminate soils and clean waters such as surface waters, rain waters or ground waters. The contamination may be biological but also physical (solids in suspension), chemical with special attention to some heavy metal that can occur from the pig farming activity such as Copper and nutrients as Phosphorous and Nitrogen.

Relation to IED/Bref

The chapter 2.12 of the intensive rearing for poultry and pig's BREF (IRPP) considers waste water as the water used by domestic, industrial, agricultural or other usage, and which has undergone changes in its properties as a result of those uses and is discharged. Additionally there is water from rainfall, which collects and flows away from built-on or compacted areas (precipitation water). Cleaning water from livestock farming facilities can contain residues of dung and urine, litter and feedstuffs as well as cleaning agents and disinfectant. [(2)]

Waste water, also called dirty water, originates from washing water, from facilities for personnel, from yard run-off and particularly from run-off from open concrete areas that are contaminated by manure. The amounts depend very much on the amount of rainfall. Dirty water can be managed in combination with slurry, but can also be treated and handled separately, in which case separate storage will be needed.
On pig farms, waste water is commonly added to the slurry and treated in combination or applied directly to land. Various treatment systems for slurry exist and they are described in IRPP's Section 2.6. On some farms in Finland using solid manure systems, waste water is conducted through a sedimentation tank into soil treatment or from production buildings into a ditch.

If kept separate, waste water (dirty water) may be applied to land through low-rate irrigators (UK) or treated in a communal or on-farm waste water treatment plant. [3]

In the IRPP BREF there is no specific BAT concerning the waste water treatment. Some good practices can also be found in the common waste water BREF but their application is only guidelines within the pig farming activities.

Execution

The type of waste water will determine the best practices for treatment or containing methods.

Domestic use: Pig farms are often located far from the urban areas served by drainage systems. There are several types of good practices in use:

- If a common drainage system is available, the treatment is made in a communal system. Common systems are cheaper to operate (concerning the rate €/m3) and are usually operated by specific trained people;
- Underground septic tanks to contain and to treat the waste waters. The treatment works with a filtration made by the soil in which the liquids with less contamination will infiltrate and the biggest amounts of pollutants will be kept as sludge.
  If septic tank built away from the rain water drainage channels the surface waters will be protected. In some countries a septic tanks constructions must be approved and a permit is required. Regular inspections and maintenance are required, such as regular cleaning to prevent excess sludge. Written records of these procedures are needed;
- Simply contain the waste waters in a tight tank or a storage tank and send them to be treated in a communal treatment facility is an easy but effective way to get rid of these wastes. The containers are usually simple structures, available in the market.
  The soil protection is an additional benefit beside the previous ones. Delivery of the waste waters only to an authorized operator may be required as well as regular inspections to the equipment. In some MS operators may have to require a permit for the equipment's installation. Written records of the waste water's transportation should be kept to show the authorities the final destination of the waste waters.

[3] Adapted from the intensive rearing on poultry and pigs BREF, chapter 2.12 treatment of waste water

- Adding the domestic waste water to the pig manure is a common practice in some MS. If the amount of manure is higher than the amount of domestic wastewater then this may be disregarded. However depending on quantities this means that the manure will have lower dry matter which increases the potential for leaks when stored. Some techniques described in chapter 4.9 of the BREF could be affected such as biological treatment of pig slurry, composting and treatment in biogas installation.

Agriculture use (from concrete areas that are contaminated by manure and cleanings)

- In many MS agriculture wastewater are usually mixed with the pig's manure and considered as a whole. Besides the above described concerning about additional water percentage in the manure it should be considered that the cleaning products and disinfectants used in the installation's cleaning should be "environmental friendly" with less percentage of chlorine. The destination is usually the land spreading. This method requires no investment and no special skills are involved. In order to preserve groundwater when land spreading is done the type of soil has to be considered because higher water percentage in manure means more permeability of the soil. Techniques mentioned in chapter 5.2.7 (land spreading pig manure) of the BREF have also to be considered.

  N.B. In countries where mechanical separation of pig manure is done a liquid fraction will be produced, which is considered in the IRPP BREF chapter 2.6.5. As
  a result of a specific treatment the liquid fraction is not considered waste water as mentioned in the chapter 2.12 of the IRPP

Biological treatment of liquid fraction

Washwaters may also include those from wheelwashes, washwater tanks and footbaths. These may be contaminated with disinfectants or traces of detergents. There are two main options for disposal. It can either be added to manure or slurry for disposal to land or removed to be treated at a licensed waste treatment plant.

Main questions for inspection

Are all waste waters emissions identified in the permit?
Where a septic tank is used does it need a permit for the installation/construction?
Can it potentially contaminate clean waters?
Does the operator have written records of regular checks and of the maintenance actions such as sludge removal?
Where storage tanks are used, do they need a specific permit for installation?
Are they included in the site layout plan and are they identified as an emission point?

How often are checks for detecting leakage problems done? When cleaned out do the waste waters go to a proper treatment plant? Are written disposal records available showing the description quantities, dates and destination?
When mixing waste waters to pig manure, are there any unexpected leaks from the storage place?
Does the storage place have the right conditions to prevent fly and odour problems?
When cleaning is done are the cleaning products and disinfectants "environmental friendly", and used in adequate concentrations?

5.9 Carcasses

Environmental importance

Animal by-products (which include whole carcasses and placentas) can potentially emit high organic strength liquids to water and cause significant local odour problems. If animal by-products are not treated quickly then decomposition occurs and can cause odour and water quality problems as well as downstream waste water problems. (adapted from the Reference Document on Best Available Techniques in the Slaughterhouses and Animal By-products Industries)

Relation to IED/Bref

Services to collect carcases and to process them by contractors are common. In Italy, many farms have equipment to transform carcases into liquid feed under special pressure and heating conditions. Also, in other Member States the processing of carcasses into feed is or has been practised, but this is now declining or forbidden.
Burying of carcasses and open burning are still widely practised methods. In some MS, such as the Netherlands, Germany, Denmark and France burying is strictly forbidden, but in the UK, Italy and Spain authorised burial is allowed. Some farms have an installation for incineration of carcasses. This can be a quite simple burner without provision for the emitted waste gases. In the UK about 3000 small scale incinerators (<50 kg/hr) are operated, mainly on large poultry and pig farms for the incineration of animal carcases. The ash may be land filled or disposed of by other routes. Otherwise carcasses are collected and processed elsewhere. Carcasses can also be composted. [4]

Execution

The IRPP refers to animal carcasses in the chapter 2.11 only about storage or disposal. There is however some other techniques used in pig farms for disposal of carcasses besides the option of delivering them to contractors.

- Incineration by operators is used in some member countries according to the BREF. The incinerators need fuel to heat the incinerators and to burn the animal by-products and the process has to be maintained for periods over one hour. The installation of this equipment and the associated fuel storage may need to be authorized. Main benefits are the shorter periods of carcases storage because incinerators can run on a daily basis and also avoiding the transportation of by-products to other plants. However the fuel consumption for incineration and the air emissions are a cross-media effect that needs to be considered. Monitoring the air emissions should be done and also to ashes should be analysed in case they are to be used as soil fertilizers.

[4] Adapted from IRPP working draft in progress

- Composting by operators is a disposal technique that is declining amongst MS. It has the same benefits as the incineration but is designed for small amounts of by-products. In IPPC pig farms where thousands of kilograms per week are produced this method is not suitable. The compound has to be properly handled and stored. This treatment can cause odours and problems due to fly nuisance.
- Burying by-products was common in several MS but is now illegal in most except in certain circumstances such as major animal disease outbreaks, (under the direction of the state veterinary authorities). It is a very cheap method of disposing by-products with the benefits of short time in storage and with no energy directly involved. It has however several cross-media effects that need to be considered. The decomposition of buried by-products takes a long period and the pollution potential to soil and underground waters remain long after the burial. This means that the cross-media effects can occur long after the disposal and for longer time periods. Air emissions such as methane will occur and so odour emissions and flies dissemination are also another cross-media effect. It is also not recommendable for sanitary reasons.

- A dedicated plant for by-products transformation means economical efficiency and environmental benefits in an IED regulated sector when comparing it to individual treatment. By-products processed by contractors is an option which is widely increasing all over Europe due to its benefits to operators. When by-products are delivered to contractors they are not collected every day and so they have to be stored in appropriate conditions with refrigeration and in sealed vessels. These vessel's characteristics depend on the amounts of produced by-products produced, the climate conditions in each country and on the frequency of the collection. The vessels can be specific equipment as use in Portugal or a common refrigerated container as seen in Italy. This method means no or low emissions from the pig farm in optimal conditions. The by-products have to be stored in optimal conditions to prevent leaks and a correct temperature to prevent decomposition.

By-products destined for use or disposal should be stored in closed vessels or rooms, during shortest possible time, before further treatment. Depending on the nature of the by-products, such as their inherent odour characteristics and how fast they biodegrade and create an odour nuisance, it may be advisable to also refrigerate them, particularly during warm weather and in hot climates. A temperature not exceeding 5 °C, for solids and less than 10 °C, for blood has been reported as being necessary, to prevent odour problems. This applies at both the slaughterhouse and the animal by-products installation. Although IPPC does not apply to the transportation of materials between installations, by implication it is a good practice to control the conditions of transport as these may have a very significant influence on, e.g. odour emissions at the by-products installation.
ABP Regulation 1774/2002/EC contains some requirements for the collection and transportation of animal by-products *in sealed new packaging or covered leak-proof containers or vehicles* and for *the maintenance of an appropriate temperature throughout transport*. [5]

Achieved environmental benefits

Reduced biological and/or thermal decomposition, which consequently leads to lower chemical oxygen demand (COD) and nitrogen levels in the waste water when treating the animal by-products. The formation and emission of odour-intensive substances is minimised. Where refrigeration is required, if the storage times are also kept as short as possible, then the refrigeration capacity and the energy consumption can also be minimized.
There may be greater opportunities for animal by-products to be recovered or recycled if they remain fresh due to short storage times or refrigeration. For example, blood meal manufactured from refrigerated blood has a higher nutritional value than unrefrigerated blood and it can be fed to non-farmed animals, such as pets. There is also a reduced risk of infestation by insects, rodents and birds.

Cross-media effects

Energy consumption may be required for refrigeration, if by-products cannot be used or disposed of before malodorous substances are produced from them, especially in summer and in warm climates.
The early and frequent despatch of animal by-products can increase the numbers of journeys between the pig farms and the animal by-products installations or equipment, transporting smaller loads, and consequently lead to an increase in the environmental harm due to transport. (4)

[5] Adapted from by-product's BREF

For additional good practices or best available techniques to refrigerator equipment the industrial cooling system's BREF should be taken in account.

Main questions for inspection

Are there any emissions or leakages from the by-products storage or treatment? (odour, flies, liquids)
Are these emissions minimised contained, treated and/or monitored?
Are by-products regularly treated / processed / transported? Is refrigerator equipment used to reduce decomposition/odours/fly dissemination?
Where an operator sends animal by-products for disposal by a specialist contractor are there records of quantities, dates and destinations.
Where the operator incinerates his own by-products is it included in the permit?

- What kind of treatment equipment is in place?
- What is the quantity of by-products produced per day in the pig farm?
- Does the equipment have the capacity to treat and transform the full amount of by-products produced?
- Do emissions to air need to be monitored?
- Are odours a problem?
- Is there any end of pipe treatment equipment to reduce odours?

Where incinerator ash is moved off-site or disposed of on farm is it recorded and/or in compliance with MS regulations.
If by-products are buried or composted is it done in a way to prevent clean water contamination and in a way to minimise odour emissions? Are there national regulations included? Are there prescriptions in the permit or are good practices to be taken in account?
Have the refrigerator equipment the right capacity for the amounts produced? Does it have the right set temperature? What kind of refrigerator fluid does it have? Are there any chlorinated fluids (ozone depleting substances) that have to be replaced?

5.10 Storage of solid manure

Environmental importance

The storage of solid manure and slurry is a source of airborne emissions of ammonia, methane and other odorous components. The liquid draining from solid manure (e.g. stacks in field) can also be considered as an emission. It can cause contamination to soil and groundwater. With residential homes nearby, odour is also a factor to be considered.

Emissions of manure storage depend on a number of factors:
chemical composition of manure/slurry/compost, physical characteristics (DM %, pH, temperature) emitting surface (size, crusts, covers), climatic conditions (ambient temperature, rain), the floor the stack is lying on (concrete, peat, clay) and application of covers.

The smaller the ratio between the surface and the volume of the storage is, the lower ammonia emissions are since the exposed surface is reduced.

Relation to IED/BREF

For a stack of pig manure that is always situated on the same place, either on the installation or in the field, BAT is to:

- apply a concrete floor, with a collection system and a tank for run-off liquid, and
- locate any new to build manure storage areas where they are least likely to cause annoyance to sensitive receptors for odour, taking into account the distance to receptors and the prevailing wind direction.

For a temporary stack of pig manure in the field, BAT is to position the manure heap away from sensitive receptors such as, neighbours, and watercourses (including field drains) that liquid run- off might enter.

Execution

Solid manure includes farmyard manure (FYM) and consists of material from litter-covered straw yards, excreta with a lot of straw in it, or solids from a mechanical separator. Solid manure and FYM are typically stored in concrete yards or on field sites ready for spreading to land.

Field stacks

For field stacks that are made in the same place every year, impermeable floors (like concrete) should be applied. Where clay soils prevail and stacks change location, no accumulation of harmful amounts of nutrients is expected and no special measures need to be applied to the bottom of the stack. To prevent water from entering the manure heap, the accumulation of rainwater at the base of the stack needs to be avoided.

Permanent stacks

Manure heaps at a fixed location should have an impermeable floor (like concrete) to prevent leakage of nutrients into the soil and groundwater. Run off rainwater can be collected and spread over land or mixed with slurry.

Manure heaps can also be covered to reduce run-off and evaporation of ammonia (and odour). Covers should be tight to the mass, since the application of simple roofs (i.e. undercover storage) increase ammonia losses compared with conventional open-air storage by 45 – 60 %. This is thought to happen because the manure surface remains porous, allowing ammonia to diffuse out of the whole heap, whereas conventional heaps are exposed to rainfall and lead to the formation of a ‘crust’ that provides a physical barrier to ammonia loss.

Run off rainwater can be collected and spread over land or mixed with slurry.

Main questions for inspection

Is the manure heap located at a fixed location?
If yes: Is the manure heap on a impermeable floor? And
Is run-off water collected?

Are sensitive objects (like neighbours) located nearby?
If yes: Is the manure heap covered to prevent odour?

Is the manure heap nearby a watercourse or field drain?
If yes, is leakage and run-off water prevented?

5.11 General environmental performance

For improving the **general environmental performance** of an intensive livestock farm, BAT is to do all of the following:

1. identify and implement education and training programmes for farm staff
2. keep records of water and energy usage, amounts of livestock feed, waste arising and field applications of inorganic fertiliser and manure
3. have an emergency procedure to deal with unplanned emissions and incidents
4. implement a repair and maintenance programme to ensure that structures and equipment are in good working order and that facilities are kept clean
5. plan activities at the site properly, such as the delivery of materials and the removal of products and waste (see paragraphs transportation and waste)
6. plan the application of manure to land properly. (see paragraph land spreading)

This part of the BREF combines specific points (spreading, water consumption …) which are explained in detail in the different sections of this guidance book. So, in this section the focus is on the organisation, planning and monitoring of the entire farm:

Organisation

1. identify and implement education and training programmes for the farm staff
2. have an emergency procedure to deal with unplanned emissions and incidents

Planning

3. plan activities at the site properly, such as the delivery of materials and the removal of products and waste, and the removal of products and waste
4. implement a repair and maintenance programme to ensure that structures and equipment are in good working order and that facilities are kept clean.

Monitoring/ record keeping

5. keep records of water and energy usage, amounts of livestock feed, disposal of waste.

Water and energy use

The records for water and energy use can be compared to the water and energy use from a farm in the same climatic region and same size. Water requirements for pig farms are given in the first draft of the Bref, paragraph 3.2.2.2. http://eippcb.jrc.es/reference/BREF/irpp_d1_0311.pdf

Main questions for inspection

- What is the size of the farm and the number of people on staff?
- Is the farm maintained well and kept clean?
- Is waste regularly removed?
- Are records of water and energy usage kept?
- Is the water and energy use normal compared to farms of the same size in the same climatic region?
- Is an (integrated)[6] environmental management system present? (in link with 1st question, small farm = simple document)?
- Are the management documents actually used or only written for IED inspection?
- What is the performance on the key points? Are they improving ?

[6] For the inspection, an integrated environmental management means the farmer links between several items, as ammonia emission and nitrogen value for manure (cross-media impact). For the farmer, an integrated management means he links between environment and other matters (technical, economy).

6. INSPECTION PREPARATION

This chapter contains the most important actions for an inspector before the on-site inspection of a pig farm. These actions contain the collection of information and study the available drawings, maps and technical information. Inspectors also study connected legislation and guidelines (if they are available). There can be a focus on the targets set in the inspection plan. Depending on the agreement in a country, the inspection report is prepared in advance, setting out the objectives of the inspection, and it's validated by the Chief Commissary (example Romania).

Some information will be retained by the operator and some by the inspecting authority depending on individual MS circumstances. However, to carry out a good inspection you will need (where applicable)

- map showing the site in a geographical context
- most recent permit including any amendments (variations, transfers and surrenders)
- any outstanding notices
- records of any on-going improvements or agreements or recommendations with the operator
- Pollution inventory returns
- Other emissions or monitoring data required by the permit or regulator
- drawing of the housing system
- site drainage plan
- history of complaints
- history of inspections
- Odour, noise or pest management plan
- Manure management plan
- if applicable: calculations of:
    - odour
    - ammonia
- map of surrounding area. The inspector must know the exact location of the installation.
- Other permits that rule on the installation. And results of other inspections. This to prevent opposite regulation and to stimulate that all inspections are geared to one another as much as possible.
- Counting procedures such as animal units.

It should be clear:

- which type and amount of animals (sows, piglets, finishers etc) are present
- which type of housing is used
- boundaries of the installation
- if any sensitive receptors (like houses) are nearby
- which activities from chapter 4 are to be expected
- if any non-farming (such as recreation) activities are present

7. ON SITE INSPECTION

For the major activities the main questions to be addressed during the inspection are described in the activity paragraphs (chapter 5). These questions are developed to help the inspector on site. This chapter gives some general tips for inspectors on site.

Usually, the inspection starts with an opening meeting on site to inform the operator about the type of inspection to be carried out and the programme of the site visit. During this meeting the operator receives an explanation about the goal of the visit and the regulation that will be checked, like the permit and general binding rules.
The visit consists of two parts. One part will examine the documents, reviews and records in the installation office, the other part will take place during the check of the installation. Also, responsible persons can be interviewed.

In general some tips when on site: (from guidance UK):

Your preparation for the visit may have identified any potential odour/noise issues from the installation. As you approach the installation, be aware of your surroundings and whether there are sensitive receptors, such as houses, nearby. On your way there, stop a few hundred metres downwind of the installation and see whether you can detect any odour or noise. Do this before, rather than after the visit, as you will become desensitised to the odour during it. There may be other farms in the area or local manure spreading taking place which may also cause odour/noise.

If you have a number of farms to visit, you could take photographs as a reference for future inspections. This will help you remember which farm is which. Poultry farms in particular can look very similar and there can be a large variety of buildings on a pig farm.

8. AFTER INSPECTION

In most cases, after the site inspection the next steps are

Record visit in database
Assess compliance with conditions of the IPPC permit
Determine if changes in permit are necessary
Check compliance with IED requirements. Also see: IMPEL IED project[7]
Determine if there is any violation of the permit or general regulation
Determine which article or regulation exactly is violated.
Determine environmental impact of the violation
Write to the operator. This letter/ compliance assessment report should contain

- An overview of the situation encountered.
- The exact articles/regulations that are violated.
- Measures to be taken by the operator to improve the environmental performance.
- A period of time for the operator to take the necessary measures.

Sanctions (if case) are applied in a separate document (or order).

In some cases (for example Romania) the report is always written during the inspection and at the end signed by the inspectors and the operator. It means that all decisions concerning measures and sanctions have to be taken during the inspection. Occasionally, when further investigations are needed, the sanctions can be applied later, within maximum 6 months after an infringement was identified.

[7] http://impel.eu/projects/environmental-inspections-of-industrial-installations-in-accordance-with-the-industrial-emissions-directive-ied/

9. REFERENCES

Best Available Techniques (BAT) reference documents; Bref IRPP 2003, http://eippcb.jrc.ec.europa.eu/reference/BREF/irpp_bref_0703.pdf

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Institut d'Élevage France; Guide des Bonnes Practiques Environnementales d"Élevage 2010: http://www.rmtelevagesenvironnement.org/pdf/bpe_avi_porcs_bovins.pdf

Institut du Porc – France:
http://www.ifip.asso.fr/online-decision-making-tools-powered-by-ifip.html

Economic Commission for Europe (Executive Body for the Convention on Long-range Transboundary Air Pollution Working Group on Strategies and Review) - Annex IX to the Gothenburg Protocol - Draft revised Annex IX: Measures for the control of emissions of ammonia from agricultural sources - 2011
http://www.clrtap-tfrn.org/webfm_send/338

Annex 1. Spreading check list

	Point	**Nature of checking**	**observation**
Management	Spreading map	Present and updated	For updating, no spread surfaces outside the fields of the map
	Manure monitoring	Quantity and quality	Before each spreading, how the quantity and the quality of manure is determined ? Is-it right as in the permit conditions?
	Annual fertilization plan and monitoring (recording) and allowed changes.	Present, completed and right	For right, checking of a field sample (balance between foreseeable requirements of the crop and nutriments total amount)
	Global balance	Present and coherence between nutriments produced, spread and exported by the crop	For nitrogen, there is a link between ammonia emission reduction and N spread.
Equipment	Equipment used	Compliance with permitting conditions	
	Band spreading and incorporation within 4or 12 hours	According to spreading recording, complains	In Italy 24h. In The Netherlands immediately (recorded delay, farmer answer, field control)
	Odour treatment	If required in permit	
Field control	not applying manure to land when the field is: • water-saturated • flooded • frozen • snow covered and during forbidden period	Aircraft and/or land control Exposure, complains	

Annex 2. General environmental management check list

	Point	Nature of checking	observation
Organisation	education and training programmes	Date of the last and the next education or training	Verbal answers are enough if staff of 3 persons or less Aim: at least one date between every inspections
	emergency	Emergency advertisement in the buildings Emergency plan with the responsibilities sharing in the staff	if staff of 3 persons or less if more than 3 people
Monitoring	livestock feed consumption and index	Evolution during the 3 last years	These technical performances are necessary to put other figures in perspective
	Water consumption	Evolution in l/kg (food) and per year during the 3 last years	Example [8] page 160-163.Comparison with manure production (see spreading check list). Poland method?
	energy consumption	Evolution in kwh per sow or pig and per year during the 3 last years	Example [9] of tool for this assessment
	Ammonia emission	Evolution kg-nh3 per sow or pig and per year during the 3 last years	Link with the N output in manure
	Apparent global balance (NP)	If available, 5 years sliding average (% output/input)	As proposed in the draft annex IX [10] of the Goteborg protocol
Planning	repair and maintenance	Cleaning of the installation If problems detected on water or energy consumption, detection of causes and repair	

[8] http://www.rmtelevagesenvironnement.org/pdf/bpe_avi_porcs_bovins.pdf
[9] http://www.ifip.asso.fr/online-decision-making-tools-powered-by-ifip.html
[10] http://www.clrtap-tfrn.org/webfm_send/338

Annex 3. Hazardous substances management checklist

	Point	**Nature of checking**	**observation**
Prevention	Substance storage	Containment basin or a catch basin present and empty. Locked room	Or other prevention mean as in the permit
	Substance refilling	Area of refilling	If in the permit
	Pollution plan	including split of responsibilities, monitoring and incident/accident management	If there is enough substances and more than 3 persons in the staff to justify a written plan. If not, verbal explanations are sufficient
Incident/accident	Existence of them	Trace of pollution close from the storage or the refilling area	
	Report in case of	Done, sufficient and with proposal or corrective action	Usually, done a few times after the incident/accident
	If necessary	corrective action implemented	