MODUL_2022

Best Available Techniques (BAT) Reference Documents (BREFs)

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Automotive case studies

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1. INTRODUCTION

A growing number of governments seek to **adopt an approach based on Best Available Techniques (BAT)** as part of the regulatory framework to prevent and control industrial emissions. There is value in supporting their efforts with guidance on how to identify and establish BAT, BAT-associated emission levels (BAT-AELs) and other environmental performance levels (BAT-AEPLs), as well as BAT-based permit conditions, including emission limit values. The OECD was tasked in 2018 by the 58th Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology to develop such guidance, in order to provide support to countries that wish to set up, or strengthen, their BAT-based policies.

Providing guidance on BAT-based permitting is, in the short term, a means to strengthen policy in individual countries. In the long term, it might facilitate greater international harmonisation of procedures to establish BAT, and BAT-AE(P)Ls. This would assist efforts to protect human health and the environment across countries, and expand the level playing field for industry (OECD, 2020).

This course provides an overview of the BAT and BREF issues and frameworks, as well as the automotive case studies within Slovakia (VW Slovakia, PSA Slovakia, Jaguar Land Rover Slovakia and KIA Slovakia).

The course is structured as follows: section 1 introduced the issue; section 2 is presented definitions of BAT and BREF concepts, section 3 is dealing with applied processes and techniques, section 5 highlights the automotive case studies of Slovak main automotive producers.

This course targets, university students, government officials and individuals interested in the issues of BAT and BREF.

1.1 HOW DOES BAT FIT IN A REGULATORY FRAMEWORK?

Large industrial and agro-industrial installations are responsible for a significant share of total human environmental impacts. They can use large amounts of material, chemicals, energy and water. They can emit significant amounts of pollutants to the air, water and soil and generate substantial shares of hazardous and non-hazardous waste.

These environmental impacts vary by type of activity and can be very specific to the type of installation or the processes incorporated in a given site. These rather varied impacts as well as varying local conditions where such installations are subject to a regulatory regime, generally necessitate site-specific requirements.

Given the diversity of installations, establishing the environmental limits for each is challenging for regulatory officials. This can be compounded by frameworks where permits are granted at a local level and officials do not have experience of dealing with multiple installations of a similar type. **The use of BAT reference documents (BREFs)** is a solution that has been employed in a number of jurisdictions around the world to support the setting of permit conditions for industrial sites. **Figure 1.1 shows how they fit in the regulatory framework and illustrates the main aspect of the overall regulatory regime** (OECD, 2020).

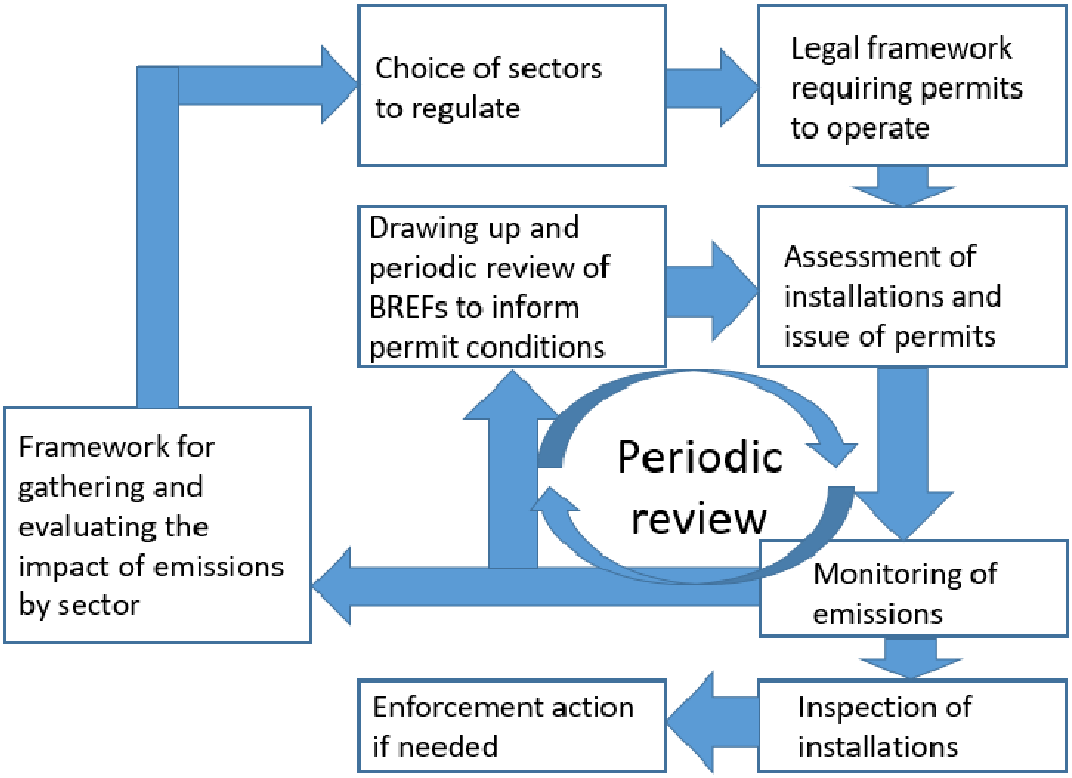

Figure 1.1 Simplified flowchart illustrating how BREFs fit in a regulatory regime for environmental impacts of industry Source: OECD (2020)

2. DEFINITIONS OF BAT AND BREF

2.1 WHAT IS BAT?

Best Available Techniques (BAT) are advanced and proven techniques for the prevention and control of industrial emissions and the wider environmental impact caused by industrial installations, which are developed at a scale that enables implementation under economically and technically viable conditions. A growing number of governments use BAT or similar concepts as a means to identify and set technically **driven emission limit values (ELVs)** and other conditions in environmental permits for industrial installations. Using BAT allows establishment of permit conditions that are rooted in techno-economic evidence and based on a participatory approach, thus to help achieve a high level of human health and environmental protection. BAT-based permit conditions can include ELVs, technical and management requirements, and monitoring requirements relating to emissions, consumption and/or waste generation (OECD, 2020).

As we can see in **Figure 2.1a**, the **best available techniques (BAT)** consists of three pillars: The first one is labelled "best" and explains the most effective way in achieving a high general level of protection of the environment as a whole. The second pillar is named "available", which means: Developed on a scale to be implemented in the relevant industrial sector, under economically and technically viable conditions, advantages balanced against costs. The last of these three pillars is designated as "techniques". It shows the technology used and the way installation is designed, built, maintained, operated and decommissioned (EC, 2023).

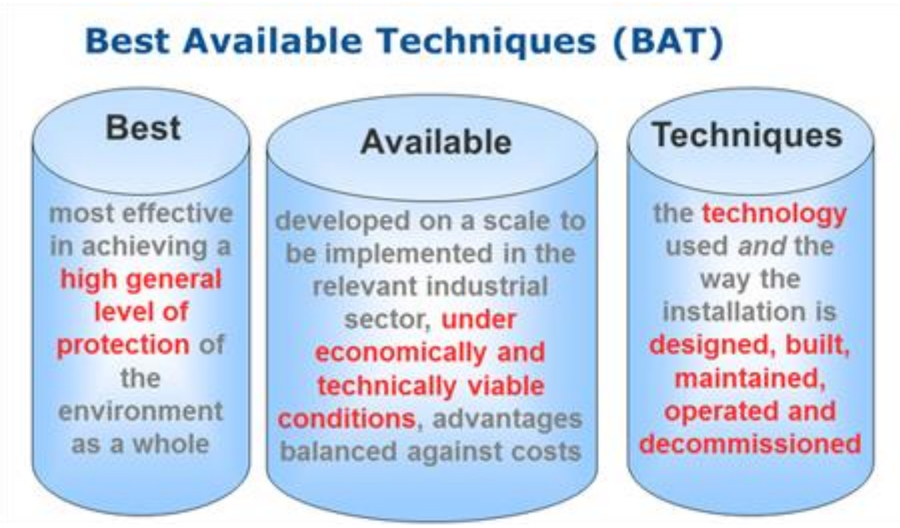

Figure 2.1a Best Available Techniques (BAT). Source: EC (2023)

Some OECD member countries and related organisations have already used BAT requirements for prevention and control of industrial pollution for several decades. The European Union (EU) is an international frontrunner, with more than 30 years of experience taking a **BAT-based approach** to establishing environmental permit conditions. More recently, an increasing number of non-EU countries have adopted BAT as a means to regulate emissions from industrial installations. While the BAT concept is interpreted differently across jurisdictions, the EU's definition of BAT, as presented in Box 2.1, remains the most widely referenced one (OECD, 2020).

Box 2.1. The European Union's definition of BAT

The European Union's Industrial Emissions Directive (EU, 2010[4]) defines Best Available Techniques (BAT) as "the most effective and advanced stage in the development of activities and their methods of operation, indicating the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where this is not practicable, to reduce emissions and the impact on the environment as a whole". Further, the Directive states that:

● **'techniques'** includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;

● **'available techniques'** means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator; and

● **'best'** means most effective in achieving a high general level of protection of the environment as a whole

In many countries, BAT are used to derive BAT-associated environmental performance levels (BAT-AEPLs). These encompass BAT-associated emission levels (BAT-AELs) as well as other environmental performance levels. BAT-AELs are – according to the European Union's Industrial Emissions Directive (IED) – "the range of emission levels obtained under normal operating conditions using a best available technique or a combination of best available techniques […] expressed as an average over a given period of time, under specified reference conditions". That is, the BAT-AELs are technologically driven; i.e. they reflect the environmental performance levels that can be achieved by implementing BAT or a combination of BAT, rather than being based on e.g. national emission targets and/or on the whole operating range of current performance of all installations.

Other BAT-associated environmental performance levels (i.e. other than the emission levels) can be related to consumption of material, water or energy, the generation of waste, abatement efficiency on pollutants and duration of visible emissions. As such, BAT-AEPLs are not limited to preventing or reducing emissions of pollutants, but can reflect sustainable chemistry, manufacturing efficiency, and other aspects of sustainable manufacturing practices.

Several jurisdictions present BAT and BAT-AE(P)Ls in BAT reference documents (BREFs), along with other relevant information. The EU defines a BREF as a document, resulting from an appropriate exchange of information amongst stakeholders, drawn up for defined activities and describing, in particular, applied techniques, present emissions and consumption levels, techniques considered for the determination of best available techniques as well as BAT Conclusions and any emerging techniques.

In many countries, such as in the EU Member States, Korea, Israel and the Russian Federation, BAT-AE(P)Ls form the basis for setting ELVs and other conditions in environmental permits for industrial installations. According to the IED, ELVs refer to the mass – expressed in terms of certain specific parameters – concentration and/or level of an emission, which may not be exceeded during one or more periods of time.

Some countries use the BAT concept in a slightly different manner. For example, the USA set national standards and emission limits for various sources and industry sectors based on best available technology and in coordination with health-based standards, to ensure an ample margin of safety for public health and the environment. The standards are typically established for larger industries emitting pollutants of concern, and states or other local authorities incorporate these into permits and may require tighter standards depending on multiple factors.

Increasingly, BAT are also used in other policy areas, many of which **contribute to progress towards the SDGs**, including related to climate action, chemical safety, circular economy and global partnerships for sustainable development.

Box presents a few examples showing findings from case studies on how BAT-based permitting can provide benefits to human health, the environment, industry and society (OECD, 2020).

Box 2.2 Examples of benefits of BAT-based permitting

Case studies show that the implementation of BAT can ensure considerable reductions in industrial emissions, and thus important benefits to society, e.g. by avoiding human health damage costs due to prevented air pollution. For example, data from the Israeli PRTR for the period 2012-17 demonstrated a considerable decline in air emissions: between 8% and 62%, depending on the pollutant. (The estimates do not account for economic activity.) The reduction likely resulted from the introduction of BAT-based permitting over the period 2011-16 (OECD, 2019[7]). Another example is Sweden, where BAT-based permitting has been applied to large industrial installations for the last five decades. Over this period, the emissions of Volatile Organic Compounds (VOC) have fallen by 70%, particles by 90%, SO2 by 97%, Hg by 99%, Pb by 99.9% and Cd by 98%. While other policies and measures may have contributed towards this significant progress, the BAT-based legislation appears to have been of pivotal importance. During the same period, the size of the Swedish economy has grown threefold (Almgren, 2009[8]) (Almgren, 2013[9]).

An EU study from 2018 explores three methods for assessing the costs and benefits of implementing BAT under the IED in the iron and steel sector. The study suggests, based on one of the methods, that the IED leads to anticipated reductions of 35% in NOx emissions from coke ovens, 71% from hot blast stoves, and 70% reductions in dust emissions from sinter plants, compared to the preceding IPPC Directive (Scarbrough et al., 2018[10]).

Furthermore, the member companies of a European Leather Tanning Association have – by introducing BAT – over ten years reduced their water consumption by about 20% and improved waste recovery to 62%. By introducing chemical products with low VOC content, they also ensured a 40% decrease in VOC emissions, equivalent to 10 000 tonnes a year. The resulting societal benefits amounted to EUR 38 million. Finally, thanks to the introduction of BAT for enhanced energy efficiency, the association secured annual savings of EUR 1.9 million and avoided 11 300 tonnes of CO^2 emissions per year, with an estimated EUR 500 000 per annum in societal benefits (EC, 2018[11]).

Some studies also show that the implementation of BAT can result in enhanced competitiveness for companies (Hitchens et al., 2001[12]).

The process of establishing BAT and BAT-associated environmental performance levels (BAT-AE[P]Ls) as well as BAT-based permit conditions, consists of several consecutive steps. A simplified illustration of these steps is provided in Figure 2.1b. The steps are based on best practices from OECD member and partner countries.

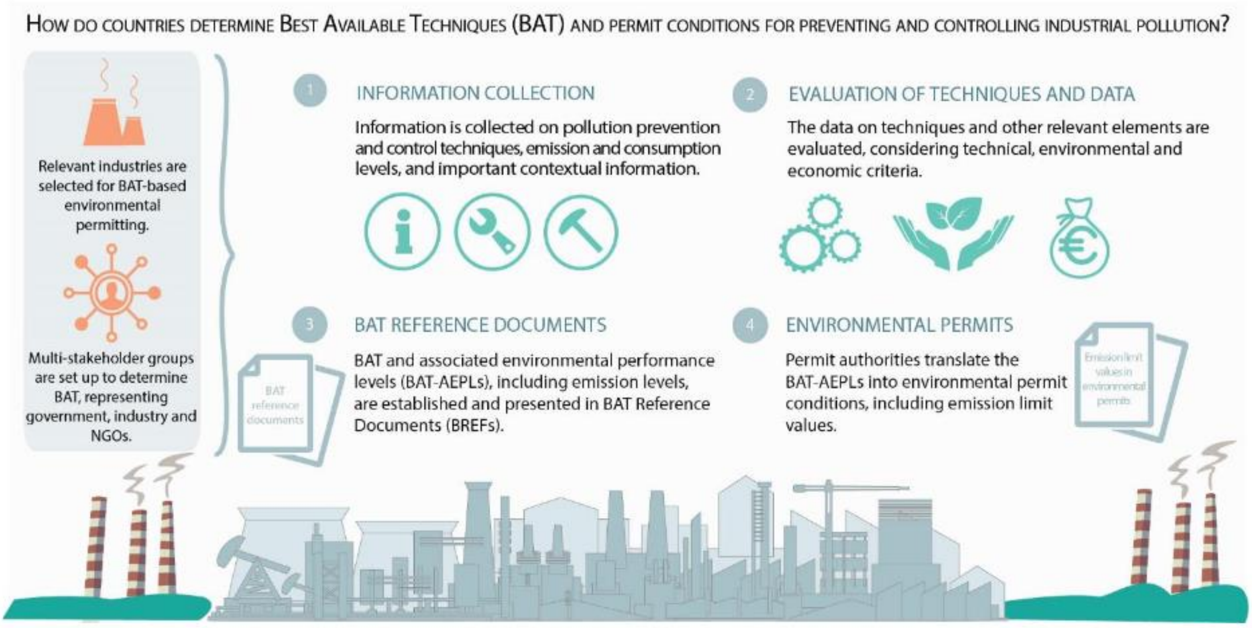

Figure 2.1b The steps to establishing BAT, BAT-AE(P)Ls and BAT-based permit conditions. Source: OECD (2020)

The **definition of BAT**, along with the approach to identifying BAT-AELs, determines the overall environmental stringency of a BAT-based permitting system. Therefore, **each jurisdiction should define BAT in their environmental legislation**, drawing on existing language and best practices from OECD member countries (see, for example, the EU's definition of BAT in Box 2.1). The specific regulations and circumstances of each country should be taken into account when defining BAT and thus the operational framework for determining BAT. The legislation in which the BAT system is embedded should convey an ambition to strengthen the environmental performance of all industrial installations with increasingly more stringent ELVs, and not simply to harmonise levels of environmental performance across installations (OECD, 2020).

2.1.1 BAT IN SLOVAK LEGISLATION

The term **"Best Available Techniques" (BAT)** was **introduced into the Slovak legislation** by Act No. 245/2003 Coll. on integrated prevention and control of environmental pollution and on amendments and additions to certain laws transposing the Council of the European Union directive 96/61/EC on integrated prevention and control of environmental pollution as amended (**Integrated Pollution Prevention and Control Directive - IPPC Directive**). European Union Council Directive 96/61/EC was repealed in 2008 by European Parliament and Council Directive 2008/1/EC, which was replaced by the currently valid European Parliament and Council Directive 2010/75/EC on industrial emissions (integrated prevention and control of environmental pollution environment). On March 15, 2013, the new Act No. 39/2013 Coll. on integrated prevention and control of environmental pollution and on amendments to certain laws (SAZP, 2023).

A **BAT reference document** is a document that is the result of an exchange of information carried out in accordance with Art. 13 of the IED, is developed for defined activities and describes in particular the techniques applied, the current levels of emissions and consumption, the techniques to be taken into account when determining the best available techniques, as well as conclusions on BAT and any new techniques, taking into account the following criteria (SIZP, 2023):

1. use of low-waste technology,
2. use of less dangerous substances,
3. supporting the recovery and recycling of substances that are created or used in the technological process, or the recovery and recycling of waste, where appropriate,
4. comparable processes, equipment or operating methods that have already been successfully tested on an industrial scale,
5. technical development and development of scientific knowledge and their interpretation,

6. the nature, effects and amount of relevant emissions,
7. dates of commissioning of new or existing equipment,
8. the time required to implement the best available technique,
9. consumption and type of raw materials (including water) used in the technological process and energy efficiency,
10. the requirement to prevent or reduce the overall effects of emissions on the environment to a minimum and the resulting environmental risks,
11. the requirement to prevent accidents and minimize their consequences on the environment,
12. information on the status and development of the best available techniques and their monitoring published by the European Commission or international organizations.

2.2 WHAT IS BREF?

BREF is an approximate acronym for **Best available techniques REFerence documents** and delineates the specific thresholds for each contaminant, based upon the best available techniques (BATs) in a given situation. This gives stakeholders the opportunity to view at a glance the limits – defined as BAT-associated emissions levels, or BAT-AELS – which they must not exceed, allowing them the opportunity to put in place preventative measures aimed at improving their overall environmental credentials. There are **several different types of BATs** which pertain to specific industries and applications.

As well as defining those legally binding thresholds, the BREF also introduces new requirements for monitoring equipment to be employed onsite, thus ensuring that emissions do not exceed the legal limits. For more information on the specific facts, figures and requirements contained in the legislation, it's a good idea to check out the article The European Union's Large Combustion Plant BREF – Monitoring and Compliance Requirements.

Defining the environmental scope implies determining the pollutants and other environmental parameters for which BAT and BAT-AE(P)Ls will be identified. This entails, first of all, deciding whether BAT should be applied to emissions to air, water and/or soil, and to, waste, energy efficiency and/or greenhouse gases. The second step is to determine which pollutants or other parameters that should be covered for each of these categories. Note: whereas some jurisdictions define the environmental scope prior to, or in parallel with, the selection of industrial sectors for implementation of BAT, this process takes place in the opposite order in other jurisdictions, such as the EU: the sectors are first selected, and the environmental scope for each one of them is later defined by the relevant TWGs.

The **environmental scope** of each BREF should be determined based on a standardised methodology and a fixed set of criteria, taking into account existing lists of priority pollutants at national and regional level, as well as the pollutants of concern and associated requirements determined by international conventions. The scope should encompass all parameters with a significant impact on the environment. Furthermore, relevant system boundaries should be considered, for example by taking into account whether the principal industrial activity of concern has an impact on the environmental performance of downstream activities, in which case the BREF also should establish BAT-AE(P)Ls designed to prevent the impact downstream.

Narrowing the **scope of a BREF** comes with important trade-offs, in face of which each jurisdiction must choose an appropriate approach to prioritise their efforts, adapted to their circumstances and based on consensus amongst key stakeholders. While defining a more limited scope reduces the complexity and thus the time and resources needed to develop a BREF, reaching consensus across stakeholders on such a scope can be a time-consuming and challenging process, possibly delaying the first steps of the drawing up or review of a BREF. Furthermore, defining a narrow scope usually implies that data only will be collected, and that monitoring only will be required, for a limited set of parameters, which might make it difficult to identify important environmental issues that lie beyond the scope further down the line. It may also limit the impact of a BREF on the reduction of emissions. On the other hand, a narrower scope allows prioritising resources towards the most pressing environmental concerns, enabling a more cost-effective approach to pollution prevention and control. Another challenge pertains to whether the environmental scope should be limited to a set of specific pollutants, or rather focused on which techniques that can optimise the reduction of the overall environmental impact of an industry (OECD, 2020).

Box 2.3 Examples of how countries and regions define the environmental scope of BREFS

European Union

The scope of the environmental issues to be addressed in the development or review of a BREF stems from the legislative framework of the IED, notably Article 13 and Annex III. Recently, the European Commission has proposed a new approach to focus the information exchange in the TWGs, with an attempt to speed up the review process and focus the resources spent. In line with this new approach, each TWG should identify the Key Environmental Issues (KEI) for the concerned industrial sector. According to the European Commission, KEI are issues for which BAT Conclusions have the highest likelihood of resulting in noteworthy additional environmental benefits (EC, 2015[34]). The criteria below were proposed for defining KEI by the EC in 2015, and have been used in recent BREF reviews, although they are not officially endorsed by the IED Forum.

- Define KEI at the earliest possible stage of the information exchange, using the following criteria:

- environmental relevance of pollution caused by the activity or process, i.e. whether it may cause an environmental problem;

- significance of activity (number of installations, geographical spread, contribution to total [industrial] emissions in the EU);

- potential of the BREF review to identify new or additional techniques that would further significantly reduce pollution; and

- potential of the BREF review to establish BAT-AELs that would significantly improve the level of environmental protection from current emission levels.

• In order to apply the identified criteria, information on the following elements is needed before the review takes place:

- the emissions of the activities concerned and their broader environmental relevance;

- the general environmental performance of the techniques applied within the sector; and

- the recent evolution of the techniques applied in the sector and their environmental performance (EC, 2015[34]).

There is currently no consensus on the KEI-based approach amongst EU stakeholders. Some highlight the need to elaborate and agree on a standard methodology to determining KEI, as has been attempted in a study by the European Union (OECD, 2019[7]). Further, environmental NGOs argue that the KEI approach arbitrarily restricts the scope of BREFs, and reduces the practical impact of a BREF in terms of pollutants covered and environmental issues addressed, as well as delays the process to develop and review BREFs.

3. APPLIED PROCESSES AND TECHNIQUES

3.1 COATING OF VEHICLES

3.1.1 GENERAL

This section briefly describes the current production process and the directly associated activities for the serial painting of cars, vans, trucks (truck chassis), truck cabins and buses. It also indicates the main integrated techniques applied for the prevention and reduction of emissions.

The information is primarily based on cars, as their coating covers the full range of applied processes and techniques. The painting processes for the coating of vans, trucks and truck cabs have many similarities with the painting of cars and can have similar environmental impacts, but they also exhibit some differences, with for example truck units (cabs and chassis) being painted separately. Significant deviations can be experienced from the serial painting of cars due to the use of different coating materials, processes, application techniques and layer constructions. Although optical surface qualities are as important as for cars, corrosion protection is more important for vans and trucks than in other sectors. Differences include different body designs and sizes, lower production volumes, the different end uses, and therefore different quality and other customer criteria.

3.1.2 OVERVIEW OF PAINT SHOP INVESTMENT, DESIGN AND OPEARATION

Each manufacturer has its own company- or brand-specific priorities and targets for the various quality demands and customer expectations for passenger cars, vans, trucks or buses. However, there are other objectives to be met, such as shareholder expectations and legal requirements including environmental issues.

These factors all influence the ‘company philosophies’ about how to design and operate a paint shop, so both the technical layout of the installations and the chosen corrosion protection and paint systems vary. The choice of paint systems and paint shop type are crucial to the reduction of VOC emissions and energy usage and are a 20- to 40-year commitment. While some retrofitting and updating of technologies may be carried out, this has a more limited effect on emissions and consumption.

Vehicle paint shops can be seen as belonging to three ‘families’. The decision to invest in a particular family is irreversible until a paint shop is rebuilt. Note that not all techniques can be combined and not all techniques are interchangeable, as the choice of compatible techniques is limited within a particular family.

Vehicle manufacturers with installations of this size are large companies and (predominantly) multinational or part of multinational groups. Such companies have well-developed management systems to balance and integrate the competing objectives outlined above. Those that may have the **most significant impacts on consumption and emissions from production** are:

- capital and business planning;
- operational management including quality systems and maintenance;
- environmental management systems.

In paint shops for passenger cars, the process steps are carried out in sequential lines and each subprocess is applied in a separate section of a line. Standard line capacities are between 30 and 60 units per hour. Normally the number of shifts per day is varied (one, two, three) to adjust the paint shop output to customer demand, rather than changing the line speed. If higher output is required, additional lines are operated in parallel.

Paint shops are large and complex installations. Together with workstations for body preparation, inspection sections, body and material storage areas, ventilation equipment, paint overspray scrubbers, VOC abatement systems, and staff and maintenance areas, an installation with one paint shop line with a capacity of 30 units per hour stretches over several floors with a total area of 70 000 m^2 to 100 000 m^2. The total line length of these different production segments is about 1.5 km. The estimated investment costs for a new paint shop of this size are between EUR 150 million and EUR 250 million (2018 values). The processing time of a body in the paint shop is between 6 and 11 hours.

The heart of the paint shop, the spray booths, are very large units with at least three floors and cabin lengths between 60 m and 90 m per subprocess. In order to implement such a spray booth, a free building height under truss of at least 14 m is required to accommodate the key elements of the booth (overspray scrubber, application zone with service and technical cabinet area and plenum) (JRC, 2020).

4. AUTOMOTIVE CASE STUDIES

4.1 VOLKSWAGEN SLOVAKIA

Volkswagen Slovakia uses the best available technologies on the market - **Best Available Technologies (BAT)** - in its production halls and pays great attention to the constant reduction of energy, materials and raw materials consumption. Air protection focuses on reducing the total amount of emissions produced, either by prioritizing materials with a low content of volatile organic compounds or by using effective separation devices. Wastewater from operations is cleaned before being released into the waterways in neutralization stations and then in a central wastewater treatment plant. In the field of waste management, the priority is prioritizing recovery (recycling) over disposal (exporting waste to a landfill) and consistent separation of waste by type in all operations. You can read **specific ecological measures** in the lines below.

Pressing plant

Instead of a mechanical flywheel, the main drive of the press and the mechanization was equipped with servo technologies with energy storage (when stopping, braking). During the pressing cycle, recovery processes take place in which energy is recovered, energy consumption drops by 20%. By installing LED lighting in the hall, 40% of energy was saved. The logistics area of the pressing plant is heated using the air flow from the pressing line equipment. By deploying KUKA KRC4 robots, 20% of energy was saved.

Body shop?

An important joining technique is energy-efficient resistance spot welding. Ecological processes are used, such as gluing with low-content adhesives, or solvent-free and laser welding. The energy efficiency of laser aggregates has been significantly increased over the past years. Many machines are hydraulically driven in the production of bodywork. The respective aggregates are equipped with catch basins. These protect the subsoil from leaking hydraulic fluid in the event of an operational failure. During welding, the fumes are extracted in a targeted manner and before being released into the environment, polluting particles are removed by means of suitable filter devices. Metal scraps left over from bodywork production are transported for recycling.

In addition to the welding workplace, the most important facilities relevant from the point of view of the environment and energy include a line for surface pretreatment of aluminum parts and a neutralization station, which according to EU regulation no. 75/2010 are among IPKZ facilities.

Paint shop

During production, we limit the generation of emissions using separators and filters. In addition, the generated wastewater is treated and cleaned before being discharged into the recipient. Thanks to the innovative 2010 painting process, the filling layer is omitted. The filler function is integrated into the base coat, which reduces the occurrence of hazardous waste and the weight of the vehicle by 0.5 kg. Electrostatic separation (E-Scrub) in the paint shop for vehicles of the New Small Family series is a technology for separating waste paint produced during body painting. The paint, which is not applied to the body during the spraying process, remains in the form of aerosols in the air of the cabin. These aerosols are removed to the separation system by forced air circulation. This system removes paint particles from the air, and 90% of the air thus cleaned becomes circulating air again. In 2011, this electrostatic separation technology was used in mass production for the first time at the VW SK plant in Bratislava. As part of the identification of the problem of the frequent occurrence of dirt during interior painting, the DÜRR company has developed a new type of heads with atomizers of spraying robots specially designed for spraying paint into the interior spaces of the body (EcoBell 3Ci). Stronger and narrower tubes can focus and direct the interior of the body much more accurately, with the oppositely charged paint to the negatively charged surface of the body immediately adhering to the surface, ensuring a faster and more efficient process.

Assembly

At the end of the line, the vehicle moves to the adjustment workstations, which, like the vibrating chair for the first test run, are equipped with exhaust air cleaning. In the area of vehicle assembly, the waste from the packaging in which the parts were packed is reused, or valorizes as a secondary raw material. For example, adhesive residues and cleaning rags containing solvents are separated from secondary raw materials by means of sorted collection.

Production of aggregates

According to the prescribed standards, the transmission oil is filled into the transmissions through a fully automatic device. This device guarantees 100% quality of our products. At the same time, oils are used that ensure lifetime operability of the gearbox without the need for an oil change. The largest and at the same time significant facility in terms of the environment and energy in the hall is the DKTL line with a neutralization station (IPKZ facility according to EU Regulation No. 75/2010).

Logistics

At the Volkswagen Slovakia plant, 6 products are produced under five corporate brands. The most modern logistics systems and technologies are used to ensure a sufficient amount of parts for production. The entire volume of material, which represents more than 30 thousand types of parts for all six products, is managed through multiple logistics systems such as LOGIS, MEMPHIS.

Several innovative technologies, such as Pick by Point, Pick by Light and FTS - an unattended transport system, are used to pick up the material at the point of consumption.

Waste water treatment plant

Volkswagen Slovakia operates its own wastewater treatment plant, which has undergone several modernizations and reconstructions during the history of the plant in order to increase its capacity and improve the purification of water generated in production and non-production operations. An indicator of the quality of purified water is the crayfish breeding station, which is filled with purified wastewater from the operation of the treatment plant.

Selected measures and BAT technologies

Adhesives management

Bags with glue are placed in the glue barrels, and only the bags with a minimal amount of glue are generated as waste. Empty barrels remain clean and can be used again. The amount of waste from barrels has been reduced by up to 70% and up to 576 barrels are saved annually.

Driverless transport systems

To transport material from the logistics department to the relevant workplace, so-called driverless transport systems, which are a substitute for forklift trucks, achieving cost and energy savings of up to 60%. The transport systems are centrally controlled and charged using an energy loop built into the floor.

In the production halls of VW SK, electronic tools are used instead of pneumatic tools, which worked on the principle of compressed air, which saves up to 30% of energy.

Intelligent lighting in the halls of the Bratislava VW SK plant is automatically switched on when employees enter the workplace. The lighting is centrally controlled and switched on only when really needed. Intelligent lighting is also introduced in the production hall in Martin, saving 264 tons of CO_2 annually (VW Slovakia 2013).

4.2 PSA SLOVAKIA

4.2.1 TECHNOLOGIES

The negative impact of car production on the environment cannot be completely eliminated, but we try to minimize it. The paint shop is the most important production process from the point of view of environmental impact and as such falls under the law on integrated pollution prevention and control. It is the main source of emissions of volatile organic compounds (VOC) into the air, wastewater and hazardous waste. In order to limit these effects, PSA Slovakia mostly use water-dilutable paints in Trnava. The paint shop also includes a physico-chemical wastewater treatment plant, which cleans wastewater from the surface treatment process and from the painting process. Heavy metals from these waters are precipitated here in the form of sludge. Sewage and industrial wastewater are treated in the biological wastewater treatment plant, which is located on the premises of the production center. Sludge from wastewater treatment is further evaluated. The implemented water-saving measures and the installation of BAT technology in the paint shop allowed us to reduce water consumption to the current 0.94 m^3/car, which makes us one of the plants with the lowest water consumption per manufactured vehicle within the PSA Groupe. PSA Slovakia have reduced energy consumption to the current 470 kWh/vehicle through appropriate energy management measures implemented throughout the company. PSA Slovakia is also one of the least energy-intensive companies in the PSA Group in terms of one vehicle produced. In the area of production of emissions of volatile organic substances, we reach a value below 20g/m^2, which puts us among the first 3 best plants (PSA Slovakia, 2023).

The Stellantis Group has decided on the allocation of a new segment B production program in its production center in Trnava. This decision in favor of Trnava is an award for the production center's performance, which it achieved thanks to the **transformational project Future in our hands**. It results in a joint commitment to become the leader of the Stellantis group in the domains of economic performance and client quality both in the short and long term. The signing of a four-year collective agreement with the trade union organization OZ KOVO also made a significant contribution to obtaining a new production program. The collective agreement protects the car company and its employees, specific obligations are predictable thanks to it, and at the same time it supports increasing the competitiveness of the production center in Trnava. The gradual start of production of the new segment B production program is planned from 2023. In order to significantly contribute to increasing carbon neutrality, a large part of the production program will also be represented by fully electric motors. Part of the Trnava team will immediately start working intensively on the project, which will gradually expand. The industrial investment in the new production program will also mean a significant mobilization of activities associated with innovations, further application of Industry 4.0 technologies, reduction of energy consumption and environmental protection. Innovations and digitization in production processes and in reducing energy consumption mean a chance to improve long-term competitiveness. They will also be a concrete contribution to the green economy. A specialized technology center team called InoLab was created to manage these projects. In addition to our joint internal mobilization, one of the key activities in favor of the decision on the allocation of investment in Trnava was also active communication with the Slovak government on improving the business environment in Slovakia (PSA Slovakia, 2021).

4.3 JAGUAR LAND ROVER SLOVAKIA

Jaguar Land Rover wants to **reduce emissions** by 46% by 2030 In addition, it will reduce average vehicle emissions in its value chains by 54%, including a 60% reduction during vehicle use.

Jaguar Land Rover has committed to reducing greenhouse gas emissions in its operations by 46% by 2030. In addition, it will reduce average vehicle emissions in its value chains by 54%, including a 60% reduction during vehicle use. These goals were approved by the Science Based Targets (SBTi) initiative and confirm the company's direction to reduce emissions corresponding to a temperature increase of 1.5 degrees Celsius in accordance with the Paris Agreement, informed Jaguar Land Rover Slovakia Corporate Affairs Manager Miroslava Remenárová.

The Science Based Targets initiative was established in 2015 to help companies set emission reduction targets in line with climate science and the goals of the Paris Agreement.

It is funded by the IKEA Foundation, Amazon, the Bezos Earth Fund, the We Mean Business coalition, the Rockefeller Brothers Fund and the UPS Foundation. In October 2021, SBTi developed and launched the world's first net zero standard, which provides a framework and tools for companies to set science-based targets and limit the global temperature increase above pre-industrial levels to 1.5 degrees Celsius (SITA, 2022).

4.4 KIA SLOVAKIA

Kia Slovakia is a company with a responsible approach to the environment, with an established and certified environmental management system according to the international standard ISO 14001, which helps not only to effectively manage and fulfil legal and other requirements, but also to constantly improve environmental protection. An important part of the system is also the regular monitoring and evaluation of the consumption of energy, media and materials, as well as the amount of produced waste, waste water and emissions per manufactured vehicle and the adoption of environmental measures to reduce the impact on the environment.

Kia Slovakia has set the following long-term environmental goals:

- reducing emissions and the risk of environmental damage
- reducing the amount of produced waste and increasing the rate of their recycling and recovery
- reducing the amount of input raw materials, energy and chemicals for the manufactured vehicle and engine
- increasing the level of emergency preparedness
- development of the management of chemical substances (REACH) and raising the awareness of employees

KIA Slovakia is focusing on the **production of environmentally friendly cars**, which is evidenced by the certificates for the produced models: LCA - Life cycle assessment according to ISO 14040 and Integrating environmental aspects into product design and development according to ISO 14062 (Kia Slovakia, 2023).

The environmental policy of Kia Slovakia is based on the principles of corporate policy Kia Corporation, whose priority concerns are people and the environment The basic vision is minimization of emissions that pollute the environment, energy conservation and active ecological implementation gentle technologies in all production areas

The basis of the environmental policy is the established and certified system of environmental management according to the ISO 14001 standard, which the company is constantly improving, and with which it was in 2017 certified for a new revision of this standard In 2021 there was a successful recertification of the "System of environmental management", which obliges the company not only to comply with legislative requirements, but also to the continuous improvement of environmental protection, regular assessment noting environmental performance and increasing environmental awareness of all employees regular monitoring and evaluation is also an important part of the system consumption of water, energy and materials, as well as the amount of produced waste and wastewater and emissions per manufactured vehicle and adopting environmental targets for improvement of these indicators In the paint shop and in the engine shop, it was possible to implement projects in the last period aimed at the recovery of waste heat and its reuse

The goal of Kia Slovakia is the permanent improvement of the environmental management of the plant, therefore even in 2022, a number of smaller and larger measures were introduced that contributed to the better sorting and minimization of waste, reducing the amount of emissions of volatile organic substances and saving electricity and natural gas (KIA Slovakia, 2022)

TEST QUESTIONS

1) Describe how BREFs fit in a regulatory regime for environmental impacts of industry?
2) What is BAT?
3) Describe three pillars of BAT?
4) The EU definition of BAT?
5) Examples of benefits of BAT-based permitting?
6) Describe the steps to establishing BAT, BAT-AE(P)Ls and BAT-based permit conditions?
7) Best Available Techniques" (BAT) in the Slovak legislation?
8) What is BREF?
9) Examples of how EU countries and regions define the environmental scope of BREFS?
10) Specific ecological measures in VW Slovakia?
11) Use of BAT in VW Slovakia?
12) Use of BAT in PSA Slovakia?
13) Use of BAT in Jaguar Land Lover Slovakia?
14) What are the targets for reducing emissions in Jaguar Land Lover Slovakia?
15) What kind of long-term environmental goals has set KIA Slovakia?

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Best Available Techniques (BAT) Reference Documents (BREFs)

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